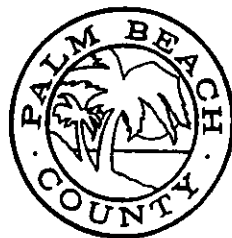


Drilling and Testing of the Deep Injection and Monitoring Wells at the Palm Beach County Southern Region Wastewater Treatment Plant

Prepared for the

**Palm Beach County
Water Utilities Department**



Prepared by

CH2M HILL

ENGINEERING REPORT

DRILLING AND TESTING OF THE DEEP INJECTION AND MONITOR WELLS AT THE PALM BEACH COUNTY SOUTHERN REGION WASTEWATER TREATMENT PLANT

Prepared for:

**The Palm Beach County
Water Utilities Department**

Prepared by:

CH2M HILL
800 Fairway Drive, Suite 350
Deerfield Beach, Florida 33441

May 1991
SEF24770.T0



Engineers
Planners
Economists
Scientists

50.349

July 26, 1991

SEF24770.T0

Mr. Bevin Beaudet, P.E.
Director Palm Beach County Water
Utilities Department
2065 Prairie Road
West Palm Beach, FL 33416

Dear Bevin:

Subject: Completion Report and Operations and Maintenance Manual for the
Deep Injection and Monitor Wells at the Palm Beach County Southern
Region Wastewater Treatment Plant

It is with great satisfaction that we submit to you the Engineering Report and
Operation and Maintenance (O&M) Manual covering construction and operation of
the Deep Injection Wells at the Palm Beach County Southern Region Wastewater
Treatment Plant.

The Engineering Report includes the data collected during the construction and
testing of the two deep injection wells and one dual-zone monitor well. These wells
wer constructed in accordance with the specific conditions of the Construction and
Testing Permit Numbers UC 50-165238 and UC 50-165239 issued by the Florida
Department of Environmental Regulations on February 27, 1990. Copies of the
Construction Permit, and their provisions are also included in Appendix A of the
report.

The O&M Manual has been prepared as a reference guide for the operation of the
Deep Injection and Monitor Wells at the Southern Region Wastewater Treatment
Plant. The manual is to be used in conjunction with the Southern Region Wastewater
Treatment Plant Phase I O&M Manual prepared by Hazen and Sawyer.

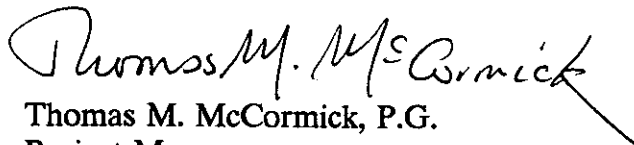
We are pleased to report that the project has been successfully completed within the
restrictive time frame and budget specified in the contract. This achievement was


Mr. Bevin Beaudet, P.E.
Page 2
May 29, 1991
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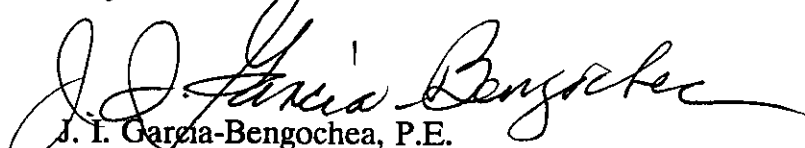
possible because of the personal interest and assistance of the Palm Beach County staff, the efficient performance by the Contractor, the cooperation of the FDER Technical Advisory Committee.

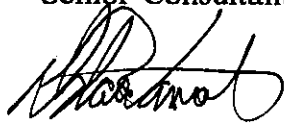
Very truly yours,


CH2M HILL


Thomas M. McCormick, P.G.
Project Manager


Albert Muniz, P.E.
Project Administrator


J. I. Garcia-Bengochea, P.E.
Senior Consultant


Doug VanNote
Project Geologist


Bart Ziegler
Project Engineer

dbt088/105.51
cc: Greg McIntyre/CH2M HILL

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ACKNOWLEDGEMENTS

The successful completion of the Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System was the result of continuous communication and cooperation between the many organizations and individuals involved in its design, construction and permitting these. These organizations are: The Palm Beach County Water Utilities Department (PBCWUD), the Florida Department of Environmental Regulation (FDER), the Environmental Protection Agency (EPA), the South Florida Water Management District (SFWMD), the Lake Worth Drainage District (LWDD), the United States Geological Survey (USGS), the Palm Beach County Health Department (PBCHD), Hazen & Sawyer, and Youngquist Brothers, Inc.

Individuals who played a key role in this achievement were:

PBCWUD

Bevin A. Beaudet, P.E., Director
Richard J. Tuttle, P.E., Assistant Director
Paul Feldman, P.E., Project Manager

FDER

Al Mueller, P.G., P.E., TAC Chairman
Margaret Highsmith, P.G., Environmental Specialist
Richard J. Deuerling, P.G., UIC Supervisor
Cathleen Conrardy, Environmental Specialist II
Bawo Okome, Environmental Specialist
Ed Rahrig, Environmental Specialist

EPA

Steve Berton, Geologist, UIC Permit Unit

SFWMD

Greg Rawl, Hydrologist, Supervisor Professional Water Use

LWDD

Patrick A. Martin, P.E., District Engineer

USGS

Michael Merritt, Research Hydrologist

PBCHD

Anthony LasCasas, Engineer II

Hazen & Sawyer

Saddi Chibbani, P.E., Project Manager
John Chesher, P.E., Resident Engineer

Youngquist Brothers, Inc.

Tim Youngquist, Vice President Youngquist Brothers
Jim Brantley, President Drilling Operations
Kevin Greuel, Project Superintendent
Mike Sordan, Contract Administrator

CH2M HILL

J. I. Garcia-Bengochea, P.E., Ph.D., Senior Consultant
Thomas M. McCormick, P.G., Project Manager
Albert Muniz, P.E., Project Administrator
Doug VanNote, Project Hydrogeologist
Bart Ziegler, Project Engineer

EXECUTIVE SUMMARY

The Palm Beach County Board of County Commissioners approved construction of the Southern Region Wastewater Treatment Plant and an effluent reuse system in May 1989. Construction of the plant, which began in June 1989, is expected to be completed in August 1991. The backup effluent disposal facilities, two deep injection wells and a dual-zone monitor well, were started in March 1990 and were completed in December 1990.

This engineering report describes the construction and testing of the two 24-inch diameter deep injection wells (IW-1 and IW-2), a dual-zone monitor well (DZMW). The deep injection wells were constructed in accordance with the applicable section of the Florida Administrative Code (FAC) Chapter 17.28, and the Contract Documents for the Construction of Two Deep Injection Wells and One Dual-Zone Monitor Well for the Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, prepared by CH2M HILL in August 1989. The effluent disposal system has a total capacity of 30 mgd.

Construction of the injection and monitor wells was performed by Youngquist Brothers, Inc., and began on March 24, 1990. IW-1 and IW-2 were drilled to a total depth of 3,311 feet and 3,450 feet, respectively. The upper and lower monitor zones of the DZMW were completed through the intervals from 1,000 feet to 1,096 feet and 1,900 feet to 1,984 feet. Construction of the two deep injection wells and DZMW were completed on December 26, 1990. Both wells successfully passed mechanical integrity testing, and appear capable of accepting 15 mgd of treated effluent each.

Section 1

INTRODUCTION

An effluent management study for the Southern Region Wastewater Treatment Plant was performed by CH2M HILL and submitted in September 1988. This study recommended wastewater treatment and effluent reuse as the primary disposal methodology with deep well injection as a backup disposal method.

In May 1989, the Palm Beach County Board of County Commissioners approved the construction of the Southern Region Wastewater Treatment Plant to serve the citizens of Palm Beach County. Phase I construction for this facility included two Class 1 municipal deep injection wells and a dual-zone monitor well. Work on the plant commenced in June 1989, construction of the wells commenced in March 1990.

SCOPE

This report describes the construction, drilling and testing of the two 24-inch inner casing injection wells, the 6-inch dual-zone monitor well, and the surge control system for the wastewater treatment plant of the Palm Beach County Southern Region Wastewater Treatment Plant in southeast Florida. It summarizes and presents the data obtained during the drilling and testing.

Construction and testing of the wells was performed in accordance with Florida Administrative Code (FAC) Chapter 17-28 Underground Injection Control (UIC), the recommendations of the Technical Advisory Committee (TAC), and the provisions of FDER construction permits. The wells and appurtenances were constructed following the contract documents for the Construction of Two Deep Injection Wells and One Dual-Zone Monitor Well for the Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, prepared by CH2M HILL in August 1989.

PROJECT DESCRIPTION

The Southern Region Wastewater Treatment plant is located west of Delray Beach, Florida, east of the Florida Turnpike, and north of Canal L-30. The plant address is 12751 Hagen Ranch Road, Boynton Beach, Florida 33473. Figures 1-1 and 1-2 show the location of the plant and the site layout, respectively.

On February 26, 1990, the Florida Department of Environmental Regulation (FDER) issued Permit Numbers UC 50-165238 and UC 50-165239 to the Palm Beach County Water Utilities Department. These permits allowed for the construction of two Class I test deep injection wells and a dual-zone monitor well at the Southern Region

PALM BEACH COUNTY



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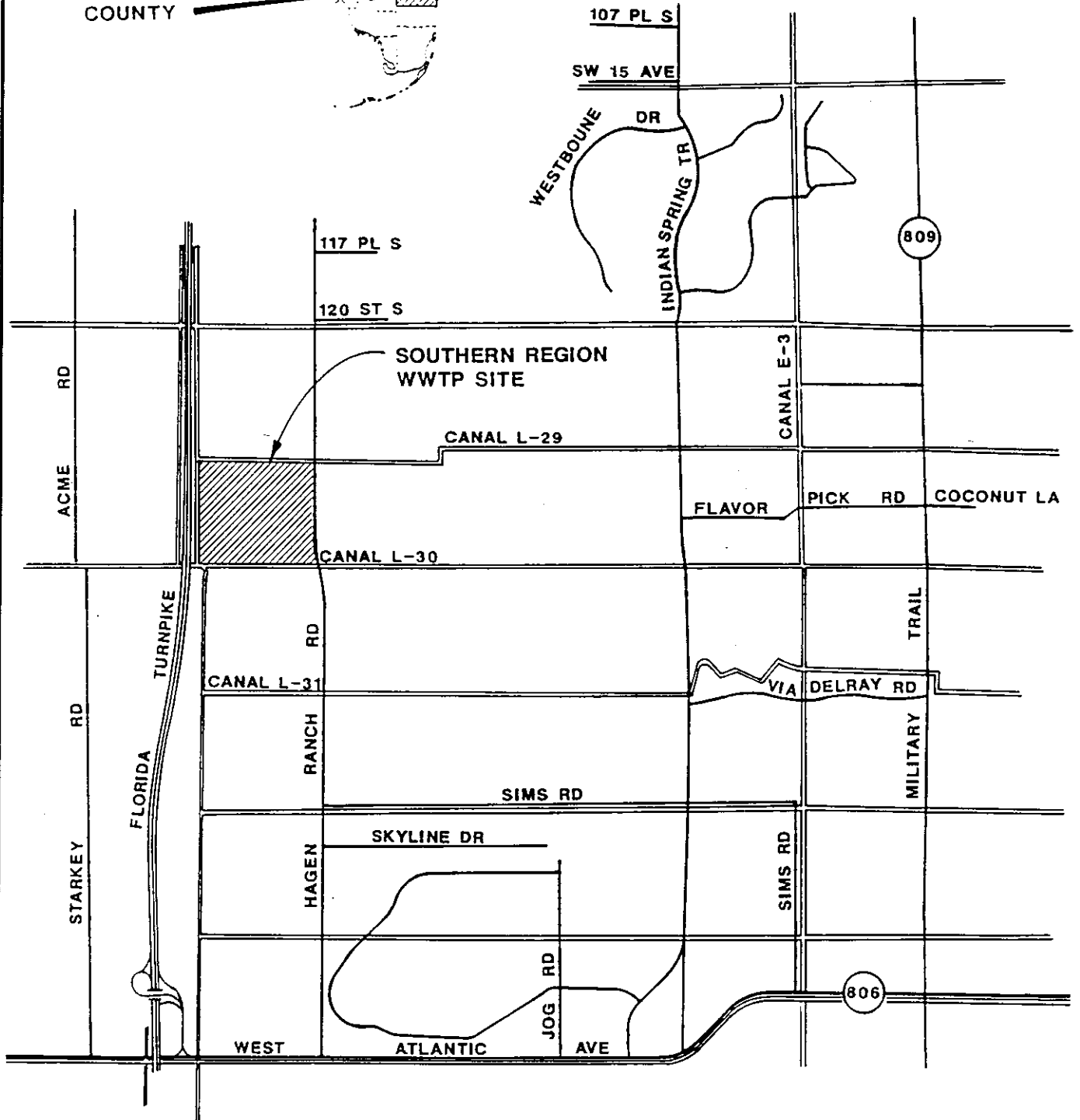


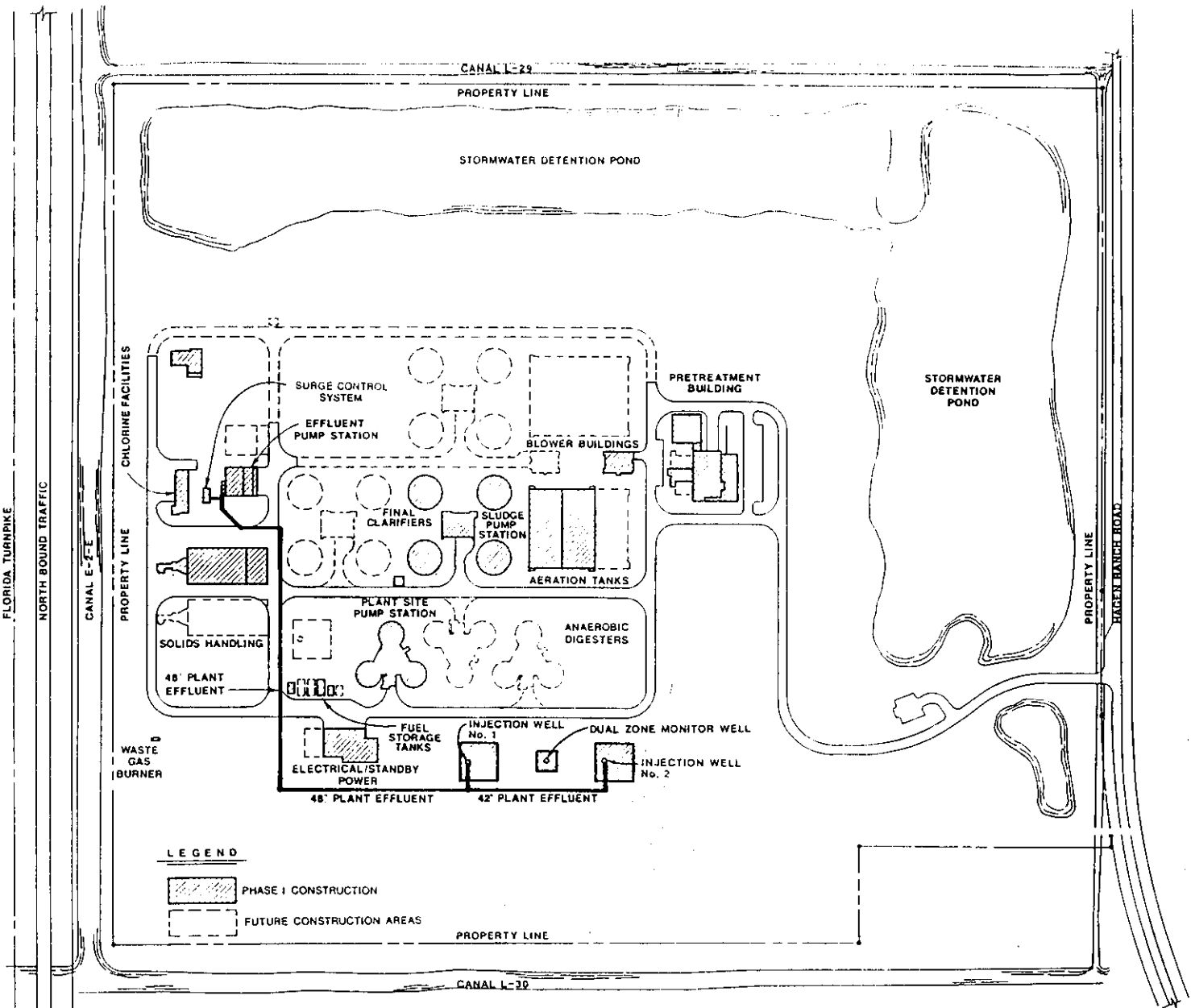
FIGURE 1-1

Project Location Map





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

 PHASE I CONSTRUCTION
 FUTURE CONSTRUCTION AREAS

FIGURE 1-2
Site Plan

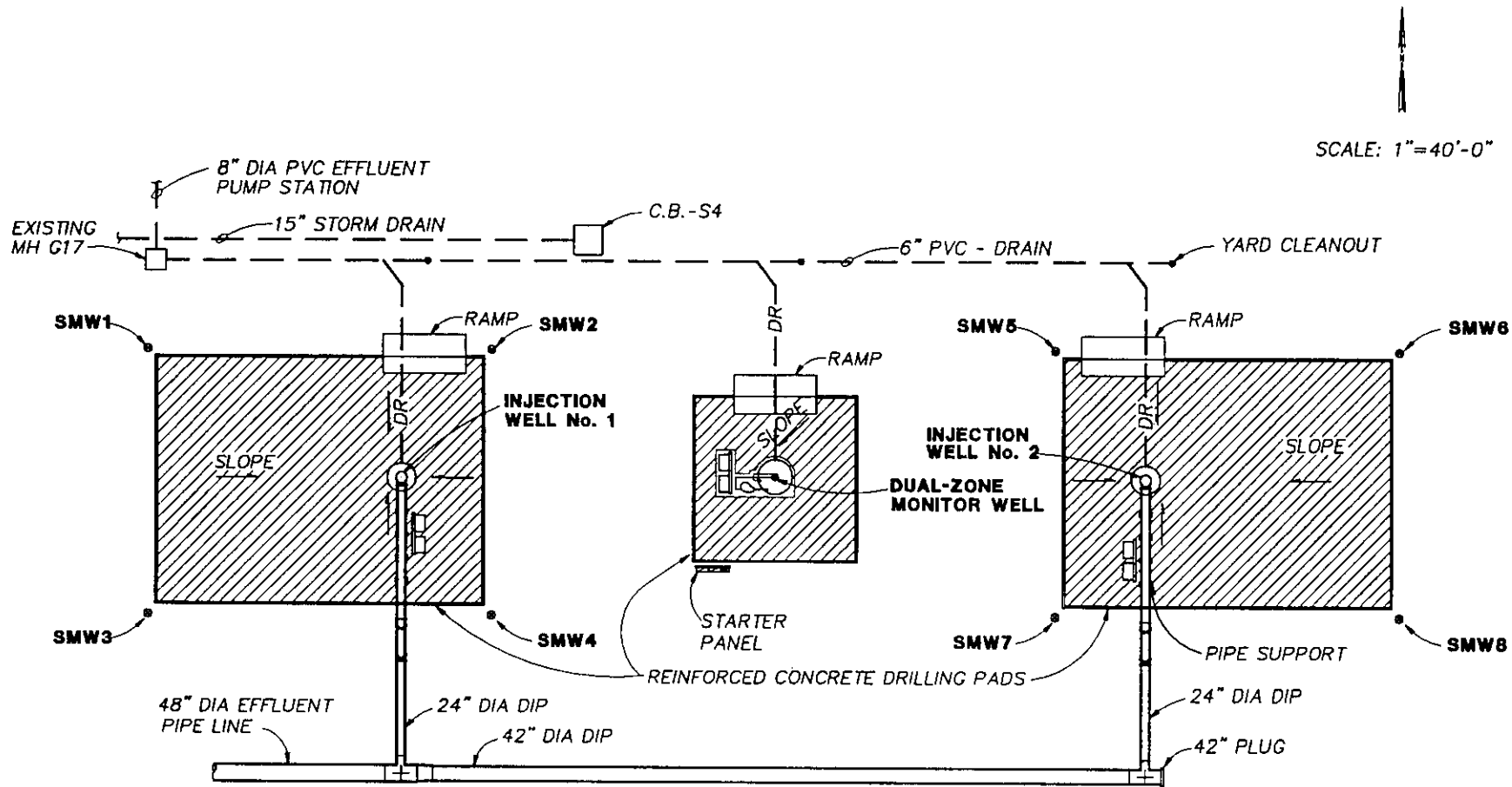


Wastewater Treatment Plant. Copies of these permits and their specific conditions are in Appendix A.

Construction of plant commenced in June 1989. Hazen & Sawyer served as the engineer of record for construction of the wastewater treatment plant. CH2M HILL served as the engineer of record for the design, permitting, and installation of the two injection wells, the dual-zone monitor well and appurtenances..

On March 24, 1990, Youngquist Brothers, Inc. (project low bidder) was given Notice to Proceed with construction of the deep injection well system. Under a 269-day (including time extensions) construction contract to Palm Beach County, Youngquist Brothers, Inc. constructed three reinforced concrete drilling pads, two 24-inch diameter deep injection wells, one 6-inch diameter dual-zone monitor well, eight surficial monitor wells, a 10,000 gallon surge control system, and associated instrumentation. Drilling and testing of the injection wells was completed on November 14, 1990.

The FDER Technical Advisory Committee (TAC) coordinated the actions of local, state, and federal agencies, including FDER's state and local representatives, the South Florida Water Management District (SFWMD), the Environmental Protection Agency (EPA), the Palm Beach County Health Department (PBCHD), and the United States Geological Survey (USGS). The TAC members met periodically to review project progress and testing procedures. Summaries of the TAC meetings are included in Appendix R. Daily engineer's and weekly summaries of the construction progress were prepared and submitted to members of the TAC and are found in Appendix P and Appendix Q, respectively.



LEGEND

- SMW Surficial Monitor Well
- MH Manhole
- CB Catch Basin
- DIP Ductile Iron Pipe

FIGURE 2-1
 Drilling Pad Diagram at the Palm Beach County
 Southern Region Wastewater Treatment Plant



Section 2

CONSTRUCTION

The effluent disposal system consists of three drilling pads, two 24-inch-diameter injection wells, a dual-zone monitoring well, and a surge control system. The reinforced concrete drilling pads were constructed prior to the initiation of drilling to provide a stable platform to support drilling equipment loads and to contain minor spills that occur during drilling operations.

The deep injection wells and dual-zone monitor well were constructed in accordance with the requirements of the FAC Chapter 17-28. Multiple, telescoped casings of new and unused steel were used during construction. The final well casings were seamless mild steel pipe with a 0.500-inch wall thickness. The cementing program was specifically tailored for each casing set.

INJECTION WELL NO. 1

Notice to proceed with construction of the wells and appurtenances system was issued to Youngquist Brothers, Inc. on March 24, 1990. Construction of three reinforced concrete drilling pads commenced on March 26, 1990. The drilling pad layout is presented in Figure 2-1. On April 19, 1990, 60-inch surface casings were vibrated in place for IW-1 and IW-2. The casings were vibrated in place to 50 feet and 25 feet below land surface (bls) for IW-1 and IW-2, respectively. All casing depths are referenced to top of pad level at each well.

Drilling of IW-1 began on May 2, 1990. Both mud rotary and reverse-air drilling techniques were used during construction. Mud rotary techniques were used to drill a pilot hole in stages to 250 feet and 1,000 feet. Subsequent stages to 2,200 feet and 3,300 feet were drilled using reverse-air techniques to remove cuttings and to collect water samples at 30-foot intervals. A closed circulation system was used during construction because there was no readily acceptable disposal site for the drilling fluids.

The drilling schedule and casing setting depths were designed to meet the hydrogeological features expected at the site as well as various regulatory agency requirements. Geologic formation samples were collected and described at 10-foot intervals during the drilling of a 12-inch-diameter pilot hole drilled ahead and at the same site of each injection and monitor well. Data from formation samples (cuttings), water samples, and geophysical logs run on each pilot hole interval were

evaluated to provide the basis for selecting the actual casing setting depths. Each pilot hole was then reamed to the specified diameter for the selected casing setting. Drilling, testing, and geophysical logging events are summarized in Table 2-1.

Four concentric steel casings (54-, 44-, 34-, and 24-inch-diameter) were used in the construction of the well. The 54-inch casing was set in a 60-inch borehole following drilling of the pilot hole. It was then cemented from the top of the upper confining beds at a total depth of 260 feet to the surface to prevent possible contamination of the surficial aquifer.

The pilot hole was continued to 1,008 feet and logged. Then, installation of the 44-inch casing was completed through the confining intervals of the Hawthorn and Tampa formations and into the top of the Floridan aquifer system to a depth of 1,000-feet. This casing setting depth was selected to prevent interference from the swelling clays and soft limestones during reverse-air drilling below 1,000-feet, and to protect the integrity of the upper confining interval.

The pilot hole was then completed to 2,200 feet and two straddle packer pumping tests were performed over the interval from 1,882 feet to 1,950 feet. The tests were performed in waters which were anticipated to have a total dissolved solid (TDS) content greater than 10,000 mg/l. The test was successful in demonstrating that waters from the tested interval contained a TDS content greater than 10,000 mg/l. Conductivity and chloride concentration of the purged water were monitored during the test. The conductivity stabilized at 48,000 umhos/cm after 1.5 hours of pumping at approximately 71 gpm. Conductivity and chloride data collected during the test are in Appendix F. A water sample collected at the end of the first test (as described in Section 4 Packer Test) indicated a TDS concentration of 36,477 mg/l.

A 34-inch casing was then installed to a depth of 1,890 feet, below the 10,000 TDS interface and cemented back to land surface. This casing was installed as a working casing to control artesian flows of the upper Floridan aquifer system and to prevent possible contamination of the Underground Source of Drinking Water.

A 24-inch diameter, 0.500-inch wall casing (API 5L Grade B Seamless) was installed to a depth of 2,660 feet and cemented in place as the conductor casing for the treated effluent. Appendix B contains the casing mill certificates submitted during construction. Appendix C contains a table summarizing the casing depth and the types and quantities of cement used. Each casing was fully cemented from the base of the

Table 2-1
Summary of Drilling, Testing, and Geophysical Logging
for IW-1 at the Palm Beach County Southern Region
Wastewater Treatment Plant

Hole Depth (feet)	Nominal Diameter (inches)	Date Completed	Geophysical Logging	Remarks and/or Section Drilled
50	60	04/19/90	None required	Surface casing vibrated in place.
270	12	05/04/90	LSN Electric, gamma ray, caliper	Logs performed on pilot hole to determine 54-inch casing setting depth.
270	60	05/08/90	None required	Completed borehole with 58-1/2-inch bit to set 54-inch casing.
260	60	05/11/90	None Required	Completed installation of 54-inch casing.
1,008	12	05/14/90	LSN Electric, gamma ray, caliper	Logs performed on pilot hole to determine 44-inch casing setting off depth.
1,010	54	05/23/90	None required	Completed borehole with 52-1/2-inch bit to set 44-inch casing.
1,010	44	05/25/90	Temperature	Performed temperature log on first stage of cement.
2,216	12	06/06/90	LSN Electric, gamma ray, caliper, temperature, fluid resistivity, dual-induction, TV	Logs performed on pilot hole to determine 34-inch casing setting depth.
1,882	12	06/07/90	Straddle packer test	Packer test performed to determine the depth of the 10,000 TDS interface
1,904	44	06/24/90	None required	Completed 42-1/2 inch borehole with 42-1/2-inch bit to set 34-inch casing and install drillable bridge plug.
1,890	34	06/28/90	Temperature	Performed temperature log on first stage of cement.

Table 2-1
 Summary of Drilling, Testing, and Geophysical Logging
 for IW-1 at the Palm Beach County Southern Region
 Wastewater Treatment Plant

Hole Depth (feet)	Nominal Diameter (inches)	Date Completed	Geophysical Logging	Remarks and/or Section Drilled
3,300	12	07/15/90	Gamma ray, caliper temperature, fluid resistivity dual-induction, high resolution dip meter, borehole compensated sonic	Logs performed on pilot hole to determine final (24-inch) casing setting depth.
2,670	34	08/02/90	Caliper	Drillable bridge plug set and perform caliper on 32-1/2-inch borehole to cement 24-inch casing.
2,660	34	08/3/90	Temperature	Performed temperature log on first stage of cement.
2,660	24	08/14/90	None required	Performed pressure test on final casing string.
3,311	24	08/22/90	None required	Completed borehole with 22-1/2-inch bit to a total depth of 3,311 feet.
3,311	24	09/19/90	T.V. Survey	Performed black and white TV survey to total depth.
3,311	24	10/30/90	Temperature, LSN, Gamma and Fluid Resistivity	Performed logging under static conditions before conducting injection test.
3,311	24	10/31/90	Fluid resistivity, temperature, and flow meter	Conducted injection test at 4,200; 7,800; and 10,500 gpm. Logs performed at 4,200 gpm.
3,311	24	11/01/90	Caliper	Performed caliper log on complete well.
3,311	24	11/14/90	Gamma ray	Performed radioactive tracer survey.

* TV survey summaries are in Appendix J.

Note: Copies of geophysical logs can be found in Volume II of this report

casing to land surface using both pressure and tremie grouting methods. The well was then drilled open hole to 3,311 feet.

Completion diagrams for the injection well and wellhead are shown in Figures 2-2 and 2-3, respectively.

INJECTION WELL NO. 2

Drilling of IW-2 commenced on June 16, 1990. The same drilling techniques and materials used to construct IW-1 were applied while constructing IW-2.

Four concentric steel casings (54-, 44-, 34-, and 24-inch-diameter) were again used in the construction of the well. The 54-inch and 44-inch casings were also set and cemented to the surface at 260 feet and 1,000 feet, respectively.

While drilling the pilot hole to 2,800 feet, seven core samples were collected at specific intervals to determine hydraulic characteristics of the confining beds above the injection zone. Coring methods and the data gathered are discussed in more detail in Section 4 of this report.

The 34-inch and 24-inch casings were set and cemented to 1,890 feet and 2,645 feet, respectively. Table 2-2 summarizes the drilling, testing, and geophysical logging events. Appendix C contains a table which summarizes the casing depths, amounts, and types of cement used in construction. Completion diagrams for the injection well and wellhead are shown in Figures 2-2 and 2-3 respectively.

DUAL-ZONE MONITOR WELL

Drilling of the 6-inch dual-zone monitor well commenced on August 7, 1990, using the same drilling techniques used for the injection wells. Fluids produced during reverse-air drilling while constructing the well through the artesian zones of the upper Floridan aquifer (below 1,000 feet) were disposed of to the completed injection well No. 1. This technique allowed open circulation drilling of the dual-zone monitor well. Open circulation results in the collection of much more representative water samples during drilling.

The upper and lower monitor zones were constructed in the Floridan aquifer above the primary confining intervals of the injection zones. The zones are open over the intervals from 1,000 feet to 1,096 feet and 1,900 feet to 1,984 feet for the upper and lower monitor zones, respectively.

Three concentric steel casings (24-, 16-, and 6-inch) were used to construct the dual-zone monitor well. Casing setting depths for the dual-zone monitor well were similar

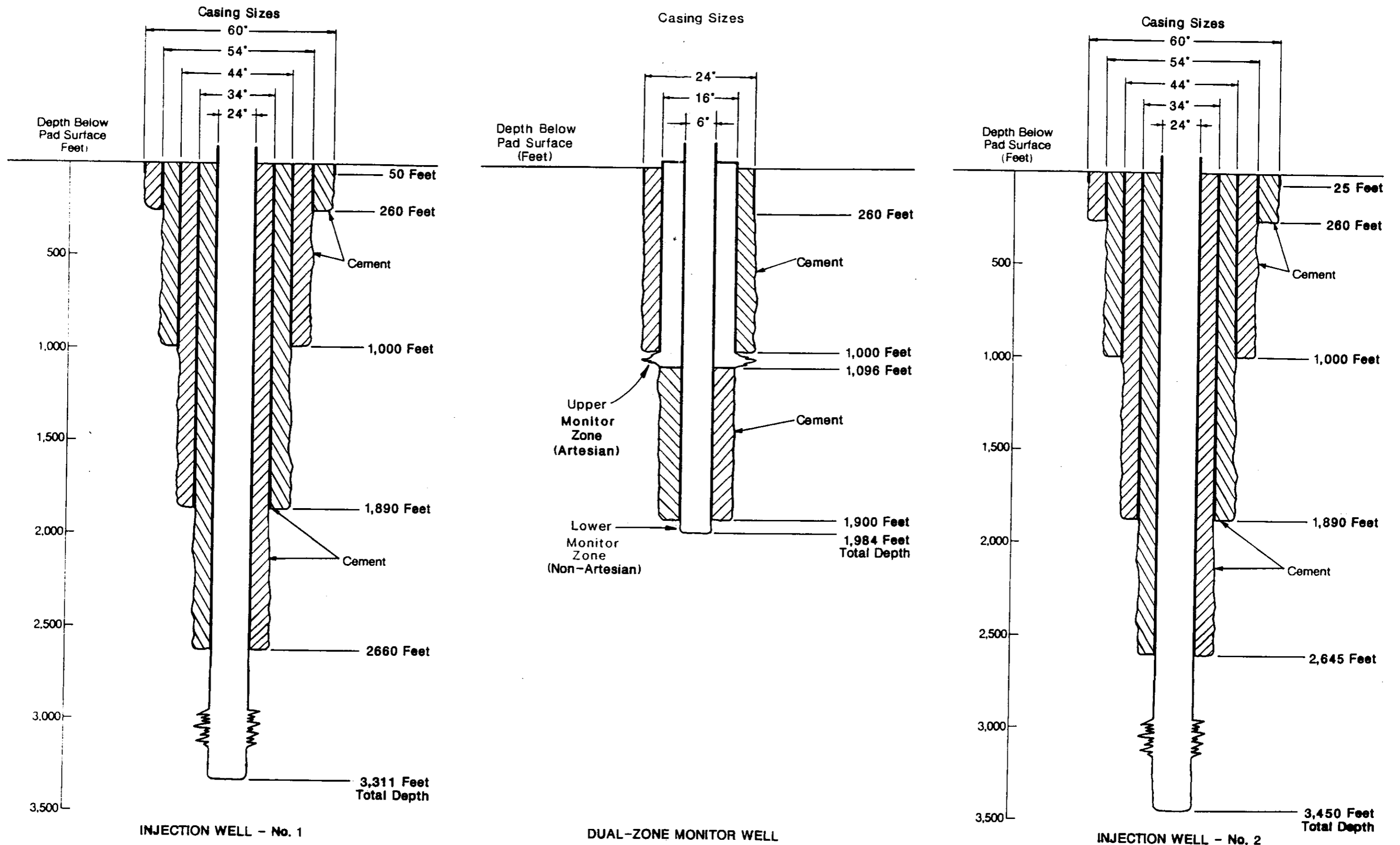


FIGURE 2-2 ©

Injection Well and Dual-Zone Monitor Well Completion Diagrams at the Palm Beach County Southern Region Wastewater Treatment Plant



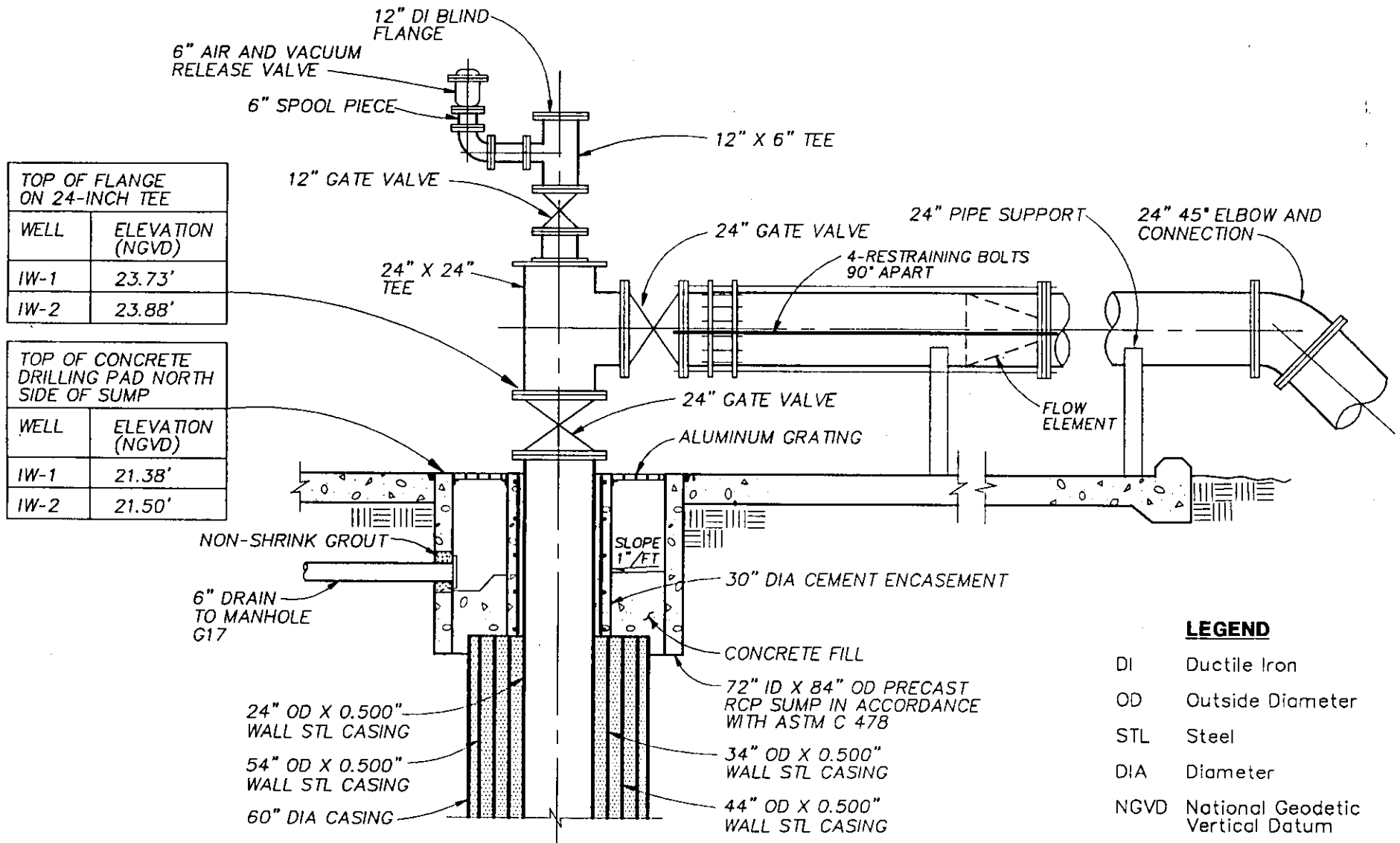


FIGURE 2-3
 Typical Injection Well Wellhead Completion Diagram at the Palm Beach County Southern Region Wastewater Treatment Plant



Table 2-2
 Summary of Drilling, Testing, and Geophysical Logging
 for IW-2 at the Palm Beach County Southern Region
 Wastewater Treatment Plant

Hole Depth Drilled (feet)	Nominal Diameter (inches)	Date Completed	Geophysical Logging	Remarks and/or Section Drilled
25	60	04/19/90	None required	Surface casing vibrated in place.
270	12	06/17/90	LSN Electric, gamma ray, caliper	Logs performed on pilot hole to determine 54-inch casing setting depth.
270	60	06/20/90	None Required	Completed borehole with 58-1/2-inch bit to set 54-inch casing.
270	60	06/22/90	None required	Completed installation of 54-inch casing.
1,010	12	06/24/90	LSN Electric, gamma ray, caliper	Logs performed on pilot hole to determine 44-inch casing setting depth.
,010	54	06/30/90	None required	Completed borehole with 52-1/2-inch bit to set 44-inch casing.
1,010	54	07/02/90	Temperature	Performed temperature log on first stage of cement.
1,953	12	07/12/90	Gamma ray, caliper, temperature, fluid resistivity, dual-induction, depth sampler	Logs performed on pilot hole to determine 34-inch casing setting depth. Depth sampler to confirm waters below 10,000 TDS interface.
1,907	44	07/27/90	None required	Completed borehole with 42-1/2-inch bit to set 34-inch casing and install drillable bridge plug.
1,890	34	07/29/90	Temperature	Performed temperature long on first stage of cement.
2,810	12	08/27/90	LSN Electric, gamma ray, caliper temperature, fluid resistivity, dual-induction, high resolution dip meter, borehole compensated sonic	Logs performed on pilot hole to determine final (24-inch) casing setting depth.

Table 2-2
 Summary of Drilling, Testing, and Geophysical Logging
 for IW-2 at the Palm Beach County Southern Region
 Wastewater Treatment Plant

Hole Depth Drilled (feet)	Nominal Diameter (inches)	Date Completed	Geophysical Logging	Remarks and/or Section Drilled
2,655	34	09/07/90	Caliper (09/09/90)	Completed with 32-1/2-inch bit to set 24-inch casing and install drillable bridge plug.
2,645	24	09/11/90	Temperature	Performed temperature log on first stage of cement.
2,645	24	09/20/90	None Required	Performed pressure test on final casing string.
3,450	24	10/09/90	None required	Completed borehole with 22-1/2-inch bit to a total depth of 3,450 feet.
3,450	24	10/20/90	T.V. Survey *	Performed black and white TV survey.
3,450	24	11/01/90	Temperature, LSN, Gamma, and Fluid resistivity	Performed logging under static conditions before injection test.
3,450	24	11/06/90	Fluid Resistivity, Temperature, and Flow meter	Conducted injection test at 4,400; 7,800; and 10,500 gpm. Logs performed at 4,400 gpm.
3,450	24	11/07/90	Caliper	Performed caliper on complete well.
3,450	24	11/13/90	Gamma ray	Performed radioactive tracer survey.

*TV survey sum Appendix J

Note: Copies of geophysical logs can be found in Volume II of this report

to those for the injection wells. A 24-inch casing was set through the surficial aquifer to 260 feet, a 16-inch casing was installed through the Hawthorn and Tampa formations into the upper Floridan aquifer to 1,000 feet, and a 6-inch casing was installed to 1,900 feet. The 6-inch casing was cemented from its base to 1,096 feet. The annulus was left open from 1,096 feet to the base of the 16-inch casing at 1,000 feet to serve as the upper monitor zone. The lower monitor zone was then completed by drilling from the base of the 6-inch casing at 1,900 feet to 1,984 feet. Table 2-3 summarizes the drilling, testing and geophysical logging performed during construction.

Two capacity tests were conducted once the depth of the 6-inch borehole reached 1,976 feet. The tests were performed while on reverse-air at 35 gpm and 45 gpm, respectively. No drawdown was detected at either rate. Once total depth of 1,984 feet was reached, the well was developed until no further cuttings or silt were removed from the borehole. Appendix C contains a table summarizing casing depths, cement types and quantities used. Completion diagrams of the dual-zone monitor well and wellhead are shown in Figures 2-2 and 2-4, respectively.

SURFICIAL MONITOR WELLS

Eight surficial monitor wells were installed at the corners of the injection well pads as shown in Figure 2-1. These wells were constructed to monitor any potential onsite saltwater contamination of the shallow groundwaters resulting from drilling activities. Construction details of the wells are shown in Figure 2-5. All eight wells were sampled at the beginning and at the conclusion of drilling activities. The eastern and western most wells were sampled on a weekly basis and analyzed for temperature, chlorides, and conductivity. The wells were left with protective casings and locking caps and can be used in the future for onsite monitoring. Water quality data from these wells is discussed further in Section 6 of this report.

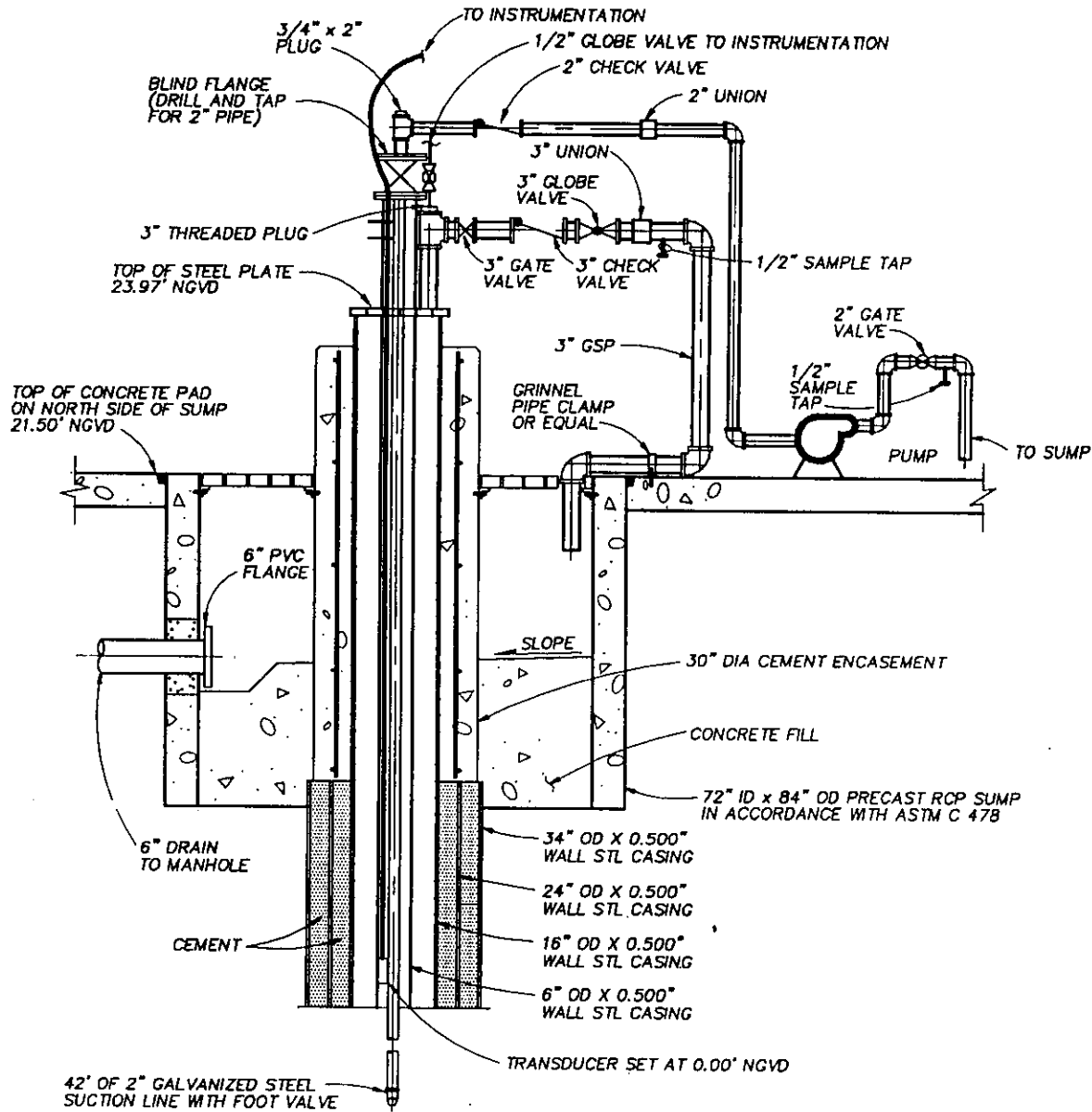
SURGE CONTROL SYSTEM

A hydropneumatic surge control system was constructed to reduce the potential for hydraulic surges within the system. The hydropneumatic tank functions by adding or releasing water to prevent separation of the water column in the wells in the event that interruption in flow occurs. The system is connected to the injection well piping at the effluent pump station as illustrated in Figure 1-2. It consists of a 10,000-gallon steel tank, an air compressor, level control system, and monitoring instrumentation.

The function of the level control system is to add air to the tank if the water level is above the maximum level and to vent air from the tank if the level is below the

Table 2-3
Summary of Drilling, Testing, and Geophysical Logging
For the Dual-Zone Monitor Well (MW) at the Palm Beach County
Southern Region Wastewater Treatment Plant

Depth Drilled (feet)	Hole Diameter (inches)	Date Completed	Logs Run	Remarks and/or Section Drilled
270	29	08/08/90	LSN Electric, Gamma Ray, and Caliper	Completed with 28-1/2-inch bit to set 24-inch casing.
260	24	08/09/90	None Required	Completed installation of the 24-inch casing.
1,050	12	08/15/90	LSN Electric, Gamma ray, and Caliper	Logs performed on pilot hole to determine 16-inch casing setting depth.
1,010	23	08/18/90	None required	Completed borehole with 22-1/2-inch bit to set 16-inch casing
1,000	23	08/20/90	Temperature	Performed temperature log on first stage of cement
1,902	15	08/28/90	LSN Electric, Gamma ray, Caliper, Fluid Resistivity, and Temperature	Logs were performed to determine 6-inch casing setting depth and to determine upper monitor zone.
1,900	6	08/30/90	Temperature	Performed temperature log on first stage of cement.
1,900	6	09/02/90	Cement Bond Log	Log performed to determine cement integrity around 6-inch casing.
1,900	6	09/04/90	None required	Performed pressure test on 6-inch casing.
1,984	6	09/07/90	Caliper	Completed 5-1/2-inch borehole and established the depth interval of the lower monitor zone from 1,900 to 1,984 feet.



LEGEND

- OD Outside Diameter
- GSP Galvanized Steel Pipe
- DIA Diameter
- NGVD National Geodetic Vertical Datum
- RCP Reinforced Concrete Pipe

FIGURE 2-4

Dual Zone Monitor Well Wellhead Completion Diagram at the Palm Beach County Southern Region Wastewater Treatment Plant



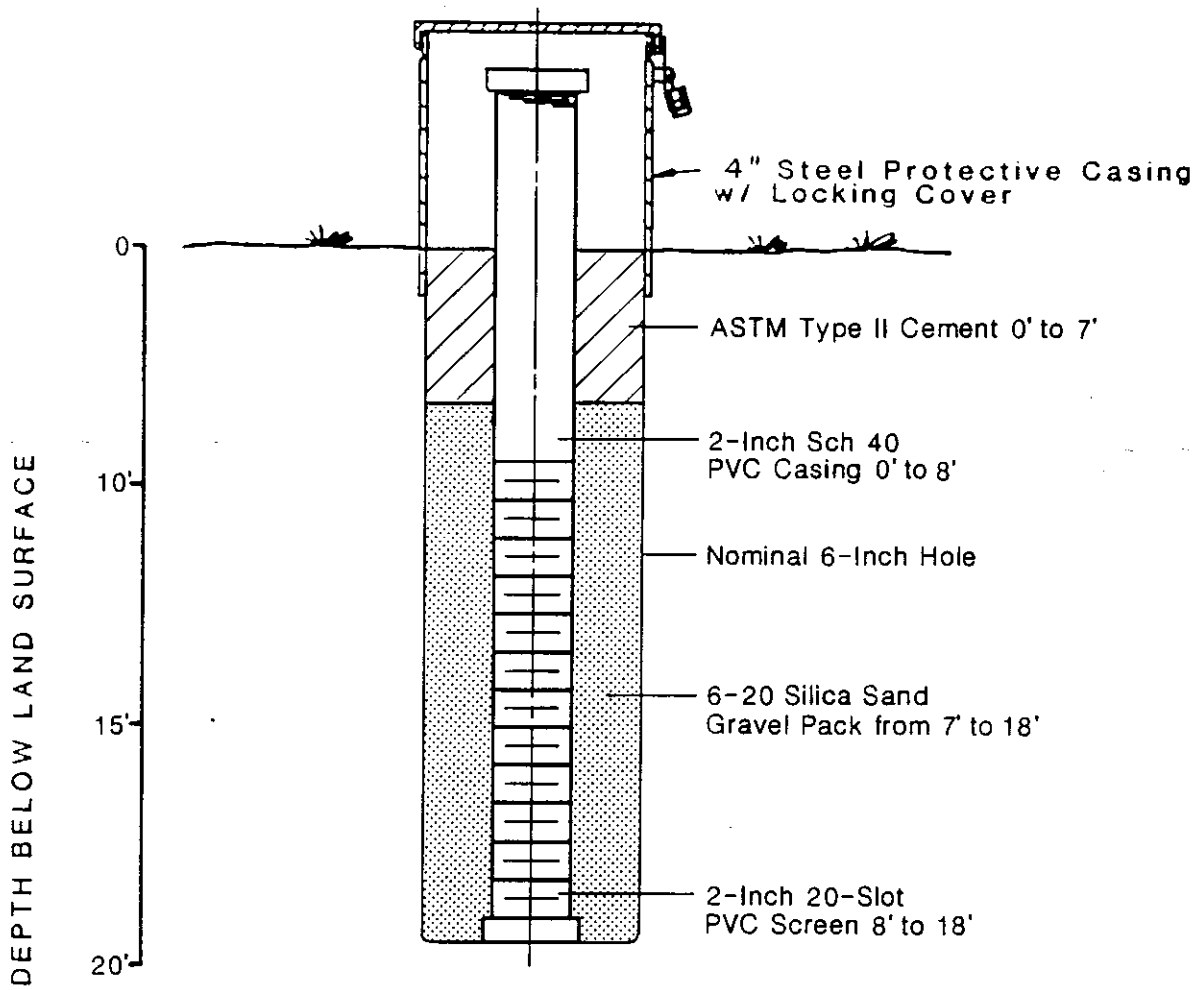


FIGURE 2-5
Surficial Monitor Well Construction Diagram at the
Palm Beach County Southern Region Wastewater Treatment Plant



minimum. Should the air supply pressure drop below a pre-set minimum, a low pressure switch will activate the air compressor. A compressor run and surge tank level signal will be activated in the MCC.

Section 3 HYDROGEOLOGIC FRAMEWORK

GEOLOGY

BACKGROUND

A stratigraphic profile of the injection and monitor wells at the Southern Region Wastewater Treatment Plant was derived from the correlation of formation samples with geophysical logs run during pilot hole drilling. Brief lithologic descriptions, and a summary of geophysical logs (gamma ray, caliper, and LSN) are included in Figures 3-1 and 3-2. Strata encountered at this site range in age from older Eocene to more recent Pleistocene deposits. The stratigraphic units and their respective ages are as follows: the Oldsmar Limestone, Lake City Limestone, and Avon Park Limestone of Eocene age; the Suwannee Limestone of Oligocene Age; the Tampa Limestone and Hawthorn Formations of Mid to Lower Miocene Age; the Tamiami Formation of Pliocene Age; and the Anastasia Formation and Pamlico Sands of the Pleistocene Age. Detailed lithologic logs of each injection well and the monitor well are provided in Appendix E. The following is a Lithostratigraphic Description encountered at the site.

LITHOSTRATIGRAPHIC DESCRIPTIONS

PLEISTOCENE SERIES

Pamlico Sand

At this site, the Pamlico Sands occur from land surface to approximately 80 feet below land surface (bls) and consist of unconsolidated gray to dark gray, fine to medium grained, well sorted, subangular to subrounded, quartz sands with some organic matter and shell. The gamma ray response in the Pamlico Sand interval is typically low (20 to 40 counts per second [cps]).

Anastasia Formation

The Anastasia Formation of Pleistocene age, which is covered by the Pamlico Sands, makes up most of the shallow aquifer system which is the principle source of groundwater in Palm Beach County. It occurs to depths of approximately 80 to 240 feet bls and consists of phosphatic arenaceous limestone and calcareous sandstone to a depth of approximately 190 feet bls. Increasing interbedded quartz

sand and sandy shelly limestone occurs from approximately 190 to 240 feet bls. An increase in the gamma ray response at 80 feet (approximately 75 cps) indicates the top of the Anastasia Formation.

PLIOCENE SERIES

Tamiami Formation

At this site, the transitional Tamiami Formation of Pliocene age occurs from approximately 240 feet to 270 feet bls and consists primarily of shelly, sandy, light olive gray, calcareous clay (marl). A low to moderate gamma ray response (50 to 75 cps) is typical through most of this interval.

MIOCENE SERIES

Hawthorn Formation and Tampa Limestone

Both the Hawthorn and Tampa formations constitute a substantial interval of confinement and low permeability between the surficial aquifer and Floridan aquifer.

The Hawthorn formation sediments occur from 270 feet to 570 feet and consist of dense, grayish-olive green, calcareous clay. The gamma ray signature through this interval is consistently moderate to high (80 to 110 cps) with the base of the formation marked by a sharp off-scale peak occurring at approximately 570 feet bls.

The Tampa Limestone was encountered below 570 feet in depth and extends to approximately 852 feet. This formation is characterized by a lithologic color change to a dusky yellow-green calcareous clay with the occurrence of grayish-yellow limestone, olive green chert, and shell. The gamma ray response through this interval is low to moderate (40 to 75 cps) with the base of the formation marked by an even sharper off-scale peak compared to the base of the Hawthorn Formation. This sharp gamma shift correlates to the occurrence of fossiliferous and arenaceous phosphatic limestones. The Long-Short Normal Electric log also indicates this formation change with a shift to slightly higher resistance: a feature typical of erosional unconformities and water-producing limestones.

OLIGOCENE SERIES

Suwannee Limestone

At this site, the Suwannee formation occurs from a depth of 852 feet bls to 930 feet bls and is characterized by a yellowish-gray to very pale orange, biomicritic fossiliferous limestone. The Suwannee is a geologic formation of the upper Floridan

aquifer system and characteristically exhibits high permeability and artesian pressure. The upper-most zone of this artesian aquifer was selected for monitoring of the upper Floridan aquifer. The gamma log indicated this formation change with a shift to higher counts. An increase in borehole diameter shown on the caliper logs from 870 feet to 890 feet correlates to a reduction rock competency and the high permeabilities typical of this formation. The base of this unit is marked by a sharp drop in the gamma ray response.

EOCENE SERIES

Avon Park Limestone

The sharp drop in the gamma ray response marking the base of the Suwannee Limestone also identifies the upper boundary of the Upper Eocene Avon Park Limestone. The observed lithology closely matches that described by Chih Shan Chen in Florida Geological Bulletin No. 45, *The Regional Lithostratigraphic Analysis of Paleocene and Eocene Rocks of Florida, 1965*. This mid-Eocene age formation is a light brown to brown, porous, finely fragmented, highly fossiliferous (biomicritic) limestone with the occurrence of a very fine to medium crystalline, rather porous, sucrosic textured dolomite. Characteristic microfauna identified in the cutting samples were *Coskinolina sp.*, *Lituonela sp.*, and *Dictyoconus sp.* Other foraminifera were present.

At this site, the Avon Park Limestone occurs from 930 feet to approximately 1,475 feet bls. A yellowish-gray, soft, biomicritic limestone predominates with microfauna identified as *Dictyoconus americanus sp.*, typical of the Avon Park formation. The natural gamma shifts from moderate to higher counts (40 to 100 cps) at a depth of 1,475 feet, indicating a change in lithology from limestone to dolomite. Below 1,475 feet, a fine to medium crystalline dolomite with vuggy texture and secondary porosity is dominant. This change could relate to the fine to medium crystalline dolomite bed forming the base of the Avon Park Limestone and overlying the Lake City Limestone as described by Chen (1965).

Lake City Limestone

In general, the Middle Eocene Lake City Limestone is considered a confining unit separating the mid-Eocene from the lower- Eocene series. This early middle Eocene limestone was identified in South Florida by Applin and Applin (1944) as a biostratigraphic unit of alternating layers of brown, hard, crystalline dolomite and dolomitic limestone, and a cream-colored, soft to hard, chalky fossiliferous limestone. Scattered chert nodules, thin chert layers and the presence of carbonaceous laminae are also noted as consistent features of this unit.

At this site, a brown, crystalline, vuggy and sucrosic-textured, very hard dolomite is predominant with intermittent chalky biomicritic fossiliferous limestone from a depth of 1,475 to 2,750 feet bls. The base of the unit is identified by a transition in lithology from interbedded dolomites to an abundantly fossiliferous limestone from 2,750 to 2,920 feet bls. The base of the Lake City Limestone is marked by an increase in response from the gamma ray, electric DIL, and Borehole Compensated Sonic Logs, and was determined to be at a depth of 2,920 feet.

Oldsmar Limestone

The top of the Lower Eocene Oldsmar Limestone at 2,920 feet is identified by increased resistance from the LSN Electric Log and a significant change in the electric DIL, and Borehole Compensated Sonic Logs. The lithology from 2,920 to 3,300 feet is predominantly a pale yellowish-orange to dusky yellowish-brown, finely crystalline, vuggy and sucrosic textured, very hard dolomite. The Fracture Identification Log from 2,920 to 3,090 feet indicates a highly fractured or cavernous formation typical of the Oldsmar Limestone of the lower Eocene Series. This cavernous formation, also known as the "Boulder Zone" is characterized by a hard, fine to coarsely crystalline fractured dolomite formation that is highly transmissive. Below 3,050 feet bls to a total depth of 3,450 feet dolomite continues to dominate but with fewer fractures or cavities. No evaporites were observed in the drill cuttings samples.

Section 4

HYDROGEOLOGIC TESTING

FORMATION SAMPLING

Formation samples were collected at 10-foot intervals from the surface to total depth on each well. The samples were washed and then characterized for rock type, color, texture, matrix materials porosity, accessories, sedimentary structure, hardness, and fossils. Their lithologic descriptions are in Appendix E.

At the end of construction, one set of samples from each well was sent to USGS in Tallahassee, Florida.

GEOPHYSICAL LOGGING

Geophysical logs were performed on pilot hole intervals to correlate formation samples taken during drilling, to identify formation boundaries, and to obtain specific data pertaining to the underground formations. The geophysical logs also provided data for determining optimum casing setting depths on both of the injection wells and the monitor well.

Copies of the logs are contained in Volume II of this report. Analytical data from geophysical logs performed during the injection test helped to define fluid loss zones (injection zones) and to provide a basis for future comparison of well performance. These data are further discussed in this section.

CORING AND ANALYSES

While drilling the IW-2 pilot hole, core samples were collected at specific intervals to determine hydraulic characteristics of the confining beds above the injection zone. Samples were obtained by a 4-inch-diameter tungsten carbide-tipped core bit on a 10-foot long core barrel between the depths of 2,061 and 2,633 feet bls. The cores were first examined onsite and then wrapped and sealed to minimize fluid loss before shipment to the testing laboratory. Table 4-1 summarizes the coring program and provides a lithologic description of the cores.

Tuscaloosa Testing Laboratories Inc. (TTL), Tuscaloosa, Alabama, was selected to determine the vertical and horizontal permeabilities and total porosities of core samples from seven district intervals. TTL encased each core sample in a cylindrical, latex membrane with porous stones and blocks on the top and bottom. The encased sample was enclosed in a triaxial cell and permeated under a differential head with water collected from the borehole of IW-2 over the cored interval. Total porosity

Table 4-1
Core Intervals and Lithologic Descriptions from IW-2 at the
Palm Beach County Southern Region Wastewater Treatment Plant

Core Run No.	Date	Cored Interval	Percent Recovery	Formation Description	Interval Sampled	Direction	Permeability Coefficient "k" (cm/sec)	Total Porosity (%)
1	08/13/90	2,061-2,071	70	Dolomite, dark yellowish-brown, very porous; finely crystalline; sucrosic and vuggy texture.	2,066.0-2,067.0	Vertical Horizontal	1.1 x 10 ⁻¹⁰ 2.1 x 10 ⁻⁸	9.9
2	08/16/90	2,092-2102.5	70	Dolomite; pale yellowish-brown to moderate yellowish-brown; slightly porous; crystalline.	2,101.5-2,102.5	Vertical Horizontal	2.9 x 10 ⁻¹⁰ 4.8 x 10 ⁻¹⁰	11.9
3	08/17/90	2,190-2,200	70	Dolomite/Fossiliferous Limestone; dark yellowish-brown to pale yellowish-brown; vuggy and sucrosic texture; very porous.	2,196.0-2,197.0	Vertical Horizontal	1.5 x 10 ⁻⁶ 1.1 x 10 ⁻⁶	16.7
4	08/19/90	2,290-2,300	80	Biomicritic Limestone, yellowish-gray; non-porous to slightly porous; trace microfauna; very hard.	2,296.5-2,297.5	Vertical Horizontal	3.8 x 10 ⁻⁶ 9.0 x 10 ⁻⁶	26.1
5	08/21/90	2,400-2,411	100	Biomicritic Limestone; white to yellowish-gray; chalky; slightly porous; moderately soft.	2,400.0-2,400.7	Vertical Horizontal	1.1 x 10 ⁻⁴ 7.9 x 10 ⁻⁵	31.8
6	08/23/90	2,506-2,519	100	Biomicritic Limestone; white to yellowish-gray; consolidated; slightly porous; moderately soft.	2,512.0-2,513.0	Vertical Horizontal	1.1 x 10 ⁻⁵ 1.1 x 10 ⁻⁵	29.2
7	08/24/90	2,620-2,633	100	Dolomitic Limestone, pale yellowish-brown; microfossils; shell casts; non-porous to slightly porous; moderately to very hard.	2,625.0-2,626.0	Vertical Horizontal	1.3 x 10 ⁻⁶ 3.7 x 10 ⁻⁶	24.2

tests were then performed on the samples. Results from both tests are presented in Table 4-1. A detailed lithologic description of the cores along with the laboratory report are contained in Appendix D.

Results of the vertical permeability tests indicated values which ranged from 1.1×10^{-10} cm/sec at 2,066 feet to 1.1×10^{-4} cm/sec at 2,400 feet which are presented in Table 4-1. The corresponding horizontal permeability values are also shown in Table 4-1.

These values represent very low permeabilities and indicate a substantial confining sequence above the injection zone. The main confining sequence, as interpreted from the cutting samples, the core data, and the geophysical logs, extends from the top of the Boulder Zone at 2,920 feet to 2,280 feet.

PACKER TESTS

A straddle packer test was performed on IW-1 during drilling to establish the depth of the 10,000-mg/l total dissolved solids (TDS) interface and to assist in the selection of the lower monitor zone.

The straddle packer test was performed over the interval from 1,882 feet to 1,950 feet. A water sample was collected during the testing and sent to a local laboratory for TDS analysis. The laboratory results indicated a TDS value of 36,477 mg/l.

The packer test equipment consisted of a 5-horsepower submersible pump set at 173 feet bls on 2-inch drop pipe inside the 6-5/8-inch drillpipe. The packer assembly was attached to the drillpipe.

Two 71-gpm pumping tests were conducted, one for 8 hours and the second for 1.2 hours. The drawdown was monitored with a pressure transducer connected to a central data collection unit (Hermit Environmental Data Logger). Manual readings were also taken to provide backup in the event of mechanical failure during the test.

A friction loss correction was necessary for the drawdown data within the drillpipe. Friction loss in the drillpipe was calculated using the Hazen-Williams equation and yielded a head loss of 1.7 feet. This head loss was used to correct the drawdown data for the specific capacity calculation. Drawdown data from the second pumping test yielded a specific capacity of 11.3 gpm/ft.

The Cooper-Jacob (1946) straight line method was also used on the second pumping test to calculate the transmissivity. Drawdown versus time were plotted on semi-log paper. The critical time after which the casing storage no longer contributes to the

well yield was determined from Driscoll (1986, p.233) to be 1.72 minutes. Data before this critical time was ignored and a straight line was fitted through the remaining data points. This method yielded a transmissivity value of approximately 59,000 gpd/ft. Water quality data and packer test data are included in Appendix F.

The test was successful in demonstrating that the straddled interval (1,882 feet to 1,950 feet) contained formation waters with TDS greater than 10,000 mg/l. The test also served along with geophysical logging to establishing the lower monitor interval as 1,900 to 1,984 feet.

INJECTION TESTS

On October 31, 1990, a 9-hour step injection test was performed on IW-1. Approval for water withdrawal was received from the LWDD and South Florida Water Management District prior to testing. This test was conducted to evaluate the hydraulic characteristics of the injection well and to verify design requirements of the injection pumps. Approximately 380 feet of 30-inch and 330 feet of 24-inch steel pipeline was run from the Lake Worth Drainage District (LWDD) L-30 Canal to the injection well. Two 12-inch hydraulic sump pumps were submerged in the canal to supercharge six 8-inch by 6-inch Mission Magnum Centrifugal Pumps. The centrifugal pumps were powered by a 1,094 horsepower diesel engine. The hydraulic sump pump intakes were screened to prevent clogging during the test. A vertical control point was established at the canal bank to monitor water levels in the canal while testing. A 24-inch flow totalizer manufactured by Water Specialties (Model ML19-NY) was installed in the pipeline to measure flow and cumulative volume of water injected. A 100-pounds-per-square-inch Heise gauge, 12-inches in diameter, was installed at the wellhead to measure injection pressures at IW-1.

Temperature and electrical conductivity of the injection fluid (canal water) were recorded at the wellhead on a hourly basis. The canal water had a temperature that ranged from 72 to 74 degrees fahrenheit, and a conductivity of 400 to 450 umhos/cm. The canal water was light brown in color with a minimal amount of suspended particles.

A 60-psi Heise gauge, 12-inches in diameter, was used to record pressure readings in the Upper Monitor Zone (1,000 to 1,050 feet) before, during, and after the injection test. Water levels were also continuously recorded in the Lower Monitor Zone (1,900 to 1,950 feet). Water level was recorded using pressure transducers connected to a central data collection unit (Hermit Environmental Data Logger). The more sensitive transducer, a 20 psi probe (resolution of 0.015 feet of water), was installed in the Lower Monitoring Zone, where changes in the water level were most likely to occur if any communication with the injection zone existed. IW-2 served as an observation

well during the injection test. Water level was recorded in IW-2 with a 100 psi pressure transducer (resolution of 0.03 feet of water).

Background data was collected at all monitor points for approximately one hour prior to the test. The step injection test was then performed at rates of approximately 4,800; 7,200; and 10,500 gallons per minute (gpm). Stable injection pressures observed at the 100 psi Heise gauge were 31.9, 40.1, and 55.5 psi for the three injection rates, respectively. The pumps were shut down after the third step to record recovery data. The shut-in pressure was 25.9 psi one hour after pump shutdown and 23.3 psi 12 hours after shut down. The observed shut-in pressure of 25.9 psi correlates with the calculated shut-in pressure of approximately 25.0 psi. Appendix K contains a plot of pressure/water level changes in IW-1, IW-2, the Upper Monitor Zone, and the Lower Monitor Zone. A summary of data collected during the injection test is also provided.

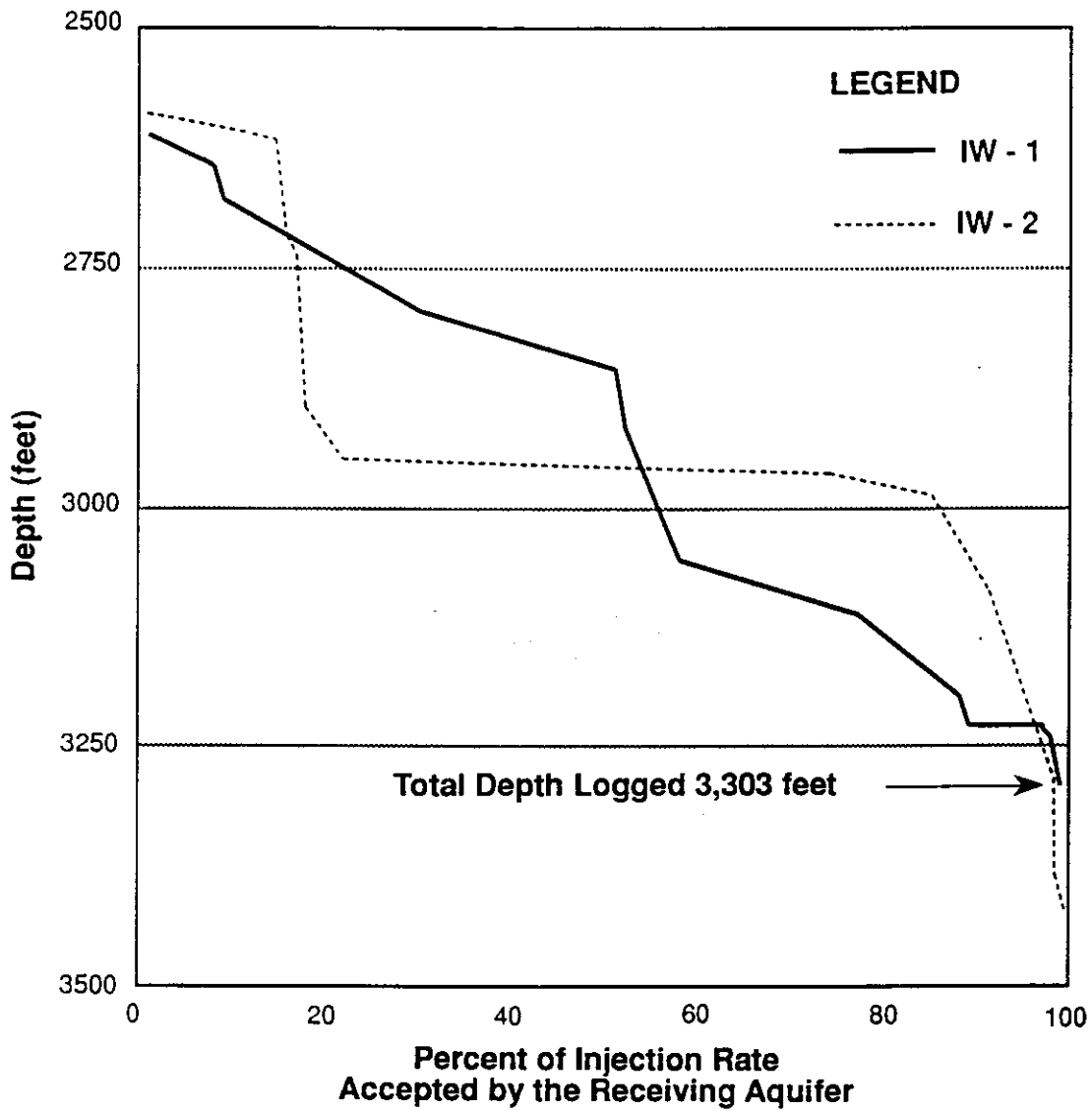
Geophysical logging was performed during the first step test after the injection pressure had stabilized. Temperature, fluid resistivity, and flow meter logs were performed over the open hole portion of the well.

The flow meter log indicated that flow was more or less uniformly accepted by the formation from approximately 2,645 feet to 3,240 feet. Little or no flow was indicated from 3,240 feet to total depth of 3,303 feet. A profile of the aquifer fluid rate of acceptance is presented in Figure 4-1.

The temperature and fluid resistivity logs conducted during the injection test showed displacement of the native formation waters throughout the borehole by the injected fluids to a depth of approximately 3,250 feet. Below 3,250 feet to total depth, the logs indicate native formation waters, implying no movement of injected waters below 3,250 feet.

Data collected from the monitor well showed only minor tidal fluctuations over the recorded time interval. No water level changes or changes in pressure that would coincide with pumping rate changes were observed in the monitor well during the injection test. This confirms that confinement exists between the injection zone of IW-1 and the overlying monitor zones.

Water level data collected from IW-2 (used as an observation well), located 200 feet from IW-1, exhibited random fluctuations. The cause of this fluctuation in head is not obvious but it is probably related to the interaction between the injected fluid (specific gravity of approximately 1.000) and that in the injection zone (specific gravity 1.025). At the start of injection, the density gradient of fluids within the well bore of IW-2 was stable, and was probably of somewhat less density than native waters due to flushing of the well before the TV survey. Injection into IW-1 displaced higher



NOTE: Log performed during first step of Injection Test (Approximately 4,200 gpm)

FIGURE 4-1
Acceptance of Injection Rate Through the Receiving Aquifer
During Injection Testing of IW-1 at the Palm Beach County
Southern Region Wastewater Treatment Plant



density formation fluids into the well bore of IW-2 disturbing the density gradient and reducing head within the well. A change in density from 1.000 to 1.025 would change the head in the amount of 2.5 feet for every 100 feet of borehole affected.

Water level data and pressure recorded for the injection wells and DZMW during the test are presented in Figure 4-2 and Figure 4-3, respectively. Datum points for the observation well and lower monitor zone of the DZMW were arbitrarily referenced to zero during the test to illustrate any water elevation changes that might occur during testing.

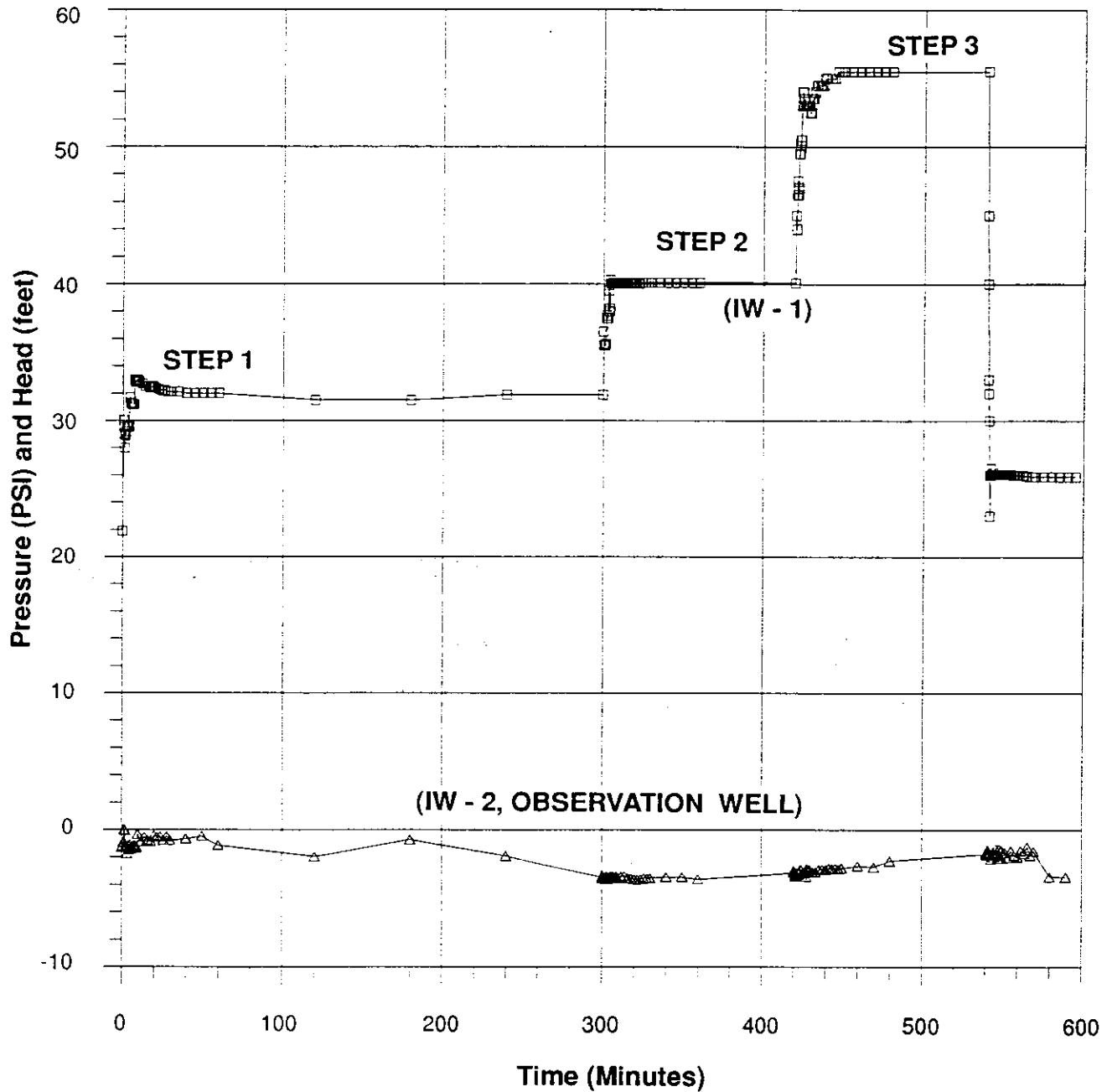
For purposes of future reference, the water elevation in the lower monitor zone at the end of construction and before the start of operational testing was 11.4 feet above NGVD and the pressure in the upper monitor zone was 9.0 psi as measured at the wellhead (March 27, 1991, 1400 hours). These data points were determined after all testing and sampling was complete and the well had been allowed to stabilize for approximately 9 weeks.

On November 6, 1990, a 9-hour, step injection test was performed on IW-2. This test was also conducted to evaluate the hydraulic characteristics of the injection well and to verify the design of the injection pumps.

The same pipe line, pumping equipment, flow totalizer, and monitoring equipment were used for the test for IW-1.

The canal water temperature ranged from 72 to 74 degrees fahrenheit, and conductivity ranged from 400 to 500 umhos/cm during the test. Temperature and conductivity of the injection fluid were again recorded on an hourly basis during the injection test.

Background data was recorded at the monitor points for approximately one hour prior to the test. The step injection test was performed at rates of approximately 4,500; 7,800; and 10,500 gpm. Stable injection pressures observed at the wellhead were 26.3, 32.7, and 40.0 psig for the three injection rates, respectively. The pump was shut down after the third step to record recovery data. The shut-in pressure was 21.6 psig one hour after pump shutdown and 21.2 psig 12 hours after shutdown. This shut in pressures was slightly less than the calculated shut in pressure of approximately 24.6 psi. This can be attributed to this injection zone occurring slightly higher than estimated and to differences in the density of waters in the borehole. Appendix K contains a plot of pressure changes in IW-1, IW-2, and the Upper and Lower Monitor Zones. A summary of data collected during the injection test is also provided.



NOTE:

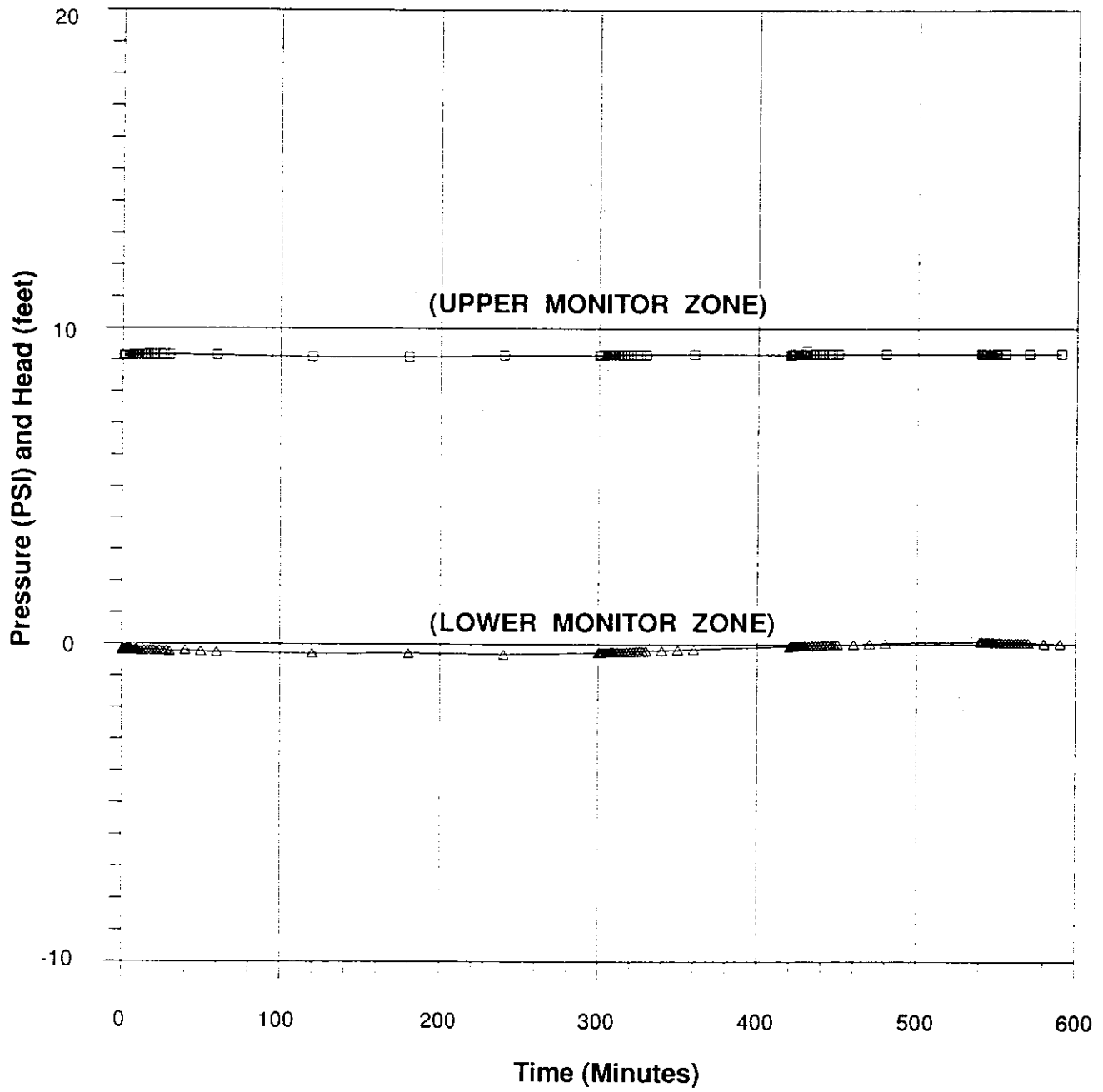
- 1.) IW - 1 Wellhead Pressure, Recorded in PSI During the Test
 - 2.) IW - 2, Observation Well, Recorded in Feet of Head.
- Transducer Datum was Referenced to Zero During Test to Facilitate Observation of Change in Head.

LEGEND

- IW - 1
- △-△-△-△ IW - 2

FIGURE 4-2
 Recorded Water Levels in the Injection Wells
 During Injection Testing of IW - 1 at the Palm Beach County
 Southern Region Wastewater Treatment Plant





NOTE:

- 1.) Upper Monitor Zone Recorded in PSI
 - 2.) Lower Monitor Zone Recorded in Feet of Head.
- Transducer Datum was Referenced to Zero During Test to Facilitate Observation of Change in Head.

LEGEND

- Upper Monitor Zone
- △△△△△ Lower Monitor Zone

FIGURE 4-3
 Recorded Water Levels in the Dual-Zone Monitor Well[®]
 During Injection Testing of IW - 1 at the Palm Beach County
 Southern Region Wastewater Treatment Plant



Geophysical logging was also performed on the complete well during the first step of this injection test. Temperature, fluid resistivity, and flow meter logs were performed after the injection pressure stabilized.

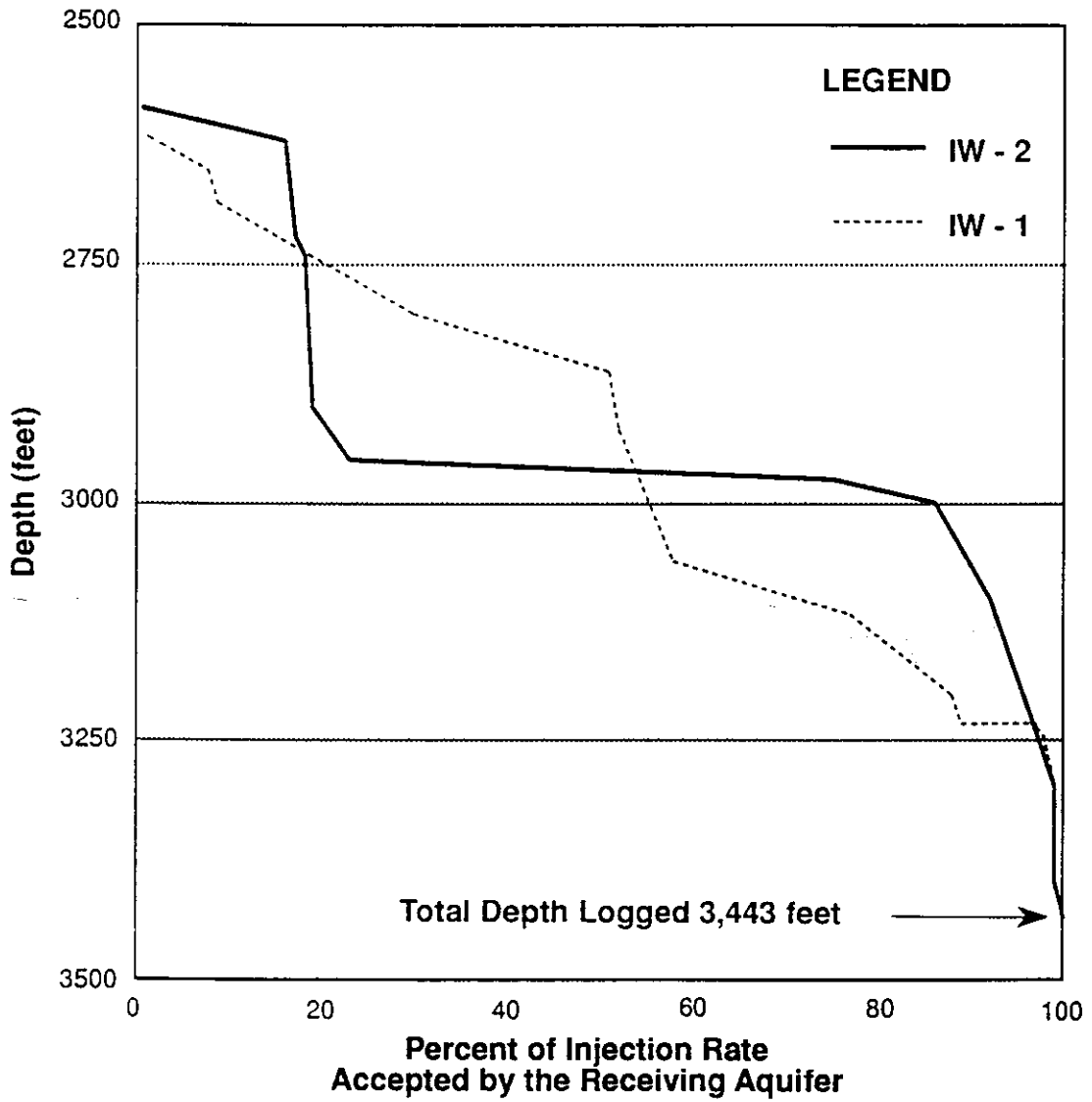
The flow meter indicated a slight acceptance of flow from approximately 2,660 feet to 2,955 feet. Approximately 70 percent of the flow was accepted over the interval from 2,955 feet to 3,000 feet. Only minor acceptance of flow by the formation was observed from 2,955 feet to the total depth logged of 3,443 feet. A profile of the rate of acceptance is presented in Figure 4-4.

The temperature and fluid resistivity logs conducted during the injection test indicated displacement of native formation waters throughout the borehole to a depth of approximately 2,975 feet. Little or no displacement of formation water below this depth is indicated by the logs.

Data collected from the monitor well showed only minor tidal fluctuations over the recorded time interval. No water level changes or changes in pressure that coincide with pumping rate changes were observed. Again, this indicates that no direct communication between the injection zone of IW-2 and monitor zones was present. As during the testing of IW-1, water level data collected from IW-1 (observation well), located 200 feet from IW-2, exhibited random fluctuations. A sudden drop of 1.59 feet of head was observed approximately 28 minutes into the second step of the test. The cause of this drop in head was not obvious. As with the fluctuation that occurred during testing of IW-1, it is probably related to the interaction of the injected fluid (specific gravity of approximately 1.000) and that in the injection zone (approximately 1.025).

Water level data and pressure recorded for the injection wells and DZMW during the test are presented in Figure 4-5 and Figure 4-6, respectively. Datum points for the observation well and lower monitor zone of the DZMW were arbitrarily referenced to zero during the test to illustrate any water elevation changes that might occur during testing.

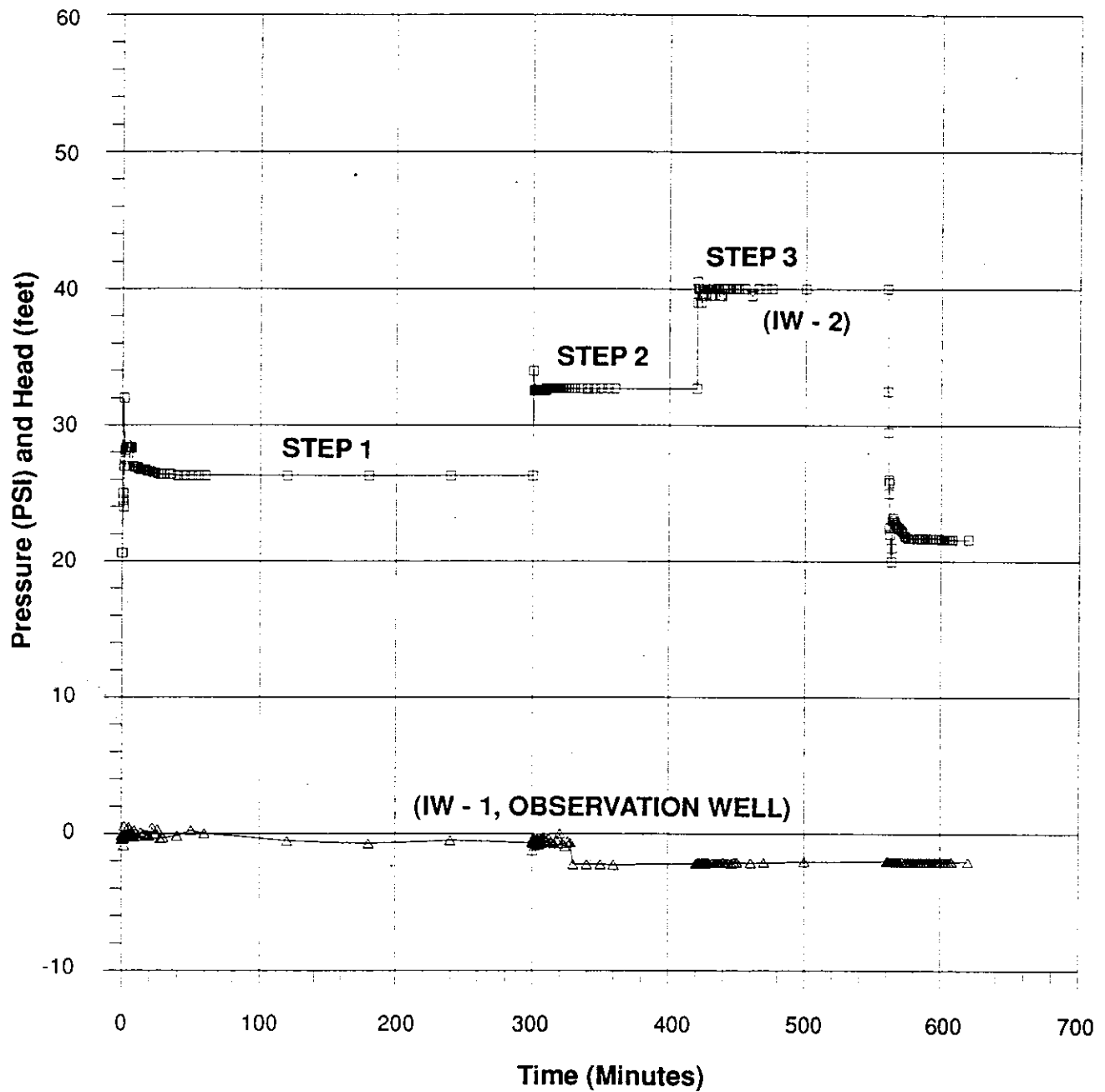
As previously stated, for future reference, the water elevation in the lower monitor zone at the end of construction and before start of operational testing was 11.4 feet above NGVD and the pressure in the upper monitor zone was 9.0 psi as measured at the wellhead (March 27, 1991, 1400 hours). This elevation was determined after all testing and sampling was complete and the well had been allowed to stabilize for approximately 9 weeks.



NOTE: Log performed during first step of Injection Test (Approximately 4,500 gpm)

FIGURE 4-4
Acceptance of Injection Rate Through the Receiving Aquifer
During Injection Testing of IW-2 at the Palm Beach County
Southern Region Wastewater Treatment Plant





NOTE:

- 1.) IW - 2 Wellhead Pressure, Recorded in PSI During the Test
- 2.) IW - 1, Observation Well, Recorded in Feet of Head.

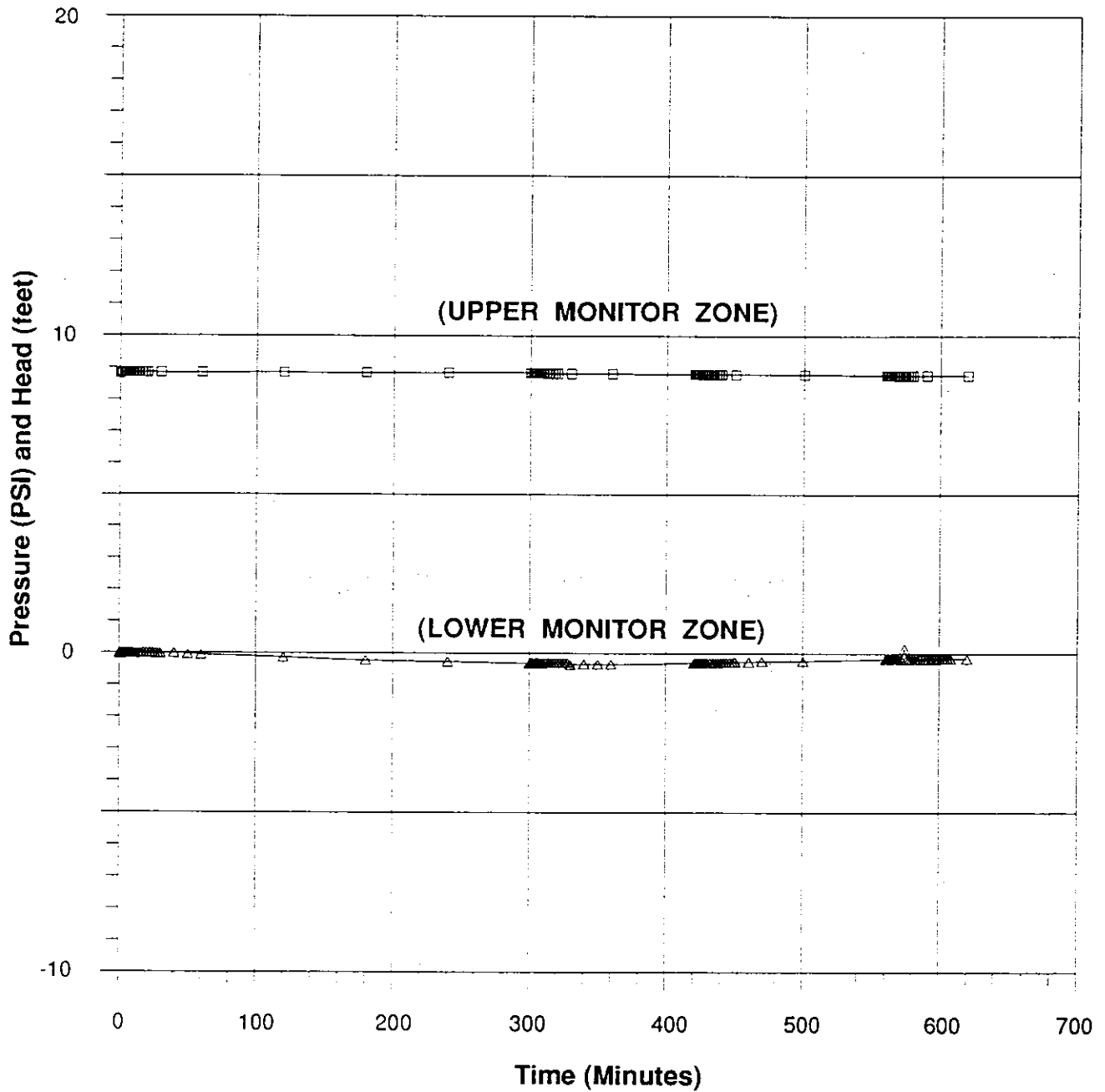
Transducer Datum was Referenced to Zero During Test to Facilitate Observation of Change in Head.

LEGEND

- IW - 1
- △△△△ IW - 2

FIGURE 4-5
 Recorded Water Levels in the Injection Wells
 During Injection Testing of IW - 2 at the Palm Beach County
 Southern Region Wastewater Treatment Plant





NOTE:

- 1.) Upper Monitor Zone Recorded in PSI
 - 2.) Lower Monitor Zone Recorded in Feet of Head.
- Transducer Datum was Referenced to Zero During Test to Facilitate Observation of Change in Head.

LEGEND

- Upper Monitor Zone
- △△△△△ Lower Monitor Zone

FIGURE 4-6
 Recorded Water Levels in the Dual-Zone Monitor Well[®]
 During Injection Testing of IW - 2 at the Palm Beach County
 Southern Region Wastewater Treatment Plant



Section 5 MECHANICAL INTEGRITY TESTING

MECHANICAL INTEGRITY TESTING OF IW-1

PRESSURE TEST

On August 14, 1990, a casing pressure test was successfully performed on IW-1. After cementing the 24-inch casing and before drilling out the cement plug, the casing was pressure tested for leaks. The casing was filled with water to eliminate air compression in the casing column and a 300-psig calibrated pressure gauge was installed to measure and record pressure during the 1-hour test. The test was run in accordance with construction permit Specific Condition 2c, which requires that the final casing be pressure tested at 1.5 times the expected operating pressure for one hour with a test tolerance of +/- 5 percent. The contractor pressurized the casing to 150 psig with a hydraulic pump. One hour after establishing 150 psi, the pressure was recorded at 146.5 psig. The drop of 3.5 psi was well within the 5 percent limit (7.5 psi) specified by FDER.

The pressure test was observed by Mr. Bawo Okome of FDER who was present as the casing was filled with water, pressurized, and depressurized. A copy of the pressure test data sheet is contained in Appendix I.

VIDEO TELEVISION SURVEY

On September 19, 1990, a black and white video television survey was performed on IW-1 to visually observe the condition of the casing and borehole and to provide a record of the condition of the well after construction. Black and white was selected because it generally captures a more detailed image of the well. The survey was run from the surface to the total depth of the well at 3,303 feet bls. The survey of the well indicated that the casing appeared in good condition. A large cavity was observed from a depth of 3,216 to 3,224 feet bls. Medium to large void spaces and horizontal and vertical fractures were observed at various depths throughout the borehole. A summary of the video survey is contained in Appendix J.

GEOPHYSICAL LOGS DURING TESTING

On October 30, 1990, final geophysical logs of the complete well under static conditions were performed on IW-1. These logs were performed to establish a downhole profile from total depth land surface. The logs included temperature, fluid

resistivity, gamma, and LSN electric. On November 1, 1990, after the injection test, a three arm Caliper was performed on the complete well.

RADIOACTIVE TRACER SURVEY

On November 14, 1990, a radioactive tracer survey (RTS) was performed on IW-1 using Schlumberger Well Services. The survey was conducted in both static and dynamic states to evaluate the integrity of the grout seal around the base of the 24-inch final casing. No upward movement of the tracer was observed by representatives of FDER (Ed Rahrig), CH2M HILL or the contractor during the test. A summary of the RTS is provided in Appendix L.

MECHANICAL INTEGRITY TESTING OF IW-2

PRESSURE TEST

On September 20, 1990, a casing pressure test was successfully performed on IW-2. This pressure test was performed following the same methods and criteria as the pressure test performed on IW-1. The casing was pressurized to 150 psig. After one hour, the pressure was recorded at 146.0 psig. Again, the drop of 4.0 psi was well within the 5 percent limit specified by FDER.

Filling, pressurizing, and depressurizing of the casing was observed by Mr. Bawo Okome of FDER. A copy of the pressure test data sheet is shown in Appendix I.

VIDEO TELEVISION SURVEY

On October 20, 1990, a black and white video television survey was performed on IW-2. The survey was run from the surface to a total depth of 3,433 feet bls. The survey through the casing indicated a depth to the bottom of the casing at 2,643.5 feet. This was approximately 4 feet higher than the depth indicated by the casing collar locator used during the RTS on November 12, 1990. The casing, appeared in good condition. Several cavities were observed in the open hole at intervals from 2,955 to 2,961; 2,968 to 2,972; 2,973 to 2,975; 3,025 to 3,042; and 3,044 to 3,046 feet bls. Overall, the video survey of IW-2 indicated a more fractured injection zone than the video survey of IW-1. A summary of the video survey is contained in Appendix J.

GEOPHYSICAL LOGS DURING TESTING

On November 1, 1990, final geophysical logs were performed on IW-2 of the complete well under static conditions. These logs were performed from the surface to total depth of the well and included temperature, fluid resistivity, gamma, and LSN electric logs. On November 7, 1990, after the injection test, a three arm Caliper was performed on the complete well. Copies of the logs are contained in Volume II of this report.

RADIOACTIVE TRACER SURVEY

On November 13, 1990, the RTS was performed on IW-2 using Schlumberger Well Services. This survey was also conducted in both the static and dynamic states to evaluate the integrity of the grout seal around the base of the 24-inch final casing. No apparent upward movement of the tracer was observed by representatives from FDER (Ed Rahrig), the Engineer, or the Contractor. A summary of this survey is also presented in Appendix L.

MECHANICAL INTEGRITY TESTING OF THE DUAL-ZONE MONITOR WELL

PRESSURE TEST

On September 4, 1990, a casing pressure test was performed on the Dual-Zone Monitor Well (MW). The casing was pressure tested after cementing the 6-inch casing prior to drilling out the cement plug. The pressure test conducted on the MW was performed following the criteria used during the pressure testing of IW-1 and IW-2. The casing was pressurized to 100 psig. After one hour, the pressure was recorded at 96.2 psig. Filling, pressurizing, and depressurizing the casing was observed by Ms. Peggie Highsmith a representative of FDER. A copy of the pressure test data sheet is shown in Appendix I.

As required by the construction permit, a cement bond log (CBL) was performed to assess the quality of the cement-to-casing bond of the final casing. The CBL measures and records the cycle of a sonic signal within the pipe in millivolts (mv). Maximum amplitudes indicate unbonded pipe, and minimum amplitudes indicate well-bonded pipe.

Results of the CBL showed signal amplitudes on the cemented portion of the casing which ranged from approximately 3 mv to 35 mv from approximately 1,094 feet to 1,800 feet (base of the Upper Monitor Zone). The uncemented portion of the borehole (900 feet to 1,094 feet) and the logged portion of the open annulus between the

6-inch and 16-inch casing (900 feet to 1,000 feet) showed signal amplitudes ranging from 50 mv to 70 mv. The CBL was terminated at 900 feet because the remainder of the annulus was open for the upper monitor zone and no benefit would have been gained by performing the log to the surface.

Section 6 MONITORING PROGRAM

BACKGROUND WATER QUALITY

Water samples were collected at approximately 30-foot intervals below the depth of 1,000 feet during reverse-air closed circulation drilling of IW-1 and IW-2 and open circulation drilling of the Dual-Zone Monitor Well. The samples were field-analyzed for conductivity, temperature, and chlorides. Water samples collected during closed circulation drilling were not truly representative due to mixing of the native formation waters throughout the borehole while drilling IW-1 and IW-2. Samples collected during the open circulation drilling of the dual-zone monitor well are more representative. However, all the data were useful in determining the general water quality trends of each well and in establishing the approximate location of the 10,000 TDS interface. Figures 6-1, 6-2 and 6-3 show the results of the water quality analyses collected during drilling. Detailed water quality data from the pilot hole drilling are also presented in Appendix G.

INJECTION WELL NO. 1

FDER requires that the lower intermediate casing (34-inch) be set below the base of the Underground Source of Drinking Water (USDW). The USDW includes all waters with a total dissolved solids (TDS) content less than 10,000 mg/l occur. To confirm the depth of native formation waters with total dissolved solids greater than 10,000 mg/l occur, a straddle packer test was performed over the interval from 1,882 to 1,950 feet on June 7, 1990. The straddle packer testing procedure and results are discussed in Section 4, Packer Tests.

On August 23, 1990, samples for analysis for primary and secondary drinking water standards were collected. The samples were collected while circulating the borehole from 3,311 feet using reverse-air techniques. Laboratory results from this sampling effort are contained in Appendix O. A 5-gallon unacidized sample was also collected and shipped to FDER Tallahassee in accordance with the requirements of the construction permit.

INJECTION WELL NO. 2

To confirm that the selected setting depth for the 34-inch casing was below the 10,000 mg/l TDS interface, a depth sample was retrieved from the pilot hole at a

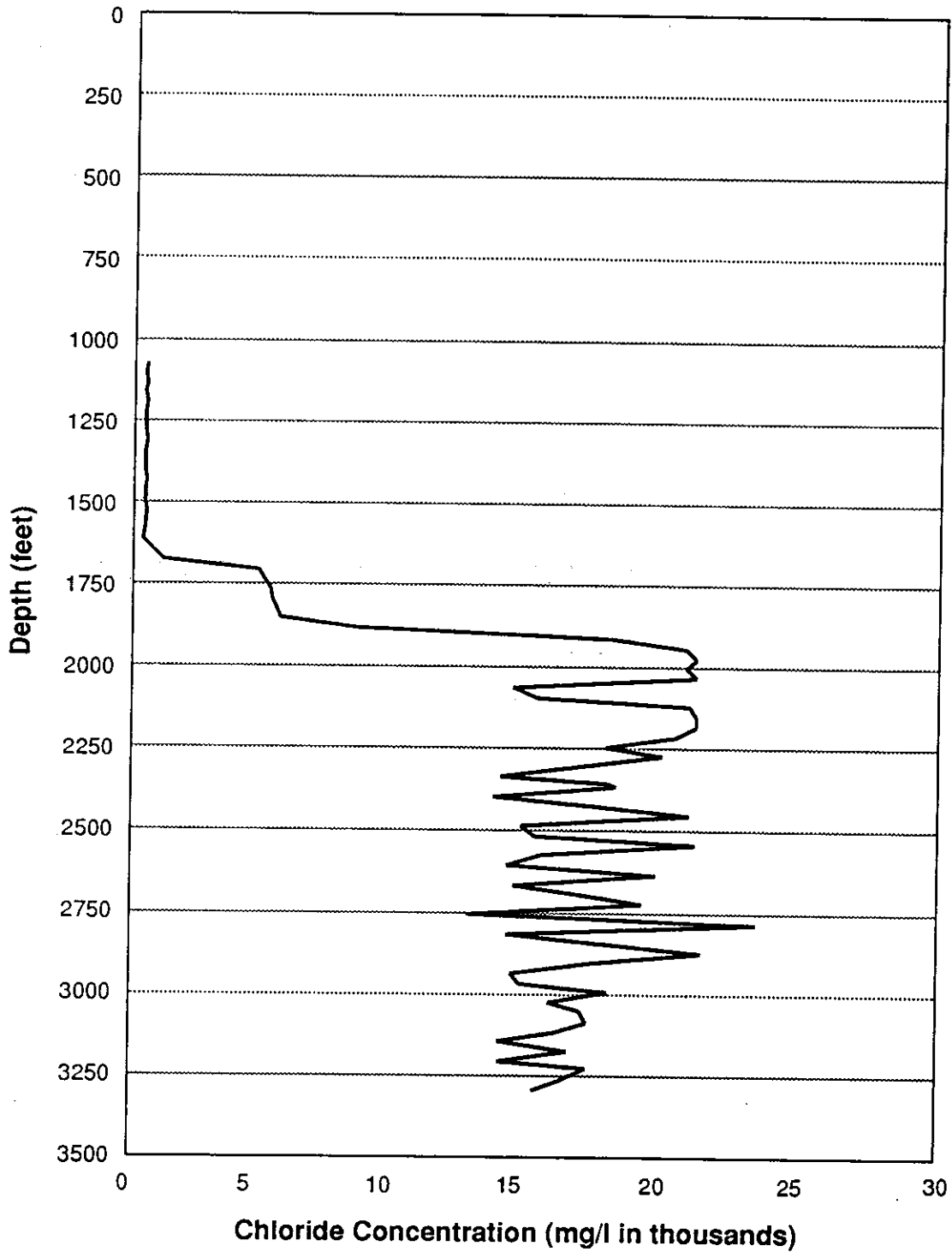


FIGURE 6-1
Pilot Hole Water Quality While Drilling IW-1 at
the Palm Beach County Southern Region
Wastewater Treatment Plant



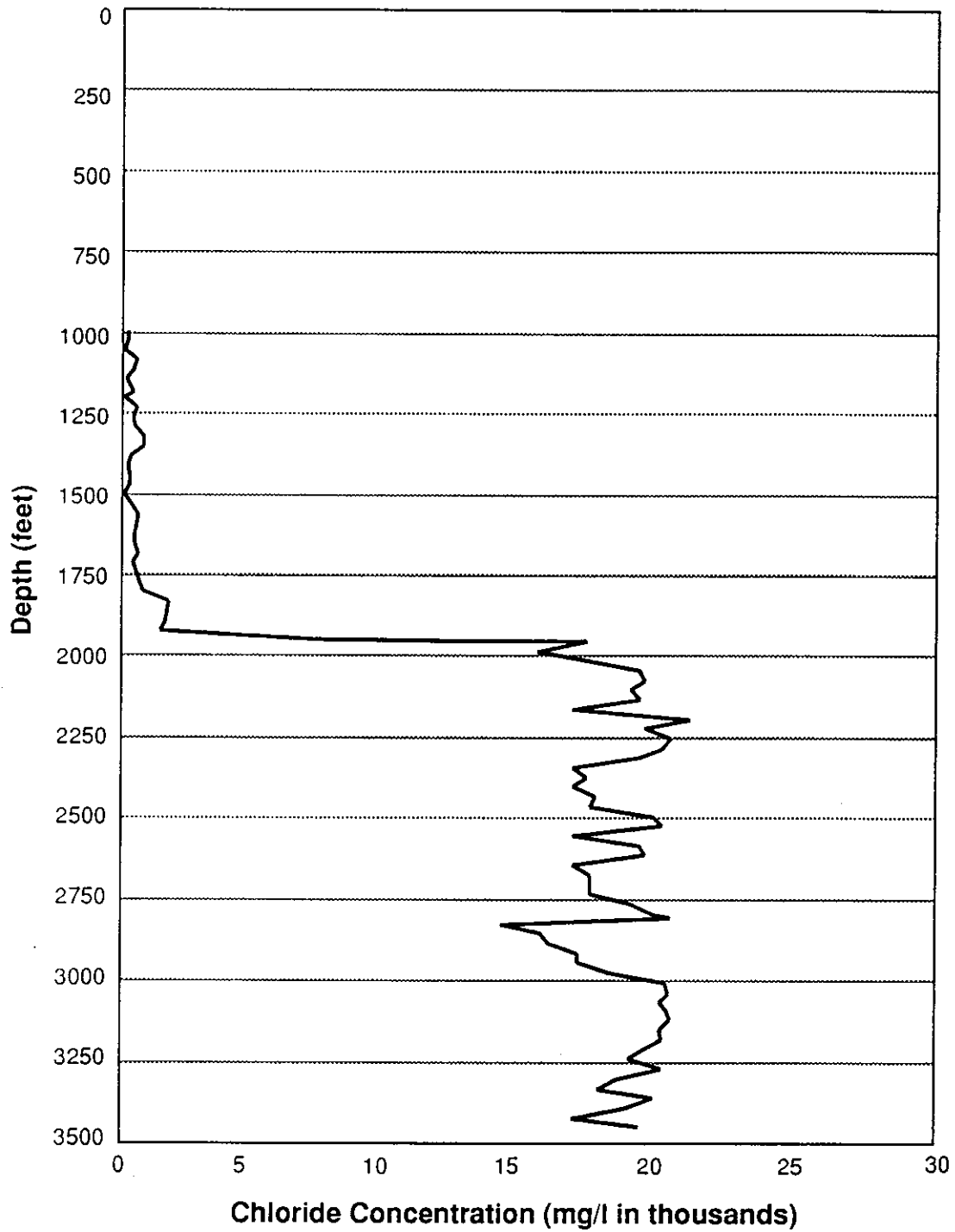


FIGURE 6-2
Pilot Hole Water Quality While Drilling IW-2 at
the Palm Beach County Southern Region
Wastewater Treatment Plant



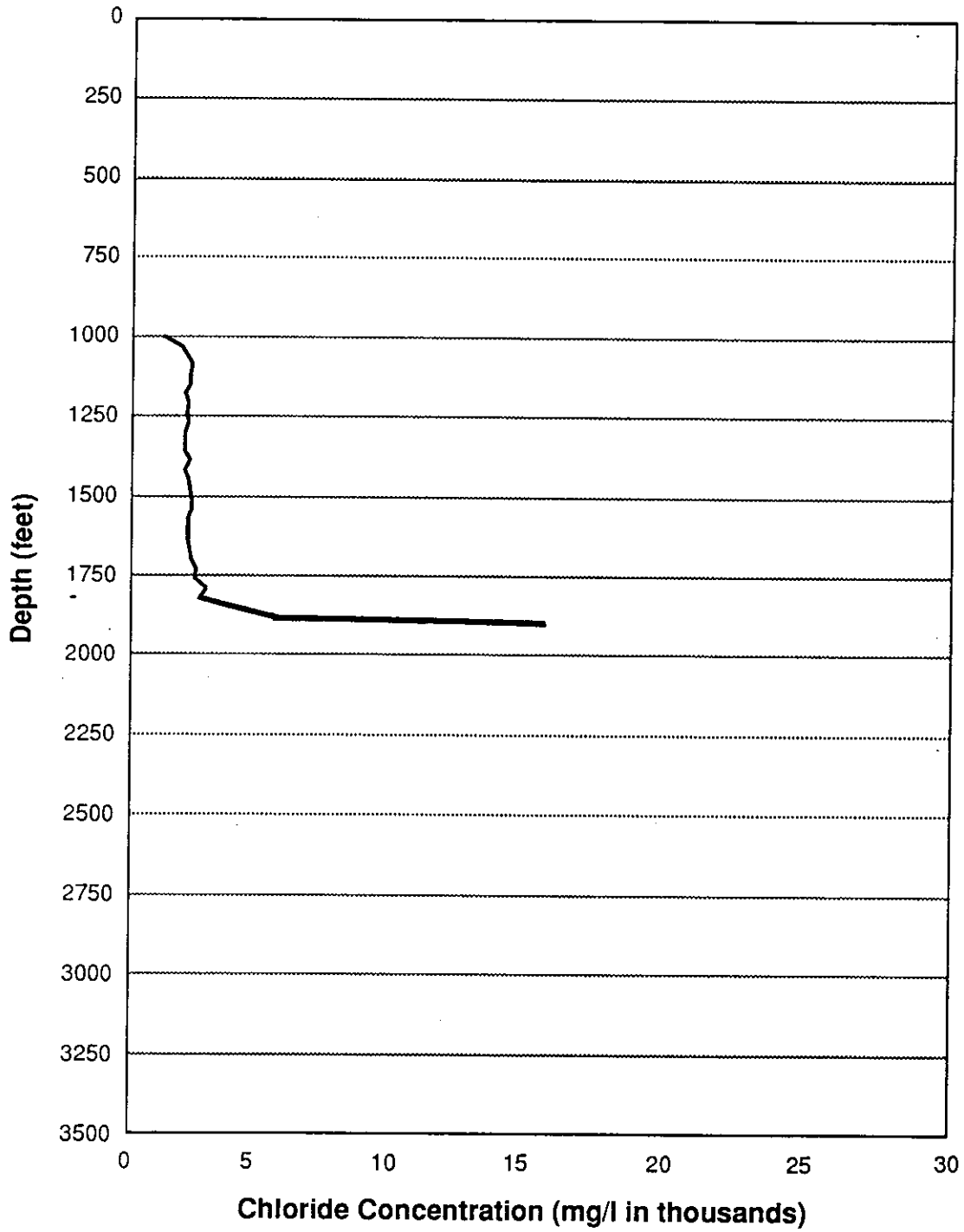


FIGURE 6-3
Dual-Zone Monitor Well Water Quality
While Drilling at the Palm Beach County
Southern Region Wastewater Treatment Plant



depth of 1,951 feet. Laboratory results indicated formation waters with a TDS concentration of 38,190 mg/l. These results are contained in Appendix G.

On October 10, 1990, primary and secondary drinking water standard samples were collected. These samples were also collected while circulating the borehole from 3,450 feet. Laboratory results are presented in Appendix O. A 5-gallon unacidized sample was also collected and shipped to FDER in Tallahassee for their use.

DUAL-ZONE MONITOR WELL

Two zones were selected for long term monitoring on the basis of water quality data and the geophysical logs from the injection wells and the DZMW pilot holes. The Upper Monitor Zone extends over the interval from 1,000 to 1,096 feet bls and will be used to monitor formation waters with less-than 10,000 mg/l TDS. The Lower Monitor Zone extends from 1,900 to 1,984 feet bls and will monitor formation waters greater-than 10,000 mg/l TDS. After completion of the DZMW, the Upper Monitor Zone was developed by back-flowing under the artesian head. The Lower Monitor Zone was developed by pumping. The development water was discharged to IW-1 for disposal.

To insure that both monitor zones had been completely developed and to establish background data, each zone was purged for approximately 2 months while the contractor completed construction at the site. A temporary submersible pump was placed in the Lower Monitor Zone and a temporary pump was placed in the DZMW pad sump to dispose of purged water to IW-1. The Upper Monitor Zone flowed at approximately 80 gpm while the Lower Monitor Zone was pumped at approximately 65 gpm. Appendix N contains a table which outlines the purging duration for each zone. At the onset of the background sampling, primary and secondary drinking water standard samples were collected for analysis. Laboratory results are contained in Appendix N. Samples were then collected on a weekly basis after allowing a minimum of 3 casing volumes to purge from each zone. The samples were field analyzed for conductivity, temperature, chlorides, and pH. These results are also presented in Appendix N.

At the conclusion of the background sampling period, primary and secondary drinking water standards were again tested to confirm the previous data. These data were fairly consistent indicating that the well had been properly developed. The data are contained in Appendix N.

The Upper Monitor Zone, monitored through the annulus between the 16-inch and 6-inch casings, is open to the upper Floridan aquifer between 1,000 and 1,096 feet bls and is under artesian pressure with a head of approximately 9.0 psi which represents a static water level of 45-feet NGVD. The Lower Monitor Zone extends from 1,900

to 1,984 feet in depth. This zone does not flow and has a static water level of approximately 11.4 feet NGVD. The zone is equipped with a self priming centrifugal pump for purging.

SURFICIAL MONITOR WELLS

Throughout construction, water samples were collected on a weekly basis from several surficial monitor wells surrounding the injection well pads. All eight Surficial Monitor Wells were sampled at the beginning and end of construction. Surficial Monitor Wells 1, 3, 6, and 8 were sampled weekly during construction. Samples were field-analyzed for temperature, conductivity, and chlorides.

An increase in chloride concentration in SMW-1 was noted during the drilling of IW-1. The elevated chloride concentration was determined to be the result of a leaking mud tank used during reverse-air drilling. The leak was patched and SMW-1 purged onto the IW-1 pad for several days. Subsequent sampling of SMW-1 indicated that the chloride levels dropped back to slightly above background level. At no time did the chlorine concentration exceed 250 mg/l, the maximum acceptable concentration for groundwater. There is a noted increase in the concentration of SMW-5 from the beginning of construction to the end. The maximum concentration observed for SMW-5 was 160 mg/l, which is below the accepted standard of 250 mg/l for groundwater. This increase may be attributed to the heavy rains that fell near the end of the project causing runoff from construction. Actual field analytical data are presented in Appendix M.

OPERATIONAL MONITORING

The monitoring system includes continuous recording and indicating instruments for flows and pressures at the wellheads and in the Motor Control Center (MCC). Flow and pressure for the effluent disposal system are electronically recorded at the MCC.

Integrity of the confining intervals above the injection zone is monitored with the dual-zone monitor well located between the injection wells, 100 feet from each. Continuous water level monitoring of the two zones is provided at the wellhead with a pressure gauge on the upper zone and pressure transducer with digital readout on the lower zone. These data are also continuously and electronically recorded in the MCC.

The injected effluent and the water quality of the two monitoring zones will be monitored periodically, in accordance with the requirements of Section 17-28.250, FAC and as required by the injection well operating permit. The operational moni-

toring plan will be developed with the Technical Advisory Committee during the operating permit application process and will be contained in the Operation and Maintenance Manual for the Deep Injection Well at the Palm Beach County Southern Region Wastewater Treatment Plant.

Section 7

SUMMARY, CONCLUSION AND RECOMMENDATIONS

SUMMARY

Construction of the effluent disposal system began in March 1990 and was completed in November 1990. Casings for the injection wells included 54-inch-diameter casings installed through the surficial aquifer to a depth of 260 feet bls, 44-inch-diameter casings installed through the confining clays to a depth of 1,000 feet bls, 34-inch-diameter casings installed through the 10,000 mg/l total dissolved solids interface to a depth of 1,890 feet bls, and 24-inch-diameter effluent conductor casings installed into the confinement above the injection zone at depths of 2,660 feet and 2,645 feet for IW-1 and IW-2, respectively.

A dual-zone monitor well was constructed to detect any changes above background water quality and to monitor pressure impacts due to injection. Casings for the well included 24-, 16-, and 6-inch diameter steel pipe installed to depths of 260, 1,000, and 1,900 feet bls, respectively. The lower zone extends over the interval from 1,900 to 1,984 feet and monitors formation waters with total dissolved solids greater than 10,000 mg/l. The upper zone extends from 1,000 to 1,096 feet bls and monitors the brackish waters of the upper Floridan Aquifer.

CONCLUSIONS

In both injection wells the 10,000 mg/l TDS interface occurs above 1,900 feet. Below this depth, TDS and chloride concentrations increase rapidly to those found in the injection zone with TDS of approximately 37,000 mg/l. The injection zone water quality analysis for IW-1 and IW-2 closely represents that of seawater with a chloride concentration of 19,200 mg/l and 20,300 mg/l and TDS of 37,000 mg/l and 37,200 mg/l, respectively.

The injection zone at IW-1 was encountered from approximately 2,645 feet bls and extends fairly uniform to total depth of 3,240 feet. While injection testing at 4,200 gpm, this interval accounted for greater than 90 percent of the fluid loss. The maximum wellhead pressure observed during this test was 55.5 psi while injecting at 10,500 gpm.

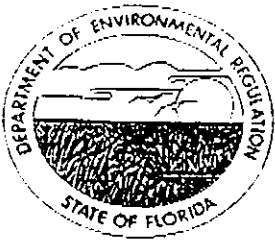
The injection zone at IW-2 was encountered at about the same depth as IW-1 but becomes highly cavernous from approximately 2,955 to a total depth of 3,443 feet bls. During the first step of the injection test, at a pumping rate of 4,400 gpm, the lower interval accounted for greater than approximately 85 percent of the fluid loss. The maximum wellhead pressure during the injection test was 40.0 psi at 10,500 gpm.

Mechanical integrity testing of the final 24-inch casings on both injection wells was performed by pressure testing, geophysical logging, radioactive tracer surveys, and television video surveys. Each of the testing procedures confirms that the 24-inch casing had mechanical integrity and met the standards of FAC 17.28.130(6).

RECOMMENDATIONS

An extended injection testing program is recommended to be initiated to monitor changes in well capacity, wellhead pressure, and to determine the effectiveness of the overlying confining units. During the test operation period, water quality of the two monitor zones and the injection fluid will be monitored. In addition, water levels in the dual-zone monitor well and the pressures and flow rates at the injection well shall be recorded. Data from the test period will be summarized and submitted to the TAC in an operation permit application.

PERMITS



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Bob Martinez, Governor

Dale Twachtmann, Secretary

John Shearer, Assistant Secretary

F
87-16

* * * * *

CERTIFICATE OF DEMONSTRATION

Florida Underground Injection Control Program

Demonstration of Financial Responsibility

Facility Name: Palm Beach County Water Utilities - Well #1

Southern Region WWTP (Phase I)

Facility Address: Hagen Ranch Road

Delray Beach, Florida 33484

Facility Contact: Paul Feldman (407)641-3429

DER/EPA Identification Number: FLS 505007543

DER Permit Number: UC-50-165238

Date Financial Information Received: September 5, 1989

Current Plugging & Abandonment Cost Estimate: \$229,200

Current Post-Closure Monitoring Estimate: n/a

Mechanism(s) Used to Demonstrate

Financial Responsibility

Local Government Guarantee

Date of Expiration

Written Consent of

DER Secretary

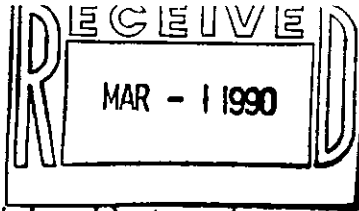
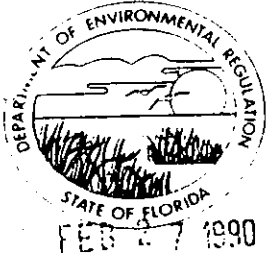
Date Mechanism(s) Approved: September 13, 1989

By: Mary J. Woodworth

Mary J. Woodworth

Management Analyst

(904) 488-3601



Florida Department of Environmental Regulation

Southeast District • 1900 S. Congress Ave., Suite A • West Palm Beach, Florida 33406 • 407-964-9668

Bob Martinez, Governor

Dale Twachmann, Secretary

John Shearer, Assistant Secretary

Scott Benyon, Deputy Assistant Secretary

NOTICE OF PERMIT

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Palm Beach County
UIC - Palm Beach County Southern Region
Wastewater Treatment Plant
Class I Injection Well, IW-2

Mr. Bevin A. Beaudet, Director
Palm Beach County Water Utilities Dept.
2065 Prairie Road
West Palm Beach, FL 33406

Dear Mr. Beaudet:

Enclosed is Permit Number UC 50-165239, to construct one (1), 24-inch, test Class I Injection Well at Palm Beach County Southern Region Water Treatment Plant, issued pursuant to Section(s) 403.087, Florida Statutes and Florida Administrative Codes 17-3, 17-4, 17-6, 17-28 & 17-550.

Any party to this Order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this Notice is filed with the Clerk of the Department.

If you have any questions please contact Peggie Highsmith or Al Mueller of this office, phone (407) 964-9668.

Executed in West Palm Beach, Florida

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

J. Scott Benyon
Deputy Assistant Secretary
1900 South Congress Avenue, Suite A
West Palm Beach, FL 33406
407/964-9668

JSB:pms/248

Copies furnished to:
Office of General Counsel, DER/Tlh.
Steve Burton, EPA/Atlanta
Richard Deuerling, DER/Tlh.
Greg Rawl, SFWMD
Tony LasCasas, PBCHU
Mike Merritt, USGS
Tom McCormick, CH2M Hill
Al Muniz, CH2M Hill
Paul Feldman, PBC Water Util.

CERTIFICATE OF SERVICE

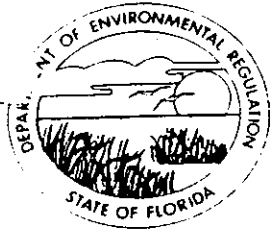
This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on FEB 27 1990 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGEMENT FILED, on this date, pursuant to the §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Maureen K. Smith
Clerk

FEB 27 1990
Date



Florida Department of Environmental Regulation

Southeast District • 1900 S. Congress Ave., Suite A • West Palm Beach, Florida 33406 • 407-964-9008

Bob Martinez, Governor

Dele Twachmann, Secretary

John Shearer, Assistant Secretary
Scott Benvon, Deputy Assistant Secretary

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Utilities Dept.
2065 Prairie Road
West Palm Beach, FL 33406

I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UG 80-165239
DATE OF ISSUE: FEB 26 1990
EXPIRATION DATE: October 15, 1991
COUNTY: Palm Beach
SECTION/TOWNSHIP/RANGE: 4/46S/42E
LATITUDE/LONGITUDE: 26°29'30"/80°10'00
PROJECT: Palm Beach County Southern Region
Wastewater Treatment Plant, Class I
Injection Well, IW-2

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rules 17-3, 17-4, 17-6, 17-28 and 17-550. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

TO CONSTRUCT: One (1) 24 inch O.D. test injection well, IW-2, to a total depth of 3300 feet with one associated 6-inch O.D. dual-zone monitor well (shared with IW-1). The injection well will be used to dispose of 15 MGD (maximum, peak hour design capacity) of non-hazardous, secondarily-treated, domestic wastewater from the Palm Beach County Southern Region Wastewater Treatment Plant.

IN ACCORDANCE WITH: Application to construct one Class I Injection Well received May 23, 1989; additional information letters received from CH2M Hill on June 26, 1989, July 24, 1989, August 4, 1989, October 26, 1989 and December 1, 1989; Certificate of Demonstration of Financial Responsibility issued September 13, 1989.

LOCATED AT: West of Hagan Ranch Road and East of the Florida Turnpike between Lake Worth drainage district Canals C-29 and C-30

TO SERVE: Palm Beach County Southern Region domestic wastewater service area.

SUBJECT TO: General Conditions 1-16 and Specific Conditions 1-7.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit, are "permit conditions" and are binding and enforceable pursuant to Sections 403.141, 403.727, or 403.859 through 403.861, F.S. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in subsections 403.087(6) and 403.722(5), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, are required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times, access to the premises where the permitted activity is located or conducted to:

- (a) Have access to and copy any records that must be kept under conditions of the permit;
- (b) Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
- (c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

- (a) A description of and cause of noncompliance; and
- (b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Section 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

GENERAL CONDITIONS:

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.
11. This permit is transferable only upon Department approval in accordance with Rule 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.
12. This permit or a copy thereof shall be kept at the work site of the permitted activity.
13. This permit also constitutes:
 - () Determination of Best Available Control Technology (BACT)
 - () Determination of Prevention of Significant Deterioration (PSD)
 - () Certification of compliance with state Water Quality Standards (Section 401, PL 92-500)
 - () Compliance with New Source Performance Standards
14. The permittee shall comply with the following:
 - (a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
 - (b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
 - (c) Records of monitoring information shall include:
 1. the date, exact place, and time of sampling or measurements;
 2. the person responsible for performing the sampling or measurements;
 3. the dates analyses were performed;
 4. the person responsible for performing the analyses;
 5. the analytical techniques or methods used;
 6. the results of such analyses.
15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware the relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.
16. In the case of an underground injection control permit, the following permit conditions also shall apply:
 - (a) All reports or information required by the Department shall be certified as being true, accurate and complete.
 - (b) Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.
 - (c) Notification of any noncompliance which may endanger health or the environment shall be reported verbally to the Department within 24 hours and again within 72 hours, and a final written report provided within two weeks.
 1. The verbal reports shall contain any monitoring or other information which indicate that any contaminant may endanger an underground source of drinking water and any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.

GENERAL CONDITIONS:

2. The written submission shall contain a description of and a discussion of the cause of the noncompliance and, if it has not been corrected, the anticipated time the noncompliance is expected to continue, the steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance and all information required by Rule 17-28.230(4)(b), F.A.C.
 - (d) The Department shall be notified at least 180 days before conversion or abandonment of an injection well, unless abandonment within a lesser period of time is necessary to protect waters of the state.
17. The following conditions also shall apply to a hazardous waste facility permit.
- (a) The following reports shall be submitted to the Department:
 1. Manifest discrepancy report. If a significant discrepancy in a manifest is discovered, the permittee shall attempt to rectify the discrepancy. If not resolved within 15 days after the waste is received, the permittee shall immediately submit a letter report, including a copy of the manifest, to the Department.
 2. Unmanifested waste report. The permittee shall submit an unmanifested waste report to the Department within 15 days of receipt of unmanifested waste.
 3. Annual report. An annual report covering facility activities during the previous calendar year shall be submitted pursuant to Chapter 17-30, F.A.C.
 - (b) Notification of any noncompliance which may endanger health or the environment, including the release of any hazardous waste that may endanger public drinking water supplies or the occurrence of a fire or explosion from the facility which could threaten the environment or human health outside the facility, shall be reported verbally to the Department within 24 hours, and a written report shall be provided within 5 days. The verbal report shall include the name, address, I.D. number, and telephone number of the facility, its owner or operator, the name and quantity of materials involved, the extent of any injuries, an assessment of actual or potential hazards, and the estimated quantity and disposition of recovered material. The written submission shall contain:
 1. A description and cause of the noncompliance.
 2. If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.
 - (c) Reports of compliance or noncompliance with, or any progress reports on, requirements in any compliance schedule shall be submitted no later than 14 days after each schedule date.
 - (d) All reports or information required by the Department by a hazardous waste permittee shall be signed by a person authorized to sign a permit application.

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Utilities Dept.

I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UC 50-165239
DATE OF ISSUE: FEB 26 1990
EXPIRATION DATE: October 15, 1991

SPECIFIC CONDITIONS:

1. Site Requirements

- a. The measurement points for drilling and logging operations will be surveyed and referenced to NGVD of 1929 prior to the onset of drilling activities for the injection well.
- b. The injection and monitor well must be surveyed for latitude and longitude and submitted on a site plan prior to operational testing approval.
- c. The four (4) surficial aquifer wells will be sampled and analyzed prior to drilling and then weekly for chlorides (mg/l), conductivity (umhos), temperature (°F), and water level (msl). Initial analyses must be submitted for Department approval prior to spudding the well.

2. Construction and Testing Requirements

- a. Blow-out preventors will be installed on the injection well prior to penetration of the Floridan Aquifer System.
- b. Upon approval by the Department, the lower monitor zone will be positioned in the first transmissive interval below the USDW. Extension of the deep Monitor well below the Hawthorn Formation is prohibited until the selection of deep monitor zone is approved by the Department.
- c. Mechanical integrity of the injection wells, will be determined pursuant to Chapter 17-28.13(6)(b)2 and (c)2. The pressure test for the final casing will be accepted if tested with a liquid-filled casing at 1.5 times the expected operating pressure with a test tolerance of $\pm 5\%$. Verification of pressure gauge calibration must be provided with the test report.
- d. Department approval and TAC review pursuant to F.A.C. 17-28 is required for the following stages of construction:
 1. Pre-construction meeting: review revised contract documents and notice to proceed. (See Specific Condition 2 g)
 2. Intermediate casing seat and lower monitor zone selection.
 3. Final casing seat selection.
 4. Mechanical integrity, confinement and injectivity testing.
- e. Department approval at a scheduled TAC meeting will be based on the permittee's presentation that shows compliance with the rules and this permit.
- f. TAC meetings are scheduled on the 2nd and 4th Tuesday of each month subject to a five working day prior notice and timely receipt of critical data by all TAC members. Emergency meetings may be arranged when justified to avoid undue construction delays.
- g. A revised set of contract documents that includes this permit and approved specification changes documented in all responses to requests for information (RFI) must be submitted to the Department and TAC prior to construction.
- h. The Department must be notified within 48-hours after drilling has begun (spud-date).
- i. Hurricane Preparedness - Upon the issuance of a "Hurricane Watch" by the National Weather Service, the preparations to be made include but are not necessarily limited to the following:
 1. Secure all on-site salt and other stockpiled additive materials to prevent surface and/or groundwater contamination.

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Utilities Dept.

I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UC 50-165239
DATE OF ISSUE: FEB 26, 1991
EXPIRATION DATE: October 19, 1991

SPECIFIC CONDITIONS:

2. Properly secure drilling equipment and rig(s) to prevent damage to well(s) and on-site treatment process equipment.
3. Quality Assurance/Quality Control Requirements
 - a. Pursuant to Chapter 17-28.310(5)(b), the Professional Engineer of Record will certify all documents related to the completion of the injection well system as a disposal facility. The Department must be notified immediately of any transfer of the Engineer of Record.
 - b. In accordance with Chapter 492, Florida Statutes, all documents prepared for the geological/hydrogeological evaluation of the injection well system must be signed and sealed by a Florida Certified Professional Geologist.
 - c. Continuous on-site supervision by qualified personnel (engineer and geologist) is required during all testing and geophysical logging operations.
4. Reporting Requirements
 - a. All reports and surveys required by this permit must be submitted concurrently to all the members of the TAC. The Technical Advisory Committee (TAC) will consist of representatives from these agencies:

Department of Environmental Regulation, West Palm Beach and Tallahassee
United States Environmental Protection Agency, Region IV, Atlanta
United States Geological Survey, Miami
South Florida Water Management District, West Palm Beach
Palm Beach County Health Department, West Palm Beach
 - b. The Department and other applicable agencies must be notified immediately of any unusual events occurring during construction activities (e.g. on-site spills, artesian flows, large volumes of circulation losses, etc.).
 - c. The Department must be notified seventy-two (72) hours prior to all testing for mechanical integrity on the injection and monitor wells.
 - d. All testing for mechanical integrity on the injection and monitor wells must be initiated during daylight hours, Monday through Friday.
 - e. A weekly submittal of construction progress reports will include at a minimum the following information:
 1. A cover letter summary of the daily engineer/geologist report and driller's log and projection for activities in next reporting period.
 2. Daily engineer/geologist report and driller's log with detailed descriptions of all testing, logging, casing, cementing and drilling activities pursuant to Chapter 17-28.340 F.A.C.
 3. Lithologic log with cuttings descriptions, drilling rate curve and formation tops.
 4. Weekly water quality analyses and water levels for the four (4) surficial aquifer wells. (See S.C. 1a and c)
 5. Detailed description of any unusual construction-related events that occur during the reporting period.
 - f. A drilling and system construction schedule will be submitted to the Department and TAC prior to site preparation for the injection well system.
 - g. An evaluation of all test results and geophysical logs must be submitted with all test data.

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Util. Dept.

I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UC 50-165239
DATE OF ISSUE: FEB 26 1991
EXPIRATION DATE: October 19, 1991

SPECIFIC CONDITIONS:

5. Operational Testing Requirements

- a. The operational testing of the injection well system with non-hazardous domestic wastewater will not commence without written authorization from the Department.
- b. A draft operation and maintenance manual with emergency procedures must be submitted to the Department and TAC prior to a request for system operation approval.
- c. Prior to operational testing approval, the following items must be submitted for Department approval and TAC review:
 1. Borehole television survey of final casing and injection zone
 2. Geophysical logs with interpretations
 3. Certification of mechanical integrity and interpreted test data
 4. Injection test data and evaluation
 5. Confining zone data (cores, etc.) and confirmation of confinement
 6. Background water quality data (monitor zones)
 7. Waste stream analysis
 8. Surface equipment completion certified pursuant to 17-6.080.

6. Operational Testing Conditions

- a. Upon receipt of written authorization from the Department (S.C. 5a), the operational testing of the injection well system will be subject to the following conditions.
 1. The progress of the operational testing for the system will be reviewed during TAC meetings scheduled at least every three months after operation has begun. Reports evaluating the system's progress must be submitted to each member of the TAC at least two weeks prior to the scheduled meeting. The conditions for the operational test period may be modified by the Department at each of these TAC review intervals.
 2. The flows to the injection well will be monitored and controlled at all times to ensure the maximum pressure at each wellhead does not exceed 66% of the tested pressure on the final casing and the velocity down the wells does not exceed 8.0 feet per second.
 3. Any failure of injection well monitoring and recording equipment for a period of more than twenty-four (24) hours will be reported immediately to the Department.
 4. The following injection well performance and monitor zone data will be recorded for each well as indicated and reported monthly:
 - a. Injection well performance:
 - total daily flow (mgd)
 - daily maximum flow (mgd)
 - daily maximum injection pressure (psig)
 - daily average injection pressure (psig)
 - monthly averages for the above daily measurements
 - b. Monitor well performance:
 1. Physical characteristics of upper and lower monitor zone:
 - daily maximum, sustained monitor zone pressure (psig)
 - daily minimum, sustained monitor zone pressure (psig)
 - daily average monitor zone pressure (psig)
 - monthly averages for the above

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Util. Dept.


I.D. NUMBER: 5050C02014
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DATE OF ISSUE: FEB 26 1990
EXPIRATION DATE: October 15, 1991

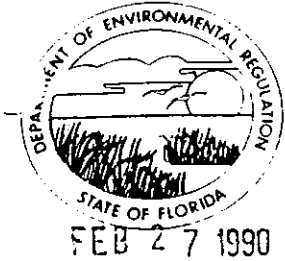
SPECIFIC CONDITIONS:

2. Chemical characteristics of upper and lower monitoring zone (weekly):
 - total dissolved solids-measured (mg/l)
 - chlorides (mg/l)
 - fecal coliform (# colonies/100 ml)
 - conductivity (umho/cm)
 - TKN (mg/l)
 - pH
 - temperature (°F)
 - ammonia (mg/l)
5. A minimum of three (3) well volumes of fluid will be evacuated from each monitor system prior to sampling for chemical parameters listed above.
6. All injection well data submissions will be clearly identified on each page with facility name, I.D. Number, date of sampling/recording and type of data shown. The lead plant operator or higher official must sign and date each submittal.
7. All monthly reports will be submitted to this office and our Tallahassee office (2600 Blair Stone Road, Tallahassee, FL 32301) by the fifteenth of each month.
8. A qualified representative of the Engineer of Record must be present for the start-up operations.
9. The Department must be notified in writing of the date operation began for the subject well.
- b. The integrity of the monitor zone sampling systems will be maintained at all times. Sampling lines and equipment shall be kept free of contamination with independent discharges and no interconnections with any other lines.
- c. All industrial sources (including reverse osmosis reject water) must comprise less than 5% of the total volume of the wastestream.
- d. Emergency discharge shall be constructed as approved under the FDER Wastewater Treatment Plant construct permit, DC 50-156882.

Issued this 26th day of February, 1990

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION


J. Scott Benyon
Deputy Assistant Secretary



Florida Department of Environmental Regulation

Southeast District • 1900 S. Congress Ave., Suite A • West Palm Beach, Florida 33406 • 407-964-9668

Bob Martinez, Governor

Dale Swachmann, Secretary

John Shearer, Assistant Secretary

Scott Benyon, Deputy Assistant Secretary

NOTICE OF PERMIT

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Palm Beach County
UIC - Palm Beach County Southern Region
Wastewater Treatment Plant
Class I Injection Well, IW-1

Mr. Bevin A. Beaudet, Director
Palm Beach County Water Utilities Dept.
2065 Prairie Road
West Palm Beach, FL 33406

Dear Mr. Beaudet:

Enclosed is Permit Number UC 50-165238, to construct one (1), 24-inch, test Class I Injection Well at Palm Beach County Southern Region Water Treatment Plant, issued pursuant to Section(s) 403.087, Florida Statutes and Florida Administrative Codes 17-3, 17-4, 17-6, 17-28 & 17-550.

Any party to this Order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this Notice is filed with the Clerk of the Department.

If you have any questions please contact Peggie Highsmith or Al Mueller of this office, phone (407) 964-9668.

Executed in West Palm Beach, Florida

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

J. Scott Benyon
Deputy Assistant Secretary
1900 South Congress Avenue, Suite A
West Palm Beach, FL 33406
407/964-9668

JSB:phs/248

Copies furnished to:
Office of General Counsel, DER/Tlh.
Steve Burton, EPA/Atlanta
Richard Deuerling, DER/Tlh.
Greg Rawl, SFWMD
Tony LasCasas, PBCHU
Mike Merritt, USGS
Tom McCormick, CH2M Hill
Al Muniz, CH2M Hill
Paul Feldman, PBC Water Util.

CERTIFICATE OF SERVICE

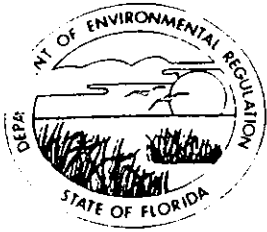
This is to certify that this NOTICE OF PERMIT and all copies were mailed before the close of business on FEB 27 1990 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGEMENT FILED, on this date, pursuant to the §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk

Date



Florida Department of Environmental Regulation

Southeast District • 1900 S. Congress Ave., Suite A • West Palm Beach, Florida 33406 • 407-964-9068

Bob Martinez, Governor

Dale Wachtmann, Secretary

John Shearer, Assistant Secretary

Scott Benson, Deputy Assistant Secretary

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Utilities Dept.
2065 Prairie Road
West Palm Beach, FL 33406

I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UC 50-165238
DATE OF ISSUE: FEB 26 1990
EXPIRATION DATE: October 19, 1991
COUNTY: Palm Beach
SECTION/TOWNSHIP/RANGE: 4/46S/42E
LATITUDE/LONGITUDE: 26°29'30"/80°10'00
PROJECT: Palm Beach County Southern Region
Wastewater Treatment Plant, Class I
Injection Well, IW-1

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rules 17-3, 17-4, 17-6, 17-28 and 17-550. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

TO CONSTRUCT: One (1) 24 inch O.D. test injection well, IW-1, to a total depth of 3300 feet with one associated 6-inch O.D. dual-zone monitor well (shared with IW-2). The injection well will be used to dispose of 15 MGD (maximum, peak hour design capacity) of non-hazardous, secondarily-treated, domestic wastewater from the Palm Beach County Southern Region Wastewater Treatment Plant.

IN ACCORDANCE WITH: Application to construct one Class I Injection Well received May 23, 1989; additional information letters received from CH2M Hill on June 26, 1989, July 24, 1989, August 4, 1989, October 26, 1989 and December 1, 1989; Certificate of Demonstration of Financial Responsibility issued September 13, 1989.

LOCATED AT: West of Hagan Ranch Road and East of the Florida Turnpike between Lake Worth drainage district Canals C-29 and C-30

TO SERVE: Palm Beach County Southern Region domestic wastewater service area.

SUBJECT TO: General Conditions 1-16 and Specific Conditions 1-7.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit, are "permit conditions" and are binding and enforceable pursuant to Sections 403.141, 403.727, or 403.859 through 403.861, F.S. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
3. As provided in subsections 403.087(6) and 403.722(5), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in this permit.
4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.
5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.
6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, are required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.
7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times, access to the premises where the permitted activity is located or conducted to:
 - (a) Have access to and copy any records that must be kept under conditions of the permit;
 - (b) Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
 - (c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.Reasonable time may depend on the nature of the concern being investigated.
8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:
 - (a) A description of and cause of noncompliance; and
 - (b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.
9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Section 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

GENERAL CONDITIONS:

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.
11. This permit is transferable only upon Department approval in accordance with Rule 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.
12. This permit or a copy thereof shall be kept at the work site of the permitted activity.
13. This permit also constitutes:
 - () Determination of Best Available Control Technology (BACT)
 - () Determination of Prevention of Significant Deterioration (PSD)
 - () Certification of compliance with state Water Quality Standards (Section 401, PL 92-500)
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 - (a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
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 1. the date, exact place, and time of sampling or measurements;
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 - (a) All reports or information required by the Department shall be certified as being true, accurate and complete.
 - (b) Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.
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 1. The verbal reports shall contain any monitoring or other information which indicate that any contaminant may endanger an underground source of drinking water and any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.

GENERAL CONDITIONS:

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 - (d) The Department shall be notified at least 180 days before conversion or abandonment of an injection well, unless abandonment within a lesser period of time is necessary to protect waters of the state.
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- (a) The following reports shall be submitted to the Department:
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 2. Unmanifested waste report. The permittee shall submit an unmanifested waste report to the Department within 15 days of receipt of unmanifested waste.
 3. Annual report. An annual report covering facility activities during the previous calendar year shall be submitted pursuant to Chapter 17-30, F.A.C.
 - (b) Notification of any noncompliance which may endanger health or the environment, including the release of any hazardous waste that may endanger public drinking water supplies or the occurrence of a fire or explosion from the facility which could threaten the environment or human health outside the facility, shall be reported verbally to the Department within 24 hours, and a written report shall be provided within 5 days. The verbal report shall include the name, address, I.D. number, and telephone number of the facility, its owner or operator, the name and quantity of materials involved, the extent of any injuries, an assessment of actual or potential hazards, and the estimated quantity and disposition of recovered material. The written submission shall contain:
 1. A description and cause of the noncompliance.
 2. If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.
 - (c) Reports of compliance or noncompliance with, or any progress reports on, requirements in any compliance schedule shall be submitted no later than 14 days after each schedule date.
 - (d) All reports or information required by the Department by a hazardous waste permittee shall be signed by a person authorized to sign a permit application.

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Utilities Dept.

I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UC 50-165238
DATE OF ISSUE: FEB 26 1990
EXPIRATION DATE: October 15, 1991

SPECIFIC CONDITIONS:

1. Site Requirements

- a. The measurement points for drilling and logging operations will be surveyed and referenced to NGVD of 1929 prior to the onset of drilling activities for the injection well.
- b. The injection and monitor well must be surveyed for latitude and longitude and submitted on a site plan prior to operational testing approval.
- c. The four (4) surficial aquifer wells will be sampled and analyzed prior to drilling and then weekly for chlorides (mg/l), conductivity (umhos), temperature (°F), and water level (msl). Initial analyses must be submitted for Department approval prior to spudding the well.

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- a. Blow-out preventors will be installed on the injection well prior to penetration of the Floridan Aquifer System.
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 1. Pre-construction meeting: review revised contract documents and notice to proceed. (See Specific Condition 2 g)
 2. Intermediate casing seat and lower monitor zone selection.
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- e. Department approval at a scheduled TAC meeting will be based on the permittee's presentation that shows compliance with the rules and this permit.
- f. TAC meetings are scheduled on the 2nd and 4th Tuesday of each month subject to a five working day prior notice and timely receipt of critical data by all TAC members. Emergency meetings may be arranged when justified to avoid undue construction delays.
- g. A revised set of contract documents that includes this permit and approved specification changes documented in all responses to requests for information (RFI) must be submitted to the Department and TAC prior to construction.
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- i. Hurricane Preparedness - Upon the issuance of a "Hurricane Watch" by the National Weather Service, the preparations to be made include but are not necessarily limited to the following:
 1. Secure all on-site salt and other stockpiled additive materials to prevent surface and/or groundwater contamination.

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Utilities Dept.

I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UC 50-165238
DATE OF ISSUE: FEB 26 1990
EXPIRATION DATE: October 15, 1991

SPECIFIC CONDITIONS:

2. Properly secure drilling equipment and rig(s) to prevent damage to well(s) and on-site treatment process equipment.
3. Quality Assurance/Quality Control Requirements
 - a. Pursuant to Chapter 17-28.310(5)(b), the Professional Engineer of Record will certify all documents related to the completion of the injection well system as a disposal facility. The Department must be notified immediately of any transfer of the Engineer of Record.
 - b. In accordance with Chapter 492, Florida Statutes, all documents prepared for the geological/hydrogeological evaluation of the injection well system must be signed and sealed by a Florida Certified Professional Geologist.
 - c. Continuous on-site supervision by qualified personnel (engineer and geologist) is required during all testing and geophysical logging operations.
4. Reporting Requirements
 - a. All reports and surveys required by this permit must be submitted concurrently to all the members of the TAC. The Technical Advisory Committee (TAC) will consist of representatives from these agencies:
Department of Environmental Regulation, West Palm Beach and Tallahassee
United States Environmental Protection Agency, Region IV, Atlanta
United States Geological Survey, Miami
South Florida Water Management District, West Palm Beach
Palm Beach County Health Department, West Palm Beach
 - b. The Department and other applicable agencies must be notified immediately of any unusual events occurring during construction activities (e.g. on-site spills, artesian flows, large volumes of circulation losses, etc.).
 - c. The Department must be notified seventy-two (72) hours prior to all testing for mechanical integrity on the injection and monitor wells.
 - d. All testing for mechanical integrity on the injection and monitor wells must be initiated during daylight hours, Monday through Friday.
 - e. A weekly submittal of construction progress reports will include at a minimum the following information:
 1. A cover letter summary of the daily engineer/geologist report and driller's log and projection for activities in next reporting period.
 2. Daily engineer/geologist report and driller's log with detailed descriptions of all testing, logging, casing, cementing and drilling activities pursuant to Chapter 17-28.340 F.A.C.
 3. Lithologic log with cuttings descriptions, drilling rate curve and formation tops.
 4. Weekly water quality analyses and water levels for the four (4) surficial aquifer wells. (See S.C. 1a and c)
 5. Detailed description of any unusual construction-related events that occur during the reporting period.
 - f. A drilling and system construction schedule will be submitted to the Department and TAC prior to site preparation for the injection well system.
 - g. An evaluation of all test results and geophysical logs must be submitted with all test data.

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Util. Dept.

I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UC 50-165238
DATE OF ISSUE: FEB 26 1990
EXPIRATION DATE: October 15, 1991

SPECIFIC CONDITIONS:

5. Operational Testing Requirements

- a. The operational testing of the injection well system with non-hazardous domestic wastewater will not commence without written authorization from the Department.
- b. A draft operation and maintenance manual with emergency procedures must be submitted to the Department and TAC prior to a request for system operation approval.
- c. Prior to operational testing approval, the following items must be submitted for Department approval and TAC review:
 1. Borehole television survey of final casing and injection zone
 2. Geophysical logs with interpretations
 3. Certification of mechanical integrity and interpreted test data
 4. Injection test data and evaluation
 5. Confining zone data (cores, etc.) and confirmation of confinement
 6. Background water quality data (monitor zones)
 7. Waste stream analysis
 8. Surface equipment completion certified pursuant to 17-6.080.

6. Operational Testing Conditions

- a. Upon receipt of written authorization from the Department (S.C. 5a), the operational testing of the injection well system will be subject to the following conditions.
 1. The progress of the operational testing for the system will be reviewed during TAC meetings scheduled at least every three months after operation has begun. Reports evaluating the system's progress must be submitted to each member of the TAC at least two weeks prior to the scheduled meeting. The conditions for the operational test period may be modified by the Department at each of these TAC review intervals.
 2. The flows to the injection well will be monitored and controlled at all times to ensure the maximum pressure at each wellhead does not exceed 66% of the tested pressure on the final casing and the velocity down the wells does not exceed 8.0 feet per second.
 3. Any failure of injection well monitoring and recording equipment for a period of more than twenty-four (24) hours will be reported immediately to the Department.
 4. The following injection well performance and monitor zone data will be recorded for each well as indicated and reported monthly:
 - a. Injection well performance:
 - total daily flow (mgd)
 - daily maximum flow (mgd)
 - daily maximum injection pressure (psig)
 - daily average injection pressure (psig)
 - monthly averages for the above daily measurements
 - b. Monitor well performance:
 1. Physical characteristics of upper and lower monitor zone:
 - daily maximum, sustained monitor zone pressure (psig)
 - daily minimum, sustained monitor zone pressure (psig)
 - daily average monitor zone pressure (psig)
 - monthly averages for the above

PERMITTEE:
Mr. Bevin A. Beaudet, Director
Palm Beach County Water Util. Dept.

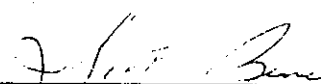
I.D. NUMBER: 5050C02014
PERMIT/CERTIFICATION NUMBER: UC 50-165238
DATE OF ISSUE: FEB 26 1990
EXPIRATION DATE: October 15, 1991

SPECIFIC CONDITIONS:

2. Chemical characteristics of upper and lower monitoring zone (weekly):
 - total dissolved solids-measured (mg/l)
 - chlorides (mg/l)
 - fecal coliform (# colonies/100 ml)
 - conductivity (umho/cm)
 - TKN (mg/l)
 - pH
 - temperature (°F)
 - ammonia (mg/l)
5. A minimum of three (3) well volumes of fluid will be evacuated from each monitor system prior to sampling for chemical parameters listed above.
6. All injection well data submissions will be clearly identified on each page with facility name, I.D. Number, date of sampling/recording and type of data shown. The lead plant operator or higher official must sign and date each submittal.
7. All monthly reports will be submitted to this office and our Tallahassee office (2600 Blair Stone Road, Tallahassee, FL 32301) by the fifteenth of each month.
8. A qualified representative of the Engineer of Record must be present for the start-up operations.
9. The Department must be notified in writing of the date operation began for the subject well.
- b. The integrity of the monitor zone sampling systems will be maintained at all times. Sampling lines and equipment shall be kept free of contamination with independent discharges and no interconnections with any other lines.
- c. All industrial sources (including reverse osmosis reject water) must comprise less than 5% of the total volume of the wastestream.
- d. Emergency discharge shall be constructed as approved under the FDER Wastewater Treatment Plant construct permit, DC 50-156882.

Issued this 26th day of February, 1990

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION



J. Scott Benyon
Deputy Assistant Secretary

CASING MILL CERTIFICATES



METALLURGICAL TEST REPORT

2

DB, CONTRACT NO. FAIRFIELD WORKS P. O. BOX 599 FAIRFIELD, AL 35064	P.O. DATE	PURCHASE ORDER NO.	
	SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.
	VEHICLE IDENTITY	DATE	

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

BARTOW STEEL INC
 P O BOX 1789
 BARTOW FL 33830

BARTOW STEEL INC
 BARTOW STEEL SIDING
 ALERT FL

M
A
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L
T
O

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

DATE 06/11/90 *L.M.*

8134255860

PSAA PIPE CARBON SMLS STD PIPE API 5L-88 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 04 MILL
 CERTIFIED T/R

SENT BY: BARTOW STEEL INC. ; 8-28-90 10:46AM ;

NO.	MATERIAL DESCRIPTION		MATL	HEAT/ LOT NO.	MIN HYDRO PSI	YIELD STR PSI	TENSILE STR PSI	ELONG. % IN 2"	GAGE WIDTH IN	FLAT	SEND
	SIZE	WALL									
	6.6250	0.5000	SMLS	X04464	3960	40,900	67,100	47.9	1.5	OK	
				X04466	3960	41,300	68,100	46.3	1.5	OK	
				END OF DATA							

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

VENDOR: USX
 P.O.# 1349 DATE: 4/30/90
 MTL REC'D. 6/90
 M.T.R.'S REC'D. 6-18-90
 FILED BY MP Youngquist
 S/O # 31439

HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B
X04464	HEAT	15	02	010	006	23	02	04	04	04				000	
	PROD	17	01	009	005	23	02	04	04	04				000	
	PROD	15	00	009	006	23	02	04	04	04				000	
X04466	HEAT	15	02	009	009	22	02	04	03	04				000	
	PROD	16	01	008	006	22	02	04	03	04				000	
	PROD	16	01	008	008	22	02	04	03	04				000	
			END OF DATA												



Member of USS Corporation

TUBULAR PRODUCTS



METALLURGICAL TEST REPORT

JOB, CONTRACT NO.		P.O. DATE	PURCHASE ORDER NO.		THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS WFGD., SAMPLED, TESTED, AND/OR INSPCT. IN ACCORDANCE WITH THE SPECIFICATION AND FULL-FILLS REQUIREMENTS IN SUCH RESPECTS. APPROVED BY THE OFFICE OF: C.S. DABKOWSKI MGR. MET. & Q.A. USS TUBULAR PRODUCTS.
VENDOR USS TUBULAR PRODUCTS		SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.	
SOLD TO BARTOW STEEL INC PO BOX 1789 BARTOW, FL 33830		VEHICLE IDENTITY		DATE	
RECEIVED MAY 11 1990		BARTOW STEEL INC PO BOX 1789 BARTOW, FL 33830		DATE: 04/26/90	

ITEM NO.	MATERIAL DESCRIPTION			MATL.	HEAT/ LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN.	FLAT	BEF
	SIZE	WALL	SPECIFICATION & GRADE									
1	24 OD	.500	ASTM A533B GRB ASMESA53GRB66	SMLS	L00888	1090	47100	72800	42.5	1 1/2	OK	
	ED1988A	DDASTM	A10688A GRB ASMESA106GRB66ED	1988A	DDAPISLG	R837TH	ED 5/88					
1	24 OD	.500	ASTM A533B GRB ASMESA53GRB66	SMLS	L00890	1090	43400	72800	43.1	1 1/2	OK	
	ED1988A	DDASTM	A10688A GRB ASMESA106GRB66ED	1988A	DDAPISLG	R837TH	ED 5/88					
1	24 OD	.500	ASTM A533B GRB ASMESA53GRB66	SMLS	L00892	1090	44600	74200	41.0	1 1/2	OK	
	ED1988A	DDASTM	A10688A GRB ASMESA106GRB66ED	1988A	DDAPISLG	R837TH	ED 5/88					
1	24 OD	.500	ASTM A533B GRB ASMESA53GRB66	SMLS	N06780	1090	44200	73500	42.0	1 1/2	OK	
	ED1988A	DDASTM	A10688A GRB ASMESA106GRB66ED	1988A	DDAPISLG	R837TH	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	L00888	HEAT	24	.06	.012	.013	.220	.02	.02	.07	.01				**				
1	L00888	PROD	25	.09	.012	.011	.240								**				
1	L00890	HEAT	24	.06	.012	.009	.230	.02	.02	.05	.01				**				
1	L00890	PROD	24	.08	.011	.009	.230								**				
1	L00892	HEAT	24	.05	.013	.012	.220	.02	.02	.04	.01				**				
1	L00892	PROD	26	.07	.013	.011	.230								**				
1	N06780	HEAT	24	.05	.011	.013	.240	.02	.02	.05	.01				**				
1	N06780	PROD	25	.08	.011	.017	.250								**				

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USS
A division of USX Corporation

TUBULAR PRODUCTS
METALLURGICAL TEST REPORT



CONTRACT NO.		P.O. DATE	PURCHASE ORDER NO.		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.
USS TUBULAR PRODUCTS		SHIPPERS NO.	MILL ORDER NO.	INVOICE NO.	
BARTOW STEEL INC PO BOX 1789 BARTOW, FL 33830		BARTOW STEEL INC PO BOX 1789 BARTOW, FL 33830		VEHICLE IDENTITY	
				04/26/90	
					DATE 04/26/90

M NO.	MATERIAL DESCRIPTION				MATL.	HEAT/ LOT NO.	MIN. HYDRO PSI	YIELD STR. PSI	TENSILE STR. PSI	ELONG. % IN 2"	GAGE WIDTH IN.	FLAT	BEND
	SIZE	WALL	SPECIFICATION & GRADE										
24	30	.500	ASTMA538BAGRBASMESA538R366		SMLS	ND6781	1090	44900	73000	41.0	1 1/2	OK	
	EO19354	DDASTM	A10683AGRBASMESA1068R366EC1938		DDAPISLER	337TH	EO 5/88						

M NO.	HEAT NO.	TYPE	C	MN	P	S	SI	CU	NI	CR	MO	SN	AL	N	V	B	TI	CB	CO
	ND6781	HEAT	25	.03	011	011	.210	.02	.02	.05	.01				**				
	ND6781	PROD	25	.08	011	013	.220												
END OF DATA THIS SHEET ***																			
															**LESS THAN .01				

**STANDARD CERTIFIED TEST REPORT
GEORGIA TUBULAR PRODUCTS, INC.**



Customer Name **YOUNGQUIST BROTHERS, INC.**
 Address **15000 PINE RIDGE ROAD**
 City, State, Zip **FORT MYERS, FLA. 33908**

Date **3-28-90**
 Customer Order No **21357**

G.T.P. Invoice No
**PALM BEACH CO. PROJ. #87-16
 CH2m HILL #SEF 24770 TO**

Specification **A-139 GR. B**

Coil or Lot No.	Size O.D.	Wr. Fr 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
5B27918	54"	.500	3891bs	55,000	76,600	37.9	.19	.79	.025	.012	
C01750	44"	"	4771bs	46,950	69,900	35	.18	.76	.017	.008	
C01533	"	"	"	52,390	71,440	35	.19	.70	.015	.009	
C01506	"	"	"	40,980	68,600	37.5	.20	.79	.016	.009	
C01744	"	"	"	49,260	72,020	30	.22	.79	.020	.009	
C01752	"	"	"	48,920	70,130	35	.19	.78	.017	.010	
5B15348	"	"	"	47,200	65,500	33	.21	.44	.019	.014	
C01750	34"	"	6181bs	46,950	69,900	35	.18	.76	.017	.008	
C01752	"	"	"	48,900	70,130	35	.19	.78	.017	.010	
C01718	"	"	"	58,610	68,740	35	.21	.74	.015	.007	
C01700	"	"	"	56,850	71,820	35	.24	.81	.016	.006	
C01483	"	"	"	44,560	69,490	35	.24	.72	.013	.006	
C01704	"	"	"	55,670	70,310	35	.21	.75	.027	.011	

The undersigned hereby certifies that the above materials have been inspected and tested in accordance with the methods prescribed in the Georgia Tubular Products, Inc. specifications and the results of such inspection and tests shown above. In determining properties or characteristics for which no methods of testing or testing are prescribed by said specifications, the standard mill inspection and testing practices of Georgia Tubular Products, Inc. have been applied. If there are any deviations in the results of such inspection and tests shown above, the undersigned believes that said materials conform to said specifications.

Marvin M. Hendrix

MARVIN M. HENDRIX
MANUFACTURING MANAGER

Name & Title

Subscribed and sworn to before me

This 28th day of March, 1990

H. Stankovic
 Notary Public
 MY COMMISSION EXPIRES FEB. 28, 1993



Georgia Tubular Products, Inc.
 P.O. Box 748 • 109 Dent Drive, Cartersville, GA 30120
 (404) 386-2553

**STANDARD CERTIFIED TEST REPORT
GEORGIA TUBULAR PRODUCTS, INC.**



Customer Name **YOUNGQUIST BROTHERS, INC.**
 Address **15000 PINE RIDGE ROAD**
 State, Zip **FORT MYERS, FLA. 33908**

Date **4-10-90**
 Customer Order No **21357**

G.T.P. Invoice No
**PALM BEACH CO. PROJ. #87-16
 CH2M HILL #SEF 24770 TO**

Specification **A-139 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
C01703	34"	.500	6181bs	57,680	67,950	37.5	.21	.75	.014	.009	
C01533	"	"	"	52,390	71,440	35	.19	.70	.015	.009	
C01292	"	"	"	47,260	75,710	40	.21	.85	.025	.007	
5B29566	"	"	"	49,400	71,400	35.5	.18	.73	.024	.019	

The undersigned 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 Georgia Tubular Products, Inc. have been followed. Unless it appears otherwise in the results of such inspection and tests shown above, the undersigned believes that said materials conform to said specifications.

Marvin M. Hendrix

MARVIN M. HENDRIX
MANUFACTURING MANAGER

Name & Title

Subscribed and sworn to before me

This 10th day of APRIL 1990

H. Stanley Chesser, Jr.
 Notary Public
 MY COMMISSION EXPIRES FEB. 23, 1993



Georgia Tubular Products, Inc.
 P.O. Box 746 • 109 Dent Drive, Cartersville, GA 30120
 (404) 386-2553

**STANDARD CERTIFIED TEST REPORT
GEORGIA TUBULAR PRODUCTS, INC.**



Customer Name **YOUUGQUIST BROTHERS, INC.**
 Address **15000 PINE RIDGE ROAD**
 City State Zip **FORT MYERS, FLA. 33908**

Date **4-10-90**
 Customer Order No. **21357**

GTP Invoice No. **PALM BEACH CO. PROJ.#87-16
 CH2M HILL # SEF 24770 TO**

Specification **A-139 GR. B**

Coil or Lot No.	Size O.D.	Wt. Fr. 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
5B29195	34"	.500	6181bs	47,700	69,500	38.5	.17	.71	.022	.011	
5B29203	"	"	"	51,800	71,200	33.5	.17	.72	.018	.010	
5B29567	"	"	"	49,800	71,200	31.4	.19	.66	.011	.016	
60161	16"	"	13131bs	43,000	73,000	40	.21	.91	.014	.020	
60212	"	"	"	39,000	71,000	40	.21	.89	.007	.017	
78804	"	"	"	47,000	75,000	40	.21	.88	.011	.013	

The undersigned 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 Georgia Tubular Products, Inc. have been applied. Unless it appears otherwise in the results of such inspection and tests shown above the undersigned believes that said materials conform to said specifications.

Marvin M. Hendrix

MARVIN M. HENDRIX

MANUFACTURING MANAGER

Name & Title

This 10th day of APRIL 1990

H. Stanley Chesin, Jr.
 Notary Public
 MY COMMISSION EXPIRES FEB. 28, 1993



Georgia Tubular Products, Inc.
 P.O. Box 748 • 109 Dent Drive, Cartersville, GA 30120
 (404) 386-2553

**STANDARD CERTIFIED TEST REPORT
GEORGIA TUBULAR PRODUCTS, INC.**



Customer Name: **YOUNGQUIST BROTHERS, INC.**

Address: **15000 PINE RIDGE ROAD**

City/State/Zip: **FORT MYERS, FLA. 33908**

Date: **4-10-90**

Customer Order No. **21357**

G.T.P. Invoice No.

**PALM BEACH CO. PROJ.#87-16
CH2M HILL # SEF 24770 TO**

Specification: **A-139 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
5B29195	34"	.500	6181bs	47,700	69,500	38.5	.17	.71	.022	.011	
B29203	"	"	"	51,800	71,200	33.5	.17	.72	.018	.010	
5B29567	"	"	"	49,800	71,200	31.4	.19	.66	.011	.016	
60161	16"	"	13131bs	43,000	73,000	40	.21	.91	.014	.020	
60212	"	"	"	39,000	71,000	40	.21	.89	.007	.017	
78804	"	"	"	47,000	75,000	40	.21	.88	.011	.013	
5B29206	24"	"	8751bs	47,800	67,500	41	.17	.72	.022	.011	
5B29197	"	"	"	47,800	69,000	38.3	.18	.71	.017	.008	

The undersigned 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 inspection or testing are prescribed by said specifications, the standard mill inspection and testing practices of Georgia Tubular Products, Inc. have been applied. If there are any deviations in the results of such inspection and tests shown above, the undersigned believes that said materials conform to said specifications.

Marvin M. Hendrix

**MARVIN M. HENDRIX
MANUFACTURING MANAGER**

Name & Title

Subscribed and sworn to before me
This 10th day of April 1990

H. Stanley
Notary Public



Georgia Tubular Products, Inc.
P.O. Box 748 • 109 Dent Drive, Cartersville, GA 30122

**STANDARD CERTIFIED TEST REPORT
GEORGIA TUBULAR PRODUCTS, INC.**



Customer Name: **YOUNGQUIST BROTHERS, INC.**

Address: **15000 PINE RIDGE ROAD**

City/State/Zip: **PORT MYERS, FLA. 33908**

Date: **3-28-90**

Customer Order No.: **21357**

G.T.P. Invoice No.

**PALM BEACH CO. PROJ.#87-16
CH2m HILL #SEF 24770 TO**

Specification: **A-139 GR. B**

Coil or Lot No.	Size O.D.	Wt./Fr. 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
5B27918	54"	.500	3891bs	55,000	76,600	37.9	.19	.79	.025	.012	
C01750	44"	"	4771bs	46,950	69,900	35	.18	.76	.017	.008	
1533	"	"	"	52,390	71,440	35	.19	.70	.015	.009	
C01506	"	"	"	40,980	68,600	37.5	.20	.79	.016	.009	
C01744	"	"	"	49,260	72,020	30	.22	.79	.020	.009	
C01752	"	"	"	48,920	70,130	35	.19	.78	.017	.010	
5B15348	"	"	"	47,200	65,500	33	.21	.44	.019	.014	

The undersigned 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 inspection or testing are prescribed by said specifications, the standard mill inspection and testing practices of Georgia Tubular Products, Inc. have been applied. Unless it appears otherwise in the results of such inspection and tests shown above, the undersigned believes that said materials conform to said specifications.

Marvin M. Hendrix

**MARVIN M. HENDRIX
MANUFACTURING MANAGER**

Name & Title

Subscribed and sworn to before me
this _____ day of _____, 1990
H. Stanley
Notary Public
MY COMMISSION EXPIRES FEB. 28, 1993



Georgia Tubular Products, Inc.
P.O. Box 748 • 109 Dent Drive, Cartersville, GA 30121
(404) 386-2553

SUMMARY OF CASING DEPTHS
AND CEMENT QUANTITIES

INJECTION WELL NO. 1

**SUMMARY OF CASING SETTING DEPTHS AND CEMENT QUANTITIES FOR IW-1
AT THE PALM BEACH COUNTY SOUTHERN REGION WASTEWATER TREATMENT PLANT**

Casing Purpose	Casing Material	-----CASING SIZE-----			Casing Depth Feet	Cement Stage	Date	Type of Cement	Quantity of cement (sacks)	Remarks
		Outside Dia. In.	Inside Dia. In.	Thickness In.						
Pit	Steel	61.000	60.000	0.500	50	NA	NA	NA	Casing vibrated in place	
Surface (Aquifer Protection)	Steel	54.000	53.000	0.500	260	#1	5/9/90	Neat	381	Pressure grout, one stage
						#2	5/10/90	Neat	224	Second stage tremied from 96 feet bls
							5/10/90	4%	74	
						Total sacks neat:		605		
						Total sacks 4%:		74		
		% of theoretical:	115							
Upper Intermed. (Construction through clays)	Steel	44.000	43.000	0.500	1000	#1	5/25/90	4%	1012	Pressure grout, 1012 sacks 4% followed by 381 sacks neat
								Neat	381	
						#2	5/26/90	4%	783	Second stage tremied from 495 feet bls
						#3	5/26/90	12%	357	Third stage tremied from 218 Feet bls
						Total Sacks Neat:		381		
						Total Sacks 4%:		1795		
						Total sacks 12%:		357		
		% of theoretical:	87							
Lower Intermed. (Construction through artesian zones)	Steel	34.000	33.000	0.500	1890	#1	6/27/90	12%	81	Pressure grout, 81 SKS 12% followed by 985 sacks neat
								Neat	985	
						#2	6/29/90	4%	536	Second stage tremied from 1,684 feet bls
						#3	6/29/90	4%	462	Third stage tremied from 1,533 feet bls
						#4	6/30/90	4%	536	Fourth stage tremied from 1,419 feet bls
						#5	7/1/90	4%	584	Fifth stage tremied from 1,244 feet bls
						#6	7/2/90	4%	465	Sixth stage tremied from 1,100 feet bls

**SUMMARY OF CASING SETTING DEPTHS AND CEMENT QUANTITIES FOR IW-1
AT THE PALM BEACH COUNTY SOUTHERN REGION WASTEWATER TREATMENT PLANT**

Casing Purpose	Casing Material	-----CASING SIZE-----			Casing Depth Feet	Cement Stage	Date	Type of Cement	Quantity of cement (sacks)	Remarks
		Outside Dia. In.	Inside Dia. In.	Thickness In.						
						#7	7/2/90	12%	567	Seventh stage tremied from 940 feet bls
						#8	7/3/90	12%	567	Eighth stage tremied from 612 feet bls
						#9	7/3/90	12%	482	Ninth stage tremied from 300 feet bls
									Total sacks neat:	985
									Total sacks 4%:	2583
									Total sacks 12%:	1697
									% of theoretical:	125
Final (Construction through confinement zones)	Steel	24.000	23.000	0.500	2660	#1	8/4/90	4%	174	Pressure grout 174 SKS 4% followed by 443 SKS of neat
								Neat	443	
						#2	8/5/90	Neat	238	Second stage tremied from 2,502
								4%	369	
						#3	8/5/90	4%	380	Third stage tremied from 2,255
						#4	8/6/90	4%	369	Fourth stage tremied from 2,199
						#5	8/6/90	4%	369	Fifth stage tremied from 2,155
						#6	8/7/90	4%	369	Sixth stage tremied from 2,061
						#7	8/7/90	4%	369	Seventh stage tremied from 2,007
						#8	8/8/90	4%	369	Eighth stage tremied from 1,973
						#9	8/8/90	4%	432	Ninth stage tremied from 1,947
						#10	8/9/90	4%	369	Tenth stage tremied from 1,942
						#11	8/9/90	4%	831	Eleventh stage tremied from 1,800
						#12	8/10/90	4%	831	Twelfth stage tremied from 1,348
						#13	8/11/90	4%	831	Thirteenth stage tremied from 896
						#14	8/11/90	4%	794	Fourteenth stage tremied from 441
									Total sacks neat:	681
									Total sacks 4%:	6856
									% of theoretical:	154

INJECTION WELL NO. 2

SUMMARY OF CASING SETTING DEPTHS AND CEMENT QUANTITIES FOR IW-2
AT THE PALM BEACH COUNTY SOUTHERN REGION WASTEWATER TREATMENT PLANT

Casing Purpose	Casing Material	Casing Size			Casing Depth Feet	Cement Stage	Date	Type Of Cement	Quantity Of Cement (Sacks)	Remarks
		Outside Dia. In.	Inside Dia. In.	Thickness In.						
Pit	Steel	61.000	60.000	0.500	25	NA	NA	NA	NA	Casing vibrated in place
Surface (Aquifer Protection)	Steel	54.000	53.000	0.500	260	#1	6/21/90	Neat	581	Pressure grout, first stage
						#2	6/22/90	Neat	132	Second stage tremied from 98 feet bls
								4%	111	
										Total sacks neat: 713
										Total sacks 4%: 111
										% of theoretical: 139
Upper Intermed. (Construction through clays)	Steel	44.000	43.000	0.500	1000	#1	7/1/90	4%	1023	Pressure grout, 1012 sacks 4% followed by 381 sacks neat
								Neat	761	
						#2	7/2/90	4%	517	Second stage tremied from 443 feet bls
						#3	7/3/90	12%	459	Third stage tremied from 225 feet bls
										Total sacks neat: 761
										Total sacks 4%: 1540
										Total sacks 12%: 459
										% of theoretical: 93
Lower Intermed. (Construction through artesian zones)	Steel	34.000	33.000	0.500	1890	#1	7/29/90	12%	97	Pressure grout, 97 sacks 12% followed by 809 sacks neat
							7/29/90	Neat	809	
						#2	7/29/90	Neat	50	Second stage, additional plug placed at bottom of 34-inch casin
						#3	7/30/90	Thixotropic	45	Third stage tremied from 1,893 feet bls
						#4	7/30/90	12%	82	Fourth stage tremied from 1,890 feet bls
						#5	7/31/90	12%	51	Fifth stage tremied from 1,875 feet bls
						#6	8/1/90	Neat	48	Sixth stage tremied from 1,863 feet bls
						#7	8/2/90	Neat	902	Seventh stage tremied from 1,845 feet bls
						#8	8/3/90	4%	477	Eighth stage tremied from 1,642 feet bls
#9	8/3/90	4%	465	Ninth stage tremied from 1,511 feet bls						

SUMMARY OF CASING SETTING DEPTHS AND CEMENT QUANTITIES FOR IW-2
AT THE PALM BEACH COUNTY SOUTHERN REGION WASTEWATER TREATMENT PLANT

Casing Purpose	Casing Material	-----Casing Size-----			Casing Depth Feet	Cement Stage	Date	Type Of Cement	Quantity Of Cement (Sacks)	Remarks
		Outside Dia. In.	Inside Dia. In.	Thickness In.						
						#10	8/4/90	4%	516	Tenth stage tremied from 1,355 feet bls
						#11	8/5/90	4%	669	Eleventh stage tremied from 1,160 feet bls
						#12	8/5/90	12%	572	Twelfth stage tremied from 983 feet bls
						#13	8/6/90	12%	572	Thirteenth stage tremied from 718 beet bls
						#14	8/7/90	12%	641	Fourteenth stage tremied from 387 feet bls
									Total sacks neat:	1809
									Total sacks 4%:	2127
									Total sacks 12%:	2015
									Total thixotropic:	45
									% of theoretical:	143
Final (Construction through confinement zones)	Steel	24.000	23.000	0.500	2645	#1	9/10/90	4% Neat	425 547	Pressure grout, 425 sacks 4% followed by 547 sacks neat
						#2	9/11/90	4%	369	Second stage tremied from 2,338 feet bls
						#3	9/12/90	4%	369	Third stage tremied from 2,194 feet bls
						#4	9/12/90	4%	277	Fourth stage tremied from 2,110 feet bls
						#5	9/13/90	4%	185	Fifth stage tremied from 2,041 feet bls
						#6	9/13/90	4%	277	Sixth stage tremied from 2,011 feet bls
						#7	9/14/90	4%	369	Seventh stage tremied from 1,976 feet bls
						#8	9/14/90	4%	369	Eighth stage tremied from 1,900 feet bls
						#9	9/15/90	4%	823	Ninth stage tremied from 1,791 feet bls
						#10	9/16/90	4%	823	Tenth stage tremied from 1,473 feet bls
						#11	9/16/90	4%	823	Eleventh stage tremied from 896 feet bls
						#12	9/17/90	4%	835	Twelfth stage tremied from 446 feet bls
									Total sacks neat:	547
									Total sacks 4%:	5944
									% of theoretical:	145

DUAL-ZONE MONITOR WELL

**SUMMARY OF CASING SETTING DEPTHS AND CEMENT QUANTITIES FOR THE DUAL-ZONE MONITOR WELL
AT THE PALM BEACH COUNTY SOUTHERN REGION WASTEWATER TREATMENT PLANT**

Casing Purpose	Casing Material	-----CASING SIZE-----			Casing Depth Feet	Cement Stage	Date	Type of Cement	Quantity Of Cement (Sacks)	Remarks			
		Outside Dia. In.	Inside Dia. In.	Thickness In.									
Surface (Aquifer Protection)	Steel	24.000	23.000	0.500	260	#1	8/9/90	4%	63	Pressure grout first stage			
								Neat	286				
								Total sacks neat:	286				
								Total sacks 4%:	63				
								% of theoretical:	129				
Upper Intermed. (Construction through clays)	Steel	16.000	15.000	0.500	1000	#1	8/19/90	4%	665	Pressure grout, first stage			
								Neat	262				
								Total sacks neat:	262				
								Total sacks 4%:	665				
								% of theoretical:	95				
Final (Construction through artesian zones)	Steel	6.625	5.625	0.500	1900	#1	8/29/90	4%	148	Pressure grout, first stage			
								Neat	102				
								#2	8/30/90		4%	185	Second stage, tremied from 1,616 feet bls
								#3	8/30/90		4%	296	Third stage, tremied from 1,514 feet bls
								#4	8/31/90		4%	148	Fourth stage, tremied from 1,313 feet bls
								#5	8/31/90		4%	151	Fifth stage, tremied from 1,243 feet bls
								Total sacks neat:	102				
								Total sacks 4%:	928				
% of theoretical:	210												

NOTE: Upper monitor interval from 1,000 feet to 1,096 feet

CORE ANALYSES and
LITHOLOGIC DESCRIPTIONS

CORE #1
(2,061-2071 feet)

CORE LITHOLOGY
70% RECOVERY

2,061-2,062	Dolomite; dark yellowish Brown (10yr 4/2) to dusky yellowish brown (10yr 2/2); very porous; sucrosic and vuggy texture; finely crystalline; very hard.
2,062-2,063	Dolomite; pale yellowish brown (10yr 6/2); porous; sucrosic and vuggy texture; very hard.
2,063-2,064	Dolomite; pale yellowish brown (10yr 6/2) to moderate yellowish brown (10yr 5/4); porous; sucrosic and vuggy texture; very hard.
2,064-2,065	Dolomite; dark yellowish brown (10yr 4/2) to dusky yellowish brown (10yr 2/2); very porous; sucrosic and vuggy texture; finely crystalline; very hard.
2,065-2,066	Dolomite; moderate, dark and dusky yellowish brown; slightly porous; sucrosic and vuggy texture; very hard.
2,066-2,067	Dolomite; pale, moderate to dark yellowish brown; slightly porous; moderate sucrosic and vuggy texture, very hard.
2,067-2,068	Dolomite; pale, moderate to dark yellowish brown; very porous; sucrosic and vuggy texture; very hard.
<p>Notes:</p> <p>Soil classification referenced from:</p> <p>Swanson, R.G. <i>Sample Examination Manual, Shell Oil Company Exploration Training</i>, The American Association of Petroleum Geologists. 1981.</p> <p>Goddard, E.N., Trask, P., Ford, R., Rose, O. <i>Rock-Color Chart</i>. Geological Society of America. 1984.</p> <p>Soil/rock descriptions conducted by Doug VanNote, CH2M HILL.</p>	

Core #2
(2,092-2,102.5 feet)

CORE LITHOLOGY
70% RECOVERY

2,092-2,093	Dolomite; moderate yellowish brown (10yr 5/4) to dark yellowish brown (10yr 4/2) to dusky yellowish brown (10yr 2/2); crystalline; vuggy texture; slightly porous.
2,093-2,094	Dolomite; moderate yellowish brown (10yr 5/14) to dark yellowish brown (10yr 4/2) to dusky yellowish brown (10yr 2/2); to crystalline; vuggy texture; slightly porous.
2,094-2,095	Dolomite; pale yellowish brown (10yr 6/2) to dark yellowish brown (10yr 4/2); slightly porous; vuggy texture; crystalline; very hard.
2,095-2,096	Dolomite; pale yellowish brown (10yr 6/2) to dark yellowish brown (10yr 4/2); slightly porous; vuggy texture; crystalline; very hard.
2,096-2,097	Dolomite; pale yellowish brown (10yr 6/2) to dark yellowish brown (10 yr 4/2); slightly porous; vuggy texture; crystalline; very hard.
2,097-2,098	Dolomite; pale yellowish brown (10yr 6/2) to dark yellowish brown (10 yr 4/2); slightly porous; vuggy texture; crystalline; very hard.
2,098-2,102.5	Dolomite; pale yellowish brown (10yr 6/2) to dark yellowish brown (10 yr 4/2); slightly porous; vuggy texture; crystalline; very hard.
<p>Notes:</p> <p>Soil classification referenced from:</p> <p>Swanson, R.G. <i>Sample Examination Manual, Shell Oil Company Exploration Training</i>, The American Association of Petroleum Geologists. 1981.</p> <p>Goddard, E.N., Trask, P., Ford, R., Rose, O. <i>Rock-Color Chart</i>. Geological Society of America. 1984.</p> <p>Soil/rock descriptions conducted by Doug VanNote, CH2M HILL.</p>	

Core #3
(2,190-2,200 feet)

CORE LITHOLOGY
65% RECOVERY

2,190-2,191	Dolomite; dark yellowish brown (10yr 4/2) to dark yellowish brown (10yr 2/2); vuggy and sucrosic texture; very porous; hard.
2,191-2,192	Dolomite; dark yellowish brown (10yr 4/2) to dark yellowish brown (10yr 2/2); vuggy and sucrosic texture; very porous; hard.
2,192-2,193	Dolomite; dark yellowish brown (10yr 4/2) to dark yellowish brown (10yr 2/2); vuggy and sucrosic texture; very porous; hard.
2,193-2,194	Limestone/Dolomite; pale yellowish brown (10 yr 6/2); to very pale orange (10yr 8/2); vuggy and sucrosic texture; fossiliferous; soft; very porous.
2,194-2,195	Fossiliferous Biomicritic Limestone; pale yellowish brown (10yr 2/2) to very pale orange (10yr 8/2); micro fossils; dolomite in matrix; soft; very porous.
2,195-2,196	Fossiliferous Biomicritic Limestone; pale yellowish brown (10yr 2/2) to very pale orange (10yr 8/2); micro fossils; dolomite in matrix; soft; very porous.
2,196-2,197	Fossiliferous Biomicritic Limestone; pale yellowish brown (10yr 2/2) to very pale orange (10yr 8/2); micro fossils; dolomite in matrix; soft; very porous.
<p>Notes:</p> <p>Soil classification referenced from:</p> <p>Swanson, R.G. <i>Sample Examination Manual, Shell Oil Company Exploration Training</i>, The American Association of Petroleum Geologists. 1981.</p> <p>Goddard, E.N., Trask, P., Ford, R., Rose, O. <i>Rock-Color Chart</i>. Geological Society of America. 1984.</p> <p>Soil/rock descriptions conducted by Doug VanNote, CH2M HILL.</p>	

Core #4
(2,290-2,300 feet)

CORE LITHOLOGY
80% RECOVERY

2,290-2,292	Biomicritic Limestone; yellowish gray (5yr 7/2); trace microfossils; non-porous to slightly porous; trace micro-fauna (Dictyonus); hard.
2,292-2,294	Biomicritic Limestone; yellowish gray (5yr 7/2); trace microfossils; non-porous to slightly porous; trace micro-fauna (Dictyonus); hard.
2,294-2,296	Biomicritic Limestone; yellowish gray (5yr 7/2) to pale yellowish brown (10yr 6/2), non-porous; very consolidated; hard.
2,296-2,298	Biomicritic Limestone; yellowish gray (5yr 7/2); slightly porous to non-porous; very consolidated; trace microfossils; hard.
<p>Notes:</p> <p>Soil classification referenced from:</p> <p>Swanson, R.G. <i>Sample Examination Manual, Shell Oil Company Exploration Training</i>, The American Association of Petroleum Geologists. 1981.</p> <p>Goddard, E.N., Trask, P., Ford, R., Rose, O. <i>Rock-Color Chart</i>. Geological Society of America. 1984.</p> <p>Soil/rock descriptions conducted by Doug VanNote, CH2M HILL.</p>	

Core #5
(2,400-2,411 feet)

CORE LITHOLOGY
100% RECOVERY

2,400-2,401	Biomicritic Fossiliferous Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; abundant foraminifera; porous; soft.
2,401-2,402	Biomicritic Fossiliferous Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; abundant foraminifera; porous; soft; shell casts.
2,402-2,403	Biomicritic Fossiliferous Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; sandy; abundant foraminifera; porous; soft.
2,403-2,404	Biomicritic Fossiliferous Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; sandy; abundant foraminifera; porous; soft.
2,404-2,405	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; shell molds and casts; moderately soft.
2,405-2,406	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; moderately soft.
2,406-2,407	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; moderately soft.
2,407-2,408	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; moderately soft.
2,408-2,409	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; moderately soft.
2,409-2,410	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; moderately soft.
2,410-2,411	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; moderately soft.
<p>Notes:</p> <p>Soil classification referenced from:</p> <p>Swanson, R.G. <i>Sample Examination Manual, Shell Oil Company Exploration Training</i>, The American Association of Petroleum Geologists. 1981.</p> <p>Goddard, E.N., Trask, P., Ford, R., Rose, O. <i>Rock-Color Chart</i>. Geological Society of America. 1984.</p> <p>Soil/rock descriptions conducted by Doug VanNote, CH2M HILL.</p>	

Core #6
(2,506-2,519 feet)

CORE LITHOLOGY
100% RECOVERY

2,506-2,508	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; consolidated; trace microfossils.
2,508-2,510	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; consolidated; trace microfossils.
2,510-2,512	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; consolidated; trace microfossils.
2,512-2,514	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; consolidated; shell casts; trace foraminifera; moderately soft.
2,514-2,516	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; consolidated; shell casts; trace foraminifera; moderately soft.
2,516-2,519	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; slightly porous; consolidated; shell casts; trace foraminifera; moderately soft.
<p>Notes:</p> <p>Soil classification referenced from:</p> <p>Swanson, R.G. <i>Sample Examination Manual, Shell Oil Company Exploration Training</i>, The American Association of Petroleum Geologists. 1981.</p> <p>Goddard, E.N., Trask, P., Ford, R., Rose, O. <i>Rock-Color Chart</i>. Geological Society of America. 1984.</p> <p>Soil/rock descriptions conducted by Doug VanNote, CH2M HILL.</p>	

Core #7
(2,620-2,633 feet)

CORE LITHOLOGY
100% RECOVERY

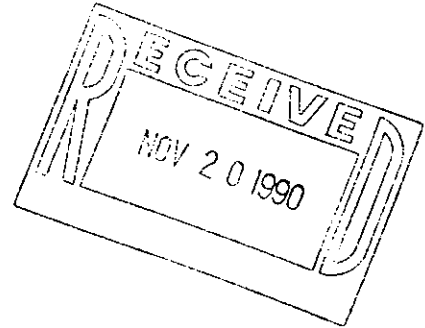
2,620-2,622	Biomicritic Limestone; white (N9) to yellowish gray (5yr 7/2); chalky; non-porous to slightly porous; intermittent dolomitic limestone.
2,622-2,624	Dolomitic Limestone; pale yellowish brown (10yr 6/2) to yellowish brown (5yr 7/2); microfossils; shell casts; well cemented; moderately hard.
2,624-2,626	Dolomitic Limestone; pale yellowish brown (10yr 6/2) to yellowish brown (5yr 7/2); microfossils; shell casts; well cemented; moderately hard.
2,626-2,628	Dolomitic Limestone; pale yellowish brown (10 yr 6/2) to yellowish brown (5yr 7/2); microfossils; shell casts; well cemented; moderately hard.
2,628-2,630	Dolomitic Limestone; pale yellowish brown (10 yr 6/2) to yellowish brown (5yr 7/2); microfossils; shell casts; well cemented; moderately hard.
2,630-2,633	Dolomitic Limestone; pale yellowish brown (10yr 6/2) to yellowish brown (5yr 7/2); microfossils; non-porous; very hard.
Notes: Soil classification referenced from: Swanson, R.G. <i>Sample Examination Manual, Shell Oil Company Exploration Training</i> , The American Association of Petroleum Geologists. 1981. Goddard, E.N., Trask, P., Ford, R., Rose, O. <i>Rock-Color Chart</i> . Geological Society of America. 1984. Soil/rock descriptions conducted by Doug VanNote, CH2M HILL.	

TTL, Inc.

PRACTICING IN THE GEOSCIENCES

3516 Greensboro Avenue • P.O. Drawer 1128 • Tuscaloosa, Alabama 35403 • Telephone 205-345-0816 • FAX 205-345-0992

November 16, 1990



Mr. Bart Ziegler
CH2M Hill
Southeast Florida Office
Hillsboro Executive Center North
800 Fairway Drive, Suite 350
Deerfield Beach, Florida 33441

Re: Deep Injection Well Core Analyses

Dear Mr. Ziegler:

TTL has completed the horizontal and vertical constant head permeability analyses and total porosity analyses requested on seven core samples received September 10, 1990. Data are presented in the table included herewith. Backup samples were also sent and will be returned to you via United Parcel Service upon your acceptance of this data.

If you or your associates have questions or comments concerning this data please do not hesitate to call me. I look forward to working with you again in the future.

Sincerely yours,

TTL, Inc.

Britette L. Lee

Britette L. Lee
Geologist

PERMEABILITY AND POROSITY TEST DATA**CH2M HILL
PALM BEACH COUNTY SOUTHERN REGION WASTEWATER TREATMENT PLANT
DEEP INJECTION WELL CORE ANALYSES**

November, 1990

**CORE SAMPLES
INJECTION WELL (IW-2)**

SAMPLE ID	DEPTH (feet)	TOTAL POROSITY (%)	PERMEABILITY COEFFICIENT "k" (cm/sec)	
			Horizontal	Vertical
1	2,101.5 - 2,102.5	11.9	4.8×10^{-10}	2.9×10^{-10}
3	2,196.0 - 2,197.0	16.7	1.1×10^{-6}	1.5×10^{-6}
6	2,296.5 - 2,297.5	26.1	9.0×10^{-6}	3.8×10^{-6}
7	2,400.0 - 2,400.7	31.8	7.9×10^{-5}	1.1×10^{-4}
10	2,512.0 - 2,513.0	29.2	1.1×10^{-5}	1.1×10^{-5}
12	2,625.0 - 2,626.0	24.2	3.7×10^{-6}	1.3×10^{-6}
14	2,066.0 - 2,067.0	9.9	2.1×10^{-8}	1.1×10^{-10}

* Horizontal sample contained many irregularly shaped voids.

LITHOLOGIC LOGS

INJECTION WELL NO. 1

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth intervals were referenced
from top of pad 21.38 NGVD

**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/06/90	50	60	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subangular to subrounded; moderately well sorted; well cemented; 10 percent shell; 5 percent black phosphate grains	DHV
05/06/90	60	70	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subrounded; moderately well to poorly sorted; moderately well cemented; 10 percent shell; trace black phosphate grains	DHV
05/06/90	70	80	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subrounded; poorly sorted; well cemented; 15 percent shell; trace black phosphate grains	DHV
05/06/90	80	90	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subangular to subrounded; poorly sorted; well cemented; 10 percent shell; trace black phosphate grains	DHV
05/06/90	90	100	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subangular to subrounded; poorly sorted; moderately well cemented; 10 percent shell; trace black phosphate grains	DHV
05/06/90	100	110	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subangular to subrounded; moderately well sorted; moderately well cemented; trace calcite crystals; 15 percent shell; trace black phosphate grains	DHV
05/07/90	110	120	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); medium grained; well sorted; sub-angular; poorly cemented; abundant calcite crystals; light gray (N7) limestone fragments; 10 percent shell; trace black phosphate grains	DHV

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Note: Depth intervals were referenced
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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/07/90	120	130	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subrounded; moderately well sorted; moderately well cemented; trace calcite crystals; increasing shell 25 percent; trace black phosphate grains	DHV
05/07/90	130	140	Coquina/Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subrounded; moderately well sorted; poorly cemented; 40 to 60 percent shell; trace black phosphate grains; trace organic material	DHV
05/07/90	140	150	Coquina/Arenaceous Limestone; light gray (N7); increasing shell 60 to 70 percent; abundant bivalves; interbedded sand; poorly cemented; fine to medium grained; subrounded; well sorted	DHV
05/07/90	150	160	Coquina/Arenaceous Limestone; light gray (N7) to yellowish gray (5Y7/2); 60 to 70 percent shell; abundant bivalves; interbedded sand; fine to medium grained; subrounded; moderately well sorted	DHV
05/07/90	160	170	Coquina/Arenaceous Limestone; yellowish gray (5Y7/2); 60 percent shell; interbedded sand; fine to medium grained; subangular to subrounded; well sorted; poorly cemented	DHV
05/07/90	170	180	Coquina/Arenaceous Limestone; yellowish gray (5Y7/2); 60 percent shell; interbedded sand; fine to medium grained; subrounded; moderately well sorted	DHV
05/08/90	180	190	Coquina/Arenaceous Limestone; yellowish gray (5Y7/2); 60 percent shell; interbedded sand; fine to medium grained; subrounded; moderately well sorted	DHV
05/08/90	190	200	Coquina/Arenaceous Limestone; yellowish gray (5Y7/2); 75 percent shell; trace fossils; decreasing sand	DHV

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Note: Depth intervals were referenced
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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/08/90	200	210	Coquina/Arenaceous Limestone; yellowish gray (5Y7/2); 75 percent shell; trace fossils; decreasing sand	DHV
05/08/90	210	220	Arenaceous Limestone with coquina; yellowish gray (5Y7/2); 45 percent shell; trace fossils; abundant black phosphate grains	DHV
05/08/90	220	230	Arenaceous Limestone with coquina; yellowish gray (5Y7/2); 45 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; abundant black phosphate grains	DHV
05/08/90	230	240	Coquina/Arenaceous Limestone; yellowish gray (5Y7/2); 70 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; abundant black phosphate grains; trace light olive gray clay (5Y5/2)	DHV
05/08/90	240	250	Coquina/Arenaceous Limestone; yellowish gray (5Y7/2); 75 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; abundant black phosphate grains; increasing light olive gray clay (5Y5/2)	DHV
05/08/90	250	260	Clay with shell; light olive gray (5Y5/2) to yellowish gray (5Y7/2); clay is light olive gray; shell is yellowish gray; trace arenaceous limestone fragments; shell 40 percent; small trace very fine sand; angular; well sorted	DHV
05/14/90	260	270	Clay; grayish olive (10Y4/2); sandy; fine to medium grained; well sorted; subrounded; arenaceous limestone fragments 25 percent, shell fragments 25 percent	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/14/90	270	280	Clay; grayish olive (10Y4/2); sandy; fine to medium grained; well sorted; subrounded; arenaceous limestone fragments 25 percent, shell fragments 25 percent	DHV
05/14/90	280	290	Clay; grayish olive (10Y4/2); sandy; fine to medium grained; well sorted; subrounded; arenaceous limestone fragments 25 percent, shell fragments 25 percent	DHV
05/14/90	290	300	Clay; grayish olive (10Y4/2); silt; decreasing shell 5 percent; decreasing arenaceous limestone fragments 5 percent	DHV
05/14/90	300	310	Clay; grayish olive (10Y4/2); 20 percent silt	DHV
05/14/90	310	320	Clay; grayish olive green (5GY3/2); 5 percent silt	DHV
05/14/90	320	330	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	330	340	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	340	350	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	350	360	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	360	370	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	370	380	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	380	390	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	390	400	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	400	410	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	410	420	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	420	430	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	430	440	Clay; grayish olive green (5GY3/2); silt	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/14/90	440	450	Clay; grayish olive green (5GY3/2); silt	DHV
05/14/90	450	460	Clay; grayish olive green (5GY3/2); silt	DHV
05/14/90	460	470	Clay; grayish olive green (5GY3/2); consolidated silt; dark greenish gray (5GY4/1); 20 percent shell fragments	DHV
05/14/90	470	480	Clay; grayish olive green (5GY3/2); clay massive; increasing consolidated silt 40 percent; dark greenish gray (5SY4/1); 20 percent shell fragments	DHV
05/14/90	480	490	Clay with siltstone; clay is grayish olive green (5GY3/2); silt is dark greenish gray (5GY4/1); consolidated silt fragments 45 percent; trace shell fragments	DHV
05/14/90	490	500	Clay; grayish olive green (5GY3/2); trace consolidated silt fragments	DHV
05/14/90	500	510	Clay; grayish olive green (5GY3/2); trace consolidated silt fragments	DHV
05/14/90	510	520	Clay; grayish olive green (5GY3/2); trace consolidated silt fragments	DHV
05/14/90	520	530	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	530	540	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	540	550	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	550	560	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	560	570	Clay; grayish olive green (5GY3/2)	DHV
05/14/90	570	580	Clay; dusky yellow green (5GY5/2); slightly calcareous	DHV
05/14/90	580	590	Calcareous clay; grayish yellow green (5GY7/2); trace siltstone fragments; olive gray (5Y4/1)	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/14/90	590	600	Calcareous clay; grayish yellow green (5GY7/2)	DHV
05/14/90	600	610	Calcareous clay; grayish yellow green (5GY7/2)	DHV
05/14/90	610	620	Calcareous clay; grayish yellow green (5GY7/2)	DHV
05/14/90	620	630	Calcareous clay; grayish yellow green (5GY7/2)	DHV
05/14/90	630	640	Calcareous clay; pale olive (10GY6/2); increasing carbonates	DHV
05/14/90	640	650	Calcareous clay; pale olive (10GY6/2); increasing carbonates	DHV
05/14/90	650	660	Calcareous clay; pale olive (10GY6/2); increasing carbonates	DHV
05/14/90	660	670	Calcareous clay; pale olive (10GY6/2); increasing carbonates	DHV
05/14/90	670	680	Calcareous clay; pale olive (10GY6/2); increasing carbonates	DHV
05/14/90	680	690	Calcareous clay; grayish yellow green (5GY7/2); trace limestone fragments; yellowish gray (5Y7/2)	DHV
05/14/90	690	700	Calcareous clay with limestone; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); increasing limestone fragments 45 percent; yellowish gray (5Y8/1)	DHV
05/14/90	700	710	Calcareous clay with limestone; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); limestone fragments 45 percent; yellowish gray (5Y8/1)	DHV
05/14/90	710	720	Calcareous clay with limestone; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); marl; increasing limestone fragments 50 percent; yellowish gray (5Y8/1)	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/14/90	720	730	Calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); thin limestone fragments; yellowish gray (5Y8/1)	DHV
05/14/90	730	740	Calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); thin limestone fragments; yellowish gray (5Y8/1)	DHV
05/14/90	740	750	Calcareous clay; pale olive (10Y6/2); trace chert fragments; grayish olive (10Y4/2)	DHV
05/14/90	750	760	Calcareous clay; pale olive (10Y6/2) to grayish olive (10Y4/2); chert fragments; grayish olive (10Y4/2)	DHV
05/14/90	760	770	Calcareous clay; pale olive (10Y6/2) to grayish olive (10Y4/2); interbedded chert fragments; grayish olive (10Y4/2)	DHV
05/14/90	770	780	Calcareous clay; pale olive (10Y6/2) to grayish olive (10Y4/2); interbedded chert; grayish olive (10Y4/2)	DHV
05/14/90	780	790	Calcareous clay; dusky yellow green (5GY5/2); trace chert; grayish olive (10Y4/2)	DHV
05/14/90	790	800	Calcareous clay; dusky yellow green (GY5/2); slightly calcareous; trace chert fragment; grayish olive (10Y4/2)	DHV
05/14/90	800	810	Calcareous clay; dusky yellow green (5GY5/2); trace chert fragments; grayish olive green (5GY3/2)	DHV
05/14/90	810	820	Calcareous clay; dusky yellow green (5GY5/2); marl; trace chert fragments; grayish olive green (5GY3/2); trace limestone fragments; yellowish gray (5Y8/1)	DHV
05/14/90	820	830	Calcareous clay with fossiliferous limestone; pale olive (10Y6/2); marl; 45 percent fossiliferous limestone fragments; yellowish gray (5Y8/1); trace chert fragments; grayish olive green (5GY3/2)	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/17/90	830	840	Fossiliferous limestone with silt and clay; limestone is grayish yellow (5Y8/4); clay and silt are pale greenish yellow (10Y8/2); 70 percent shell fragments; trace black organic fragments and chert	DHV
05/17/90	840	850	Calcareous clay with fossiliferous limestone; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 60 percent shell fragments; trace black organic fragments and chert	DHV
05/17/90	850	860	Calcareous clay with fossiliferous limestone; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 60 percent shell fragments; trace olive green (10Y4/2) chert	DHV
05/17/90	860	870	Calcareous clay with fossiliferous limestone; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 60 percent shell fragments; trace olive green (10Y4/2) chert	DHV
05/17/90	870	880	Calcareous clay with fossiliferous limestone; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 40 percent shell fragments; trace olive green (10Y4/2) chert	DHV
05/17/90	880	890	Calcareous clay with fossiliferous limestone; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); decreasing shell fragments; trace olive green (10Y4/2) chert	DHV
05/17/90	890	900	Calcareous clay with fossiliferous limestone; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); increasing limestone fragments; decreasing shell fragments	DHV
05/17/90	900	910	Limestone and arenaceous limestone with calcareous clay; grayish yellow green (5GY7/2); silt; trace black siltsized phosphate grains	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
05/17/90	910	920	Limestone and arenaceous limestone with calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); color becoming lighter	DHV
05/17/90	920	930	Limestone with arenaceous limestone; yellowish gray (5Y8/1); arenaceous limestone is light greenish gray (5GY8/1)	DHV
05/17/90	930	940	Limestone with arenaceous limestone; yellowish gray (5Y8/1); arenaceous limestone is light greenish gray (5GY8/1); trace black siltsized phosphate grains	DHV
05/17/90	940	950	Limestone with clay; light greenish gray (5GY8/1); trace fossils and shell fragments; clay is greenish gray (5GY6/1)	DHV
05/17/90	950	960	Calcareous clay; pale olive (10Y6/2) with fine sand and silt; 30 percent limestone fragments; abundant black siltsized phosphate grains	DHV
05/17/90	960	970	Calcareous clay; pale olive (10Y6/2) with fine sand and increasing silt; 20 percent limestone fragments; abundant black siltsized phosphate grains	DHV
05/17/90	970	980	Calcareous clay; pale olive (10Y6/2) with fine sand and increasing silt; 20 percent limestone fragments; abundant black siltsized phosphate grains	DHV
05/17/90	980	990	Calcareous clay with fine sand and silt; pale olive (10Y6/2); increasing fine sand and silt; 10 percent limestone fragments; 45 percent black siltsized phosphate grains	DHV
05/17/90	990	1000	Limestone with calcareous clay and silt; limestone is yellowish gray (5Y8/1); clay is pale olive (10Y6/2); limestone fragments 80 percent; 20 percent black siltsized phosphate grains	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/01/90	1000	1010	Limestone, yellowish gray (5Y8/1); porous; trace echinoids; trace medium light gray (N6) arenaceous limestone fragments; 5% black phosphate grains.	DHV
06/01/90	1010	1020	Limestone; yellowish gray (5Y8/1); porous; trace echinoids; trace bryozoans; trace medium light gray (N6) calcareous siltstone fragments; trace silt sized black phosphate grains.	DHV
06/01/90	1020	1030	Limestone; yellowish gray (5Y8/1); as above.	DHV
06/01/90	1030	1040	Limestone; yellowish gray (5Y8/1); as above; trace shell casts and shells.	DHV
06/01/90	1040	1050	Limestone; yellowish gray (5Y8/1); as above.	DHV
06/01/90	1050	1060	Limestone; yellowish gray (5Y8/1); as above.	DHV
06/01/90	1060	1070	Limestone; yellowish gray (5Y8/1); as above; increasing trace medium light gray (N6) calcareous siltstone fragments (30%).	DHV
06/01/90	1070	1080	Limestone; yellowish gray (5Y8/1); as above; increasing trace medium light gray (N6) calcareous siltstone fragments (40%); trace calcite.	DHV
06/01/90	1080	1090	Limestone; yellowish gray (5Y8/1); as above.	DHV
06/01/90	1090	1100	Limestone; yellowish gray (5Y8/1); as above; trace foraminifera (Dictyonus); pelecypod fragments.	DHV
06/01/90	1100	1110	Limestone; yellowish gray (5Y8/1); as above.	DHV
06/01/90	1110	1120	Limestone; yellowish gray (5Y8/1); as above.	DHV
06/01/90	1120	1130	Limestone; yellowish gray (5Y8/1); as above; 25% trace medium light gray (N6) calcareous siltstone fragments.	DHV
06/01/90	1130	1140	Limestone; yellowish gray (5Y8/1); as above.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/01/90	1140	1150	Limestone; very pale orange (10YR8/2); 30% arenaceous limestone fragments; medium light gray (N6); trace echinoids, pelecypods and foraminifera (Dictyconus).	DHV
06/01/90	1150	1160	Limestone; very pale orange (10Y8/2); as above.	DHV
06/01/90	1160	1170	Limestone; very pale orange (10Y8/2); as above.	DHV
06/01/90	1170	1180	Limestone; very pale orange (10Y8/2); as above.	DHV
06/01/90	1180	1190	Limestone (biomicritic); very pale orange (10Y8/2); medium light gray (N6) calcareous siltstone fragments (40%).	DHV
06/01/90	1190	1200	Limestone (biomicritic); very pale orange (10Y8/2); with light gray (N6) calcareous siltstone fragments (20%).	DHV
06/01/90	1200	1210	Limestone (biomicritic); very pale orange (10Y8/2); light gray (N6) calcareous siltstone fragments (20%); slightly porous.	DHV
06/01/90	1210	1220	Limestone (biomicritic); very pale orange (10Y8/2); light gray (N6) calcareous siltstone fragments (10%); very porous; trace echinoids; trace bryozoans; pelecypods; foraminifera (Dictyconus, Miliolina); shell casts.	DHV
06/01/90	1220	1230	Limestone (biomicritic); very pale orange (10Y8/2); as above.	DHV
06/01/90	1230	1240	Limestone (biomicritic); very pale orange (10Y8/2); as above.	DHV
06/01/90	1240	1250	Limestone (biomicritic); very pale orange (10Y8/2); as above.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/01/90	1250	1260	Limestone with fine sand; yellowish gray (5Y8/1); 60% sand; fine grained; very well sorted; subrounded; trace fossils: echinoid fragments; Miliolina foraminifera; fine shell fragments; abundant black silt sized phosphate grains.	DHV
06/01/90	1260	1270	Limestone with fine sand; yellowish gray (5Y8/1); as above; trace organic material (lignite); 40% phosphate grains.	DHV
06/01/90	1270	1280	Limestone with fine sand; limestone is white (N9) to yellowish gray (5Y8/1); 70% sand; very well sorted; subangular to subrounded; trace echinoids; Miliolina foraminifera; abundant black silt sized phosphate grains.	DHV
06/01/90	1280	1290	Limestone with fine sand; limestone increasing white (N9); 65% sand; as above.	DHV
06/01/90	1290	1300	Limestone w/ fine sand; yellowish gray (5Y8/1) to white (N9); as above.	DHV
06/01/90	1300	1310	Limestone w/ fine sand; yellowish gray (5Y8/1) to white (N9); as above; very well sorted; subangular to subrounded; trace echinoids; Miliolina foraminifera; abundant black silt size phosphate grains.	DHV
06/01/90	1310	1320	Limestone w/ fine sand; yellowish gray (5Y8/1) to white (N9); 50% sand; as above.	DHV
06/01/90	1320	1330	Limestone w/ fine sand; yellowish gray (5Y8/1) increasing white (N9); 35% sand; as above.	DHV
06/01/90	1330	1340	Limestone w/ fine sand; white (N9) to yellowish gray (5Y8/1); 65% sand; as above.	DHV
06/01/90	1340	1350	Limestone (biomicritic); yellowish gray (5Y8/1); porous; shell casts; well consolidated.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/01/90	1350	1360	Limestone (biomicritic); yellowish gray (5Y8/1); very porous; trace medium light gray (N6) calcareous siltstone fragments; well consolidated.	DHV
06/01/90	1360	1370	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV
06/01/90	1370	1380	Limestone (biomicritic); yellowish gray (5Y8/1); trace organic material; as above.	DHV
06/01/90	1380	1390	Limestone (biomicritic); yellowish gray (5Y8/1); very porous; consolidated.	DHV
06/01/90	1390	1400	Limestone (biomicritic); very light gray (N8) to yellowish gray (5Y8/1); as above.	DHV
06/02/90	1400	1410	Limestone (biomicritic); yellowish gray (5Y8/1); very porous; consolidated; 30% light gray (N7) calcareous siltstone fragments.	DHV
06/02/90	1410	1420	Limestone (biomicritic); yellowish gray (5Y8/1); as above; 20% light gray (N7) calcareous siltstone fragments; shell casts; trace bryozoans; echinoids; foraminifera: Dictyoncus, Miliolina.	DHV
06/02/90	1420	1430	Limestone (biomicritic); very pale orange (10YR8/2); very porous; 35% light gray (N7) calcareous siltstone fragments; shell casts.	DHV
06/02/90	1430	1440	Limestone (biomicritic); very pale orange (10YR8/2); very porous; shell casts; 30% light gray (N7) calcareous siltstone fragments; 5% pale yellowish brown (10YR6/2) dolomite; well consolidated.	DHV
06/02/90	1440	1450	Limestone (biomicritic); very pale orange (10YR8/2); as above; decreasing light gray (N7) calcareous siltstone fragments; increasing (30%) pale yellowish brown (10YR6/2) dolomite; well consolidated.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/02/90	1450	1460	Limestone (biomicritic); very pale orange (10YR8/2); as above; 30% pale yellowish brown (10YR6/2) dolomite; well consolidated.	DHV
06/02/90	1460	1470	Limestone (biomicritic); very pale orange (10YR8/2); as above; 30% pale yellowish brown (10YR6/2) dolomite; well consolidated.	DHV
06/02/90	1470	1480	Limestone (biomicritic); very pale orange (10YR8/2); 10% light gray (N7) calcareous siltstone fragments; increasing (40%) pale yellowish brown (10YR6/2) dolomite; well consolidated.	DHV
06/02/90	1480	1490	Limestone (biomicritic) with dolomite; very pale orange (10YR8/2) to pale yellowish brown (10YR6/2); limestone is very porous; well consolidated.	DHV
06/02/90	1490	1500	Dolomite; pale yellowish brown (10YR6/2); very hard; very pale orange (10YR8/2) biomicritic limestone fragments; porous.	DHV
06/02/90	1500	1510	Dolomite; pale yellowish brown (10YR6/2); as above.	DHV
06/02/90	1510	1520	Dolomite; pale yellowish brown (10YR6/2) to moderate yellowish brown (10YR5/4); crystalline; very hard.	DHV
06/02/90	1520	1530	Dolomite; pale yellowish brown (10YR6/2); crystalline; 10% black (N1) sandstone fragments; medium grained; well sorted; subangular; increasing (20%) white (N9) to yellowish gray (5Y8/1) biomicritic limestone.	DHV
06/02/90	1530	1540	Limestone (biomicritic); yellowish gray (5Y8/1); porous; 40% black (N1) sandstone medium to fine grained; well sorted; subangular; 20% pale yellowish brown (10YR6/2) dolomite; very hard.	DHV

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Note: Depth intervals were referenced
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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/02/90	1540	1550	Limestone (biomicritic); yellowish gray (5Y8/1); porous; 30% black (N1) sandstone fragments as above; 10% pale yellowish brown (10YR6/2) dolomite; very hard.	DHV
06/02/90	1550	1560	Limestone (biomicritic); yellowish gray (5Y8/1); as above; 15% black (N1) to medium light gray (N6) sandstone; trace pale yellowish brown (10YR6/2) dolomite fragments.	DHV
06/02/90	1560	1570	Limestone (biomicritic); yellowish gray (5Y8/1); as above; decreasing dolomite.	DHV
06/02/90	1570	1580	Limestone (biomicritic); yellowish gray (5Y8/1); 20% light gray (N7) limestone fragments; foraminifera: Dictyconus; shell casts; trace dolomite fragments.	DHV
06/02/90	1580	1590	Limestone (biomicritic); yellowish gray (5Y8/1); very porous; soft, 30% light gray (N7) limestone fragments; fossils; shell casts; foraminifera.	DHV
06/02/90	1590	1600	Limestone (biomicritic); yellowish gray (5Y8/1); very porous; soft, 35% light gray (N7) limestone fragments; fossils; shell casts; foraminifera.	DHV
06/02/90	1600	1610	Dolomite; dark yellowish brown (10YR4/2); very hard; 45% biomicritic limestone; very pale orange (10YR8/2); soft; porous; trace Miliolina, Dictyconus and shell casts.	DHV
06/02/90	1610	1620	Dolomite; dark yellowish brown (10YR4/2); very hard; decreasing (10%) biomicritic limestone fragments.	DHV
06/02/90	1620	1630	Dolomite; dark yellowish brown (10YR4/2); no biomicritic limestone present.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/02/90	1630	1640	Dolomite; dark yellow brown (10YR4/2) to pale yellowish brown (10YR8/2) becoming lighter in color.	DHV
06/02/90	1640	1650	Dolomite; pale yellowish brown to very pale orange (10YR8/2); very hard.	DHV
06/02/90	1650	1660	Dolomite; light gray (N7) pale to yellowish brown (10YR6/2); slow reaction to HCL; trace fossils; very hard; trace biomicritic limestone fragments.	DHV
06/02/90	1660	1670	Dolomite; light gray (N7) pale to yellowish brown (10YR6/2); as above.	DHV
06/02/90	1670	1680	Dolomite; pale yellowish brown (10YR6/2); very hard; 30% fossiliferous limestone; light gray (N7); abundant fossils: foraminifera and shells; trace very pale orange to light gray calcareous clay.	DHV
06/02/90	1680	1690	Dolomite; dark yellowish brown (10YR4/2); very porous; very hard.	DHV
06/02/90	1690	1700	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1700	1710	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1710	1720	Dolomite; dark yellowish brown (10YR4/2); as above;	DHV
06/02/90	1720	1730	Dolomite; dark yellowish brown (10YR4/2); crystalline fragments; porous; very hard.	DHV
06/02/90	1730	1740	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1740	1750	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/02/90	1750	1760	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1760	1770	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1770	1780	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1780	1790	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1790	1800	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1800	1810	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/02/90	1810	1820	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1820	1830	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); porous; crystalline; very hard.	DHV
06/03/90	1830	1840	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1840	1850	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1850	1860	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1860	1870	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1870	1880	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/03/90	1880	1890	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1890	1900	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1900	1910	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1910	1920	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/03/90	1920	1930	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
06/10/90	1930	1940	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); porous; crystalline; very hard.	DHV
06/10/90	1940	1950	Dolomite; dark yellowish brown (10YR4/2); crystalline; very porous, very hard.	DHV
06/10/90	1950	1960	Dolomite; grayish orange (10YR/4), pale yellowish brown (10YR6/2), dusky yellowish brown (10YR2/2); large color variation; highly crystalline; very porous, very hard.	DHV
06/10/90	1960	1970	Dolomite; grayish orange (10YR/4); pale yellowish brown (10YR6/2), dusky yellowish brown (10YR2/2); large color variation; highly crystalline; very porous, very hard.	DHV
06/10/90	1970	1980	Dolomite; grayish orange (10YR/4), pale yellowish brown (10YR6/2), dusky yellowish brown (10YR2/2); as above.	DHV
06/10/90	1980	1990	Dolomite; pale yellowish brown (10YR6/2) to dusky yellowish brown (10YR2/2); very hard; crystalline fragments.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/10/90	1990	2000	Dolomite; grayish orange (10YR7/4), dark yellowish brown (10YR4/2), dusky yellowish brown (10YR2/2); large color variation; very hard.	DHV
06/10/90	2000	2010	Dolomite; very pale orange (10YR8/2), pale yellowish brown (10YR6/2), dark yellowish brown (10YR4/2), dusky yellowish brown (10YR2/2); large color variation; very hard.	DHV
06/10/90	2010	2020	Dolomite; very pale orange (10YR8/2) to dark yellowish brown (10YR4/2); very porous; very hard.	DHV
06/10/90	2020	2030	Dolomite; light gray (N7) to dark yellowish brown (10YR4/2); porous; very hard.	DHV
06/10/90	2030	2040	Dolomite; light gray (N7) to dark yellowish brown (10YR4/2); as above.	DHV
06/10/90	2040	2050	Dolomite; light gray (N7) to dark yellowish brown (10YR4/2); as above.	DHV
06/10/90	2050	2060	Dolomite; light gray (N7) to dark yellowish brown (10YR4/2); as above.	DHV
06/10/90	2060	2070	Dolomite; very pale orange (10YR8/2), pale yellowish brown (10YR6/2); dark yellowish brown (10YR4/2); very porous; very hard.	DHV
06/10/90	2070	2080	Dolomite; light gray (N7), very pale orange (10YR8/2), pale yellowish brown (10YR6/2), dusky yellowish brown (10YR2/2); large color variation, very hard.	DHV
06/10/90	2080	2090	Dolomite; light gray (N7), very pale orange (10YR8/2), pale yellowish brown (10YR6/2), dusky yellowish brown (10YR2/2); as above.	DHV
06/10/90	2090	2100	Dolomite; light gray (N7), very pale orange (10YR8/2), pale yellowish brown (10YR6/2), dusky yellowish brown (10YR2/2); as above.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/10/90	2100	2110	Dolomite; large color variation as above; with moderate yellowish brown (10YR5/4).	DHV
06/10/90	2110	2120	Dolomite; large color variation as above; with moderate yellowish brown (10YR5/4).	DHV
06/10/90	2120	2130	Dolomite; very pale orange (10YR8/2), grayish orange (10YR7/4) to pale yellowish brown (10YR6/2); color becoming lighter; very hard.	DHV
06/10/90	2130	2140	Dolomite; very pale orange (10YR8/2), grayish orange (10YR7/4) to pale yellowish brown (10YR6/2); color becoming lighter; as above.	DHV
06/10/90	2140	2150	Dolomite; very pale orange (10YR8/2) to light gray (N7); increasing hardness; less porous.	DHV
06/10/90	2150	2160	Dolomite; very pale orange (10YR8/2) to light gray (N7); as above.	DHV
06/10/90	2160	2170	Dolomite; very pale orange (10YR8/2), pale yellowish brown (10YR6/2), dark yellowish brown (10YR4/2); increasing hardness; less porous.	DHV
06/10/90	2170	2180	Dolomite with limestone; very pale orange (10YR8/2); light gray (N7) interstitial fossiliferous limestone.	DHV
06/10/90	2180	2190	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2).	DHV
06/10/90	2190	2200	Dolomite; dark yellowish brown (10YR4/2); increasing hardness; less porous.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	2200	2210	Dolomite; dark yellowish brown (10YR 4/2) to dark gray (N3); slightly crystalline; porous; very hard; sucrosic texture.	DHV
07/17/90	2210	2220	Dolomite; moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2); highly crystalline; very porous; sucrosic texture.	DHV
07/17/90	2220	2230	Dolomite; moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2); as above; 15% dark gray (N3) dolomite fragments.	DHV
07/17/90	2230	2240	Dolomite, grayish orange (10YR 7/4) to dusky yellowish brown (10YR 2/2); very porous; crystalline; sucrosic texture; 5% interstitial limestone.	DHV
07/17/90	2240	2250	Dolomite, moderate yellowish brown (10YR 5/4) to dusky yellowish brown (10YR 2/2); as above.	DHV
07/17/90	2250	2260	Fossiliferous limestone with dolomite; limestone is yellowish gray (5Y 8/1); abundant foraminifera; shell fragments; soft; dolomite is moderate yellowish brown (10YR 5/4); very porous; crystalline.	DHV
07/17/90	2260	2270	Fossiliferous limestone; yellowish gray (5Y 8/1); abundant shell fragments; foraminifera; 40% moderate yellowish brown (10YR 5/4) dolomite; very porous; crystalline.	DHV
07/17/90	2270	2280	Dolomite; dusky yellowish brown (10YR 2/2); crystalline; slightly porous; very hard.	DHV
07/17/90	2280	2290	Granular biomicritic fossiliferous limestone; yellowish gray (5Y 7/2); consolidated very fine sand; well sorted; subrounded; foraminifera and shell fragments in matrix; very hard.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	2290	2300	Biomicritic fossiliferous limestone; yellowish gray (5Y 7/2); as above; 30% dusky yellowish brown (10YR 4/2) dolomite; very porous; crystalline.	DHV
07/17/90	2300	2310	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); foraminifera; shell fragments; sand in matrix; 10% moderate yellowish brown dolomite (10YR 5/4); porous; crystalline.	DHV
07/17/90	2310	2320	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); fine cemented sand in matrix; as above.	DHV
07/17/90	2320	2330	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); fine cemented sand matrix; as above; 30% dark yellowish brown dolomite (10YR 4/2); porous.	DHV
07/17/90	2330	2340	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); fine cemented sand in matrix; 5% dark yellowish brown dolomite (10YR 4/2); porous.	DHV
07/17/90	2340	2350	Biomicritic fossiliferous limestone; yellowish gray (5YR 8/1); abundant foraminifera: Quinqueloculina, Triloculina; 5% dark yellowish brown dolomite (10YR 4/2); porous.	DHV
07/17/90	2350	2360	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); abundant foraminifera: Triloculina; Miliolina; 5% dolomite.	DHV
07/17/90	2360	2370	Biomicritic fossiliferous limestone; yellowish gray (5YR 8/1); biomicrite matrix; fine sand in matrix; foraminifera; as above; 5% dark yellowish brown dolomite (10YR 4/2); as above.	DHV
07/17/90	2370	2380	Biomicritic fossiliferous limestone; yellow gray (5YR 8/1); as above; 7% dark yellowish brown (10YR 4/2) dolomite; as above.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	2380	2390	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); as above; foraminifera: Triloculina, Quinqueloculina; 10% dark yellowish brown (10YR 4/2) dolomite; as above.	DHV
07/17/90	2390	2400	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); 10% dark yellowish brown dolomite; as above.	DHV
07/17/90	2400	2410	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); 10% dark yellowish brown (10YR 4/2) dolomite; as above.	DHV
07/17/90	2410	2420	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); 15% dark yellowish brown (10YR 4/2); dolomite; as above.	DHV
07/17/90	2420	2430	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); 15% dark yellowish brown (10YR 4/2) dolomite; as above.	DHV
07/17/90	2430	2440	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); 5% dark yellowish brown (10YR 4/2) dolomite.	
07/17/90	2440	2450	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); trace dolomite; trace white (N9) calcareous clay.	DHV
07/17/90	2250	2460	Dolomite; dark yellowish brown (10YR 4/2); very porous; very hard; 5% biomicritic fossiliferous limestone.	DHV
07/17/90	2460	2470	Biomicritic fossiliferous limestone; as above; 45% dark yellowish brown (10YR 4/2) dolomite; as above.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	2470	2480	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1) to white (N9); micrite matrix; abundant foraminifera.	DHV
07/17/90	2480	2490	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); 35% dolomite; dark yellowish brown (10Y 4/2); sucrosic texture; porous.	DHV
07/17/90	2490	2500	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); 10% dolomite; dark yellowish brown (10YR 4/2); sucrosic texture; porous.	DHV
07/17/90	2500	2510	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); foraminifera; 0% dolomite.	DHV
07/17/90	2510	2520	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); foraminifera; 45% dark yellowish brown dolomite (10YR 4/2); sucrosic and vuggy texture.	DHV
07/17/90	2520	2530	Dolomite; moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2); sucrosic and vuggy texture; crystalline; moderately hard.	DHV
07/17/90	2530	2540	Dolomite; moderate yellowish brown (10YR 5/4) to dark yellowish brown (10YR 4/2); sucrosic and vuggy texture; crystalline; moderately hard.	DHV
07/17/90	2540	2550	Dolomite; dusky yellowish brown (10YR 2/2); crystalline; sucrosic and vuggy texture; very hard.	DHV
07/17/90	2550	2560	Dolomite; dusky yellowish brown (10YR 2/2); crystalline; sucrosic and vuggy texture; very hard.	DHV
07/17/90	2560	2570	Dolomite; dusky yellowish brown (10YR 2/2); coarsely crystalline; sucrosic and vuggy texture; very hard.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	2570	2580	Dolomite; dusky yellowish brown (10YR 2/2); coarsely crystalline; sucrosic and vuggy texture; very hard.	DHV
07/17/90	2580	2590	Dolomite; dusky yellowish brown (10YR 2/2); coarsely crystalline; sucrosic and vuggy texture; very hard.	DHV
07/17/90	2590 -	2600	Dolomite; dusky yellowish brown (10YR 2/2); very porous; sucrosic texture; very hard.	DHV
07/17/90	2600	2610	Dolomite; dusky to moderate yellowish brown (10YR 5/4); crystalline; sucrosic and vuggy texture.	DHV
07/17/90	2610	2620	Dolomite; dusky to moderate yellowish brown (10YR 5/4); as above.	DHV
07/17/90	2620	2630	Dolomitic limestone; yellowish gray (5Y 8/10); fossiliferous; pelecypods; foraminifera; casts and molds; very fine sand in matrix; well cemented.	DHV
07/17/90	2630	2640	Dolomitic limestone; as above.	DHV
07/17/90	2640	2650	Dolomitic limestone; as above.	DHV
07/17/90	2650	2660	Biomicrotic fossiliferous limestone; yellowish gray (5Y 8/1); very fine sand in matrix; foraminifera; well cemented.	DHV
07/17/90	2660	2670	Biomicrotic fossiliferous limestone; yellowish gray (5Y 8/1); very fine sand in matrix; foraminifera; well cemented.	DHV
07/17/90	2670	2680	Dolomite; dark yellowish brown (10YR 4/2); sucrosic and vuggy texture; very hard; crystalline.	DHV
07/17/90	2680	2690	Dolomite; dark yellowish brown (10YR 4/2); sucrosic and vuggy texture; very hard; crystalline.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	2690	2700	Dolomite; dark yellowish brown (10YR 4/2); sucrosic and vuggy texture; very hard; crystalline.	DHV
07/17/90	2700	2710	Dolomite; dark yellowish brown (10YR 4/2); sucrosic and vuggy texture; very hard; crystalline.	DHV
07/17/90	2710	2720	Dolomite; dark yellowish brown (10YR 4/2); with large grayish black (N2) chert fragments.	DHV
07/17/90	2720	2730	Dolomite; dark yellowish brown; as above; no chert.	DHV
07/17/90	2730	2740	Dolomitic limestone; light olive gray (5Y 6/1); very hard; trace moderate green (5G 5/6) olivine crystals in matrix.	DHV
07/17/90	2740	2750	Dolomitic limestone; light olive gray (5Y 6/1); very hard; trace moderate green (5G 5/6) olivine crystals in matrix as above; 45% biomicritic fossiliferous limestone; yellowish gray (5Y 8/1).	DHV
07/17/90	2750	2760	Dolomitic limestone with calcareous clay; dolomite is dark yellowish brown (10YR 4/2); light gray (N6) cemented limestone; 30% white (N9) calcareous clay.	DHV
07/17/90	2770	2780	Biomicritic fossiliferous limestone; light gray (N6) to yellowish gray (5Y 8/1); soft; moderately well cemented; some dolomitization.	DHV
07/17/90	2780	2790	Compacted limestone (micrite); light gray (N6); very well cemented; 10% dolomite; moderate yellow brown; sucrosic and vuggy texture.	DHV
07/17/90	2790	2800	Compacted fossiliferous limestone (biomicrite); light gray (N6); very well cemented; trace dolomite.	DHV
07/17/90	2800	2810	Compacted limestone (micrite); light gray (N6); very well cemented; 15% dolomite.	DHV

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**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	2810	2820	Biomicritic fossiliferous limestone with clay; light gray (N7); very poorly cemented; very fine sand in matrix; trace dolomite.	DHV
07/17/90	2820	2830	Biomicritic fossiliferous limestone with clay; yellowish gray (5Y 8/1); poorly cemented; as above; trace white (N9) calcareous clay.	DHV
07/17/90	2830	2840	Biomicritic fossiliferous limestone with clay; yellowish gray (5Y 8/1); well cemented; trace white (N9) calcareous clay.	DHV
07/17/90	2840	2850	Biomicritic fossiliferous limestone with clay; yellowish gray (5Y 8/1); well cemented; trace white (N9) calcareous clay.	DHV
07/17/90	2850	2860	Biomicritic fossiliferous limestone with clay; yellowish gray (5Y 8/1); very poorly cemented; soft; trace white (N9) calcareous clay.	DHV
07/17/90	2860	2870	Biomicritic fossiliferous limestone with clay; yellowish gray (5Y 8/1); very poorly cemented; soft; trace white (N9) calcareous clay.	DHV
07/17/90	2870	2880	Biomicritic fossiliferous limestone with clay; yellowish gray (5Y 8/1); very soft, 10% white (N9) calcareous gray.	DHV
07/17/90	2880	2890	Biomicritic fossiliferous limestone with clay; as above; 5% dolomite; trace white (N9) calcareous clay.	DHV
07/17/90	2890	2900	Biomicritic fossiliferous limestone with clay; as above; 10% dolomite; dark yellowish brown (10YR 4/2); very hard.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth intervals were referenced
from top of pad 21.38 NGVD

**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	2900	2910	Biomicrotic fossiliferous limestone with clay; as above; yellowish gray to white (N9); very soft; moderate well cemented; 8% dolomite.	DHV
07/17/90	2910	2920	Biomicrotic fossiliferous limestone with clay; as above; yellowish gray to white (N9); very soft; 5% dolomite fragments.	DHV
07/17/90	2920	2930	Biomicrotic fossiliferous limestone with clay; as above; very soft; 10% dolomite fragments.	DHV
07/17/90	2930	2940	Dolomite; grayish orange (10YR 7/4) to dusky yellowish brown (10YR 2/2); very hard; finely crystalline; sucrosic texture.	DHV
07/17/90	2940	2950	Dolomite; grayish orange (10yR 7/4) to dusky yellowish brown (10YR 2/2); very hard; finely crystalline; sucrosic texture.	DHV
07/17/90	2950	2960	Dolomite; grayish orange (10YR 7/4); 10% biomicritic limestone; yellowish gray (5Y 8/1); moderately cemented; friable.	DHV
07/17/90	2960	2970	Dolomite; pale yellowish brown (10YR 6/2) to grayish orange (10YR 7/4); very hard; color lighter.	DHV
07/17/90	2970	2980	Dolomite; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2); very hard.	DHV
07/17/90	2980	2990	Dolomite; pale yellow to grayish orange (10YR 2/2); as above.	DHV
07/17/90	2990	3000	Dolomite; as above to very pale orange (10YR 8/2); 20% limestone fragments; very hard; drusy crystallization; sucrosic texture.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth intervals were referenced
from top of pad 21.38 NGVD

**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	3000	3010	Dolomite; dark gray (N2) to dusky yellowish brown (10YR 2/2); very hard; finely crystalline; 2% limestone fragments.	DHV
07/17/90	3010	3020	Dolomite; dark gray (N2) to dusky yellowish brown (10YR 2/2); very hard; finely crystalline to cryptocrystalline; 2% limestone fragments.	DHV
07/17/90	3020	3030	Dolomite; very pale orange (10YR 8/2) to pale yellowish brown (10 YR 6/2); very hard; as above.	DHV
07/17/90	3030	3040	Dolomite; very pale orange (10YR 8/2) to pale yellowish brown (10YR 6/2); very hard, as above.	DHV
07/17/90	3040	3050	Dolomite; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2); cryptocrystalline to finely crystalline.	DHV
07/17/90	3050	3060	Dolomite; very pale orange (10 YR 8/2) to grayish orange (10YR 7/4); crystalline as above.	DHV
07/17/90	3060	3070	Dolomite; very pale orange (10YR 8/2) to moderate yellowish brown (10YR 5/4); very hard.	DHV
07/17/90	3070	3080	Dolomite; dusky yellowish brown to dark gray (N2); cryptocrystalline to finely crystalline; very hard; trace limestone fragments.	DHV
07/17/90	3080	3090	Dolomite; light olive gray (5Y 6/1); very hard; sucrosic fractures; trace calcareous clay and limestone fragments.	DHV
07/17/90	3090	3100	Dolomite; pale yellowish brown (10YR 6/2); very hard; sucrosic fractures; trace calcareous clay and limestone fragments.	DHV
07/17/90	3100	3110	Dolomite; pale yellowish brown to very pale orange (10YR 8/2); very hard; finely crystalline.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth intervals were referenced
from top of pad 21.38 NGVD

**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	3110	3120	Dolomite; light gray to (N6) pale yellowish brown (10YR 6/2); very hard; finely crystalline; sucrosic fractures.	DHV
07/17/90	3120	3130	Dolomite; light gray to (N6) pale yellowish brown (10YR 6/2); very hard; finely crystalline; sucrosic fractures.	DHV
07/17/90	3130	3140	Dolomite; light gray (N6) to yellowish brown (10YR 6/2); as above.	DHV
07/17/90	3140	3150	Dolomite; light gray (N6) to yellowish brown (10YR 6/2); very hard; sucrosic fractures; non crystalline.	DHV
07/17/90	3150	3160	Dolomite; light gray (N6) to grayish orange (10YR 7/4); very hard; sucrosic texture; finely crystalline.	DHV
07/17/90	3160	3170	Dolomite; light gray (N6) to grayish orange (10YR 7/4); very hard; sucrosic texture; finely crystalline.	DHV
07/17/90	3170	3180	Dolomite; grayish orange (10YR 7/4) to pale yellowish brownish (10YR 6/2); vuggy and sucrosic texture; very hard.	DHV
07/17/90	3080	3190	Dolomite; grayish orange (10YR 7/4) to pale yellowish brown (10YR 6/2) to moderately yellowish brown (10YR 5/4); very hard.	DHV
07/17/90	3190	3200	Dolomite; grayish orange (10YR 7/4) to pale yellowish brown (10YR 6/2); as above.	DHV
07/17/90	3200	3210	Dolomite; pale yellowish orange (10YR 8/2) to pale yellowish brown (10YR 6/2) to moderate yellowish brown (5YR 5/2); very hard	DHV
07/17/90	3210	3220	Dolomite; pale yellowish orange (10YR 8/2) to pale yellowish brown (5YR 5/2); finely crystalline; very hard; sucrosic fractures.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth intervals were referenced
from top of pad 21.38 NGVD

**IW-1
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/17/90	3220	3230	Dolomite; light olive gray (5Y 6/1); vuggy and sucrosic texture; finely crystalline; very hard.	DHV
07/17/90	3230	3240	Dolomite; light olive gray (5Y 6/1) to pale yellowish brown (10YR 6/2); vuggy and sucrosic texture; finely crystalline; very hard.	DHV
07/17/90	3240	3250	Dolomite; dark yellowish brown (10YR 4/2); finely crystalline; fractures; very hard.	DHV
07/17/90	3250	3260	Dolomite; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2); finely crystalline; fractures; very hard.	DHV
07/17/90	3260	3270	Dolomite; pale yellow brown (10YR 6/2) to light olive gray (5Y 6/1); fractures; very hard.	DHV
07/17/90	3270	3280	Dolomite; dusky yellowish brown (10YR 2/2); trace limestone fragments; very hard.	DHV
07/17/90	3280	3290	Dolomite; pale yellowish brown (10YR 6/2) to light olive green (5Y 6/1); vuggy and sucrosic texture; very hard.	DHV
07/17/90	3290	3300	Dolomite; pale yellow brown (10YR 6/2) to light olive green (5Y 6/1); vuggy and sucrosic texture; very hard.	DHV

INJECTION WELL NO. 2

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
from top of pad - 21.50 NGVD

**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/23/90	50	60	Sand with calcareous clay; medium light gray to light gray (N6-N7); fine to medium grained; subrounded; very well sorted; 30 percent calcareous clay; very light gray (N8); 5 percent black phosphate grains	DHV
06/23/90	60	70	Sand with calcareous clay; medium gray to medium dark gray (N4-N5); fine to medium grained; sub-rounded; moderately well to poorly sorted; 10 percent shell; trace black phosphate grains	DHV
06/23/90	70	80	Sand with calcareous clay; medium gray to medium dark gray (N4-N5); fine to medium grained; sub-rounded; well sorted; trace calcareous sandstone; trace black phosphate grains	DHV
06/23/90	80	90	Sand with calcareous clay; medium gray to medium dark gray (N4-N5); fine to medium grained; sub-angular to subrounded; very well sorted; trace calcareous sandstone fragments; trace black phosphate grains	DHV
06/23/90	90	100	Sand with calcareous clay; medium gray to medium dark gray (N4-N5); fine to medium grained; sub-angular to subrounded; moderately well sorted; 15 percent calcareous sandstone fragments; trace black phosphate grains	DHV
06/23/90	100	110	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subangular to subrounded; moderately well sorted; moderately well cemented; trace calcite crystals; 5 percent shell; trace black phosphate grains	DHV
06/23/90	110	120	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); medium grained; well sorted; sub-angular; poorly cemented; abundant calcite crystals; light gray (N7) limestone fragments; 5 percent shell; trace black phosphate grains	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
from top of pad - 21.50 NGVD

**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/23/90	120	130	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subrounded; moderately well sorted; poorly cemented; trace calcite crystals; shell 10 percent; trace arenaceous limestone fragments; trace black phosphate grains	DHV
06/23/90	130	140	Calcareous Sandstone; medium gray to medium dark gray (N4-N5); fine to medium grained; subrounded; moderately well sorted; poorly cemented; increasing shell 35 percent; trace black phosphate grains	DHV
06/23/90	140	150	Coquina/Arenaceous Limestone; light gray (N7); increasing shell 90 percent; abundant bivalves; shell casts; interbedded sand; fine to medium grained; subrounded; well sorted	DHV
06/23/90	150	160	Coquina/Arenaceous Limestone; light gray (N7) to yellowish gray (5Y7/2); 60 percent shell; well cemented; trace shell casts; abundant bivalves; interbedded sand; fine to medium grained; subrounded; moderately well sorted; increasing arenaceous limestone fragments (40%)	DHV
06/23/90	160	170	Coquina with sand; yellowish gray (5Y7/2); 40 percent shell; abundant sand grains; fine to medium grained; subangular to subrounded; well sorted; poorly cemented	DHV
06/23/90	170	180	Coquina with sand; yellowish gray (5Y7/2); 60 percent shell; 20 percent sand; fine to medium grained; subrounded; moderately well sorted; 20 percent arenaceous limestone fragments.	DHV
06/23/90	180	190	Coquina with sand; yellowish gray (5Y7/2); 80 percent shell; 10 percent sand; fine to medium grained; subrounded; moderately well sorted; 10 percent arenaceous limestone fragments.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

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from top of pad - 21.50 NGVD

**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/23/90	190	200	Coquina with sand; yellowish gray (5Y7/2); 75 percent shell; trace fossils; trace arenaceous limestone fragments; trace calcite crystals	DHV
06/23/90	200	210	Coquina with sand; yellowish gray (5Y7/2); 80 percent shell; trace fossils; decreasing sand; abundant calcite crystals; increasing arenaceous limestone fragments	DHV
06/23/90	210	220	Arenaceous Limestone with coquina; yellowish gray (5Y7/2); 45 percent shell; trace fossils; trace calcite crystals	DHV
06/23/90	220	230	Coquina with calcareous clay; yellowish gray (5Y7/2); 60 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; abundant black phosphate grains; 40% calcareous clay; increasing clay	DHV
06/23/90	230	240	Coquina with calcareous clay; yellowish gray (5Y7/2); 70 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; abundant black phosphate grains; 30 percent light olive gray calcareous clay (5Y5/2)	DHV
06/23/90	240	250	Calcareous clay with sand; yellowish gray (5Y7/2); 30 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; abundant black phosphate grains; increasing light olive gray clay (5Y5/2); decreasing shell	DHV
06/23/90	250	260	Calcareous clay with shell; light olive gray (5Y5/2) to yellowish gray (5Y7/2); clay is light olive gray; shell is yellowish gray; trace arenaceous limestone fragments; shell 30 percent; well cemented; small trace very fine sand; angular; well sorted	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/23/90	260	270	Calcareous clay; grayish olive (10Y4/2); sandy; fine to medium grained; well sorted; subrounded; trace arenaceous limestone fragments; shell fragments 25 percent	DHV
06/23/90	270	280	Calcareous clay; grayish olive (10Y4/2); sandy; fine to medium grained; well sorted; subrounded;	DHV
06/25/90	280	290	Calcareous clay; grayish olive (10Y4/2); sandy; fine to medium grained; well sorted; subrounded; arenaceous limestone fragments 10 percent.	DHV
06/25/90	290	300	Calcareous clay; grayish olive (10Y4/2); very silty	DHV
06/25/90	300	310	Calcareous clay; grayish olive (10Y4/2); 20 percent silt	DHV
06/25/90	310	320	Calcareous clay; grayish olive (10Y4/2); 10 percent silt	DHV
06/25/90	320	330	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	330	340	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	340	350	Calcareous clay; grayish olive (10Y4/2); 20 percent silt	DHV
06/25/90	350	360	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	360	370	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	370	380	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	380	390	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	390	400	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	400	410	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	410	420	Calcareous clay; grayish olive (10Y4/2); trace limestone fragments; 10 percent silt	DHV

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Project No. SEF24770.T0

Note: Depth Intervals were referenced
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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/25/90	420	430	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	430	440	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	440	450	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	450	460	Calcareous clay; grayish olive (10Y4/2); as above	DHV
06/25/90	460	470	Calcareous clay; grayish olive green (5GY3/2); consolidated silt; dark greenish gray (5GY4/1)	DHV
06/25/90	470	480	Calcareous clay; grayish olive green (5GY3/2); clay massive; increasing consolidated silt 40 percent; increasing dark greenish gray (5GY4/1);	DHV
06/25/90	480	490	Calcareous clay; grayish olive green (5GY3/2); consolidated silt fragments 20 percent	DHV
06/25/90	490	500	Calcareous clay; grayish olive green (5GY3/2); trace consolidated silt fragments	DHV
06/25/90	500	510	Calcareous clay; grayish olive green (5GY3/2); trace consolidated silt fragments	DHV
06/25/90	510	520	Calcareous clay; grayish olive green (5GY3/2); trace consolidated silt fragments	DHV
06/25/90	520	530	Calcareous clay; grayish olive green (5GY3/2); as above	DHV
06/25/90	530	540	Calcareous clay; grayish olive green (5GY3/2); as above	DHV
06/25/90	540	550	Calcareous clay; grayish olive green (5GY3/2); as above	DHV
06/25/90	550	560	Calcareous clay; grayish olive green (5GY3/2); as above	DHV
06/25/90	560	570	Calcareous clay; grayish olive green (5GY3/2)	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/25/90	570	580	Calcareous clay; dusky yellow green (5GY5/2); 25 percent yellowish gray (5Y8/1) limestone fragments; 10 percent silt	DHV
06/25/90	580	590	Calcareous clay; dusky yellow green (5GY5/2); trace siltstone fragments; 20 percent limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	590	600	Calcareous clay; dusky yellow green (5GY5/2)	DHV
06/25/90	600	610	Calcareous clay; grayish yellow green (5GY7/2); color becoming lighter	DHV
06/25/90	610	620	Calcareous clay; grayish yellow green (5GY7/2)	DHV
06/25/90	620	630	Calcareous clay; grayish yellow green (5GY7/2); color becoming lighter	DHV
06/25/90	630	640	Calcareous clay; pale olive (10GY6/2); increasing carbonates; 40 percent limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	640	650	Calcareous clay; pale olive (10GY6/2); increasing carbonates; as above	DHV
06/25/90	650	660	Calcareous clay; pale olive (10GY6/2); increasing carbonates; 30 percent limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	660	670	Calcareous clay; pale olive (10GY6/2); increasing carbonates; as above	DHV
06/25/90	670	680	Calcareous clay; pale olive (10GY6/2); increasing carbonates; as above	DHV
06/25/90	680	690	Calcareous clay; grayish yellow green (5GY7/2); 45 percent limestone fragments; yellowish gray (5Y7/2); increasing limestone fragments	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/25/90	690	700	Calcareous clay with limestone; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); increasing limestone fragments 45 percent; yellowish gray (5Y8/1)	DHV
06/25/90	700	710	Calcareous clay with limestone; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); limestone fragments 45 percent; yellowish gray (5Y8/1)	DHV
06/25/90	710	720	Calcareous clay with limestone; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); increasing limestone fragments 50 percent; yellowish gray (5Y8/1)	DHV
06/25/90	720	730	Calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); 30 percent limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	730	740	Calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); 20 percent limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	740	750	Calcareous clay; pale olive (10Y6/2); trace limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	750	760	Calcareous clay; pale olive (10Y6/2) to grayish olive (10Y4/2); trace limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	760	770	Calcareous clay; pale olive (10Y6/2) to grayish olive (10Y4/2); trace limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	770	780	Calcareous clay; pale olive (10Y6/2) to grayish olive (10Y4/2); as above	DHV
06/25/90	780	790	Calcareous clay; dusky yellow green (5GY5/2); trace chert fragments; grayish olive (10Y4/2)	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/25/90	790	800	Calcareous clay; dusky yellow green (GY5/2); trace chert fragments; grayish olive (10Y4/2); trace consolidated silt	DHV
06/25/90	800	810	Calcareous clay; dusky yellow green (5GY5/2); increasing chert fragments; grayish olive green (5GY3/2)	DHV
06/25/90	810	820	Calcareous clay; dusky yellow green (5GY5/2); 30 percent chert fragments; grayish olive green (5GY3/2); 10 percent limestone fragments; yellowish gray (5Y8/1)	DHV
06/25/90	820	830	Calcareous clay with fossiliferous limestone; pale olive (10Y6/2); 30 percent fossiliferous limestone fragments; yellowish gray (5Y8/1); 30 percent chert fragments; grayish olive green (5GY3/2)	DHV
06/25/90	830	840	Calcareous clay; pale greenish yellow (10Y8/2); 20 percent limestone fragments; grayish yellow (5Y8/4); silt is pale greenish yellow (10Y8/2); 10 percent shell fragments; trace chert fragments	DHV
06/25/90	840	850	Calcareous clay with fossiliferous limestone; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 10 percent shell fragments; trace chert fragments	DHV
06/25/90	850	860	Fossiliferous limestone with calcareous clay; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 60 percent shell fragments; trace olive green (10Y4/2) chert	DHV
06/25/90	860	870	Fossiliferous limestone with calcareous clay; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 40 percent shell fragments; trace olive green (10Y4/2) chert	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/25/90	870	880	Fossiliferous limestone; clay ball; pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 40 percent shell fragments; trace olive green (10Y4/2) chert	DHV
06/25/90	880	890	Fossiliferous limestone; grayish yellow (5Y8/4); decreasing shell fragments; trace olive green (10Y4/2) chert	DHV
06/25/90	890	900	Fossiliferous limestone with clay ball; clay is pale olive (10Y6/2); limestone grayish yellow (5Y8/4); increasing limestone fragments; decreasing shell fragments	DHV
06/25/90	900	910	Limestone and arenaceous limestone with calcareous clay; grayish yellow green (5GY7/2); silt; trace black siltsized phosphate grains	DHV
06/25/90	910	920	Limestone and arenaceous limestone with calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2)	DHV
06/25/90	920	930	Limestone with arenaceous limestone; yellowish gray (5Y8/1); arenaceous limestone is light greenish gray (5GY8/1); increasing silt; abundant black siltsized phosphate grains	DHV
06/25/90	930	940	Calcareous clay; pale olive (10Y6/2) with fine sand and silt; 30 percent limestone fragments; abundant black siltsized phosphate grains	DHV
06/25/90	940	950	Calcareous clay; pale olive (10Y6/2) with fine sand and silt; 30 percent limestone fragments; abundant black siltsized phosphate grains	DHV
06/25/90	950	960	Calcareous clay; pale olive (10Y6/2) with fine sand and silt; 30 percent limestone fragments; abundant black siltsized phosphate grains	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
06/25/90	960	970	Calcareous clay; pale olive (10Y6/2) with fine sand and increasing silt; 20 percent limestone fragments; abundant black siltsized phosphate grains	DHV
06/25/90	970	980	Calcareous clay; pale olive (10Y6/2) with fine sand and increasing silt; 20 percent limestone fragments; abundant black siltsized phosphate grains	DHV
06/25/90	980	990	Calcareous clay with fine sand and silt; pale olive (10Y6/2); increasing fine sand and silt; 10 percent limestone fragments; 45 percent black siltsized phosphate grains	DHV
06/25/90	990	1000	Limestone with calcareous clay and silt; limestone is yellowish gray (5Y8/1); clay is pale olive (10Y6/2); limestone fragments 80 percent; 20 percent black siltsized phosphate grains	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth intervals were referenced
from top of pad - 21.50 NGVD

**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1000	1010	Limestone (biomicritic); yellowish gray (5Y8/1); porous; trace echinoids; trace medium light gray (N6) calcareous siltstone fragments; 5% black phosphate grains.	DHV
07/14/90	1010	1020	Limestone (biomicritic); yellowish gray (5Y8/1); porous; trace echinoids; trace bryozoans; trace medium light gray (N6) calcareous siltstone fragments; trace silt sized black phosphate grains.	DHV
07/14/90	1020	1030	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV
07/14/90	1030	1040	Limestone (biomicritic); yellowish gray (5Y8/1); as above; trace shell casts and shells.	DHV
07/14/90	1040	1050	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV
07/14/90	1050	1060	Limestone (biomicritic); yellowish gray (5Y8/1); as above; trace calcite crystals.	DHV
07/14/90	1060	1070	Limestone (biomicritic); yellowish gray (5Y8/1); as above; trace calcite crystals.	DHV
07/14/90	1070	1080	Limestone (biomicritic); yellowish gray (5Y8/1); as above; 20% medium light gray (N6) calcareous siltstone fragments; trace calcite.	DHV
07/14/90	1080	1090	Limestone (biomicritic); yellowish gray (5Y8/1); porous; trace echinoids.	DHV
07/14/90	1090	1100	Limestone (biomicritic); yellowish gray (5Y8/1); as above; trace foraminifera (Dictyonus); pelecypod fragments.	DHV
07/14/90	1100	1110	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV

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Note: Depth intervals were referenced
from top of pad - 21.50 NGVD

**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1110	1120	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV
07/14/90	1120	1130	Limestone (biomicritic); yellowish gray (5Y8/1); as above; trace black (N1) chert fragments.	DHV
07/14/90	1130	1140	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV
07/14/90	1140	1150	Limestone (biomicritic); yellowish gray (5Y8/1); trace echinoids, pelecypods and foraminifera (Dictyconus).	DHV
07/14/90	1150	1160	Limestone (biomicritic); very pale orange (10Y8/2) to yellowish gray (5Y8/1); as above; 20% medium light gray (N6) calcareous siltstone fragments.	DHV
07/14/90	1160	1170	Limestone (biomicritic); very pale orange (10Y8/2); as above; 30% medium light gray calcareous siltstone fragments.	DHV
07/14/90	1170	1180	Limestone (biomicritic); very pale orange (10Y8/2); trace echinoids.	DHV
07/14/90	1180	1190	Limestone (biomicritic); very pale orange (10Y8/2); trace echinoids.	DHV
07/14/90	1190	1200	Limestone (biomicritic); very pale orange (10Y8/2); with light gray (N6) calcareous siltstone fragments (20%).	DHV
07/14/90	1200	1210	Limestone (biomicritic); very pale orange (10Y8/2); light gray (N6) calcareous siltstone fragments (40%); slightly porous.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1210	1220	Limestone (biomicritic); very pale orange (10Y8/2); light gray (N6) calcareous siltstone fragments (30%); very porous; trace echinoids; trace bryozoans; pelecypods; foraminifera (Dictyonus, Miliolina); shell casts.	DHV
07/14/90	1220	1230	Limestone (biomicritic); very pale orange (10Y8/2); very porous; trace bryozoans; trace echinoids.	DHV
07/14/90	1230	1240	Limestone (biomicritic); very pale orange (10Y8/2); as above.	DHV
06/01/90	1240	1250	Limestone (biomicritic); very pale orange (10Y8/2); as above; trace light gray (N6) calcareous siltstone fragments (10%); trace calcite crystals; foraminifera (Dictyonus, Miliolina).	DHV
06/14/90	1250	1260	Limestone (biomicritic); yellowish gray (5Y8/1); 10% calcareous siltstone fragments; trace fossils: echinoid fragments; Miliolina foraminifera; fine shell fragments; trace black (N1) chert fragments.	DHV
07/14/90	1260	1270	Limestone (biomicritic); yellowish gray (5Y8/1); trace calcite crystals.	DHV
07/14/90	1270	1280	Limestone with calcareous clay; limestone is white (N9) to yellowish gray (5Y8/1); clay is grayish olive (10Y4/2); trace echinoids; Miliolina foraminifera; trace shell.	DHV
07/14/90	1280	1290	Limestone with calcareous clay; limestone increasing white (N9); clay is grayish olive (10Y4/2); as above.	DHV
07/23/90	1290	1300	Limestone (biomicritic); yellowish gray (5Y8/1) to white (N9); as above.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/23/90	1300	1310	Limestone (biomicritic); yellowish gray (5Y8/1) to white (N9); as above; trace echinoids; Miliolina foraminifera; soft.	DHV
07/23/90	1310	1320	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV
07/23/90	1320	1330	Limestone (biomicritic); yellowish gray (5Y8/1); as above; porous.	DHV
07/23/90	1330	1340	Limestone (biomicritic); white (N9) to yellowish gray (5Y8/1); as above.	DHV
07/23/90	1340	1350	Limestone (biomicritic); yellowish gray (5Y8/1); porous; shell casts; soft; as above.	DHV
07/23/90	1350	1360	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV
07/23/90	1360	1370	Limestone (biomicritic); yellowish gray (5Y8/1); as above.	DHV
07/23/90	1370	1380	Limestone (biomicritic); yellowish gray (5Y8/1) to pale yellowish brown (10YR6/2); trace black banding; as above; some dolomitization.	DHV
07/23/90	1380	1390	Limestone (biomicritic); yellowish gray (5Y8/1); very porous; soft; as above.	DHV
07/23/90	1390	1400	Limestone (biomicritic); very light gray (N8) to yellowish gray (5Y8/1); as above; more consolidated.	DHV
07/14/90	1400	1410	Limestone (biomicritic); very pale orange (10YR8/2); very porous; 20% light gray (N7) calcareous siltstone fragments.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1410	1420	Limestone (biomicritic); very pale orange (10YR8/2); as above; 10% light gray (N7) calcareous siltstone fragments; shell casts; trace bryozoans; echinoids; foraminifera: Dictyconus, Miliolina.	DHV
07/14/90	1420	1430	Limestone (biomicritic) with calcarrows clay; very pale orange (10YR8/2); very porous; clay is white (N9); trace shell casts; foraminifera.	DHV
07/14/90	1430	1440	Limestone (biomicritic); very pale orange (10YR8/2); very porous; shell casts; abundant Dictyconus foraminifera.	DHV
07/14/90	1440	1450	Limestone (biomicritic); very pale orange (10YR8/2); as above.	DHV
07/14/90	1450	1460	Limestone (biomicritic); very pale orange (10YR8/2); as above.	DHV
07/14/90	1460	1470	Limestone (biomicritic); very pale orange (10YR8/2); as above.	DHV
07/14/90	1470	1480	Limestone (biomicritic); very pale orange (10YR8/2); as above.	DHV
07/14/90	1480	1490	Dolomite; dark yellowish brown (10YR4/2); trace biomicritic limestone.	DHV
07/14/90	1490	1500	Dolomite; dark yellowish brown (10YR4/2); very hard; porous; trace very pale orange (10YR8/2) biomicritic limestone fragments.	DHV
07/14/90	1500	1510	Limestone (biomicritic); very pale orange (10YR8/2); trace dark yellowish brown (10YR6/4) dolomite fragments.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1510	1520	Dolomite; pale yellowish brown (10YR6/2) to moderate yellowish brown (10YR5/4); crystalline; very hard; trace very pale orange (10YR8/2) biomicritic limestone fragments.	DHV
07/14/90	1520	1530	Calcareous clay with dolomite and biomicritic limestone; clay is white (N9); dolomite is yellowish brown (10YR6/2); biomicritic limestone is yellowish gray (5Y8/1).	DHV
07/14/90	1530	1540	Limestone (biomicritic); yellowish gray (5Y8/1); porous; 40% medium gray (N6) calcareous siltstone fragments; 20% black (N1) coal or lignite fragments.	DHV
07/14/90	1540	1550	Limestone (biomicritic); very pale orange (10YR8/2); trace echinoids; foraminifera.	DHV
07/14/90	1550	1560	Limestone (biomicritic) with dolomite; yellowish gray (5Y8/1); as above; 10% pale yellowish brown (10YR6/2) dolomite fragments; trace black (N1) coal fragments.	DHV
07/14/90	1560	1570	Limestone (biomicritic); yellowish gray (5Y8/1); 40% medium gray (N6) calcareous sandstone; 20% black (N1) coal or lignite fragments.	DHV
07/14/90	1570	1580	Limestone (biomicritic); yellowish gray (5Y8/1); 30% light gray (N7) calcareous sandstone; foraminifera: Dictyconus; shell casts; trace crystalline dolomite fragments.	DHV
07/14/90	1580	1590	Limestone (biomicritic); yellowish gray (5Y8/1); very porous; soft; fossils; shell casts; foraminifera.	DHV
07/14/90	1590	1600	Limestone (biomicritic); yellowish gray (5Y8/1); very porous; soft, 35% light gray (N7) limestone fragments; fossils; shell casts; foraminifera; 10% black (N1) coal or lignite fragments.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1600	1610	Limestone (biomicritic); yellowish gray (5Y8/1); soft; porous; trace Miliolina, Dictyonus; shell casts; trace black (N1) coal or lignite fragments.	DHV
07/14/90	1610	1620	Dolomite; dark yellowish brown (10YR/4/2); very hard; crystalline; decreasing (10%) biomicritic limestone fragments.	DHV
07/14/90	1620	1630	Dolomite; dark yellowish brown (10YR4/2); as above; no biomicritic limestone present.	DHV
07/14/90	1630	1640	Dolomite; dark yellow brown (10YR4/2) to moderate yellowish brown (10YR5/4); very porous; crystalline; becoming lighter in color.	DHV
07/14/90	1640	1650	Dolomite; moderate yellowish brown (10YR5/4); very porous; hard.	DHV
07/14/90	1650	1660	Dolomite; dark yellowish brown (10YR4/2); very porous; hard; trace biomicritic limestone fragments.	DHV
07/14/90	1660	1670	Fossiliferous limestone; light gray (N7) pale to yellowish brown (10YR6/2); cemented lecy pods; shellcasts; trace pale yellowish brown (10YR6/2) dolomite fragments.	DHV
07/14/90	1670	1680	Dolomite; moderate yellowish brown (10YR5/4); very hard; 10% fossiliferous limestone; light gray (N7); abundant fossils: foraminifera and shells.	DHV
07/14/90	1680	1690	Dolomite; dark yellowish brown (10YR4/2); very porous; very hard.	DHV
07/14/90	1690	1700	Dolomite; dark yellowish brown (10YR4/2); as above; trace yellowish gray (5Y8/1) biomicritic limestone fragments.	DHV
07/14/90	1700	1710	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); as above; crystalline.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1710	1720	Limestone (biomicritic); yellowish gray (5Y8/1); 20% dolomite fragments; dark yellowish brown to dusky yellowish brown (10YR2/2); as above.	DHV
07/14/90	1720	1730	Dolomite; dark yellowish brown (10YR4/2); crystalline fragments; porous; very hard.	DHV
07/14/90	1730	1740	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
07/14/90	1740	1750	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
07/14/90	1750	1760	Dolomite; dark yellowish brown (10YR4/2); as above; trace yellowish gray (5Y8/1) biomicritic limestone fragments.	DHV
07/14/90	1760	1770	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); porous; crystalline.	DHV
07/14/90	1770	1780	Dolomite; dark yellowish brown (10YR4/2); to moderate yellowish brown (10YR5/4); as above.	DHV
07/14/90	1780	1790	Limestone (biomicritic); white (N9); trace echinoids; foraminifera; 10% moderate yellowish brown (10YR5/4) crystalline dolomite fragments.	DHV
07/14/90	1790	1800	Dolomite; dark yellowish brown (10YR4/2); very hard; porous; crystalline; trace white (N1) biomicritic limestone fragments.	DHV
07/14/90	1800	1810	Dolomite; grayish orange (10YR7/4) to moderate yellowish brown (10YR5/4); as above.	DHV
07/14/90	1810	1820	Dolomite; dark yellowish brown (10YR4/2); porous; crystalline; very hard.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1820	1830	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); porous; crystalline; very hard; trace biomicritic limestone fragments.	DHV
07/14/90	1830	1840	Dolomite; dark yellowish brown (10YR4/2) to moderate yellowish brown (10YR5/4); as above.	DHV
07/14/90	1840	1850	Dolomite; dark yellowish brown (10YR4/2) to moderate yellowish brown (10YR5/4); as above.	DHV
07/14/90	1850	1860	Dolomite; dark yellowish brown (10YR4/2) to moderate yellowish brown (10YR5/4); as above.	DHV
07/14/90	1860	1870	Dolomite; dark yellowish brown (10YR4/2) to moderate yellowish brown (10YR5/4); as above.	DHV
07/14/90	1870	1880	Dolomite; dark yellowish brown (10YR4/2) to moderate yellowish brown (10YR5/4); as above.	DHV
07/14/90	1880	1890	Dolomite; dark yellowish brown (10YR4/2) to moderate yellowish brown (10YR5/4); as above.	DHV
07/14/90	1890	1900	Dolomite; dark yellowish brown (10YR4/2); as above; 15% white (N1) biomicritic limestone fragments.	DHV
07/14/90	1900	1910	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
07/14/90	1910	1920	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
07/14/90	1920	1930	Dolomite; grayish orange (10YR/4); pale yellowish brown (10YR6/2), dusky yellowish brown (10YR2/2); large color variation; highly crystalline; very porous, very hard.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
07/14/90	1930	1940	Dolomite; dark yellowish brown (10YR4/2); porous; crystalline; very hard.	DHV
07/14/90	1940	1950	Dolomite; dark yellowish brown (10YR4/2); crystalline; very porous, very hard.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/29/90	1950	1960	Dolomite; moderate yellowish brown (5YR 3/4), dark yellowish brown (10YR 4/2), dusky yellowish brown (10YR 2/2); large color variation; highly crystalline; sucrosic texture, very hard.	DHV
08/29/90	1960	1970	Dolomite; pale yellowish brown (10YR 6/2) to dusky yellowish brown (10YR 2/2); large color variation; highly crystalline; porous, sucrosic and vuggy texture; very hard.	DHV
08/29/90	1970	1980	Dolomite; pale yellowish brown (10YR 6/2), dusky yellowish brown (10YR 2/2); as above.	DHV
08/29/90	1980	1990	Dolomite; very pale orange (10YR 8/2), pale yellowish brown (10YR 6/2), to dusky yellowish brown (10YR 2/2); very hard; crystalline fragments; color becoming lighter.	DHV
08/29/90	1990	2000	Dolomite; very pale orange (10YR 8/2), grayish orange (10YR 7/4), dark yellowish brown (10YR 4/2), to dusky yellowish brown (10YR 2/2); very fragmented; as above.	DHV
08/29/90	2000	2010	Dolomite; dark yellowish brown (10YR 4/2), to dusky yellowish brown (10YR 2/2); large color variation; porous; sucrosic and vuggy texture; very hard.	DHV
08/29/90	2010	2020	Dolomite; very pale orange (10YR 8/2) to dark yellowish brown (10YR 4/2); large color variation; porous; crystalline fragments; very hard.	DHV
08/29/90	2020	2030	Dolomite; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2); porous; very hard.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/29/90	2030	2040	Dolomite; pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2); crystalline fragments; as above.	DHV
08/29/90	2040	2050	Dolomite; light gray (N7) to pale yellowish brown (10YR 6/2); as above.	DHV
08/29/90	2050	2060	Dolomite; very pale orange (10YR 8/2) to moderate yellowish brown (10YR 5/4); very crystalline; sucrosic texture; as above.	DHV
08/29/90	2060	2070	Dolomite; very pale orange (10YR 8/2), pale yellowish brown (10YR 6/2); dark yellowish brown (10YR 4/2); porous; vuggy texture; very hard.	DHV
08/29/90	2070	2080	Dolomite; pale yellowish brown (10YR 6/2), to moderate yellowish brown (10YR 5/4); crystalline fragments; vuggy texture; moderately hard.	DHV
08/29/90	2080	2090	Dolomite; light gray (N7), very pale orange (10YR 8/2), pale yellowish brown (10YR 6/2), dusky yellowish brown (10YR 2/2); large color variation; sucrosic and vuggy texture; porous; hard.	DHV
08/29/90	2090	2100	Dolomite; pale yellowish brown (10YR 6/2); porous; sucrosic and vuggy texture; moderately hard.	DHV
08/29/90	2100	2110	Dolomite; pale yellowish brown (10YR 6/2); as above.	DHV
08/29/90	2110	2120	Dolomite; grayish orange (10YR 7/4), pale yellowish brown (10YR 6/2), moderate yellowish brown (10YR 5/4); very fragmented; crystalline fragments; vuggy texture; moderately hard.	DHV
08/29/90	2120	2130	Dolomite; very pale orange (10YR 8/2), grayish orange (10YR 7/4), to dark yellowish brown (10YR 4/2); crystalline fragments; porous; very hard.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/29/90	2130	2140	Dolomite; very pale orange (10YR 8/2), grayish orange (10YR 7/4), pale yellowish brown (10YR 6/2), to moderate yellowish brown (10YR 5/4); crystalline fragments; sucrosic and vuggy texture; as above.	DHV
08/29/90	2140	2150	Dolomite; moderate yellowish brown (10YR 5/4); porous; sucrosic and vuggy texture; moderately hard.	DHV
08/29/90	2150	2160	Dolomite; very pale orange (10YR 8/2) to light gray (N7); as above.	DHV
08/29/90	2160	2170	Dolomite; moderate yellowish brown (10YR 5/4); less porous; very hard.	DHV
08/29/90	2170	2180	Dolomite; dark yellowish brown (10YR 4/2); slightly porous; very hard.	DHV
08/29/90	2180	2190	Dolomite; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2); sucrosic texture; porous; hard.	DHV
08/29/90	2190	2200	Dolomite; pale yellowish brown (10YR 6/2); moderate yellowish brown (10YR 5/4); slightly porous; very hard.	DHV
08/29/90	2200	2210	Dolomite; dark yellowish brown (10YR 4/2); slightly crystalline; porous; sucrosic texture, very hard;	DHV
08/29/90	2210	2220	Dolomite; dark yellowish brown (10YR 4/2); very porous; vuggy texture; hard.	DHV
08/29/90	2220	2230	Dolomitic limestone; very pale orange (10YR 8/2); trace dolomitic limestone fragments; fossils absent; moderately soft.	DHV
08/29/90	2230	2240	Dolomitic limestone; very pale orange (10YR 8/2) to yellowish gray (5YR 8/1); trace foraminifera; moderately soft.	DHV

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GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/29/90	2240	2250	Dolomite; dusky yellowish brown (10YR 2/2); very porous; sucrosic vuggy texture; crystalline fragments; hard.	DHV
08/29/90	2250	2260	Biomicritic limestone; yellowish gray (5Y 8/1); trace foraminifera; soft.	DHV
08/29/90	2260	2270	Biomicritic limestone; yellowish gray (5Y 8/1); trace foraminifera; soft.	DHV
08/29/90	2270	2280	Biomicritic limestone; yellowish gray (5Y8/1); trace shell casts; foraminifera; soft.	DHV
08/29/90	2280	2290	Biomicritic limestone; yellowish gray (5Y 7/2); consolidated very fine sand; well sorted; subrounded rounded; foraminifera and shell fragments in matrix; moderately soft.	DHV
08/29/90	2290	2300	Biomicritic fossiliferous limestone; yellowish gray (5Y 7/2); as above; increasing fossiliferous matrix; shell casts; trace foraminifera; soft.	DHV
10/02/90	2300	2310	Biomicritic limestone; yellowish gray (5Y 7/2); micro fossils; sandy matrix; soft.	DHV
10/02/90	2310	2320	Biomicritic limestone; yellowish gray (5Y 7/2); fine cemented sand in matrix; trace microfossils; soft.	DHV
10/02/90	2320	2330	Biomicritic limestone; yellowish gray (5Y 7/1); fine cemented sand matrix; slightly porous; as above.	DHV
10/02/90	2330	2340	Biomicritic limestone; yellowish gray (5Y 7/2); as above.	DHV
10/02/90	2340	2350	Biomicritic limestone; yellowish gray (5YR 7/2); trace foraminifera; as above.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/02/90	2350	2360	Biomicritic limestone; yellowish gray (5Y 7/2); as above.	DHV
10/02/90	2360	2370	Biomicritic limestone; yellowish gray (5YR 7/2); biomicrite matrix; fine sand in matrix; trace foraminifera; as above.	DHV
10/02/90	2370	2380	Biomicritic limestone; yellowish gray (5YR 7/2); as above.	DHV
10/02/90	2380	2390	Biomicritic limestone; yellowish gray (5Y 7/2); as above.	DHV
10/02/90	2390	2400	Biomicritic limestone; yellowish gray (5Y 7/2); fine sand micrite matrix; trace foraminifera; very soft; 20% dark yellowish brown dolomite; porous; very hard.	DHV
10/02/90	2400	2410	Biomicritic limestone; yellowish gray (5Y 7/2); trace microfossils; sand micrite matrix; 10% dark yellowish brown (10YR 4/2) dolomite; as above.	DHV
10/02/90	2410	2420	Biomicritic limestone; yellowish gray (5Y 7/2); as above; very soft; 10% dark yellowish brown dolomite; as above.	DHV
10/02/90	2420	2430	Biomicritic limestone; yellowish gray (5Y 7/2); fine sandy micrite matrix; slightly porous; trace foraminifera; very soft.	DHV
10/02/90	2430	2440	Biomicritic limestone; yellowish gray (5Y 7/2); as above.	DHV
10/02/90	2440	2450	Biomicritic fossiliferous limestone; yellowish gray (5Y 7/2); as above; trace dolomite.	DHV
10/02/90	2250	2460	Biomicritic limestone; yellowish gray (5Y 7/2); as above; trace dolomite.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
from top of pad 21.50 NGVD

**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/02/90	2460	2470	Biomicritic limestone yellowish gray (5Y 7/2); as above; 40% dark yellowish brown (10YR 4/2) dolomite; porous; very hard.	DHV
10/02/90	2470	2480	Biomicritic limestone; yellowish gray (5Y 7/2); fine sand micrite matrix; abundant foraminifera; trace dolomite fragments.	DHV
10/02/90	2480	2490	Biomicritic limestone; yellowish gray (5Y 7/2); as above; 40% dolomite; dark to dusky yellowish brown (10Y 4/2); sucrosic texture; porous; very hard.	DHV
10/02/90	2490	2500	Biomicritic limestone; yellowish gray (5Y 7/2); as above; 10% dolomite; dark yellowish brown (10YR 4/2); sucrosic texture; porous, very hard.	DHV
10/02/90	2500	2510	Biomicritic limestone; yellowish gray (5Y 7/2); as above.	DHV
10/02/90	2510	2520	Biomicritic limestone; yellowish gray (5Y 7/2); as above.	DHV
10/02/90	2520	2530	Biomicritic limestone; yellowish gray (5Y 7/2); as above.	DHV
10/02/90	2530	2540	Biomicritic limestone; yellowish gray (5Y 7/2); as above.	DHV
10/02/90	2540	2550	Dolomite limestone; pale yellowish brown (10YR 6/2); fine sand micrite matrix; trace foraminifera; micro fossils; moderately soft.	DHV
10/02/90	2550	2560	Dolomite; dusky yellowish brown (10YR 2/2); finely crystalline; sucrosic and vuggy texture; porous; very hard.	DHV
10/02/90	2560	2570	Dolomite; dusky yellowish brown (10YR 2/2); finely crystalline; sucrosic and vuggy texture; very hard.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/02/90	2570	2580	Dolomite; dusky yellowish brown (10YR 2/2) to dark yellowish brown (10YR 4/2); coarsely to finely crystalline; sucrosic and vuggy texture; porous; very hard.	DHV
10/02/90	2580	2590	Dolomite; dusky yellowish brown (10YR 2/2); finely crystalline; sucrosic and vuggy texture; porous; very hard.	DHV
10/02/90	2590	2600	Dolomite; dusky yellowish brown (10YR 2/2) to moderately yellowish brown (10YR 5/4); very porous; coarsely crystalline; sucrosic texture; very hard.	DHV
10/02/90	2600	2610	Dolomitic limestone; pale yellowish brown (10YR 6/2); micro fossils; trace foraminifera; fine sand in micrite matrix; moderately soft.	DHV
10/02/90	2610	2620	Biomicritic limestone; yellowish gray (5Y 8/1); fine sand in micrite matrix; micro fossils; well cemented; soft.	DHV
10/02/90	2620	2630	Dolomitic limestone; yellowish gray (5Y 8/1) to pale yellowish brown (10YR 6/2); micro fossils; trace shell casts; foraminifera; very fine sand in micrite matrix; well cemented; soft.	DHV
10/02/90	2630	2640	Biomicritic limestone; yellowish gray (5Y 8/1); trace micro fossils; as above; 5% dolomite fragments.	DHV
10/02/90	2640	2650	Biomicritic limestone; yellowish gray (5Y 8/1) to white (N9); as above; color becoming lighter.	DHV
10/02/90	2650	2660	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1) to white (N9); very fine sand in micrite matrix; trace foraminifera; well cemented; very soft.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/02/90	2660	2670	Biomicritic fossiliferous limestone; very pale orange (10YR 8/2); very fine sand in micrite matrix; trace foraminifera; micro fossils; well cemented; soft.	DHV
10/02/90	2670	2680	Dolomite; dusky yellowish brown (10YR 2/2); sucrosic and vuggy texture; finely crystalline, very hard.	DHV
10/02/90	2680	2690	Dolomite; dark yellowish brown (10YR 4/2); sucrosic and vuggy texture; finely crystalline, very hard.	DHV
10/02/90	2690	2700	Dolomite; dusky yellowish brown (10YR 4/2); sucrosic and vuggy texture; very hard.	DHV
10/02/90	2700	2710	Dolomite; pale yellowish brown (10YR 6/2) to dusky yellowish brown (10YR 2/2); sucrosic and vuggy texture; crystalline; very hard.	DHV
10/02/90	2710	2720	Dolomite; light gray (N7); trace greenish gray (5GY 6/1) olivine inclusions; sucrosic and vuggy texture; very hard.	DHV
10/02/90	2720	2730	Biomicritic limestone; very pale orange (10YR 8/2); very fine sand in micrite matrix; slightly porous; trace micro fossils; very soft; trace dolomite fragments.	DHV
10/02/90	2730	2740	Dolomitic limestone; light olive gray (5Y 6/1); very hard; trace greenish gray (5GY 6/1) olivine inclusions; large color variation from light gray (N7) to dark yellowish brown (10YR 4/2).	DHV
10/02/90	2740	2750	Dolomitic limestone; light olive gray (5Y 6/1); very hard; trace greenish gray (5GY 6/1) olivine inclusions; large color variation; as above.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/02/90	2750	2760	Biomicritic limestone; yellowish gray (5Y 8/1) to white (N9); very well cemented; very hard; 45% dark yellowish brown (10YR 4/2) dolomite, sucrosic and vuggy texture; very hard.	DHV
10/02/90	2760	2770	Biomicritic limestone; yellowish gray (ST 8/1) to white (N9); very well cemented; very hard; 45% dark yellowish brown (10YR 4/2) dolomite sucrosic and vuggy texture; very hard.	DHV
10/02/90	2770	2780	Biomicritic limestone; medium light gray (N6); very well cemented; very hard; 45% dark yellowish brown (10YR 4/2); dolomite; large color variation from black (N1) to dark yellowish brown (10YR 4/2).	DHV
10/02/90	2780	2790	Dolomitic limestone; light gray (N6) to dark yellowish brown (10YR 4/2); very well cemented; 40% dolomite; moderate yellowish brown; sucrosic and vuggy texture, very large color variation.	DHV
10/02/90	2790	2800	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); fine sand in micrite matrix; micro fossils; soft.	DHV
10/02/90	2800	2810	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1); as above; some dolomitization.	DHV
10/02/90	2810	2820	Biomicritic fossiliferous limestone; very pale orange (10YR 8/2); very fine sand in micrite matrix; soft.	DHV
10/02/90	2820	2830	Biomicritic fossiliferous limestone; yellow gray (5Y 8/1) to white (N9); as above; very soft.	DHV
10/02/90	2830	2840	Biomicritic fossiliferous limestone; very pale orange (10YR 8/2); trace micro fossils; as above.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/02/90	2840	2850	Biomicritic fossiliferous limestone; yellowish gray (5Y 8/1) to white (N9); porous; micro fossils; fine sand in micrite matrix; very soft.	DHV
10/02/90	2850	2860	Biomicritic fossiliferous limestone; very pale orange (10YR 8/2) to white (N9); poorly cemented; very soft; fine sand in micrite matrix.	DHV
10/02/90	2860	2870	Biomicritic fossiliferous limestone; very pale orange (10YR 8/2); very poorly cemented; very soft; fine sand in matrix.	DHV
10/02/90	2870	2880	Biomicritic fossiliferous limestone; very pale orange (10YR 8/2); very soft; fine sand in matrix.	DHV
10/02/90	2880	2890	Biomicritic fossiliferous limestone; very pale orange (10YR 8/2); as above.	DHV
10/02/90	2890	2900	Dolomite; dusky yellowish brown (10YR 2/2); sucrosic vuggy texture; very hard.	DHV
10/02/90	2900	2910	Dolomite, dusky yellowish brown (10YR 2/2); as above.	DHV
10/02/90	2910	2920	Dolomite; dark yellowish brown (10YR 4/2); crystalline; as above.	DHV
10/02/90	2920	2930	Dolomite; very pale orange (10YR 8/2) to dark yellowish brown (10YR 4/2); sucrosic and vuggy texture; crystalline; very hard.	DHV
10/02/90	2930	2940	Dolomite; dusky yellowish brown (10YR 2/2); finely crystalline; sucrosic texture; very hard.	DHV
10/02/90	2940	2950	Dolomite; dark yellowish brown (10YR 4/2); finely crystalline; vuggy and sucrosic texture; very hard.	DHV

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Note: Depth Intervals were referenced
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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/02/90	2950	2960	Dolomite; pale yellowish brown (10YR 6/2) to moderately yellowish brown (10YR 5/4); sucrosic texture; finely crystalline; moderately hard.	DHV
10/02/90	2960	2970	Dolomite; moderate yellowish brown (10YR 5/4) to dusky yellowish brown (10YR 2/2); vuggy texture; very hard.	DHV
10/02/90	2970	2980	Dolomite; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2); very hard; crystalline; 10% biomicritic limestone fragments.	DHV
10/02/90	2980	2990	Biomicritic limestone; yellowish gray (5Y 8/1); fine sand in matrix; micro fossils; well cemented; trace dolomitic limestone fragments; light gray (N7); very hard.	DHV
10/02/90	2990	3000	Dolomite; very pale orange (10YR 8/2); abundant sucrosic texture; porous; very hard; trace biomicritic limestone fragments; soft.	DHV
10/02/90	3000	3010	Dolomite; medium light gray (N6); finely to coarsely crystalline; vuggy texture; very hard.	DHV
10/02/90	3010	3020	Dolomite; medium light gray (N6); as above.	DHV
10/02/90	3020	3030	Dolomite; dark gray (N3) to dusky, yellowish brown (10YR 2/2); coarsely crystalline; vuggy and sucrosic texture; very hard.	DHV
10/02/90	3030	3040	Dolomite; dusky yellowish brown (10YR 2/2); crystalline; vuggy and sucrosic texture; very hard.	DHV
10/02/90	3040	3050	Dolomite; pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2); finely crystalline; sucrosic texture; very hard.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/02/90	3050	3060	Dolomite; very pale orange (10 YR 8/2) to grayish orange (10YR 7/4); as above.	DHV
10/02/90	3060	3070	Dolomite; very pale orange (10YR 8/2) to moderate yellowish brown (10YR 5/4); as above; trace limestone fragments.	DHV
10/02/90	3070	3080	Dolomite; dusky yellowish brown to dark gray (N2); finely crystalline; very hard; trace limestone fragments.	DHV
10/02/90	3080	3090	Dolomite; pale yellowish brown (10YR 6/2); very hard; trace limestone fragments.	DHV
10/02/90	3090	3100	Dolomite; pale yellowish brown (10YR 6/2) to very pale orange (10YR 8/2); very hard; trace limestone fragments.	DHV
10/02/90	3100	3110	Dolomite; pale yellowish brown (10YR 6/2) to very pale orange (10YR 8/2); as above.	DHV
10/02/90	3110	3120	Dolomite; light gray to (N6) pale yellowish brown (10YR 6/2); finely crystalline; very hard.	DHV
10/07/90	3120	3130	Dolomite; light gray to (N6) pale yellowish brown (10YR 6/2); finely crystalline; sucrosic texture; very hard.	DHV
10/07/90	3130	3140	Dolomite; light gray (N6) to yellowish brown (10YR 6/2); noncrystalline; very hard.	DHV
10/07/90	3140	3150	Dolomite; light gray (N6) to yellowish brown (10YR 6/2); noncrystalline; very hard.	DHV
10/07/90	3150	3160	Dolomite; light gray (N6) to grayish orange (10YR 7/4); noncrystalline; very hard.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/07/90	3160	3170	Dolomite; light gray (N6) to grayish orange (10YR 7/4); noncrystalline; very hard.	DHV
10/07/90	3170	3180	Dolomite; grayish orange (10YR 7/4) to pale yellowish brown (10YR 6/2); sucrosic texture; very hard.	DHV
10/07/90	3180	3190	Dolomite; grayish orange (10YR 7/4) to pale yellowish brown (10YR 6/2); as above.	DHV
10/07/90	3190	3200	Dolomite; pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2); as above.	DHV
10/07/90	3200	3210	Dolomite; pale yellowish orange (10YR 8/2), pale yellowish brown (10YR 6/2) to moderate yellowish brown (5YR 5/2); finely crystalline; sucrosic texture; very hard.	DHV
10/07/90	3210	3220	Dolomite; pale yellowish orange (10YR 8/2) to pale yellowish brown (5YR 5/2); finely crystalline; very hard.	DHV
10/07/90	3220	3230	Dolomite; black (N1) to dark yellowish brown (10YR 4/2); sucrosic texture; finely crystalline; very hard.	DHV
10/07/90	3230	3240	Dolomite; light olive gray (5Y 6/1), pale yellowish brown (10YR 6/2) to dark yellowish brown (10YR 4/2); sucrosic texture; finely crystalline; very hard.	DHV
10/07/90	3240	3250	Dolomite; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2); finely crystalline; very hard.	DHV
10/07/90	3250	3260	Dolomite; dark yellowish brown (10YR 4/2) to dusky yellowish brown (10YR 2/2); finely crystalline; very hard.	DHV

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Project No. SEF24770.T0

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/07/90	3260	3270	Dolomite; pale yellowish brown (10YR 6/2) to dusky yellowish brown (10YR 2/2); very hard.	DHV
10/07/90	3270	3280	Dolomite; dusky yellowish brown (10YR 2/2) to light olive gray (5Y 6/1); very hard.	DHV
10/07/90	3280	3290	Dolomite; pale yellowish brown (10YR 6/2) to light olive green (5Y 6/1); sucrosic texture; very hard.	DHV
10/07/90	3290	3300	Dolomite; dark yellowish brown (10YR 4/2) to light olive green (5Y 6/1); very hard.	DHV
10/07/90	3300	3310	Dolomite; light olive gray (5Y 6/1); sucrosic texture; very hard.	DHV
10/07/90	3310	3320	Dolomite; light olive gray to dusky yellowish brown (10YR 2/2); as above.	DHV
10/07/90	3320	3330	Dolomite; light olive gray to dark yellowish brown (10YR 4/2); as above.	DHV
10/07/90	3330	3340	Dolomite; black (N1) to light olive gray (5Y 6/1); very hard.	DHV
10/12/90	3340	3350	Dolomite; pale yellowish brown (10YR 6/2) to light olive gray (5Y 6/1); porous; vuggy and sucrosic texture; very hard.	DHV
10/12/90	3350	3360	Dolomite; black (N1) to pale yellowish brown (10YR 6/2); porous, finely crystalline; vuggy texture; very hard.	DHV
10/12/90	3360	3370	Dolomite; light gray (N7), light olive gray (5Y 6/1) to pale yellowish brown (10YR 6/2); finely crystalline; vuggy and sucrosic texture; slightly porous; very hard.	DHV

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**IW-2
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/12/90	3370	3380	Dolomite; pale yellowish brown (10YR 6/2) to light olive gray (5Y 6/1); very porous; vuggy and sucrosic texture; moderately hard.	DHV
10/12/90	3380	3390	Dolomite; pale yellowish brown (10YR 6/2); as above.	DHV
10/12/90	3390	3400	Dolomite; pale yellowish brown (10YR 6/2) to light olive gray (5Y 6/1); very porous; vuggy and sucrosic texture; moderately hard.	DHV
10/12/90	3400	3410	Dolomite; pale yellowish brown (10YR 6/2) to light olive gray (5Y 6/1); as above.	DHV
10/12/90	3410	3420	Dolomite; pale yellowish brown (10YR 6/2) to light olive gray (5Y 6/1); slightly porous; sucrosic and moderately vuggy texture; very hard.	DHV
10/12/90	3420	3430	Dolomite; olive gray (5Y 4/1) to dark greenish gray (5GY 4/1); slightly porous; phosphatic, sucrosic texture; very hard.	DHV
10/12/90	3430	3440	Dolomite; olive gray (5Y 4/1) to dark greenish gray (5GY 4/1); porous; phosphatic; sucrosic texture; finely crystalline; very hard.	DHV
10/12/90	3440	3450	Dolomite; medium dark gray (N4); olive gray (5Y 4/1), to pale yellowish brown (10YR 6/2); phosphatic; very hard.	DHV

DUAL-ZONE MONITOR WELL

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
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**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/13/90	0	10	Sand; dusky brown (5YR2/2); coarse- to medium-grained; subangular to subrounded; very well sorted	DHV
08/13/90	10	20	Sand; dusky brown (5YR2/2); as above.	DHV
08/13/90	20	30	Sand; dusky brown (5YR2/2); as above.	DHV
08/13/90	30	40	Sand; brownish gray (5YR4/1); coarse- to medium-grained; subrounded to subangular; very well sorted	DHV
08/13/90	40	50	Sand; brownish gray (5YR4/1); as above.	DHV
08/13/90	50	60	Sand; brownish gray (5YR4/1); medium-grained; subrounded to subangular; very well sorted; 5 percent black phosphate grains	DHV
08/13/90	60	70	Sand; brownish gray (5YR4/1); coarse- to medium-grained; subangular to subrounded; very well sorted; trace black phosphate grains	DHV
08/13/90	70	80	Sand; brownish gray (5YR4/1); coarse- to medium-grained; subangular to subrounded; very well sorted	DHV
08/13/90	80	90	Sand with arenaceous limestone; brownish gray (5YR4/1) to olive gray (5Y6/1); fine- to medium-grained; subangular to subrounded; very well sorted; 20 percent calcite fragments; trace shell fragments; trace black phosphate grains	DHV
08/13/90	90	100	Sand with arenaceous limestone; medium gray to medium dark gray (N4-N5); fine- to medium-grained; subangular to subrounded; moderately well sorted; 15 percent calcite fragments; trace shell fragments; trace black phosphate grains	DHV

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**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/13/90	100	110	Arenaceous limestone with sand; medium gray to medium dark gray (N4-N5); fine- to medium-grained; subangular to subrounded; moderately well sorted; 15 percent limestone fragments; trace calcite fragments; 5 percent shell; trace black phosphate grains	DHV
08/13/90	110	120	Arenaceous limestone; medium gray to medium dark gray (N4-N5); poorly cemented; abundant calcite fragments; 8 percent light gray (N7) limestone fragments; 10 percent shell; increasing shell; trace black phosphate grains	DHV
08/13/90	120	130	Arenaceous limestone; medium gray to medium dark gray (N4-N5); as above.	DHV
08/13/90	130	140	Arenaceous limestone/coquina; medium gray to medium dark gray (N4-N5); poorly cemented; increasing shell 35 percent; trace black phosphate grains	DHV
08/13/90	140	150	Coquina/Arenaceous Limestone; light gray (N7); increasing shell 75 percent; abundant bivalves; shell casts; interbedded sand; fine to medium grained; subrounded; well sorted; trace black phosphate grains	DHV
08/13/90	150	160	Coquina/Arenaceous Limestone; light gray (N7) to yellowish gray (5Y7/2); 80 percent shell; abundant bivalve fragments; interbedded sand; fine to medium grained; subrounded; moderately well sorted	DHV
08/13/90	160	170	Coquina/arenaceous limestone; yellowish gray (5Y7/2) to light gray (N7); 45 percent shell; abundant sand grains; fine to medium grained; subangular to subrounded; well sorted; poorly cemented	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

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**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/13/90	170	180	Coquina/arenaceous limestone; yellowish gray (5Y7/2) to light gray (N7); 70 percent shell; 10 percent sand; fine to medium grained; subrounded; moderately well sorted; 20 percent arenaceous limestone fragments	DHV
08/13/90	180	190	Coquina with sand; yellowish gray (5Y7/2); 70 percent shell; 20 percent sand; fine to medium grained; subrounded; moderately well sorted; 10 percent arenaceous limestone fragments; trace black phosphate grains	DHV
08/13/90	190	200	Coquina/arenaceous limestone; yellowish gray (5Y7/2) to light gray (N7); 70 percent shell; trace fossils; 20 percent arenaceous limestone fragments; trace calcite fragments	DHV
08/13/90	200	210	Coquina with sand; yellowish gray (5Y7/2); 70 percent shell; trace fossils; 20 percent sand; abundant calcite crystals; 10 percent arenaceous limestone fragments	DHV
08/13/90	210	220	Arenaceous Limestone with coquina; yellowish gray (5Y7/2) to light gray (N7); 60 percent shell; trace fossils; trace calcite fragments; 40 percent arenaceous limestone	DHV
08/13/90	220	230	Coquina; yellowish gray (5Y7/2); 60 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; abundant black phosphate grains	DHV
08/13/90	230	240	Arenaceous limestone with coquina; yellowish gray (5Y7/2) to light ray (N7); 45 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; trace black phosphate grains	DHV

CH2M HILL
Engineers

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Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

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**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/13/90	240	250	Coquina; yellowish gray (5Y7/2); 95 percent shell; trace fossils; sand; fine to medium grained; moderately well sorted; subrounded; abundant black phosphate grains; 5 percent light gray (N7) arenaceous limestone	DHV
08/13/90	250	260	Coquina yellowish gray (5Y7/2); 20 percent arenaceous limestone fragments; small trace very fine sand; angular; well sorted; trace light olive gray (5Y5/2) calcareous clay	DHV
08/13/90	260	270	Coquina; yellowish gray (5Y7/2); 10 percent arenaceous limestone fragments; trace fine sand; angular; well sorted; increasing light olive gray (5Y5/2); calcareous clay	DHV

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Note: Depth Intervals were referenced
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**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/19/90	270	280	Calcareous clay; grayish olive (10Y4/2); 40 percent silt.	DHV
08/19/90	280	290	Calcareous clay; grayish olive (10Y4/2) to pale olive (10Y6/2); 45 percent silt; 10 percent medium gray (N5) arenaceous limestone fragments.	DHV
08/19/90	290	300	Calcareous clay; grayish olive (10Y4/2); 50 percent silt.	DHV
08/19/90	300	310	Calcareous clay; grayish olive (10Y4/2); 45 percent silt	DHV
08/19/90	310	320	Calcareous clay; grayish olive (10Y4/2); 25 percent silt	DHV
08/19/90	320	330	Calcareous clay; grayish olive (10Y4/2) to light olive (10Y5/4); consolidated silt fragments	DHV
08/19/90	330	340	Calcareous clay; grayish olive (10Y4/2) to light olive (10Y5/4); as above	DHV
08/19/90	340	350	Calcareous clay; grayish olive (10Y4/2); 25 percent silt	DHV
08/19/90	350	360	Calcareous clay; grayish olive (10Y4/2); as above	DHV
08/19/90	360	370	Calcareous clay; grayish olive (10Y4/2); to pale olive (10Y6/2); as above	DHV
08/19/90	370	380	Calcareous clay; grayish olive (10Y4/2); as above	DHV
08/19/90	380	390	Calcareous clay; grayish olive (10Y4/2); 10 percent silt; decreasing silt	DHV
08/19/90	390	400	Calcareous clay; grayish olive (10Y4/2); as above; becoming darker in color	DHV
08/19/90	400	410	Calcareous clay; grayish olive (10Y4/2) to olive gray (5Y3/2); as above	DHV

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**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/19/90	410	420	Calcareous clay; grayish olive (10Y4/2) to olive gray (5Y3/2); as above	DHV
08/19/90	420	430	Calcareous clay; olive gray (5Y3/2); as above	DHV
08/19/90	430	440	Calcareous clay; olive gray (5Y3/2); as above	DHV
08/19/90	440	450	Calcareous clay; grayish olive (10Y4/2) to olive gray (5Y3/2); as above	DHV
08/19/90	450	460	Calcareous clay; olive gray (5Y3/2); as above	DHV
08/19/90	460	470	Calcareous clay; grayish olive green (5GY3/2) to olive gray (5Y3/2); as above	DHV
08/19/90	470	480	Calcareous clay; grayish olive green (5GY3/2); as above	DHV
08/19/90	480	490	Calcareous clay; grayish olive green (5GY3/2); as above	DHV
08/19/90	490	500	Calcareous clay; grayish olive green (5GY3/2); 10 percent silt	DHV
08/19/90	500	510	Calcareous clay; grayish olive green (5GY3/2); to olive gray (5Y3/2); 15 percent silt	DHV
08/19/90	510	520	Calcareous clay; grayish olive (10Y4/2); as above	DHV
08/19/90	520	530	Calcareous clay; grayish olive green (5GY3/2); as above	DHV
08/19/90	530	540	Calcareous clay; grayish olive green (5GY3/2); as above	DHV
08/19/90	540	550	Calcareous clay; dusky yellowish green (10GY3/2); as above	DHV
08/19/90	550	560	Calcareous clay; grayish olive green (5GY3/2); as above	DHV

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Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/19/90	560	570	Calcareous clay; dusky yellowish green (10GY3/2); as above	DHV
08/19/90	570	580	Calcareous clay; grayish olive (10Y4/2); 5 percent yellowish gray (5Y8/1) limestone fragments	DHV
08/19/90	580	590	Calcareous clay; grayish olive (10Y4/2); 5 percent yellowish gray (5Y8/1) limestone fragments; becoming lighter in color	DHV
08/19/90	590	600	Calcareous clay; grayish olive (10Y4/2) to pale olive (10Y6/2); as above	DHV
08/19/90	600	610	Calcareous clay; pale olive (10Y6/2) to moderate greenish yellow (10Y7/4); trace limestone and siltstone fragments	DHV
08/19/90	610	620	Calcareous clay; grayish olive (10Y4/2) to pale olive (10Y6/2); trace black (N1) chert fragments	DHV
08/19/90	620	630	Calcareous clay; pale olive (10Y6/2); trace black (N1) chert fragments and yellowish gray (5Y8/1) limestone fragments	DHV
08/19/90	630	640	Calcareous clay; pale olive (10GY6/2); no chert; trace yellowish gray (5Y8/1) limestone fragments	DHV
08/19/90	640	650	Calcareous clay; pale olive (10GY6/2); as above	DHV
08/19/90	650	660	Calcareous clay; pale olive (10GY6/2); to pale greenish yellow (10Y8/2); as above	DHV
08/19/90	660	670	Calcareous clay; pale olive (10GY6/2); as above	DHV
08/19/90	670	680	Calcareous clay; pale olive (10GY6/2); increasing carbonates; trace yellowish gray (5Y8/1) limestone fragments	DHV
08/19/90	680	690	Calcareous clay; grayish yellow green (5GY7/2); trace yellowish gray (5Y7/2) limestone fragments; as above	DHV

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GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/19/90	690	700	Calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); increasing limestone fragments 15 percent; yellowish gray (5Y8/1)	DHV
08/19/90	700	710	Calcareous clay with limestone; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); limestone fragments 30 percent; yellowish gray (5Y8/1)	DHV
08/19/90	710	720	Calcareous clay with limestone; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); increasing limestone fragments 30 percent; yellowish gray (5Y8/1); trace consolidated silt fragments	DHV
08/19/90	720	730	Calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); 15 percent limestone fragments; yellowish gray (5Y8/1)	DHV
08/19/90	730	740	Calcareous clay; pale olive (10Y6/2); 10 percent limestone fragments; yellowish gray (5Y8/1); trace consolidated silt fragments	DHV
08/19/90	740	750	Calcareous clay; pale olive (10Y6/2); 10 percent limestone fragments; yellowish gray (5Y8/1)	DHV
08/19/90	750	760	Calcareous clay; pale olive (10Y6/2); trace limestone fragments; yellowish gray (5Y8/1)	DHV
08/19/90	760	770	Calcareous clay; pale olive (10Y6/2); trace limestone fragments; yellowish gray (5Y8/1); trace consolidated silt fragments	DHV
08/19/90	770	780	Calcareous clay; pale olive (10Y6/2); as above	DHV
08/19/90	780	790	Calcareous clay; grayish olive (10Y4/2); as above	DHV
08/19/90	790	800	Calcareous clay; grayish olive (10Y4/2); trace grayish olive (10Y4/2) chert fragments; trace consolidated silt fragments	DHV

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GEOLOGIC DATA**

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	From	To		
08/19/90	800	810	Calcareous clay; grayish olive green (5Y3/2); becoming darker in color	DHV
08/19/90	810	820	Calcareous clay; grayish olive green (5Y3/2); 5 percent limestone fragments; yellowish gray (5Y8/1)	DHV
08/19/90	820	830	Calcareous clay; pale olive (10Y6/2); trace limestone fragments; as above	DHV
08/19/90	830	840	Calcareous clay; pale greenish yellow (10Y8/2); 20 percent grayish yellow (5Y8/4) limestone fragments; 10 percent shell fragments; trace black (N1) chert fragments	DHV
08/19/90	840	850	Calcareous clay; pale olive (10Y6/2); trace fossiliferous limestone (5Y8/4); 5 percent shell fragments	DHV
08/19/90	850	860	Calcareous clay with fossiliferous limestone; clay is pale olive (10Y6/2); limestone is grayish yellow (5Y8/4); 40 percent shell fragments	DHV
08/19/90	860	870	Fossiliferous limestone with calcareous clay; clay is pale olive (10Y6/2); limestone is grayish yellow (5Y8/4); 30 percent shell fragments	DHV
08/19/90	870	880	Fossiliferous limestone with clay ball; pale olive (10Y6/2); limestone grayish yellow (5Y8/4); 40 percent shell fragments; trace black (N1) chert fragments	DHV
08/19/90	880	890	Fossiliferous limestone with calcareous clay; pale olive (10Y6/2); decreasing shell fragments; trace black (N1) chert fragments	DHV

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GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
08/19/90	890	900	Fossiliferous limestone with calcareous clay; clay is pale olive (10Y6/2); limestone is grayish yellow (5Y8/4); increasing limestone fragments; decreasing shell fragments; 20 percent calcite fragments	DHV
08/19/90	900	910	Limestone and arenaceous limestone with calcareous clay; grayish yellow green (5GY7/2); silt; trace black (N1) siltsized phosphate grains	DHV
08/19/90	910	920	Limestone and arenaceous limestone with calcareous clay; pale olive (10Y6/2) to pale greenish yellow (10Y8/2); trace black (N1) chert fragments	DHV
08/19/90	920	930	Limestone with calcareous clay; yellowish gray (5Y8/1); calcareous clay is pale olive (10Y6/2); silt; abundant black (N1) siltsized phosphate grains	DHV
08/19/90	930	940	Calcareous clay with limestone; pale olive (10Y6/2); 40 percent limestone fragments; abundant black (N1) siltsized phosphate grains	DHV
08/19/90	940	950	Calcareous clay with limestone; pale olive (10Y6/2); 50 percent limestone fragments; 20 percent arenaceous limestone fragments; abundant black (N1) siltsized phosphate grains	DHV
08/19/90	950	960	Limestone with calcareous clay; grayish olive (10Y4/2); 80 percent yellowish gray (5Y8/1) limestone fragments; trace black (N1) siltsized phosphate grains	DHV
08/19/90	960	970	Calcareous clay; pale olive (10Y6/2); increasing silt; 15 percent grayish yellow (5Y8/4) limestone fragments	DHV
08/19/90	970	980	Calcareous clay; pale olive (10Y6/2); 10 percent grayish yellow (5Y8/4) limestone fragments	DHV

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GEOLOGIC DATA**

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	From	To		
08/19/90	980	990	Calcareous clay; pale olive (10Y6/2); 5 percent grayish yellow (5Y8/4) limestone fragments; 30 percent black (N1) siltsized phosphate grains	DHV
08/19/90	990	1000	Calcareous clay; pale olive (10Y6/2); 10 percent limestone fragments; trace black (N1) siltsized phosphate grains	DHV
08/19/90	1000	1010	Calcareous clay with limestone; pale olive (10Y6/2); 20 percent limestone fragments; 5 percent black (N1) phosphate grains	DHV
08/19/90	1010	1020	Calcareous clay with limestone; pale olive (10Y6/2); limestone is yellowish gray (5Y8/1); trace black (N1) siltsized phosphate grains	DHV
08/19/90	1020	1030	Limestone with calcareous clay; yellowish gray (5Y8/1) to pale greenish yellow (10Y8/2); as above	DHV
08/19/90	1030	1040	Limestone; yellowish gray (5Y8/1); 25 percent calcareous clay; pale greenish yellow (10Y8/2)	DHV
08/19/90	1040	1050	Limestone; yellowish gray (5Y8/1); trace pale greenish yellow (10Y8/2) calcareous clay	DHV

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GEOLOGIC DATA**

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	From	To		
10/3/90	1050	1060	Biomieritic fossiliferous limestone; medium gray (N5) to yellowish gray (5Y8/1); porous; microfossils; shell casts; very soft; 10% medium gray (N5) calcareous siltstone fragments.	DHV
10/3/90	1060	1070	Biomieritic limestone; yellowish gray (5Y8/1) to medium gray (N5); very soft; 10% medium gray (N5) calcareous siltstone fragments.	DHV
10/3/90	1070	1080	Biomieritic limestone; yellow gray (5Y8/1); as above; 5% medium gray (N6) calcareous siltstone fragments.	DHV
10/3/90	1080	1090	Biomieritic limestone; yellowish gray (5Y7/2); porous; trace microfossils; very soft	DHV
10/3/90	1090	1100	Biomieritic limestone; yellowish gray (5Y7/2); as above; abundant foraminifera (Dictyconus); pelecypod fragments; 5% medium gray (N5) calcareous siltstone fragments.	DHV
10/3/90	1100	1110	Biomieritic limestone; yellowish gray (5Y7/2); as above.	DHV
10/3/90	1110	1120	Biomieritic limestone; yellowish gray (5Y7/2); as above; 5% medium gray (N5) calcareous siltstone fragments.	DHV
10/3/90	1120	1130	Biomieritic limestone; yellowish gray (5Y7/2); as above; decreasing medium gray (N5) calcareous siltstone fragments.	DHV
10/3/90	1130	1140	Biomieritic limestone; yellowish gray (5Y7/2); as above.	DHV
10/3/90	1140	1150	Biomieritic limestone; yellowish gray (5SY7/2); trace echinoids, pelecypods and foraminifera (Dictyconus, Elphidium).	DHV

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Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/3/90	1150	1160	Biomicritic limestone; very pale orange (10YR8/2); abundant foraminifera (Dictyconus, Miliolina); brozoans; porous; very soft.	DHV
10/3/90	1160	1170	Biomicritic limestone; very pale orange (10YR8/2); as above.	DHV
10/3/90	1170	1180	Biomicritic limestone; very pale orange (10YR8/2); as above.	DHV
10/3/90	1180	1190	Biomicritic limestone; very pale orange (10YR8/2); as above; 40% medium gray (N5) calcareous siltstone fragments.	DHV
10/3/90	1190	1200	Biomicritic limestone; very pale orange (10YR8/2); as above; 35% light gray (N6) calcareous siltstone fragments.	DHV
10/3/90	1200	1210	Biomicritic limestone; very pale orange (10YR8/2); as above; 10% medium gray (N5) calcareous siltstone fragments.	DHV
10/3/90	1210	1220	Biomicritic limestone; very pale orange (10YR8/2); very porous; trace echinoids; trace bryozoans; pelecypods; foraminifera (Dictyconus, Miliolina); shell casts; very soft.	DHV
10/3/90	1220	1230	Biomicritic limestone; very pale orange (10YR8/2); as above.	DHV
10/3/90	1230	1240	Biomicritic limestone; very pale orange (10YR8/2); as above.	DHV
10/3/90	1240	1250	Biomicritic limestone; very pale orange (10Y8R/2); as above.	DHV
10/3/90	1250	1260	Biomicritic limestone; yellowish gray (5Y8/1); trace microfossils; echinoid fragments; Miliolina foraminifera; fine shell fragments.	DHV

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	From	To		
10/3/90	1260	1270	Biomicritic fossiliferous limestone with silt; yellowish gray (5Y8/1) to very pale orange (10YR8/2); abundant microfossils; as above.	DHV
10/3/90	1270	1280	Biomicritic fossiliferous limestone with silt; white (N9) to very pale orange (10YR8/2); trace microfossils: echinoids and Miliolina foraminifera.	DHV
10/3/90	1280	1290	Biomicritic fossiliferous limestone with silt; white (N9) to very pale orange (10YR8/2); as above.	DHV
10/3/90	1290	1300	Biomicritic fossiliferous limestone with silt; yellowish gray (5Y8/1) to very pale orange (10YR8/2); as above.	DHV
10/3/90	1300	1310	Biomicritic fossiliferous limestone with silt; yellowish gray (5Y8/1) to very pale orange (10YR8/2); as above; trace microfossils: echinoids and Miliolina foraminifera.	DHV
10/3/90	1310	1320	Biomicritic fossiliferous limestone with silt; yellowish gray (5Y8/1) to very pale orange (10YR8/2); as above.	DHV
10/3/90	1320	1330	Biomicritic fossiliferous limestone with silt; yellowish gray (5Y8/1) to very pale orange (10YR8/2); as above.	DHV
10/3/90	1330	1340	Biomicritic limestone with silt; very pale orange (10YR8/2); as above.	DHV
10/3/90	1340	1350	Biomicritic fossiliferous limestone; yellowish gray (5Y8/1) to very pale orange (10YR8/2); very porous; shell casts; microfossils; very soft.	DHV
10/3/90	1350	1360	Biomicritic fossiliferous limestone; very pale orange (10YR8/2); as above.	DHV
10/3/90	1360	1370	Biomicritic fossiliferous limestone; yellowish gray (5Y8/1) to very pale orange (10YR8/2); as above.	DHV

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Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/3/90	1370	1380	Biomicrotic fossiliferous limestone; yellowish gray (5Y8/1) to medium gray (N5); 45% medium gray (N5) calcareous siltstone fragments.	DHV
10/3/90	1380	1390	Biomicrotic limestone; yellowish gray (5Y8/1) to very pale orange (10YR8/2); porous; abundant foraminifera (Dictyonus); echinoids; very soft.	DHV
10/3/90	1390	1400	Biomicrotic fossiliferous limestone; white (N9) to yellowish gray (5Y8/1); as above.	DHV
10/3/90	1400	1410	Biomicrotic limestone; yellowish gray (5Y8/1) to light gray (N7); porous; as above; 25% light gray (N7) calcareous siltstone fragments.	DHV
10/3/90	1410	1420	Biomicrotic fossiliferous limestone; yellowish gray (5Y8/1); as above; 30% light gray (N7) calcareous siltstone fragments; shell casts; trace bryozoans; echinoids; foraminifera: Dictyonus, Miliolina; very soft.	DHV
10/3/90	1420	1430	Dolomitic limestone; pale yellowish brown (10YR6/2); trace microfossils; 35% biomicrotic limestone; very soft.	DHV
10/3/90	1430	1440	Dolomitic limestone; pale yellowish brown (10YR6/2); 30% yellowish gray (5Y8/1); biomicrotic limestone; shell casts; porous; soft.	DHV
10/3/90	1440	1450	Dolomitic limestone; medium gray (N5) to pale yellowish brown (10YR6/2); vuggy texture; 30% biomicrotic limestone; white (N9); trace microfossils; shell casts; soft.	DHV
10/3/90	1450	1460	Biomicrotic fossiliferous limestone; very pale orange (10YR8/2); as above.	DHV

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Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/3/90	1460	1470	Dolomitic limestone with silt; pale yellowish brown (10YR6/2); 40% very pale orange (10YR8/2) biomicritic limestone; abundant foraminifera; echinoids; shell fragments; very soft.	DHV
10/3/90	1470	1480	Dolomitic limestone; very pale orange (10YR8/2) to dark yellowish brown (10YR4/2); very porous; vuggy texture; increasing (35%) dark yellowish brown (10YR4/2) dolomite; increasing hardness.	DHV
10/3/90	1480	1490	Dolomite with biomicritic limestone; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); limestone is very porous and soft; dolomite is vuggy textured and hard.	DHV
10/3/90	1490	1500	Dolomite with biomicritic limestone; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); dolomite is very hard; 20% very pale orange (10YR8/2) biomicritic limestone fragments; porous.	DHV
10/3/90	1500	1510	Dolomite; dark yellowish brown (10YR4/2); vuggy texture; porous; 15% biomicritic limestone fragments; microfossils; moderately soft.	DHV
10/3/90	1510	1520	Dolomitic limestone; pale yellowish brown (10YR6/2) to moderate yellowish brown (10YR5/4); sucrosic texture; microfossils; 40% biomicritic limestone fragments.	DHV
10/4/90	1520	1530	Biomicritic limestone; yellowish gray (5Y8/1); abundant foraminifera; shell fragments; echinoids; very soft; trace pale yellowish brown (10YR6/2) dolomitic limestone fragments.	DHV
10/4/90	1530	1540	Biomicritic limestone; yellowish gray (5Y8/1); as above; 10% pale yellowish brown (10YR6/2) dolomitic limestone fragments.	DHV

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Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/4/90	1540	1550	Biomicritic limestone; yellowish gray (5Y8/1); as above, trace pale yellowish brown (10YR6/2) dolomitic limestone fragments.	DHV
10/4/90	1550	1560	Biomicritic limestone; yellowish gray (5Y8/1); as above.	DHV
10/4/90	1560	1570	Biomicritic limestone; yellowish gray (5Y8/1); as above.	DHV
10/4/90	1570	1580	Biomicritic limestone; yellowish gray (5Y8/1); as above; trace dolomite fragments.	DHV
10/4/90	1580	1590	Biomicritic limestone; yellowish gray (5Y8/1); very porous; very soft, microfossils; shell casts; foraminifera.	DHV
10/4/90	1590	1600	Biomicritic limestone; yellowish gray (5Y8/1); very porous; very soft, microfossils; shell casts; foraminifera (Dictyonus).	DHV
10/4/90	1600	1610	Biomicritic limestone with dolomite; yellowish gray (5Y8/1) to dark yellowish brown (10YR4/2); biomicritic limestone is yellowish gray; very soft; porous; trace foraminifera (Miliolina, Dictyonus) and shell casts; dolomite is dark yellowish brown (10YR4/2); hard.	DHV
10/4/90	1610	1620	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); sucrosic texture; very hard.	DHV
10/4/90	1620	1630	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); porous; sucrosic texture; very hard.	DHV
10/4/90	1630	1640	Dolomite; pale yellowish brown (10YR6/2); porous; sucrosic texture; moderately hard.	DHV

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	From	To		
10/4/90	1640	1650	Dolomite; pale yellowish brown (10YR6/2) to very pale orange (10YR8/2); color becoming lighter; porous; moderately hard.	DHV
10/4/90	1650	1660	Dolomite; very pale orange (10YR8/2) to yellowish brown (10YR6/2); trace fossils; porous; very hard; trace biomicritic limestone fragments.	DHV
10/4/90	1660	1670	Dolomite with biomicritic limestone; very pale orange (10YR8/2) to pale yellowish brown (10YR6/2); as above; 40% yellowish gray biomicritic limestone; porous; trace microfossils; very soft.	DHV
10/4/90	1670	1680	Dolomite; pale yellowish brown (10YR6/2) to dusky yellowish brown (10YR2/2); porous; very hard; 25% fossiliferous limestone; light gray (N7) to yellowish gray (5Y8/1); abundant microfossils: foraminifera and shells; trace light gray (N7); calcareous clay.	DHV
10/4/90	1680	1690	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); very porous; sucrosic texture; hard.	DHV
10/4/90	1690	1700	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); as above.	DHV
10/4/90	1700	1710	Dolomite; dark yellowish brown (10YR4/2); as above; trace biomicritic limestone fragments; very soft.	DHV
10/4/90	1710	1720	Dolomite; dusky yellowish brown (10YR2/2); sucrosic and vuggy texture; very porous; finely crystalline; very hard.	DHV
10/4/90	1720	1730	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); as above.	DHV
10/4/90	1730	1740	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); as above.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
from top of pad - 21.50 NGVD

**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/4/90	1740	1750	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); as above; trace biomicritic limestone fragments.	DHV
10/4/90	1750	1760	Dolomite; very pale orange (10YR8/2) to pale yellowish brown (10YR6/2); porous; sucrosic and vuggy texture; very hard.	DHV
10/4/90	1760	1770	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); slightly porous; vuggy texture; moderately hard.	DHV
10/4/90	1770	1780	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); porous; sucrosic and vuggy texture; moderately hard.	DHV
10/4/90	1780	1790	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); very porous; sucrosic and vuggy texture; very hard.	DHV
10/4/90	1790	1800	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
10/4/90	1800	1810	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); as above.	DHV
10/4/90	1810	1820	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
10/4/90	1820	1830	Dolomite; pale yellowish brown (10YR6/2); as above; 30% yellowish gray biomicritic limestone fragments.	DHV
10/4/90	1830	1840	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); porous; finely crystalline; hard.	DHV
10/4/90	1840	1850	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); very porous; sucrosic and vuggy texture; very hard.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
from top of pad - 21.50 NGVD

**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/4/90	1850	1860	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); as above.	DHV
10/4/90	1860	1870	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR6/2); very porous; vuggy and sucrosic texture; finely crystalline; very hard.	DHV
10/4/90	1870	1880	Dolomite; moderately yellowish brown (10YR5/4) to dark yellowish brown (10YR4/2); very porous; sucrosic and vuggy texture; hard.	DHV
10/4/90	1880	1890	Dolomite; dark yellowish brown (10YR4/2); as above.	DHV
10/4/90	1890	1900	Dolomite; dark yellowish brown (10YR4/2) to dusky yellowish brown (10YR2/2); as above.	DHV
10/4/90	1900	1910	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); slightly porous; very hard.	DHV
10/4/90	1910	1920	Dolomite; dark yellowish brown (10YR4/2); very porous; vuggy and sucrosic texture; finely crystalline; very hard.	DHV
10/4/90	1920	1930	Dolomite; moderate yellowish brown (10YR5/4) to dark yellowish brown (10YR4/2); very porous; vuggy and sucrosic texture; very hard.	DHV
10/4/90	1930	1940	Dolomite; pale yellowish brown (10YR6/2) to dark yellowish brown (10YR4/2); porous; finely crystalline; very hard.	DHV
10/4/90	1940	1950	Dolomite; dark yellowish brown (10YR4/2); very porous, very hard.	DHV
10/4/90	1950	1960	Dolomite; grayish orange (10YR/4), pale yellowish brown (10YR6/2) to dusky yellowish brown (10YR2/2); large color variation; vuggy texture; very porous, very hard.	DHV

Client: Palm Beach Southern Regional Wastewater Treatment Plant Effluent System

Project No. SEF24770.T0

Note: Depth Intervals were referenced
from top of pad - 21.50 NGVD

**MW
GEOLOGIC DATA**

Date	Depth Interval (ft)		Observer's Description	Initials
	From	To		
10/4/90	1960	1970	Dolomite; grayish orange (10YR/4); pale yellowish brown (10YR6/2) to dusky yellowish brown (10YR2/2); vuggy texture; very porous, very hard.	DHV
10/4/90	1970	1980	Dolomite; grayish orange (10YR/4), pale yellowish brown (10YR6/2) to dusky yellowish brown (10YR2/2); as above.	DHV

PACKER TEST DATA

Project: PBC SRWWTP DIW's
 Project No: SEF24770.T0
 Date: June 7, 1990
 Well No: IW-1

IW-1 Packer Test Water Quality Data

DATE	TIME (HRS)	DEPTH (feet)	TEMP. (C)	CONDUCTIVIT (umhos/cm)	CHLORIDE (mg/l)	COMMENTS
6/7	0958	1,900	28	47,000	--	
6/7	1015	--	26	16,000	--	Fresh water from TV
6/7	1028	1,900	26	42,000	--	
6/7	1056	1,900	26	48,000	--	
6/7	1120	1,900	26	48,000	--	
6/7	1136	1,900	26	48,000	--	
6/7	1137	--	24	200	37.5	Sample collected from City water supply
6/7	1220	1,900	26	48,000	--	
6/7	1305	1,900	27	48,000	--	
6/7	1330	1,900	27	47,500	--	
6/7	1345	1,900	27	47,500	--	
6/7	1400	1,900	27	47,500	19,044	
6/7	1415	1,900	27	47,500	--	
6/7	1430	1,900	27	47,000	--	
6/7	1445	1,900	27	47,000	--	
6/7	1500	1,900	27	47,500	18,094	
6/7	1515	1,900	27	47,500	--	
6/7	1530	1,900	27	47,500	--	
6/7	1545	1,900	27	47,500	--	
6/7	1600	1,900	26.5	47,000	19,294	
6/7	1615	1,900	27.5	47,000	--	
6/7	1630	1,900	26	48,000	--	
6/7	1645	1,900	26	48,000	--	
6/7	1700	1,900	26.5	48,000	18,694	
6/7	1715	1,900	26	48,000	--	
6/7	1730	1,900	26	48,000	--	
6/7	1745	1,900	26	48,000	--	Water sample collected for TDS Analysis
6/7	2304	1,900	25	48,000	--	
6/7	2330	1,900	26	48,000	20,793	

Notes:

- 1) Straddle Packer Interval (1,882 feet to 1,950 feet)
- 2) Temperature conductivity and chlorides field analyzed. A final sample (2330 hours) was collected and shipped to a testing laboratory for TDS Analysis.
- 3) Data collected by Bart Ziegler.

MFORMA

ANALYSIS REPORT

CH2M HILL CORPORATION

CLIENT NAME AND ADDRESS

800 FAIRWAY DRIVE SUITE 350

DEERFIELD BEACH, FLORIDA 33441

46232

SAMPLE NUMBER

06-11-90 - CLIENT 06-11-90 1055

DATE TIME COLL RECD

SOUTHERN REGION WWTP

ID ANALYTE	MCL DET LIMIT	METHOD	ANAL DATE INITIAL NBR	RESULTS UNITS
70304 TDS	1	209C	06-11-90 CH 81-135	36,477 MG/L

Sample collected 6/7/90, PBCSRWWTP IW-1 Packer Test No. 1 (1,885-1,950 ft)

DATE 06-12-90

LAB ID 86122,86109, E86048

BY

DIRECTOR



SE1000B
 Environmental Logger
 06/08 09:50

Unit# 00490 Test# 0

INPUT 1: Level (F)

Reference 0.00
 Scale factor 29.92
 Offset 0.00

First Packer Test On IW-1
 (Drawdown)

Data reflects change in water
 level in drill stem.

Step# 0 06/07 09:53

Elapsed Time	Value
-----	-----
0.0000	0.75
0.0033	0.73
0.0066	- 6.65
0.0099	- 3.30
0.0133	0.00
0.0166	- 0.17
0.0200	5.83
0.0233	- 1.26
0.0266	- 1.12
0.0300	- 0.07
0.0333	- 1.63
0.0500	0.17
0.0666	- 0.50
0.0833	- 2.30
0.1000	- 3.09
0.1166	- 3.56
0.1333	- 4.66
0.1500	- 5.79
0.1666	- 5.96
0.1833	- 6.01
0.2000	- 6.26
0.2166	- 6.71
0.2333	- 6.84
0.2500	- 6.97
0.2666	- 7.22
0.2833	- 7.46
0.3000	- 7.68
0.3166	- 7.56
0.3333	- 7.53
0.4167	- 7.51
0.5000	- 7.35
0.5833	- 7.22
0.6667	- 7.12
0.7500	- 7.06
0.8333	- 7.13
0.9167	- 7.06
1.0000	- 7.02

1.0833	-	6.90
1.1667	-	7.05
1.2500	-	6.93
1.3333	-	7.12
1.4166	-	6.93
1.5000	-	7.01
1.5833	-	6.97
1.6667	-	7.01
1.7500	-	6.91
1.8333	-	7.08
1.9167	-	7.01
2.0000	-	6.98
2.5000	-	6.98
3.0000	-	6.94
3.5000	-	6.92
4.0000	-	6.70
4.5000	-	6.80
5.0000	-	6.88
5.5000	-	6.66
6.0000	-	6.52
6.5000	-	6.46
7.0000	-	6.57
7.5000	-	6.64
8.0000	-	6.53
8.5000	-	6.48
9.0000	-	6.51
9.5000	-	6.31
10.0000	-	6.15
12.0000	-	6.17
14.0000	-	5.88
16.0000	-	5.99
18.0000	-	6.30
20.0000	-	7.46
22.0000	-	8.85
24.0000	-	10.33
26.0000	-	11.89
28.0000	-	13.18
30.0000	-	14.70
32.0000	-	15.83
34.0000	-	17.03
36.0000	-	18.21
38.0000	-	18.55
40.0000	-	18.33
42.0000	-	18.52
44.0000	-	18.54
46.0000	-	18.52
48.0000	-	18.27
50.0000	-	18.47
52.0000	-	18.41
54.0000	-	18.47
56.0000	-	18.37
58.0000	-	18.27
60.0000	-	18.33
62.0000	-	18.31

64.0000	- 18.36
66.0000	- 18.42
68.0000	- 18.37
70.0000	- 18.29
72.0000	- 18.46
74.0000	- 18.51
76.0000	- 18.52
78.0000	- 18.38
80.0000	- 18.32
82.0000	- 18.35
84.0000	- 18.45
86.0000	- 18.40
88.0000	- 18.53
90.0000	- 18.35
92.0000	- 18.44
94.0000	- 18.39
96.0000	- 18.34
98.0000	- 18.33
100.000	- 18.38
110.000	- 18.36
120.000	- 18.38
130.000	- 18.44
140.000	- 18.43
150.000	- 18.43
160.000	- 18.34
170.000	- 18.38
180.000	- 18.47
190.000	- 18.40
200.000	- 18.38
210.000	- 18.51
220.000	- 18.43
230.000	- 18.39
240.000	- 18.48
250.000	- 18.29
260.000	- 18.35
270.000	- 18.54
280.000	- 18.38
290.000	- 18.49
300.000	- 18.53
310.000	- 18.45
320.000	- 18.47
330.000	- 18.43
340.000	- 18.37
350.000	- 18.47
360.000	- 18.43
370.000	- 18.47
380.000	- 18.45
390.000	- 18.26
400.000	- 18.36
410.000	- 18.29
420.000	- 18.32
430.000	- 18.33
440.000	- 18.21
450.000	- 18.25

460.000	- 18.33
470.000	- 18.30
480.000	- 18.30

END

SE1000B
 Environmental Logger
 06/08 09:53

Unit# 00490 Test# 0

INPUT 1: Level (F)

Reference 0.00
 Scale factor 29.92
 Offset 0.00

First Packer Test IW-1
 (Recovery)

Step# 1 06/07 17:57

Elapsed Time	Value
-----	-----
0.0000	- 18.13
0.0033	- 18.12
0.0066	- 18.37
0.0099	- 18.36
0.0133	- 18.35
0.0166	- 18.37
0.0200	- 16.42
0.0233	- 16.52
0.0266	- 17.33
0.0300	- 17.42
0.0333	- 18.26
0.0500	- 17.82
0.0666	- 16.67
0.0833	- 15.37
0.1000	- 15.68
0.1166	- 13.87
0.1333	- 13.22
0.1500	- 12.73
0.1666	- 12.20
0.1833	- 11.66
0.2000	- 10.99
0.2166	- 10.58
0.2333	- 9.98
0.2500	- 9.70
0.2666	- 9.08
0.2833	- 8.90
0.3000	- 8.69
0.3166	- 8.52
0.3333	- 8.34
0.4167	- 8.04
0.5000	- 8.98
0.5833	- 10.27
0.6667	- 11.62
0.7500	- 12.54
0.8333	- 12.80
0.9167	- 12.44
1.0000	- 11.63

Data reflects change in water level in drill stem.

1.0833	- 10.77
1.1667	- 10.03
1.2500	- 9.73
1.3333	- 9.90
1.4166	- 10.46
1.5000	- 11.13
1.5833	- 11.65
1.6667	- 11.94
1.7500	- 11.88
1.8333	- 11.52
1.9167	- 11.04
2.0000	- 10.58
2.5000	- 11.54
3.0000	- 10.48
3.5000	- 11.39
4.0000	- 10.72
4.5000	- 11.11
5.0000	- 11.01
5.5000	- 10.85
6.0000	- 11.13
6.5000	- 10.81
7.0000	- 11.09
7.5000	- 10.90
8.0000	- 10.95
8.5000	- 11.02
9.0000	- 10.87
9.5000	- 11.01
10.0000	- 10.88
12.0000	- 10.96
14.0000	- 10.90
16.0000	- 10.90
18.0000	- 10.88
20.0000	- 10.88
22.0000	- 10.85
24.0000	- 10.86
26.0000	- 10.85
28.0000	- 10.85
30.0000	- 10.85
32.0000	- 10.85
34.0000	- 10.83
36.0000	- 10.82
38.0000	- 10.82
40.0000	- 10.80
42.0000	- 10.79
44.0000	- 10.79
46.0000	- 10.80
48.0000	- 10.79
50.0000	- 10.77
52.0000	- 10.77
54.0000	- 10.77
56.0000	- 10.75
58.0000	- 10.75
60.0000	- 10.76
62.0000	- 10.73

64.0000	- 10.74
66.0000	- 10.74
68.0000	- 10.73
70.0000	- 10.73
72.0000	- 10.72
74.0000	- 10.73
76.0000	- 10.72
78.0000	- 10.72
80.0000	- 10.71
82.0000	- 10.69
84.0000	- 10.70
86.0000	- 10.70
88.0000	- 10.70
90.0000	- 10.70
92.0000	- 10.71
94.0000	- 10.70
96.0000	- 10.70
98.0000	- 10.69
100.000	- 10.69
110.000	- 10.68
120.000	- 10.69
130.000	- 10.68

END

SE1000B
 Environmental Logger
 06/08 09:58

Unit# 00490 Test# 1

INPUT 1: Level (F)

Reference 0.00
 Scale factor 29.92
 Offset 0.00

Second Packer Test On IW-1
 (Drawdown)

Step# 0 06/07 22:33

Data reflects change in water
 level in drill stem.

Elapsed Time	Value
-----	-----
0.0000	- 35.01
0.0033	- 35.81
0.0066	- 37.40
0.0099	- 31.89
0.0133	- 33.92
0.0166	- 41.79
0.0200	- 37.32
0.0233	- 35.58
0.0266	- 34.87
0.0300	- 31.45
0.0333	- 34.90
0.0500	- 35.08
0.0666	- 36.99
0.0833	- 37.41
0.1000	- 38.60
0.1166	- 39.21
0.1333	- 40.04
0.1500	- 40.24
0.1666	- 40.67
0.1833	- 41.11
0.2000	- 41.43
0.2166	- 41.83
0.2333	- 42.10
0.2500	- 42.31
0.2666	- 42.52
0.2833	- 42.74
0.3000	- 42.70
0.3166	- 42.69
0.3333	- 42.88
0.4167	- 42.77
0.5000	- 42.68
0.5833	- 42.54
0.6667	- 42.48
0.7500	- 42.47
0.8333	- 42.44
0.9167	- 42.60
1.0000	- 42.56

1.0833	- 42.61
1.1667	- 42.60
1.2500	- 42.62
1.3333	- 42.56
1.4166	- 42.65
1.5000	- 42.60
1.5833	- 42.68
1.6667	- 42.63
1.7500	- 42.63
1.8333	- 42.65
1.9167	- 42.71
2.0000	- 42.60
2.5000	- 42.73
3.0000	- 42.71
3.5000	- 42.74
4.0000	- 42.75
4.5000	- 42.75
5.0000	- 42.71
5.5000	- 42.72
6.0000	- 42.74
6.5000	- 42.72
7.0000	- 42.72
7.5000	- 42.70
8.0000	- 42.73
8.5000	- 42.73
9.0000	- 42.77
9.5000	- 42.81
10.0000	- 42.84
12.0000	- 42.92
14.0000	- 42.87
16.0000	- 42.78
18.0000	- 42.85
20.0000	- 42.96
22.0000	- 43.04
24.0000	- 43.03
26.0000	- 42.94
28.0000	- 43.00
30.0000	- 43.12
32.0000	- 42.97
34.0000	- 43.03
36.0000	- 43.12
38.0000	- 43.16
40.0000	- 43.07
42.0000	- 43.18
44.0000	- 43.10
46.0000	- 43.18
48.0000	- 42.73
50.0000	- 42.85
52.0000	- 42.78
54.0000	- 42.94
56.0000	- 42.91
58.0000	- 42.63
60.0000	- 42.87
62.0000	- 43.01

64.0000	- 43.16
66.0000	- 42.79
68.0000	- 42.64
70.0000	- 42.52
72.0000	- 34.77

END



SUBJECT Packer Test Data
Reduction IXV-1

BY WJZ DATE 8/20/20

SHEET NO. 1 OF 3

PROJECT NO. SEF 24770.70

NOTE: CONTINUED ON PAGE 2 OF 3 BY:
 PETE KUWATKOWSKI

I Packer Test Performed June 7, 1990

Two Pumping Tests, 12" Pilot, Interval 1882^{ft} - 1950 ft
 Drill Pipe OD = 7" ID = 6", Drill Pipe OD = 1 7/8"

II Head Loss Due To Friction In Drill Pipe

Hazen & Williams Eq (Cameron)

$$h_f = 0.002083 L \left(\frac{100}{D} \right)^{1.85} * \frac{GPM^{1.85}}{d^{4.8655}}$$

$$L = 1882 \text{ ft}$$

$$D = 100$$

$$GPM = 71$$

$$d = 6 \text{ inches}$$

$$h_f = \underline{1.71 \text{ ft}}$$

III Using Data From Second Pumping Test Calculate

(Estimate) T Using $T = 2000 \text{ G/DAS}$

f_{over transducer}

$$\text{Drawdown @ 62 min } 43.01 - 35.01 = 8 \text{ ft}$$

$$\text{Drawdown Less Friction} = 8 - 1.7 \text{ ft} = 6.3 \text{ ft}$$

$$T = 2000 (71) / 6.3 = 22,539.68$$

$$T = \underline{22,000 \text{ spd/ft}}$$

$$\text{Specific Capacity } \frac{71 \text{ gpm}}{6.3} = \underline{11.3 \text{ gpm/ft}}$$



SUBJECT Transmissivity Calculation
IW-1 Straddle Packer Test

BY P. Kwiatkowski DATE 8/21/90

SHEET NO. 2 OF 3

PROJECT NO. SEF24770, TØ.30

Well: IW-1

Q = 71 gpm

Interval Tested: 1882' - 1950' b6

Critical Time Calculation (Driscoll [1986] p.233)

$$t_c = \frac{0.6 (d_c^2 - d_p^2)}{Q/s}$$

where

t_c = time (minutes) when casing storage becomes negligible

d_c = inside diameter of drop pipe (inches) = 6 inches

d_p = outside diameter of pump column (inches) = 1.88 inches

Q/s = specific capacity (gpm/ft) = 11.3 gpm/ft

$$t_c = \frac{0.6 ([6 \text{ inches}]^2 - [1.88 \text{ inches}]^2)}{11.3 \text{ gpm/ft}}$$

$$= \boxed{1.72 \text{ minutes}}$$

Cooper-Jacob Method

$$T = \frac{264 Q}{\Delta s}$$

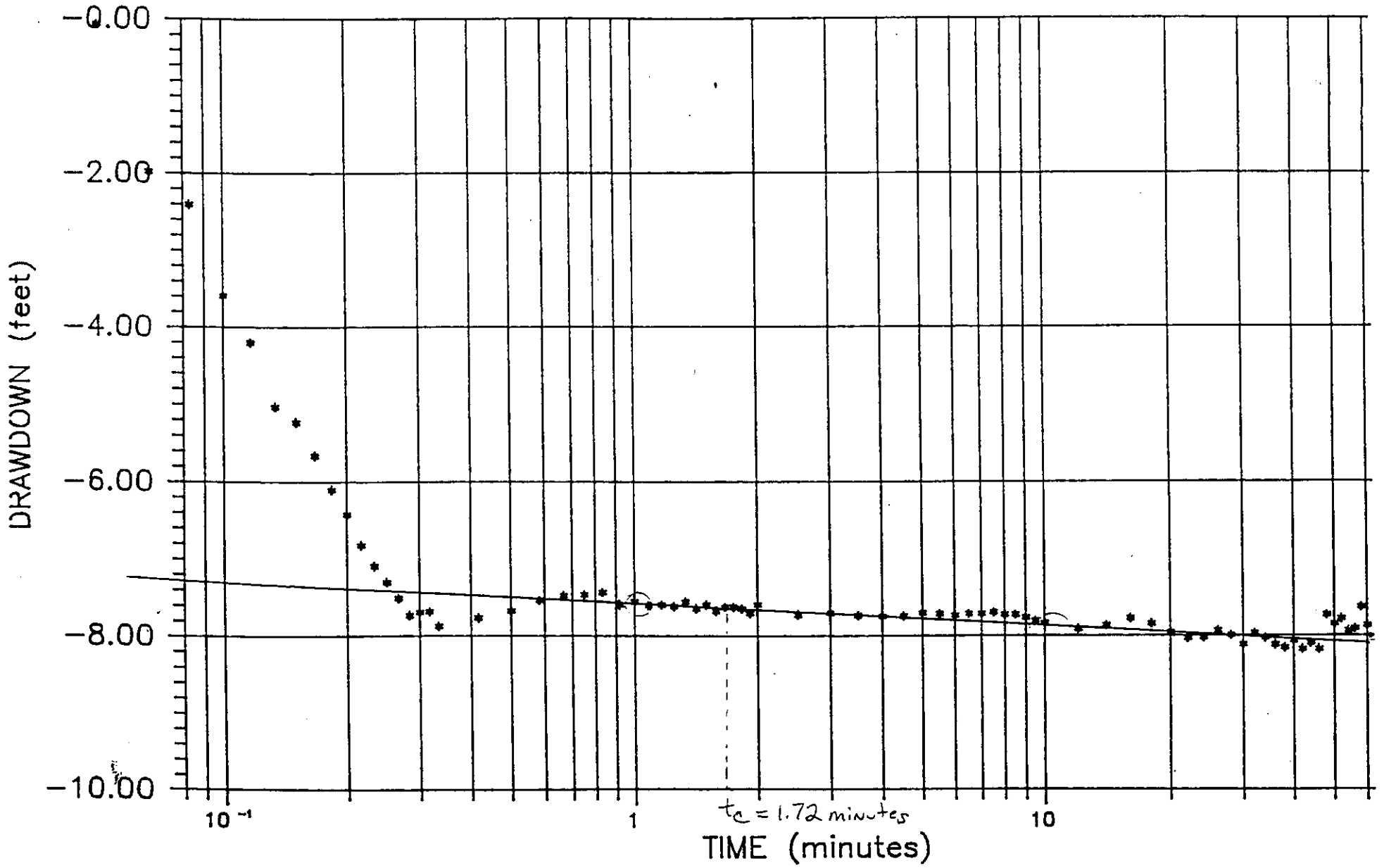
T = gpd / ft

Q = gpm (71 gpm)

Δs = slope over 1 log cycle (.32)

$$T = \frac{(264)(71 \text{ gpm})}{0.32} = \boxed{59,000 \text{ gpd/ft}}$$

IW-1



PILOT HOLE DRILLING WATER QUALITY DATA

INJECTION WELL NO. 1

Project No:
SEF24770.T0

PBC SRWWTP DIW

IW-1

Water Quality Data from Pilot Hole Drilling

DATE	TIME (HRS)	DEPTH (feet)	TEMP. (C)	SPECIFIC COND. (umhos/cm)	CHLORIDE (mg/l)	REMARKS	BY
05/30/90	0100	1,075	22	1,850	417	Mud settled out; sample taken 05/30/90	DHV
05/30/90	0200	1,105	20	1,900	375		DHV
05/30/90	0305	1,135	20	1,800	425	Not representative of formation; diluted	DHV
05/30/90	0430	1,165	20	1,700	400		DHV
05/30/90	0500	1,195	20	1,800	422		DHV
05/30/90	0630	1,225	20	1,650	369		DHV
05/30/90	0800	1,236	19	1,900	372		DHV
05/30/90	0915	1,266	19	1,850	372		DHV
05/31/90	0200	1,315	22	1,800	447		DHV
05/31/90	0500	1,345	20	1,700	372		DHV
05/31/90	0700	1,375	20	1,700	372		DHV
05/31/90	0825	1,405	20	1,675	397		DHV
05/31/90	1005	1,435	19	1,625	422		DHV
05/31/90	1220	1,465	20	1,625	397		DHV
05/31/90	1230	1,495	20	1,625	372		DHV
05/31/90	1235	1,526	21	1,800	447		DHV
05/31/90	1515	1,586	21	1,700	369		DHV
06/01/90	1900	1,616	21	1,750	349		DHV
06/02/90	0115	1,646	21	2,700	669		DHV
06/02/90	0625	1,675	22	3,700	1,049		DHV
06/02/90	0715	1,706	21	15,000	4,671		DHV
06/02/90	0800	1,736	21	15,000	4,821		DHV
06/02/90	0845	1,766	21	15,000	5,095		DHV
06/02/90	0915	1,796	21	15,000	5,120		DHV
06/02/90	0945	1,856	21	15,000	5,470		DHV
06/03/90	1515	1,886	24	22,000	8,297		WBZ
06/03/90	0745	1,916	24	44,000	17,795		WBZ
06/03/90	1300	1,946	24	44,000	20,593		WBZ
06/03/90	2145	1,976	24	45,000	20,993		WBZ
06/04/90	0700	2,006	24	45,000	20,593		WBZ
06/04/90	1030	2,036	24	46,000	20,993		WBZ
06/04/90	1600	2,066	24	35,000	14,196		WBZ
06/04/90	2230	2,096	24	36,000	15,095		WBZ
06/05/90	0500	2,126	24	46,000	20,693		WBZ
06/05/90	1015	2,156	24	47,000	20,993		WBZ
06/05/90	1545	2,186	24	47,000	20,993		WBZ

Project No:
SEF24770.T0

PBC SRWWTP DIW

IW-1

Water Quality Data from Pilot Hole Drilling

DATE	TIME (HRS)	DEPTH (feet)	TEMP. (C)	SPECIFIC COND. (umhos/cm)	CHLORIDE (mg/l)	REMARKS	BY
06/06/90	2100	2,216	24	47,000	20,193		WBZ
07/07/90	1315	2,247	24	30,000	17,594	Samples were analyzed on 7/12/90	DHV
07/07/90	1345	2,277	24	48,000	19,693	Samples were analyzed on 7/12/90	DHV
07/07/90	0100	2,307	24	47,000	17,661	Samples were analyzed on 7/12/90	DHV
07/07/90	1700	2,337	23	47,000	13,745	Samples were analyzed on 7/12/90	DHV
07/07/90	1900	2,367	24	48,000	17,994	Samples were analyzed on 7/12/90	DHV
07/08/90	0700	2,397	24	47,000	13,495	Samples were analyzed on 7/12/90	DHV
07/08/90	0915	2,427	24	48,000	16,994	Samples were analyzed on 7/12/90	DHV
07/08/90	1145	2,450	24	48,000	20,693	Samples were analyzed on 7/12/90	DHV
07/08/90	1400	2,486	24	48,000	14,495	Samples were analyzed on 7/12/90	DHV
07/08/90	1900	2,517	24	48,000	14,995	Samples were analyzed on 7/12/90	DHV
07/08/90	2420	2,547	24	48,000	20,993	Samples were analyzed on 7/12/90	DHV
07/09/90	0500	2,577	24	48,000	15,245	Samples were analyzed on 7/12/90	DHV
07/09/90	0700	2,605	24	48,000	13,995	Samples were analyzed on 7/12/90	DP'
07/09/90	1100	2,638	24	47,500	19,493	Samples were analyzed on 7/12/90	DH.
07/09/90	1430	2,668	23	48,000	14,245	Samples were analyzed on 7/12/90	DHV
07/09/90	2100	2,697	23	48,000	16,494	Samples were analyzed on 7/12/90	DHV
07/09/90	0130	2,728	24	48,250	18,994	Samples were analyzed on 7/12/90	DHV
07/10/90	0345	2,758	23	48,000	12,496	Samples were analyzed on 7/12/90	DHV
07/10/90	0700	2,788	24	47,500	21,993	Samples were analyzed on 7/12/90	DHV
07/10/90	1115	2,818	23	47,250	13,995	Samples were analyzed on 7/12/90	DHV
07/10/90	1515	2,848	22	47,250	17,244	Samples were analyzed on 7/12/90	DHV
07/10/90	2000	2,879	24	47,500	21,243	Samples were analyzed on 7/12/90	DHV
07/10/90	2215	2,909	23	48,000	16,994	Samples were analyzed on 7/12/90	DHV
07/11/90	0145	2,939	23	48,250	14,095	Samples were analyzed on 7/12/90	DHV
07/11/90	0610	2,968	24	48,000	14,495	Samples were analyzed on 7/12/90	DHV
07/11/90	0700	2,998	23	48,000	17,744	Samples were analyzed on 7/12/90	DHV
07/11/90	1930	3,028	25	31,000	15,595	Samples were analyzed on 7/16/90	DHV
07/12/90	0140	3,056	24	33,000	16,745	Samples were analyzed on 7/16/90	DHV
07/12/90	0700	3,088	24	41,000	16,995	Samples were analyzed on 7/16/90	DHV
07/12/90	0920	3,119	24	41,000	15,745	Samples were analyzed on 7/16/90	DHV
07/13/90	0700	3,148	24	40,000	13,750	Samples were analyzed on 7/16/90	DHV
07/13/90	0815	3,179	24	35,000	16,245	Samples were analyzed on 7/16/90	DHV
07/13/90	1845	3,208	24	33,000	13,746	Samples were analyzed on 7/16/90	DHV
07/14/90	1910	3,230	24	34,000	16,995	Samples were analyzed on 7/16/90	DHV
07/15/90	0540	3,268	24	34,000	15,995	Samples were analyzed on 7/16/90	DHV
07/15/90	1700	3,300	24	34,000	14,995	Samples were analyzed on 7/16/90	DH'

INJECTION WELL NO. 2

Project No:
SEF24770.T0

PBC SRWWTP DIW

IW-2

Water Quality Data from Pilot Hole Drilling

DATE	TIME (HRS)	DEPTH (feet)	TEMP. (C)	SPECIFIC COND. (umhos/cm)	CHLORIDE (mg/l)	REMARKS	BY
07/08/90	1845	995	30	1,600	178	Samples were analyzed on 7/12/90	DHV
07/08/90	2400	1,025	30	1,200	182	Samples were analyzed on 7/12/90	DHV
07/08/90	400	1,055	30	800	89	Samples were analyzed on 7/12/90	DHV
07/08/90	0645	1,085	26	2,800	519	Samples were analyzed on 7/12/90	DHV
07/08/90	0715	1,115	25	2,300	394	Samples were analyzed on 7/12/90	DHV
07/08/90	0845	1,145	25	800	101	Samples were analyzed on 7/12/90	DHV
07/08/90	0930	1,185	25	2,300	385	Samples were analyzed on 7/12/90	DHV
07/08/90	1000	1,203	25	600	87	Samples were analyzed on 7/12/90	DHV
07/09/90	1100	1,233	25	2,250	500	Samples were analyzed on 7/12/90	DHV
07/09/90	1230	1,263	25	2,225	365	Samples were analyzed on 7/12/90	DHV
07/09/90	1515	1,293	25	2,100	442	Samples were analyzed on 7/12/90	DHV
07/09/90	0500	1,323	25	2,300	788	Samples were analyzed on 7/12/90	DHV
07/09/90	0645	1,353	25	2,200	750	Samples were analyzed on 7/12/90	DHV
07/09/90	0900	1,380	25	2,400	288	Samples were analyzed on 7/12/90	DHV
07/09/90	1300	1,414	24	2,200	208	Samples were analyzed on 7/12/90	DHV
07/09/90	1500	1,443	24	2,000	256	Samples were analyzed on 7/12/90	DHV
07/10/90	1600	1,472	24	1,300	240	Samples were analyzed on 7/12/90	DHV
07/10/90	1740	1,504	24	1,300	80	Samples were analyzed on 7/12/90	DHV
07/10/90	2315	1,533	24	2,250	320	Samples were analyzed on 7/12/90	DHV
07/10/90	0200	1,564	26	2,800	558	Samples were analyzed on 7/12/90	DHV
07/10/90	0400	1,596	24	2,400	529	Samples were analyzed on 7/12/90	DHV
07/10/90	0430	1,625	24	2,400	449	Samples were analyzed on 7/12/90	DHV
07/10/90	0500	1,655	24	2,400	416	Samples were analyzed on 7/12/90	DHV
07/11/90	0600	1,685	25	2,200	568	Samples were analyzed on 7/12/90	DHV
07/11/90	0700	1,715	25	2,200	403	Samples were analyzed on 7/12/90	DHV
07/11/90	0915	1,744	25	2,400	538	Samples were analyzed on 7/12/90	DHV
07/11/90	1150	1,774	25	2,800	625	Samples were analyzed on 7/12/90	DHV
07/11/90	1460	1,803	25	3,600	731	Samples were analyzed on 7/12/90	DHV
07/12/90	1600	1,835	25	6,000	1,730	Samples were analyzed on 7/12/90	DHV
07/12/90	2000	1,865	25	6,500	1,654	Samples were analyzed on 7/12/90	DHV
07/12/90	2400	1,895	24	5,500	1,596	Samples were analyzed on 7/12/90	DHV
07/12/90	0700	1,925	24	5,500	1,400	Samples were analyzed on 7/12/90	DHV
07/12/90	1000	1,950	24	2,200	7,917	Samples were analyzed on 7/12/90	DHV
07/12/90	1700	1,953	24	40,500	13,162	Samples were analyzed on 7/12/90	DHV
07/13/90	0500	1,951	24	47,000	17,161	Depth sample pulled during logging @ 1951 ft.	DHV
08/11/90	1230	1,985	28	30,000	15,328	Samples were analyzed on 8/17/90	DHV

Project No:
SEF24770.T0

PBC SRWWTP DIW

IW-2

Water Quality Data from Pilot Hole Drilling

DATE	TIME (HRS)	DEPTH (feet)	TEMP. (C)	SPECIFIC COND. (umhos/cm)	CHLORIDE (mg/l)	REMARKS	BY
08/11/90	0714	2,045	25	31,000	19,160	Samples were analyzed on 8/17/90	DHV
08/14/90	1845	2,075	25	30,000	19,327	Samples were analyzed on 8/17/90	DHV
08/16/90	0730	2,105	28	49,000	18,827	Samples were analyzed on 8/17/90	DHV
08/17/90	0100	2,135	28	48,000	19,135	Samples were analyzed on 8/17/90	DHV
08/17/90	0515	2,165	29	50,000	16,662	Samples were analyzed on 8/17/90	DHV
08/17/90	2300	2,196	26	48,000	20,993	Samples were analyzed on 8/24/90	DHV
08/18/90	2100	2,226	25	47,000	19,327	Samples were analyzed on 8/24/90	DHV
08/19/90	0100	2,256	25	47,000	20,327	Samples were analyzed on 8/24/90	DHV
08/19/90	0400	2,286	27	46,000	19,994	Samples were analyzed on 8/24/90	DHV
08/20/90	0500	2,316	25	48,000	19,161	Samples were analyzed on 8/24/90	DHV
08/20/90	0800	2,347	27	48,000	16,662	Samples were analyzed on 8/24/90	DHV
08/20/90	1145	2,376	26	47,000	17,161	Samples were analyzed on 8/24/90	DHV
08/22/90	1000	2,406	26	48,000	16,662	Samples were analyzed on 8/24/90	DHV
08/22/90	1200	2,436	27	48,000	17,495	Samples were analyzed on 8/24/90	DF
08/22/90	1345	2,465	26	47,000	17,328	Samples were analyzed on 8/24/90	DHV
08/22/90	1615	2,496	26	48,000	19,661	Samples were analyzed on 8/24/90	DHV
08/23/90	0230	2,527	26	39,000	19,994	Samples were analyzed on 8/28/90	WBZ
08/24/90	0500	2,557	26	4,000	16,662	Samples were analyzed on 8/28/90	WBZ
08/24/90	0940	2,587	26	40,500	19,161	Samples were analyzed on 8/28/90	WBZ
08/24/90	1345	2,617	26	42,500	19,327	Samples were analyzed on 8/28/90	WBZ
08/25/90	1315	2,648	26	41,000	16,662	Samples were analyzed on 8/28/90	WBZ
08/25/90	1715	2,678	26	41,000	17,328	Samples were analyzed on 8/28/90	WBZ
08/25/90	2315	2,708	26	42,000	17,328	Samples were analyzed on 8/28/90	WBZ
08/25/90	0545	2,738	26	42,000	17,328	Samples were analyzed on 8/28/90	WBZ
08/25/90	1100	2,768	26	42,000	18,827	Samples were analyzed on 8/28/90	WBZ
08/25/90	1400	2,798	26	42,000	19,661	Samples were analyzed on 8/28/90	WBZ
08/26/90	1615	2,810	26	43,000	20,327	Samples were analyzed on 8/28/90	WBZ
09/22/90	0500	2,829	25	37,000	13,995	Wtr coll from 24" borehole analyzed 9/24/90	WBZ
09/22/90	0820	2,859	25	38,000	15,495	Wtr coll from 24" borehole analyzed 9/24/90	WBZ
09/22/90	1415	2,889	25	39,000	15,764	Wtr coll from 24" borehole analyzed 9/24/90	WBZ
09/22/90	2320	2,919	25	40,000	16,894	Wtr coll from 24" borehole analyzed 9/24/90	WBZ
09/23/90	1100	2,949	25	42,000	16,894	Wtr coll from 24" borehole analyzed 9/24/90	WBZ
09/23/90	1830	2,979	25	46,000	17,994	Wtr coll from 24" borehole analyzed 9/24/90	WBZ
09/24/90	1000	3,009	25	50,000	20,292	Max scale on cond. meter 50,000 umhos/cm	WBZ
09/25/90	0945	3,039	25	50,000	20,092	Max scale on cond. meter 50,000 umhos/cm	WBZ
09/26/90	0600	3,069	25	49,000	19,894		WBZ
09/26/90	2230	3,092	25	49,000	20,193		Wf
09/28/90	1730	3,122	25	48,000	20,293		WBZ
10/02/90	1030	3,153	25	48,000	19,894		WBZ
10/03/90	1200	3,184	25	50,000	19,994	Max scale on cond. meter 50,000 umhos/cm	WBZ

Project No:
SEF24770.T0

PBC SRWWTP DIW

IW-2

Water Quality Data from Pilot Hole Drilling

DATE	TIME (HRS)	DEPTH (feet)	TEMP. (C)	SPECIFIC COND. (umhos/cm)	CHLORIDE (mg/l)	REMARKS	BY
10/04/90	0545	3,214	26	48,000	19,294	Analyzed on 10/10/90	WBZ
10/05/90	0200	3,244	25	48,000	18,744	Analyzed on 10/10/90	DHV
10/06/90	1207	3,274	25	47,000	19,994	Samples were analyzed on 10/10/90	DHV
10/06/90	2153	3,304	24	48,000	18,328	Samples were analyzed on 10/10/90	DHV
10/07/90	1315	3,335	26	48,000	17,661	Samples were analyzed on 10/10/90	DHV
10/08/90	1000	3,365	26	48,000	19,661	Samples were analyzed on 10/10/90	DHV
10/08/90	1745	3,395	26	50,000	18,661	Max scale on cond. meter 50,000 umhos/cm	DHV
10/09/90	0900	3,425	26	50,000	16,661	Max scale on cond. meter 50,000 umhos/cm	DHV
10/10/90	2330	3,450	26	50,000	19,162	Max scale on cond. meter 50,000 umhos/cm	DHV

MFORMA

ANALYSIS REPORT

CH2M HILL CORPORATION

CLIENT NAME AND ADDRESS

800 FAIRWAY DRIVE SUITE 350

DEERFIELD BEACH, FLORIDA 33441

46594

SAMPLE NUMBER

07-13-90 CLIENT 07-16-90 1608

DATE TIME COLL RECD

IW-2 DEPTH 1951

ID ANALYTE	MCL DET LIMIT	METHOD	ANAL DATE INITIAL NBR	RESULTS UNITS
70304 TDS	1	209C	07-23-90 DM	38,190 MG/L

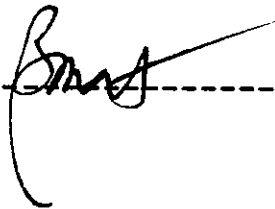
Depth sample collected during geophysical logging.

DATE 07-23-90

LAB ID 86122,86109, E86048

BY

DIRECTOR



DUAL-ZONE MONITOR WELL

DEVIATION SURVEYS

INJECTION WELL NO. 1

Project No. SEF24770.T0
PBC SRWWTP DIW's

IW-1

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
5/4/90	60	26.25	12 1/4" Pilot hole
5/4/90	120	26.25	12 1/4" Pilot hole
5/4/90	180	22.50	12 1/4" Pilot hole
5/6/90	60	30.00	58 1/2" Reamed hole
5/7/90	120	7.50	58 1/2" Reamed hole
5/8/90	180	22.50	58 1/2" Reamed hole
5/8/90	240	15.00	58 1/2" Reamed hole
5/12/90	300	18.75	12 1/4" Pilot hole
5/12/90	360	22.50	12 1/4" Pilot hole
5/12/90	420	26.25	12 1/4" Pilot hole
5/12/90	480	7.50	12 1/4" Pilot hole
5/13/90	540	7.50	12 1/4" Pilot hole
5/13/90	600	15.50	12 1/4" Pilot hole
5/13/90	660	26.25	12 1/4" Pilot hole
5/13/90	720	18.75	12 1/4" Pilot hole
5/14/90	780	15.00	12 1/4" Pilot hole
5/14/90	840	26.25	12 1/4" Pilot hole
5/14/90	900	22.50	12 1/4" Pilot hole
5/14/90	960	15.00	12 1/4" Pilot hole
5/15/90	330	3.75	52 1/2" Reamed hole
5/16/90	390	18.75	52 1/2" Reamed hole
5/16/90	450	22.50	52 1/2" Reamed hole
5/17/90	510	30.00	52 1/2" Reamed hole
5/19/90	570	7.50	52 1/2" Reamed hole
5/19/90	630	26.25	52 1/2" Reamed hole
5/20/90	690	22.50	52 1/2" Reamed hole
5/21/90	750	26.25	52 1/2" Reamed hole
5/22/90	810	22.50	52 1/2" Reamed hole

Reference point PAD - North Side of Sump

NOTE: Deviation in minutes
as read by Engineer

Elevation 21.38 ft. NGVD

Project No. SEF24770.T0
PBC SRWWTP DIW's

IW-1

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
5/22/90	870	26.25	52 1/2" Reamed hole
5/23/90	930	15.00	52 1/2" Reamed hole
5/29/90	1075	26.25	12 1/4" Pilot hole
5/30/90	1135	15.00	12 1/4" Pilot hole
5/30/90	1195	26.25	12 1/4" Pilot hole
5/30/90	1255	22.25	12 1/4" Pilot hole
5/30/90	1315	22.50	12 1/4" Pilot hole
5/30/90	1375	26.25	12 1/4" Pilot hole
5/30/90	1435	22.50	12 1/4" Pilot hole
5/31/90	1495	18.75	12 1/4" Pilot hole
5/31/90	1555	26.25	12 1/4" Pilot hole
6/1/90	1615	22.50	12 1/4" Pilot hole
6/1/90	1675	7.50	12 1/4" Pilot hole
6/2/90	1735	22.50	12 1/4" Pilot hole
6/2/90	1795	7.50	12 1/4" Pilot hole
6/2/90	1855	22.50	12 1/4" Pilot hole
6/3/90	1915	7.50	12 1/4" Pilot hole
6/4/90	2035	18.75	12 1/4" Pilot hole
6/4/90	2095	26.25	12 1/4" Pilot hole
6/5/90	2155	7.50	12 1/4" Pilot hole
6/9/90	1080	7.50	42-1/2" Reamed hole
6/9/90	1140	22.50	42-1/2" Reamed hole
6/10/90	1200	22.50	42-1/2" Reamed hole
6/11/90	1260	30.00	42-1/2" Reamed hole
6/11/90	1320	22.50	42-1/2" Reamed hole
6/12/90	1350	7.50	42-1/2" Reamed hole
6/12/90	1410	7.50	42-1/2" Reamed hole
6/15/90	1470	22.50	42-1/2" Reamed hole

Reference point PAD - North Side of Sump
Elevation 21.38 ft. NGVD

NOTE: Deviation in minutes
 as read by Engineer

Project No. SEF24770.T0
PBC SRWWTP DIW's

IW-1

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
6/15/90	1530	7.50	42-1/2" Reamed hole
6/16/90	1590	15.00	42-1/2" Reamed hole
6/17/90	1650	26.25	42-1/2" Reamed hole
6/19/90	1710	26.25	42-1/2" Reamed hole
6/21/90	1770	22.50	42-1/2" Reamed hole
6/23/90	1830	15.00	42-1/2" Reamed hole
7/7/90	2240	15.00	12-1/4" Pilot hole
7/8/90	2300	7.50	12-1/4" Pilot hole
7/8/90	2360	15.00	12-1/4" Pilot hole
7/8/90	2420	15.00	12-1/4" Pilot hole
7/8/90	2480	7.50	12-1/4" Pilot hole
7/9/90	2540	7.50	12-1/4" Pilot hole
7/9/90	2600	26.25	12-1/4" Pilot hole
7/9/90	2660	22.50	12-1/4" Pilot hole
7/10/90	2720	7.50	12-1/4" Pilot hole
7/10/90	2780	22.50	12-1/4" Pilot hole
7/10/90	2840	26.25	12-1/4" Pilot hole
7/10/90	2900	11.25	12-1/4" Pilot hole
7/12/90	2960	26.25	12-1/4" Pilot hole
7/12/90	3020	15.00	12-1/4" Pilot hole
7/19/90	1960	15.00	32 1/2" Reamed Hole
7/21/90	2035	18.75	32 1/2" Reamed Hole
7/23/90	2095	11.25	32 1/2" Reamed Hole
7/24/90	2155	15.00	32 1/2" Reamed Hole
7/28/90	2240	22.50	32 1/2" Reamed Hole
7/29/90	2300	26.25	32 1/2" Reamed Hole
7/29/90	2360	22.50	32 1/2" Reamed Hole
7/29/90	2420	22.50	32 1/2" Reamed Hole

Reference point PAD - North Side of Sump

NOTE: Deviation in minutes
as read by Engineer

Elevation 21.38 ft. NGVD

Project No. SEF24770.T0
 PBC SRWWTP DIW's

IW-1

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
7/30/90	2480	22.50	32 1/2" Reamed Hole
7/31/90	2540	15.00	32 1/2" Reamed Hole
7/31/90	2600	15.00	32 1/2" Reamed Hole
8/15/90	2660	11.25	22 1/2" Reamed hole
8/15/90	2720	22.50	22 1/2" Reamed hole
8/16/90	2780	26.25	22 1/2" Reamed hole
8/16/90	2840	26.25	22 1/2" Reamed hole
8/16/90	2900	15.00	22 1/2" Reamed hole
8/17/90	2960	22.50	22 1/2" Reamed hole
8/18/90	3020	15.00	22 1/2" Reamed hole
8/18/90	3080	15.00	22 1/2" Reamed hole
8/19/90	3140	15.00	22 1/2" Reamed hole
8/21/90	3200	15.00	22 1/2" Reamed hole
8/21/90	3260	30.00	22 1/2" Reamed hole

Reference point PAD - North Side of Sump
 Elevation 21.38 ft. NGVD

NOTE: Deviation in minutes as read by Engineer

INJECTION WELL NO. 2

Project No. SEF24770.T0
PBC SRWWTP DIW's

IW-2

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
6/17/90	60	26.25	12" Pilot hole
6/17/90	120	22.50	12" Pilot hole
6/17/90	180	26.25	12" Pilot hole
6/17/90	240	22.50	12" Pilot hole
6/19/90	62	26.25	58 1/2" Reamed hole
6/19/90	120	26.25	58 1/2" Reamed hole
6/20/90	180	22.50	58 1/2" Reamed hole
6/22/90	240	22.50	58 1/2" Reamed hole
6/22/90	300	22.50	12 1/4" Pilot hole
6/23/90	360	7.50	12 1/4" Pilot hole
6/23/90	420	11.25	12 1/4" Pilot hole
6/23/90	480	11.25	12 1/4" Pilot hole
6/23/90	540	15.00	12 1/4" Pilot hole
6/23/90	600	22.50	12 1/4" Pilot hole
6/24/90	660	15.00	12 1/4" Pilot hole
6/24/90	720	15.00	12 1/4" Pilot hole
6/24/90	780	15.00	12 1/4" Pilot hole
6/24/90	840	15.00	12 1/4" Pilot hole
6/24/90	900	11.25	12 1/4" Pilot hole
6/26/90	960	7.50	12 1/4" Pilot hole
6/26/90	360	15.00	52 1/2" Reamed hole
6/26/90	420	15.00	52 1/2" Reamed hole
6/26/90	480	26.25	52 1/2" Reamed hole
6/26/90	540	26.25	52 1/2" Reamed hole
6/27/90	600	15.00	52 1/2" Reamed hole
6/27/90	660	7.50	52 1/2" Reamed hole
6/28/90	720	22.50	52 1/2" Reamed hole
6/28/90	780	30.00	52 1/2" Reamed hole

Reference point PAD- North Side of Sump

NOTE: Deviation in minutes
as read by Engineer

Elevation 21.50 ft. NGVD

Project No. SEF24770.T0
PBC SRWWTP DIW's

IW-2

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
6/29/90	840	15.00	52 1/2" Reamed hole
6/29/90	900	22.50	52 1/2" Reamed hole
7/8/90	1020	7.50	12 1/4" Pilot hole
7/8/90	1080	7.50	12 1/4" Pilot hole
7/9/90	1140	15.00	12 1/4" Pilot hole
7/9/90	1200	22.50	12 1/4" Pilot hole
7/9/90	1260	15.00	12 1/4" Pilot hole
7/9/90	1320	22.50	12 1/4" Pilot hole
7/10/90	1380	15.00	12 1/4" Pilot hole
7/10/90	1440	22.50	12 1/4" Pilot hole
7/10/90	1500	7.50	12 1/4" Pilot hole
7/10/90	1560	15.00	12 1/4" Pilot hole
7/10/90	1620	15.00	12 1/4" Pilot hole
7/11/90	1680	22.50	12 1/4" Pilot hole
7/11/90	1740	15.00	12 1/4" Pilot hole
7/11/90	1800	26.25	12 1/4" Pilot hole
7/12/90	1860	11.25	12 1/4" Pilot hole
7/15/90	1020	22.50	42 1/2" Reamed hole
7/27/90	1080	26.25	Contractor's Deviation Surveys out of sequence will perform on Wipper Run
7/27/90	1140	11.25	42 1/2" Reamed hole
7/16/90	1160	15.00	42 1/2" Reamed hole
7/16/90	1200	15.00	42 1/2" Reamed hole
7/17/90	1260	15.00	42 1/2" Reamed hole
7/17/90	1320	22.50	42 1/2" Reamed hole
7/18/90	1380	15.00	42 1/2" Reamed hole
7/18/90	1440	7.50	42 1/2" Reamed hole
7/19/90	1500	15.00	42 1/2" Reamed hole
7/20/90	1560	15.00	42 1/2" Reamed hole

Reference point PAD- North Side of Sump

NOTE: Deviation in minutes
as read by Engineer

Elevation 21.50 ft. NGVD

Project No. SEF24770.T0
PBC SRWWTP DIW's

IW-2

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
7/20/90	1620	15.00	42 1/2" Reamed hole
7/22/90	1680	15.00	42 1/2" Reamed hole
7/23/90	1740	11.25	42 1/2" Reamed hole
7/24/90	1800	7.50	42 1/2" Reamed hole
7/27/90	1860	22.50	42 1/2" Reamed hole
8/10/90	1920	11.25	12 1/4" Pilot hole
8/11/90	1980	22.50	12 1/4" Pilot hole
8/12/90	2040	15.00	12 1/4" Pilot hole
8/14/90	2092	7.50	12 1/4" Pilot hole
8/17/90	2160	7.50	12 1/4" Pilot hole
8/19/90	2220	22.50	12 1/4" Pilot hole
8/20/90	2280	7.50	12 1/4" Pilot hole
8/20/90	2340	7.50	12 1/4" Pilot hole
8/22/90	2400	15.00	12 1/4" Pilot hole
8/22/90	2460	15.00	12 1/4" Pilot hole
8/24/90	2510	15.00	12 1/4" Pilot hole
8/24/90	2580	7.50	12 1/4" Pilot hole
8/25/90	2640	15.00	12 1/4" Pilot hole
8/26/90	2700	7.50	12 1/4" Pilot hole
8/26/90	2760	15.00	12 1/4" Pilot hole
8/31/90	1980	15.00	32 1/2" Reamed hole
9/01/90	2040	15.00	32 1/2" Reamed hole
9/02/90	2100	15.00	32 1/2" Reamed hole
9/04/90	2160	7.50	32 1/2" Reamed hole
9/05/90	2220	15.00	32 1/2" Reamed hole
9/05/90	2280	15.00	32 1/2" Reamed hole
9/05/90	2300	7.50	32 1/2" Reamed hole
9/05/90	2400	15.00	32 1/2" Reamed hole

Reference point PAD- North Side of Sump

Elevation 21.50 ft. NGVD

NOTE: Deviation in minutes
as read by Engineer

Project No. SEF24770.T0
 PBC SRWWTP DIW's

IW-2

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
9/06/90	2460	15.00	32 1/2" Reamed hole
9/06/90	2520	7.50	32 1/2" Reamed hole
9/06/90	2580	22.50	32 1/2" Reamed hole
9/21/90	2700	7.50	22 1/2" Reamed hole
9/22/90	2760	15.00	22 1/2" Reamed hole
9/22/90	2820	7.50	22 1/2" Reamed hole
9/22/90	2880	15.00	22 1/2" Reamed hole
9/23/90	2940	7.50	22 1/2" Reamed hole
9/25/90	3000	15.00	22 1/2" Reamed hole

Reference point PAD- North Side of Sump
 Elevation 21.50 ft. NGVD

NOTE: Deviation in minutes as read by Engineer

DUAL-ZONE MONITOR WELL

Project No. SEF24770.T0
PBC SRWWTP DIW's

Dual-Zone
Monitor Well

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
8/7/90	60	22.50	30" hole
8/7/90	120	15.00	30" hole
8/8/90	210	26.25	30" hole
8/8/90	270	15.00	30" hole
8/13/90	330	11.25	12 1/4" Pilot hole
8/13/90	390	11.25	12 1/4" Pilot hole
8/13/90	454	15.00	12 1/4" Pilot hole
8/14/90	517	15.00	12 1/4" Pilot hole
8/14/90	578	7.50	12 1/4" Pilot hole
8/14/90	640	26.25	12 1/4" Pilot hole
8/14/90	700	26.25	12 1/4" Pilot hole
8/14/90	760	7.50	12 1/4" Pilot hole
8/14/90	820	15.00	12 1/4" Pilot hole
8/14/90	883	22.50	12 1/4" Pilot hole
8/14/90	945	15.00	12 1/4" Pilot hole
8/14/90	1005	22.50	12 1/4" Pilot hole
8/16/90	330	15.00	22-1/2" Reamed hole
8/16/90	390	26.25	22-1/2" Reamed hole
8/17/90	454	15.00	22-1/2" Reamed hole
8/17/90	517	15.00	22-1/2" Reamed hole
8/17/90	578	15.00	22-1/2" Reamed hole
8/17/90	640	22.5	22-1/2" Reamed hole
8/18/90	700	22.5	22-1/2" Reamed hole
8/18/90	760	22.5	22-1/2" Reamed hole
8/18/90	823	22.5	22-1/2" Reamed hole
8/18/90	880	7.5	22-1/2" Reamed hole

Reference point PAD- North Side of sump

NOTE: Deviation in minutes as
read by Engineer

Elevation 21.50 ft. NGVD

Project No. SEF24770.T0
PBC SRWWTP DIW's

Dual-Zone
Monitor Well

DEVIATION SURVEYS

DATE	DEPTH (ft)	DEVIATION (minutes)	CONSTRUCTION ACTIVITY
8/18/90	940	22.5	22-1/2" Reamed hole
8/18/90	1000	15	22-1/2" Reamed hole
8/25/90	1060	15	14 3/4" hole
8/25/90	1120	15	14 3/4" hole
8/25/90	1180	18.75	14 3/4" hole
8/25/90	1240	18.75	14 3/4" hole
8/28/90	1300	30	14 3/4" hole- Survey performed while tripping out
8/26/90	1360	22.5	14 3/4" hole
8/26/90	1420	15	14 3/4" hole
8/26/90	1480	15	14 3/4" hole
8/26/90	1540	15	14 3/4" hole
8/26/90	1600	7.5	14 3/4" hole
8/27/90	1660	15	14 3/4" hole
8/27/90	1720	18.75	14 3/4" hole
8/27/90	1780	15	14 3/4" hole
8/27/90	1840	22.5	14 3/4" hole
8/28/90	1900	22.5	14 3/4" hole

Reference point PAD- North Side of sump

NOTE: Deviation in minutes as
read by Engineer

Elevation 21.50 ft. NGVD

PRESSURE TEST DATA

INJECTION WELL NO. 1

//////////
CH2M HILL
//////////

PBC SRWWTP DIW's
SEF24770.T0
PAGE 1 OF 2

DATE: AUGUST 14, 1990

HEADER PRESSURE DURING TESTING
IW-1 (24-INCH CASING)

<u>TIME</u> (hours)	<u>TOTAL</u> <u>MINUTES</u>	<u>HEADER PRESSURE</u> (psi)	<u>COMMENTS</u>
1219	0	0.00	BEGIN PRESSURIZING CASING
1220	1	40.00	
1221	2	50.00	
1222	3	70.00	
1223	4	90.00	
1224	5	120.00	
1228	8	165.00	STOP PRESSURIZING AND BLEED BACK TO 150 PSI, START TEST
1230	0	150.00	
1235	5	150.00	NO CHANGE
1240	10	149.00	DOWN 1 PSI
1245	15	149.00	NO CHANGE
1250	20	148.50	DOWN 1.5 PSI
1255	25	148.00	DOWN 2 PSI
1300	30	148.00	NO CHANGE
1305	35	147.50	DOWN 2.5 PSI
1310	40	147.50	NO CHANGE
1315	45	147.50	NO CHANGE
1320	50	147.00	DOWN 3 PSI
1325	55	147.00	NO CHANGE
1330	60	146.50	DOWN 3.5 PSI

TEST SUCCESSFULLY COMPLETED

OBSERVERS: B. OKOME/FDER/WPB
J. PETRONIO/FDER/WPB
D. VANNOTE/CH2M HILL
T. MCCORMICK\CH2M HILL
B. ZIEGLER\CH2M HILL

BARFIELD INSTRUMENT CORPORATION
4101 N.W. 29th Street
P.O. Box 420-537
Miami, Florida 33142

RECORD OF INSTRUMENT CALIBRATION COMPARISON

For: YOUNGQUIST BROTHERS, INC.

BIC W.O.: 47144

Mfr: AMETEK/U.S. GAUGE DIVISION

Model: 0-300 PSI

Type: PRESSURE GAUGE

S/N: 92668BIC

BIC TEST UNIT

CUSTOMER UNIT

0	0
20	19
40	39
60	59
80	79
100	99
120	119
140	139
160	159
180	179
200	200
220	220
240	240
260	260
280	280
300	300

For pressure test of 24-inch casing on IW-1

The above calibration comparison was made by BARFIELD INSTRUMENT CORPORATION
Miami, Florida using an approved BIC Test Unit.

Date: JULY 18, 1990

Temperature: 24°C.

Tested By: M. ROSS

Inspected By: [Signature]

INJECTION WELL NO. 2

XXXXXXXXXX
CH2M HILL
XXXXXXXXXX

PBC SRWWTP DIW's
SEF24770.T0
PAGE 1 OF 2

DATE: SEPTEMBER 20, 1990

HEADER PRESSURE DURING TESTING
W-2 (24-INCH CASING)

<u>TIME</u> <u>(MMSS)</u>	<u>TOTAL</u> <u>MINUTES</u>	<u>HEADER PRESSURE</u> <u>(psi)</u>	<u>COMMENTS</u>
0904	0	0.00	BEGIN PRESSURIZING 24-INCH CASING
0934	0	154.00	CASING PRESSURIZED TO 154 PSI. PRESSURE BLED BACK TO 150 PSI
0935	0	150.00	BEGIN PRESSURE TEST
0947	0	149.50	
0945	10	149.00	
0950	15	149.00	
0955	20	148.50	
1000	25	148.00	
1005	30	148.00	
1010	35	147.50	
1015	40	147.00	
1020	45	147.00	
1025	50	146.50	
1030	55	146.00	
0755	50	146.00	TEST SUCCESSFULLY COMPLETED

OBSERVERS B. OKOME/FFDER
E. ZIEGLER/CH2M HILL
K. GREUEL/YBWD

BARFIELD INSTRUMENT CORPORATION
 4101 N.W. 29th Street
 P.O. Box 420-537
 Miami, Florida 33142

RECORD OF INSTRUMENT CALIBRATION COMPARISON

For: YOUNGQUIST BROTHERS, INC. BIC W.O.: 57067
 Mfr: US GAUGE Model: 0-300 PSI
 Type: PRESSURE GAUGE S/N: 900124 BIC

BIC TEST UNIT	CUSTOMER UNIT
0	0
20	20
40	40
60	60
80	80
100	100
120	120
140	140
160	160
180	180
200	200
220	220
240	240
260	260
280	280
300	300

The above calibration comparison was made by BARFIELD INSTRUMENT CORPORATION
 Miami, Florida using an approved BIC Test Unit.

Date: 9/14/90
 Temperature: 24 1/2 C.
 Tested By: T. SABOLEWKI
 Inspected By: [Signature]

Form No. 13 (Rev. 2/21/85)

Rev. 3/87

Test Equipment

**INSPECTION
 CERTIFICATION**

Customer: Youngquist Brothers
 BIC W.O. No.: 57067
 Item: Pressure Gauge
 Mfg: US Gauge
 Part/Model No.: 0-300 PSI
 Serial No.: 900124 BIC

This unit is certified to be within manufacturers' specifications, except as noted:

And the accuracy is traceable to the National Bureau of Standards, or reference standards based upon fundamental constants of nature.

Signed: [Signature]
 Date: 9.14.90

**BARFIELD INSTRUMENT
 CORPORATION**

4101 N.W. 29th Street
 Miami, FL 33142
 1475 Central Avenue
 Atlanta, GA 30344

DUAL-ZONE MONITOR WELL

//////////
CH2M HILL
//////////

PBC SRWWTP DIW's
SEF24770.T0
PAGE 1 OF 2

DATE: SEPTEMBER 4, 1990

HEADER PRESSURE DURING TESTING
MW (6-INCH CASING)

<u>TIME</u> (hours)	<u>TOTAL</u> <u>MINUTES</u>	<u>HEADER PRESSURE</u> (psi)	<u>COMMENTS</u>
1646	0	100.00	6-INCH CASING WAS PRESSURIZED
1651	5	99.90	TO 120 PSI AND THEN BLED BACK
1656	10	99.22	TO 100 PSI AT START OF TEST
1701	15	99.00	
1706	20	98.50	
1711	25	98.00	
1716	30	98.00	
1712	35	97.80	
1726	40	97.20	
1731	45	97.00	
1736	50	96.80	
1741	55	96.80	
1746	60	96.20	TEST SUCCESSFULLY COMPLETED

OBSERVERS: P. HIGHSMITH\FDER
T. POWELL\FDER
S. BENYON\FDER
T. MCCORMICK\CH2M HILL
E. POMAR\CH2M HILL
B. ZIEGLER\CH2M HILL

RECORD OF INSTRUMENT CALIBRATION COMPARISON

For: YOUNGQUIST BROTHERS BIC W.O.: 9055650
 Mfr: AMETEK/US GAUGE Model: 0-300 PSI
 Type: PRESSURE GAUGE S/N: 900124BIC

BIC TEST UNIT

CUSTOMER UNIT

0
 20
 40
 60
 80
 100
 120
 140
 160
 180
 200
 220
 240
 260
 280
 300

0
 20
 40
 60
 80
 100
 120
 140
 160
 180
 200
 220
 240
 262
 282
 300

- NO EXCEPTIONS NOTED
- MAKE CORRECTIONS NOTED
- REJECTED REVISE AND RESUBMIT
- SUBMIT SPECIFIED ITEM

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction; coordination of his work with that of all other trades and the satisfactory performance of his work.

By Bart. Zeigler (N.N.)
 Date 8/31 19 90

CH2M HILL
 ENGINEERS

For pressure test on 6-inch casing of the dual-zone monitor well

The above calibration comparison was made by BARFIELD INSTRUMENT CORPORATION Miami, Florida using an approved BIC Test Unit.

Date: 8/30/90

Temperature: 24 DEGREES C

Tested By: T. SABOLEWSKI

Inspected By: [Signature]

Test Equipment

INSPECTION CERTIFICATION

Customer: Monquist Brothers
 BIC W/O No. 55649
 Item: Pressure Gauge
 Mfg. Omelik/US Gauge
 Part/Model No. D-300 PSI
 Serial No. 900124 BLC

This unit is Certified to be within manufacturers' specifications, except as noted:

And the accuracy is traceable to the National Bureau of Standards, or reference standards based upon fundamental constants of nature.

Signed: William S. Sordahl
 Date: 8.30.90

BARFIELD INSTRUMENT CORPORATION

4101 N.W. 29th Street
Miami, FL 33142

1478 Central Avenue
East Point, GA 30344

For pressure test of 6-inch casing of the dual-zone monitor well

VIDEO SURVEY SUMMARIES

INJECTION WELL NO. 1

Record of Underwater TV Survey

Project: Palm Beach County Southern Region WWTP

Well: IW-1

Survey By: Schlumberger Well Services

Survey Date: 09/19/90 Total Depth: 3303 feet

Total Depth Casing: 2,660 feet

Witnessed By: Bart Ziegler

Reviewed By: Doug VanNote, Bart Ziegler Date: 09/25/90

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
		0	123	CSG-24" at 2660'
0	0	123	125	TD-3311, Bit-22 1/2", Zero-Pad level
0	1	123	125	Top of 24" @ ground zero; first joint
1	15	125	224	Casing joint-clear picture
15	21	224	259	Casing joint; clear picture
21	45	259	371	Casing joint; clear picture
45	75	371	509	Casing joint; clear picture
75	105	509	642	Casing joint; clear picture

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
105	130	642	769	Casing joint; clear picture
130	172	769	920	Casing joint; clear picture
172	215	920	1006	Casing joint; camera light brighter
215	254	1006	1032	Casing joint; clear picture
254	296	1032	1386	Casing joint; clear picture
296	339	1386	1536	Casing joint; clear picture
339	381	1536	1679	Casing joint; clear picture
381	423	1679	1819	Casing joint; clear picture
423	465	1819	1953	Casing joint; clear picture
465	507	1953	2085	Casing joint; clear picture
507	548	2085	2233	Casing joint; clear picture
548	589	2233	2357	Casing joint; clear picture
589	630	2357	2478	Casing joint; clear picture
630	672	2478	2597	Casing joint; clear picture
672	715	2597	2718	Casing joint; clear picture
715	756	2718	2831	Casing joint; clear picture
756	797	2831	2943	Casing joint; clear picture
797	840	2943	3059	Casing joint; clear picture
840	881	3059	3169	Casing joint; clear picture
881	923	3169	3277	Casing joint; clear picture
923	963	3277	3380	Casing joint; clear picture
963	1005	3380	3484	Casing joint; clear picture
1005	1046	3484	3588	Casing joint; clear picture

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
1046	1087	3588	3689	Casing joint; clear picture
1087	1130	3689	3793	Casing joint; clear picture
1130	1171	3793	3890	Casing joint; clear picture
1171	1212	3890	3988	Casing joint; clear picture
1212	1252	3988	4080	Casing joint; clear picture
1252	1292	4080	4175	Casing joint; clear picture
1292	1332	4175	4266	Casing joint; clear picture
1332	1373	4266	4359	Casing joint; clear picture
1373	1409	4359	4441	Casing joint; clear picture
1409	1444	4441	4519	Casing joint; clear picture
1444	1486	4519	4611	Casing joint; clear picture
1486	1527	4611	4701	Casing joint; clear picture
1527	1567	4701	4790	Casing joint; clear picture
1567	1608	4790	4880	Casing joint; clear picture
1608	1650	4880	4947	Casing joint; clear picture
1650	1692	4947	5035	Casing joint; clear picture
1692	1733	5035	5116	Casing joint; clear picture
1733	1776	5116	5198	Casing joint; clear picture
1776	1819	5198	5276	Casing joint; clear picture
1819	1861	5276	5325	Casing joint; clear picture
1861	1904	5352	5427	Casing joint; clear picture
1904	1945	5427	5500	Casing joint; clear picture
1945	1985	5500	5572	Casing joint; clear picture

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
1985	2027	5572	5644	Casing joint; clear picture
2027	2061	5644	5731	Camera stopped; end tape #1
	2061	0	89	Intro-start tape #2
2061	2069	89	143	Continue down hole-water slightly cloudy
2061	2074	89	170	Casing joint; slightly cloudy;
2074	2111	170	355	Casing joint; clear picture
2111	2153	355	546	Casing joint; clear picture
2153	2195	546	733	Casing joint; clear picture
2195	2227	733	870	Casing joint; clear picture
2227	2270	870	1042	Casing joint; clear picture
2270	2308	1042	1194	Casing joint; clear picture
2308	2350	1194	1350	Casing joint; clear picture
2350	2391	1350	1499	Casing joint; clear picture
2391	2434	1499	1651	Casing joint; clear picture
2434	2475	1651	1774	Casing joint; clear picture
2475	2514	1774	1888	Casing joint; clear picture
2514	2555	1888	2003	Casing joint; clear picture
2555	2597	2003	2118	Casing joint; clear picture
2597	2636	2118	2225	Casing joint; cement on walls
2636	2660	2225	2290	Casing end (2,660); going into open hole
2660	2662	2290	2295	Open hole
2662	2665	2295	2303	Small cavities around borehole

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
2665	2672	2303	2320	Smooth hole with very small cavities
2672	2685	2322	2355	Smooth borehole with vug small spaces
2685	2686	2355	2356	Small cavity on side of borehole
2686	2693	2356	2376	Smooth borehole with small cavities; camera hit walls; borehole becoming cloudy
2693	2705	2376	2407	Borehole very cloudy from camera hitting mud or very fine silt on bore walls
2705	2707	2407	2412	Moderate size cavity; very cloudy
2707	2713	2412	2430	Intermittent cavities; very cloudy
2713	2730	2430	2472	Mostly smooth; very cloudy borehole with small vug spaces throughout
2730	2731	2472	2475	Moderate cavity; very cloudy
2731	2737	2475	2489	Moderate cavity; cloudy; some vertical fractures
2737	2741	2489	2499	Smooth borehole with small vug spaces; cloudy
2741	2742	2499	2502	One horizontal cavity (medium); cloudy
2742	2750	2502	2524	Fairly smooth with small cavities and some fractures; cloudy
2750	2760	2524	2547	Very large cavity at top with smaller vug spaces and fractures; water remains cloudy
2760	2766	2547	2562	Fairly smooth borehole with small vug spaces and fractures; very cloudy

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
2766	2767	2562	2564	Large horizontal cavity; very cloudy
2767	2775	2564	2585	Some large intermittent cavities and horizontal fractures; very cloudy
2775	2794	2585	2633	Very cloudy; smooth borehole with small vug spaces and fractures
2794	2795	2633	2636	One moderate size horizontal fracture; cloudy
2795	2797	2636	2640	Some larger vug space openings; cloudy
2797	2801	2640	2650	Medium size cavities and vug spaces with small fractures; cloudy
2801	2812	2650	2679	Large vug spaces and fractures throughout; cloudy
2812	2815	2679	2685	Borehole picture begins to clear; vug spaces
2815	2819	2685	2696	Large cavity; picture clearer
2819		2696		Camera hit walls again creating turbulence; picture becoming cloudy at 2819'
2819	2869	2696	2821	Cloudy picture; smooth borehole with small vug spaces and fractures
2869	2870	2821	2823	Horizontal fractures; cloudy picture
2870	2914	2823	2929	Smooth borehole with occasional vug spaces and horizontal and vertical fractures; cloudy
2914	2918	2929	2939	Cloudy picture, could be due to tool arms hitting against wall; horizontal fracture at 2918'

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
2918	2926	2939	2959	Horizontal fracture at 2919'; cloudy picture
2926	2932	2959	2974	Large cavities vertical and horizontal; picture clearing
2932	2962	2974	3044	Picture darker and borehole appears very fractured (dolomite); picture clearer
2962	2994	3044	3120	Borehole fractured and vuggy; clear picture
2994	3025	3120	3193	Horizontal cavities and large vug spaces; clear; abundant cavities and vugs; some fractures
3025	3027	3193	3198	Very large cavity; picture very clear
3027	3048	3198	3248	Large vugs and small cavities throughout
3048	3063	3248	3282	Fairly smooth borehole; large horizontal and vertical fractures at 3052'; abundant vertical fractures at 3054'; fractures increasing in this area; clear picture
3063	3069	3282	3298	Large vug spaces and small cavities; fairly large cavity at 3065'; horizontal and vertical fractures at 3066'
3069	3070	3298	3300	Very large cavity and loose fragments; clear picture
3070	3073	3302	3306	Small cavities and large vug spaces; clear picture; very large cavity at 3071'

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
3073	3089	3306	3343	Smooth borehole; water getting cloudy again; small vug spaces with small vertical and horizontal fractures at 3081'
3089	3093	3343	3352	Horizontal cavity and small vuggy openings; picture clearing
3093	3095	3352	3356	Very large cavity; clear picture
3095	3103	3356	3373	Smooth borehole; horizontal fracture at 3095'; small vuggy openings
3103	3110	3373	3392	Vertical fracture at 3103'; smooth borehole; fractures and vugs throughout; clear picture
3110	3116	3392	3404	Cavities and large vug spaces with vertical fractures; picture clear
3116	3120	3404	3414	Smooth borehole; small vugs
3120	3122	3414	3418	Large cavity with loose fragments
3122	3133	3418	3443	Smooth borehole; some vertical fractures
3133	3135	3443	3448	Fairly large cavity; clear picture
3135	3163	3448	3511	Smooth borehole with abundant small vug spaces and some fractures
3163	3167	3511	3521	Small cavity with abundant vug spaces; clear picture
3167	3177	3521	3543	Largely vuggy textured; some large fractures
3177	3200	3543	3595	Fairly smooth; some fractures; vuggy with very small cavities in spots

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
3200	3216	3595	3632	Borehole very smooth; abundant vug spaces; very clear picture
3216	3224	3632	3649	Very large deep cavity (3216'-3224'); 8 feet deep
3224	3235	3649	3677	Smooth borehole with small vertical fractures and very small vug spaces
3235	3256	3677	3733	Camera hit sides of large cavern above (3216') and water became cloudy; borehole has vugs and fractures
3256	3257	3733	3735	Small cavity; cloudy picture; debris appears to be flowing upward
3257	3303	3735	3849	Fairly smooth borehole to bottom with occasional vertical fractures and medium to large vug spaces; total depth was at 3303'

INJECTION WELL NO. 2

Record of Underwater TV Survey

Project: Palm Beach County Southern Region Wastewater Treatment Plant

Well: IW-2

Survey By: Schumberger Well Services

Survey Date: 10/20/90 Total Depth: 3,433 feet

Total Depth Casing: 2,643.5 feet

Witnessed By: D. VanNote

Reviewed By: Doug VanNote, Bart Ziegler Date: 11/27/90

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
0	0	30	79	Introduction
0	0	79	170	Top of casing @ surface; pad level
0	22	170	265	Casing joint; casing wall coated with iron bacteria; clear
22	63.5	265	417	Casing joint; casing wall coated with iron bacteria; clear
63.5	104	417	566	Casing joint; casing wall coated with iron bacteria; clear
104	109	417	582	Casing mark due to drill bit; not casing joint

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
109	145	582	678	Casing joint; casing wall coated with iron bacteria; clear
145	187	678	825	Casing joint; casing wall coated with iron bacteria; clear
187	228	825	947	Casing joint; drill bit casing marks; casing walls coated with iron bacteria; clear
228	268	947	1,064	Casing joint; drill bit casing marks; casing walls coated with iron bacteria; clear
268	310	1,064	1,181	Casing joint; drill bit casing marks; casing walls coated with iron bacteria; clear
310	353	1,181	1,298	Casing joint; drill bit casing marks; casing walls coated with iron bacteria; clear
353	407	1,298	1,440	Casing joint; drill bit casing marks; casing walls coated with iron bacteria; clear
407	439	1,440	1,524	Casing joint; drill bit casing marks; casing walls coated with iron bacteria; clear
439	471	1,524	1,605	Casing joint; drill bit casing marks; casing walls coated with iron bacteria; clear
471	507	1,605	1,697	Casing joint; drill bit casing marks; clear
507	550	1,697	1,803	Casing joint; drill bit casing marks; clear
550	592	1,803	1,906	Casing joint; drill bit casing marks; clear

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
592	635	1,906	2,007	Casing joint; drill bit casing marks; clear
635	677	2,007	2,105	Casing joint; clear; trace bacteria
677	715	2,105	2,193	Casing joint; clear; increasing trace bacteria; clear
715	753	2,193	2,279	Casing joint; large drill bit scrapes on casing; iron bacteria
753	789	2,279	2,360	Casing joint; large drill bit scrapes on casing; iron bacteria
789	828	2,360	2,446	Casing joint; large drill bit scrapes on casing; iron bacteria
828	869	2,446	2,536	Casing joint; large drill bit scrapes on casing; iron bacteria
869	903	2,536	2,609	Casing joint; large drill bit scrapes on casing; iron bacteria
903	944	2,609	2,695	Casing joint; large drill bit scratches on casing; clear
944	985	2,695	2,780	Casing joint; large drill bit scratches on casing; clear
985	1,025	2,780	2,862	Casing joint; large drill bit scratches on casing; clear
1,025	1,068	2,862	2,951	Casing joint; large drill bit; iron bacteria; clear
1,068	1,102	2,951	3,019	Casing joint; large drill bit; iron bacteria; clear
1,102	1,143	3,091	3,102	Casing joint; large drill bit; iron bacteria; clear
1,143	1,185	3,102	3,184	Casing joint; drill bit scrapes on casing; clear

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
1,185	1,225	3,184	3,262	Casing joint; drill bit scrapes on casing; clear
1,225	1,259	3,262	3,325	Casing joint; drill bit scrapes on casing; clear
1,259	1,299	3,325	3,402	Casing joint; drill bit scrapes on casing; clear
1,299	1,342	3,402	3,485	Casing joint; drill bit scrapes on casing; clear
1,342	1,385	3,485	3,568	Casing joint; drill bit scrapes on casing; clear
1,385	1,427	3,568	3,647	Casing joint; drill bit scrapes on casing; clear
1,427	1,469	3,647	3,725	Casing joint; drill bit scrapes on casing; clear
1,469	1,506	3,725	3,795	Casing joint; drill bit scrapes on casing; clear
1,506	1,548	3,795	3,873	Casing joint; drill bit scrapes on casing; clear
1,548	1,591	3,873	3,951	Casing joint; drill bit scrapes on casing; clear
1,591	1,627	3,951	4,017	Casing joint; drill bit scrapes on casing; clear
1,627	1,667	4,017	4,092	Casing joint; drill bit scrapes on casing; clear
1,667	1,709	4,092	4,169	Casing joint; drill bit scrapes on casing; clear
1,709	1,751	4,169	4,243	Casing joint; drill bit scrapes on casing; clear

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
1,751	1,792	4,243	4,318	Casing joint; drill bit scrapes on casing; clear
1,792	1,835	4,318	4,394	Casing joint; becoming slightly cloudy
1,835	1,875	4,394	4,466	Casing joint; becoming slightly cloudy
1,875	1,919	4,466	4,540	Casing joint; slightly cloudy
1,919	1,960	4,540	4,605	Casing joint; slightly cloudy
1,960	2,000	4,609	4,663	Casing joint; slightly cloudy
2,000	2,043	4,663	4,725	Casing joint; slightly cloudy
2,043	2,085	4,725	4,786	Casing joint; slightly cloudy
2,085	2,126	4,786	4,844	Casing joint; drill bit marks on casing; slightly cloudy
2,126	2,167	4,844	4,902	Casing joint; drill bit marks on casing; slightly cloudy
2,167	2,203	4,902	4,953	Casing joint; drill bit marks on casing; slightly cloudy
2,203	2,245	4,953	5,014	Casing joint; drill bit marks on casing; slightly cloudy
2,245	2,287	5,014	5,071	Casing joint; drill bit marks on casing; slightly cloudy
2,287	2,329	5,071	5,128	Casing joint; drill bit marks on casing; slightly cloudy
2,329	2,369	5,128	5,182	Casing joint; drill bit marks on casing; slightly cloudy
2,369	2,412	5,182	5,239	Casing joint; drill bit marks on casing; slightly cloudy
2,412	2,454	5,239	5,295	Casing joint; drill bit marks on casing; slightly cloudy

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
2,454	2,496	5,295	5,351	Casing joint; drill bit marks on casing; slightly cloudy
2,496	2,537	5,351	5,406	Casing joint; drill bit marks on casing; slightly cloudy
2,537	2,578	5,406	5,461	Casing joint; drill bit marks on casing; clear
2,578	2,619	5,461	5,516	Casing joint; drill bit marks on casing; clear
2,619	2,643.5	5,516	5,553	Bottom of casing at 2,643.5; slightly cloudy
2,643.5	2,645.5	5,553	5,556	2 foot void below casing; slightly cloudy
2,645.5	2,647	5,556	5,558	Large cavity at 2,646; small cavity at 2,647
2,647	2,649	5,558	5,561	Small pockets; some fractures; clear picture
2449	2,650	5,561	5,563	Small pockets; borehole size abnormal due to lost drill pipe during drilling.
2650	2659	5563	5580	Very smooth; picture very bright; bright reflection due to formation; slightly porous
2659	2663	5580	5586	Fairly smooth borehole; very porous
2663	2667	5586	5593	Fairly smooth borehole; small pockets and voids; clear picture
2667	2676	5593	5616	Rough borehole; larger voids at 2,667; small pockets and very porous
2676	2678	5616	5622	Rough borehole; larger voids; very porous

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
2678	2684	5622	5636	Rough borehole; very porous; pockets; larger pockets at 2,684
2,684	2,689	5,636	5,651	Large cavity; large pockets
2,689	2,693	5,651	5,660	Fairly smooth borehole; small pockets
2,693	2,698	5,660	5,673	Fairly large voids from 2,693-2,698
2,698	2,700	5,673	5,677	Smooth borehole; vertical fractures; clear
2,710	2,715	5,697	5,708	Small pockets; porous; trace vertical fractures
2,715	2,717	5,708	5,714	Larger void spaces; vertical fractures
2,717	2,744	5,714	5,772	Light brighter due to formations; small pockets; borehole abnormal in size due to lost drill pipe during drilling; cloudy; horizontal fracture at 2,737
2,744	2,758	5,772	5,799	Rough borehole; porous horizontal fractures at 2,744; pockets increasing; clear picture
2,758	2,771	5,799	5,836	Large void; very porous; abnormal sized borehole due to lost pipe; small cavities, some vertical fractures
2,771	2,772	5,836	5,838	Camera got stuck at 2,772. End of tape at 2,772; abnormal sized borehole due to lost drill pipe
2,772	2,776	5,838	1,091	Very cloudy; camera stuck in borehole
2,776	2,780	1,091	1,105	Rough borehole; horizontal fracture at 2,779; small pockets

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
2,780	2,794	1,109	1,179	Rough borehole; porous; small pockets; trace fracturing formation change at 2,794
2,794	2,882	1,179	1,646	Borehole fairly smooth; suspended solids; cloudy with some pockets and vertical fracturing
2,882	2,896	1,646	1,695	Smooth borehole; horizontal fracture at 2,896
2,896	2,901	1,695	1,717	Smooth borehole; some small pockets
2,901	2,903	1,717	1,727	Picture getting darker; vertical fractures; small pockets
2,903	2,904	1,727	1,737	Moderately large cavity; vertical fractures
2,904	2,912	1,737	1,780	Large vertical fracture from 2,904 to 2,911; borehole abnormal in size (22 inches); drill rod retrieved at approximately 2,905.
2,912	2,919	1,780	1,814	Moderately large cavities; vertical fracturing
2,919	2,927	1,814	1,850	Fairly smooth; large pockets and fractures
2,927	2,934	1,850	1,881	Fairly smooth; light increasing due to change in formation, porous; small pockets
2,934	2,941	1,881	1,913	Fairly smooth; small voids; trace fractures; picture cloudy
2,941	2,946	1,913	1,938	Some cavernous area from 2,941 to 2,946; large vertical fractures
2,946	2,948	1,938	1,951	Smooth borehole; slightly porous

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
2,948	2,961	1,951	2,017	Large cavern, very dark; huge cavern from 2,955 to 2,961 (6 feet); active becoming clear
2,961	2,968	2,017	2,051	Rough borehole; large pockets; some fracturing and slightly cloudy
2,968	2,972	2,2051	2,072	Cavernous interval (2,968-2,972)' dark
2,972	2,973	2,072	2,080	Vertical fractures; moderately large void spaces
2,973	2,975	2,080	2,088	Large cavernous zone (2,973-2,975); vertical fractures
2,975	2,980	2,088	2,117	Fairly smooth borehole; light increasing; vertical fractures; large horizontal fracture at 2,979
2,980	2,984	2,117	2,130	Moderately smooth boreholes; very porous; small pockets
2,984	2,986	2,130	2,139	Huge cavernous zone from 2,984 to 2,986
2,986	3,021	2,139	2,263	Smooth borehole; horizontal fracture at 2,986 and 2,989; slightly porous; vertical fractures at 2,995; small pockets; large vertical fracture at 3,004
3,021	3,209	2,263	2,282	Moderately smooth borehole; larger pockets; moderate fracture
3,029	3,042	2,282	2,369	Huge cavernous zone at 3,025 to 3,042; very clear picture
3,042	3,044	2,369	2,377	Fairly smooth borehole; large pockets between two large caverns

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
3,044	3,046	2,377	2,388	Large cavernous zone (2 feet); very clear picture
3,046	3,112	2,388	2,605	Fairly smooth borehole; porous; small pockets; small horizontal and vertical fractures; clear picture
3,112	3,188	2,605	2,868	Smooth borehole; trace small horizontal and vertical fractures; large pocket at 3,112; porous; large vertical fracture at 3,158-3,165
3,188	3,199	2,868	2,901	Smooth borehole; abundant horizontal and vertical fractures; very porous at 3,188
3,199	3,217	2,901	2,969	Rough borehole; moderately large cavernous zone at 3,199; very porous; fractures; small pockets
3,217	3,254	2,969	3,114	Rough borehole; large pockets, some fractures; large void space at 3,218; very porous; clear picture; vertical fractures at 3,233 to 3,235; large pocket at 3,240 and 3,242
3,254	3,357	3,114	3,400	Smooth borehole _____ horizontal fractures at 3,254 very porous; small pockets; tract vertical fractures; clear picture
3,357	3,358	3,400	3,403	Rough borehole; large cavernous zone at 3,357-3,358; very porous
3,358	3,368	3,403	3,432	Very smooth borehole; small pockets;; large pockets at 3,365 and 3,367; porous; large pockets at 3,378
3,368	3,375	3,432	3,452	Rough borehole; many pockets; very porous

Depth in Feet		Reel Counter		OBSERVATIONS
From	To	From	To	
3,375	3,401	3,452	3,520	Rough borehole, large horizontal fracture at 3,384; very porous; many pockets
3,401	3,418	3,520	3,566	Very smooth borehole; slightly porous; small pockets
3,418	3,443	3,566	3,639	Smooth borehole; horizontal fracture at 3,418, 3,420, 3,421, and 3,426; large pockets at 3,429
3,443				Total depth of borehole 3,443 feet

INJECTION TEST DATA

INJECTION WELL NO. 1

Palm Beach County
Southern Region Wastewater
Treatment Plant DIW's
Injection Test Data
IW-1
October 31, 1990
SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)	
STEP 0 (BACKGROUND)									
0700	0.00				0.00	0.00			Start data logger - 0700 hrs Pressure transducers set AT 0.0 feet NGVD in IW-2 and the Lower Monitor Zone. Transducers referenced to zero to indicate change in head.
	0.25				1.26	-0.04			
	0.50				1.33	-0.01			
	0.75				0.85	-0.03			
0701	1.00				0.09	-0.02			
	1.25				0.15	-0.02			
	1.50				0.15	-0.02			
	1.75				0.31	0.00			
0702	2.00				0.00	-0.02			
	2.50				-0.86	-0.02			
0703	3.00				0.09	-0.01			
	3.50				-0.07	-0.03			
0704	4.00				-0.16	-0.02			
	4.50				0.28	-0.01			
0705	5.00				0.03	-0.02			
	5.50				-0.10	-0.01			
0706	6.00				-0.04	-0.02			
	6.50				0.15	-0.02			
0707	7.00				-0.07	-0.03			
	7.50				-0.04	-0.03			
0708	8.00				0.09	-0.04			
	8.50				-0.48	-0.03			
0709	9.00				-0.42	-0.02			
	9.50				0.03	-0.05			
0710	10.00				-1.43	-0.05			
0712	12.00				0.38	-0.02			
0714	14.00				-0.76	-0.04			

Palm Beach County
Southern Region Wastewater
Treatment Plant DIW's
Injection Test Data
IW-1
October 31, 1990
SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)	
0716	16.00				-0.29	-0.04			
0718	18.00				0.31	-0.05			
0720	20.00				-0.95	-0.04			
0722	22.00				-0.29	-0.05			
0724	24.00				-0.60	-0.06			
0726	26.00				0.06	-0.07			
0728	28.00				-0.57	-0.07			
0730	30.00				-0.67	-0.05			
0740	40.00				-0.54	-0.08			
0750	50.00				-0.67	-0.08			
0800	60.00			21.90	-0.86	-0.11	21.11	9.14	Start recording from IW-1 wellhead and upper zone.
0810	70.00			21.90	-0.73	-0.13			
0820	80.00				-1.14	-0.14			
0830	90.00				-1.24	-0.17			
STEP 1									
0830	0.00		514800	21.90	-1.27	-0.16			Water level in canal: 15'10" NGVD; start step 1
	0.25			30.00	-1.24	-0.18			
	0.50	1,000		29.00	-1.17	-0.16			
	0.75			29.50	-0.92	-0.18			
0831	1.00			30.00	-0.92	-0.17	21.11	9.14	Flow rate fluctuating
	1.25			28.00	-0.95	-0.17			
	1.50			28.90	0.03	-0.17			
	1.75	2,000	514900	29.00	-1.30	-0.17			
0832	2.00			29.20	-0.04	-0.17	21.11	9.14	
	2.50			29.50	-1.30	-0.17			
	3.00	3,800		29.50	-1.17	-0.17	21.11	9.14	
	3.25			29.50					IW-1 Pressure stabilizing
	3.50			29.60	-1.74	-0.17			

Palm Beach County
Southern Region Wastewater
Treatment Plant DIW's
Injection Test Data

IW-1

October 31, 1990

SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)	
	3.75			29.50					
0834	4.00		515000	29.50	-1.11	-0.17	21.11	9.14	
	4.50	3,800		31.70	-1.46	-0.18			
0835	5.00	3,800	515000	31.30	-1.40	-0.17	21.11	9.14	
	5.50			31.20	-1.08	-0.17			
0836	6.00	3,800		31.20	-1.40	-0.18	21.11	9.14	
	6.50			31.20	-1.17	-0.18			
0837	7.00			31.20	-1.33	-0.18	21.14	9.15	
	7.50	3,800	515100	33.00	-1.14	-0.18			
0838	8.00	3,800		32.80	-1.11	-0.19	21.16	9.16	
	8.50	3,800		32.90	-1.17	-0.18			
0839	9.00	4,000		33.00	-1.24	-0.18	21.16	9.16	
	9.50	4,000		32.90	-1.30	-0.17			
0840	10.00	4,000	515200	32.80	-0.32	-0.18	21.16	9.16	
0841	11.00	4,000	515200						
0842	12.00	4,000	515300	32.70	-0.89	-0.20	21.16	9.16	
0843	13.00	4,000	515350						
0844	14.00	4,000		32.50	-0.51	-0.18	21.16	9.16	
0845	15.00	3,500	515500						
0846	16.00	4,600	515500	32.50	-0.76	-0.19	21.16	9.16	
0847	17.00	4,500	515700	32.40					
0848	18.00			32.50	-0.86	-0.19	21.16	9.16	
0849	19.00			32.50					
0850	20.00	4,700	515700	32.40	-0.42	-0.18	21.16	9.16	
0852	22.00	4,700	515800	32.30	-0.54	-0.20			
0854	24.00	4,800	515900	32.20	-0.48	-0.19			
0856	26.00	4,800	516000	32.20	-0.76	-0.20	21.16	9.16	
0858	28.00	4,400	516100	32.10	-0.48	-0.19			
0900	30.00	4,600	516200	32.10	-0.76	-0.22	21.16	9.16	IW-1 wellhead: Cond.: 400 uhmos/cm;temp.: 72 F

Palm Beach County
Southern Region Wastewater
Treatment Plant DIW's
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IW-1
October 31, 1990
SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS	
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)			
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)		
0905	35.00	4,800	516500	32.10					Start logging with flow meter Logger stuck Logger free; IW-1 wellhead: cond.: 400 uhmos/cm; IW-1 wellhead: Cond.: 400 uhmos/cm; temp.: 74 F Start step 2; IW-1 wellhead: cond.: 450 uhmos/cm; Temp.: 72 F	
0910	40.00	4,600	516700	32.00	-0.64	-0.19				
0915	45.00	4,700	516900	32.00						
0920	50.00	4,600	517100	32.00	-0.45	-0.22				
0925	55.00	4,500	517350	32.00						
0930	60.00	4,800	517450	32.00	-1.11	-0.24	21.14	9.15		
1030	120.00	4,500	520380	31.50	-1.95	-0.29	21.02	9.10		
1130	180.00	4,600	522930	31.50	-0.70	-0.28	21.02	9.10		
1230	240.00	4,600	525750	31.90	-1.90	-0.31	21.14	9.15		
1330	300.00	4,600	528200	31.90	-3.48	-0.26	21.14	9.15		
STEP 2										
1330	0.00		528340	36.50	-3.48	-0.25				Start step 2; increase flowrate
	0.25			35.50	-3.32	-0.26				
	0.50			35.50	-3.51	-0.25				
	0.75			35.50	-3.52	-0.25				
1331	1.00			35.50	-3.55	-0.25	21.14	9.15		
	1.25			35.60	-3.48	-0.25				
	1.50	6,000	528540	35.60	-3.51	-0.25				
	1.75			37.70	-3.51	-0.25				
1332	2.00			37.50	-3.51	-0.25	21.14	9.15		
	2.25			37.50						
	2.50	7,000	528580	37.50	-3.58	-0.25				
	2.75			37.50						
1333	3.00			39.90	-3.36	-0.25	21.18	9.17		
	3.25			39.50						
	3.50	7,000	528640	38.00	-3.51	-0.24				
	3.75			38.20						

Palm Beach County
 Southern Region Wastewater
 Treatment Plant DIW's
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 IW-1
 October 31, 1990
 SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
						(FEET)	(FEET)	(PSI)	
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)	
1334	4.00			38.20	-3.58	-0.25	21.21	9.18	Flow Rate Fluctuating
	4.25			40.30					
	4.50			40.00	-3.48	-0.24			
	4.75			40.00					
1335	5.00	7,800	528710	40.00	-3.45	-0.24	21.21	9.18	
	5.50		528740	40.10	-3.36	-0.24			
1336	6.00		528780	40.10	-3.45	-0.24	21.21	9.18	
	6.50		528810	40.10	-3.51	-0.24			
1337	7.00		528840	40.10	-3.42	-0.24	21.21	9.18	
	7.50	7,200	528880	40.10	-3.45	-0.24			
1338	8.00	7,200	528920	40.00	-3.45	-0.24	21.18	9.17	
	8.50			40.10	-3.48	-0.24			
1339	9.00	7,200	529000	40.00	-3.39	-0.24	21.18	9.17	
	9.50	7,200	529030	40.10	-3.45	-0.24			
1340	10.00	7,200	529060	40.10	-3.51	-0.24	21.18	9.17	
1341	11.00	7,200	529150	40.00					
1342	12.00	7,200	529210	40.00	-3.39	-0.24	21.18	9.17	
1343	13.00	7,200	529280	40.00					
1344	14.00	7,200	529360	40.10	-3.36	-0.23	21.18	9.17	
1345	15.00	7,200	529420	40.10					
1346	16.00	7,200	529510	40.00	-3.51	-0.23	21.18	9.17	
1347	17.00	7,200	529560	40.00					
1348	18.00	7,200	529640	40.10	-3.55	-0.22	21.18	9.17	
1349	19.00	7,200	529760	40.00					
1350	20.00	7,200	529780	40.10	-3.58	-0.22	21.18	9.17	
1352	22.00	7,200	529860	40.00	-3.64	-0.22			
1354	24.00	7,200	530160	40.10	-3.58	-0.21			
1356	26.00	7,200	530210	40.10	-3.51	-0.21	21.18	9.17	
1358	28.00	7,200	530350	40.10	-3.55	-0.21			

Palm Beach County
Southern Region Wastewater
Treatment Plant DIW's
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IW-1

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SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)	
1400	30.00	7,200	530500	40.10	-3.51	-0.20	21.18	9.17	IW-1 wellhead: Cond.: 425 uhmos/cm; temp.: 74 F Level in canal up 1" from start of test
1405	35.00	7,200	530850	40.10					
1410	40.00	7,200	531210	40.10	-3.45	-0.18			
1415	45.00	7,200	531570	40.10					
1420	50.00	7,200	531920	40.10	-3.45	-0.17			
1425	55.00	7,200	532280	40.10					
1430	60.00	7,200	532630	40.10	-3.61	-0.15	21.21	9.18	
1530	120.00				-3.10	-0.05	21.18	9.17	IW-1 wellhead: Cond.: 450 uhmos/cm; temp.: 74 F Increase flow rate; start step 3
STEP 3									
1529	0.00		536900	40.10	-2.94	-0.05	21.18	9.17	Start Step 3
	0.25			45.00	-3.07	-0.06			
	0.50	10,000		44.00	-3.10	-0.05			
1531	0.75	10,500		44.00	-3.04	-0.05			Still increasing flowrate
	1.00	10,000	537400	46.50	-3.36	-0.05	21.18	9.17	
	1.25			47.50	-3.26	-0.04			
	1.50			46.50	-3.07	-0.05			
	1.75			47.00	-3.13	-0.04			
1532	2.00	10,000		49.50	-3.32	-0.05	21.25	9.20	
	2.25			49.50					
	2.50			49.50	-3.23	-0.04			
	2.75			50.10					
1533	3.00			50.50	-3.07	-0.04	21.25	9.20	
	3.25			50.50					
	3.50			53.00	-3.17	-0.04			
1534	3.75			53.00					Flow rate stable
	4.00			54.00	-3.07	-0.04	21.25	9.20	
	4.25			54.00					
	4.50			53.00	-2.85	-0.04			

Palm Beach County
Southern Region Wastewater
Treatment Plant DIW's
Injection Test Data
IW-1
October 31, 1990
SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)	
1535	4.75			53.50					
	5.00			53.50	-2.88	-0.03	21.25	9.20	
	5.50			53.00	-3.23	-0.03	21.25	9.20	
1536	6.00	10,000	537550	53.00	-3.10	-0.03	21.25	9.20	
	6.50			53.00	-3.13	-0.03	21.25	9.20	
1537	7.00			53.00	-3.04	-0.03	21.25	9.20	
	7.50			53.00	-2.98	-0.03	21.25	9.20	
1538	8.00	10,500	537700	53.00	-3.39	-0.03	21.25	9.20	
	8.50			52.50	-2.82	-0.03	21.25	9.20	
1539	9.00	10,600	537800	52.50	-3.01	-0.03	21.25	9.20	
	9.50			52.50	-3.01	-0.02	21.25	9.20	
1540	10.00	10,500	537900	53.50	-2.91	-0.03	21.25	9.20	Adjust flow rate, just below 10,500 gpm
1541	11.00	10,500	538000	53.50			21.25	9.20	
1542	12.00	10,500	538100	54.00	-3.07	-0.03	21.25	9.20	
1543	13.00	10,250	538300	54.50			21.25	9.20	
1544	14.00	10,500	538400		-3.04	-0.02	21.25	9.20	
1545	15.00	10,400	538000	54.50			21.25	9.20	
1546	16.00	10,500		54.50	-2.91	-0.02	21.25	9.20	
1547	17.00			54.50			21.25	9.20	
1548	18.00			55.00	-2.85	-0.02	21.25	9.20	
1549	19.00	10,500	538800	55.00			21.25	9.20	
1550	20.00	11,000	539000		-2.91	-0.01	21.25	9.20	
1552	22.00	10,200	539100	55.00	-2.79	0.00			
1554	24.00			55.00	-2.82	0.00			
1556	26.00	10,000	539400	55.50	-2.79	0.00	21.25	9.20	
1558	28.00	10,600	539700	55.50	-2.85	0.00			
1600	30.00	10,500	540100	55.50	-2.79	0.01	21.25	9.20	Rate stable @10.4-10.5k gpm
1605	35.00	10,500	540300	55.50					IW-1 wellhead: Cond.: 400 uhmos/cm; temp.: 74 F
1610	40.00	10,700	540900	55.50	-2.63	0.01			

Palm Beach County
Southern Region Wastewater
Treatment Plant DIW's
Injection Test Data
IW-1
October 31, 1990
SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS	
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)			
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)		
1615	45.00	10,700	541500	55.50						
1620	50.00	10,400	542200	55.50	-2.69	0.03				
1625	55.00	10,400	542600	55.50						
1630	60.00	10,500	543100	55.50	-2.25	0.05	21.25	9.20	IW-1 wellhead: Cond.: 400 uhmos/cm; temp.: 74 F Stop step 3; start recording recovery (Step 4)	
1729	120.00	10,500	549000	55.50			21.25	9.20		
STEP 4 RECOVERY	TIME SINCE PUMP STOPPED									
1729	0.00	0	549000	55.50	-1.74	0.09				Shut pump down slowly; start step 4 (Recovery)
	0.25	0	549000	45.00	-1.74	0.09				
	0.50	0	549000	40.00	-1.62	0.09				
	0.75	0	549000	33.00	-1.81	0.09				
1730	1.00	0	549000	32.00	-1.62	0.09	21.25	9.20		
	1.25	0	549000	30.00	-1.43	0.09				
	1.50	0	549000	26.00	-1.43	0.09				
	1.75	0	549000	23.00	-1.55	0.09				
1731	2.00	0	549000	26.00	-1.74	0.09	21.25	9.20		
	2.25	0	549000	26.50						
	2.50	0	549000	26.00	-1.58	0.09				
	2.75	0	549000	26.00						
1732	3.00	0	549000	26.10	-1.65	0.08	21.25	9.20	0.0 flow	
	3.25	0	549000	26.10						
	3.50	0	549000	26.20	-2.12	0.08				
	3.75	0	549000	26.10						
1733	4.00	0	549000	26.20	-1.90	0.08	21.25	9.20		
	4.25	0	549000	26.10						
	4.50	0	549000	26.10	-1.71	0.08				
	4.75	0	549000	26.10						
1734	5.00	0	549000	26.10	-1.58	0.08	21.25	9.20		
	5.50	0	549000	26.10	-1.90	0.08				

Water level in canal: 15'11" NGVD

Palm Beach County
Southern Region Wastewater
Treatment Plant DIW's
Injection Test Data
IW-1
October 31, 1990
SEF24770.T0

ACTUAL TIME	TIME SINCE PUMP STARTED	APPROXIMATE FLOW RATE	TOTALIZER x100	IW-1 WELLHEAD PRESSURE	IW-2 WATER LEVEL	DUAL-ZONE MONITOR WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
(HOURS)	(MIN)	(GPM)	(GALLONS)	(PSI)	(FEET)	(FEET)	(FEET)	(PSI)	
1735	6.00	0	549000	26.10	-1.74	0.08	21.25	9.20	
	6.50	0	549000	26.10	-1.36	0.07			
1736	7.00	0	549000	26.10	-1.68	0.07	21.25	9.20	
	7.50	0	549000	26.10	-1.81	0.08			
1737	8.00	0	549000	26.10	-2.06	0.08	21.25	9.20	
	8.50	0	549000	26.10	-1.33	0.07			
1738	9.00	0	549000	26.10	-1.84	0.07	21.25	9.20	
	9.50	0	549000	26.10	-2.03	0.07			
1739	10.00	0	549000	26.10	-1.46	0.08	21.25	9.20	
1740	11.00	0	549000	26.10					
1741	12.00	0	549000	26.10	-1.62	0.08			
1742	13.00	0	549000	26.10					
1743	14.00	0	549000	26.10	-2.00	0.07			
1744	15.00	0	549000	26.05			21.25	9.20	
1745	16.00	0	549000	26.01	-1.49	0.06			
1746	17.00	0	549000	26.00					
1747	18.00	0	549000	26.00	-1.84	0.07			
1748	19.00	0	549000	26.00					
1749	20.00	0	549000	26.00	-1.96	0.06			
1751	22.00	0	549000	26.00	-1.49	0.06			
1753	24.00	0	549000	25.95	-1.71	0.06			
1755	26.00	0	549000		-1.21	0.06			
1757	28.00	0	549000	25.90	-1.84	0.06			
1759	30.00	0	549000	25.90	-1.52	0.06	21.25	9.20	
1804	35.00	0	549000	25.90					
1809	40.00	0	549000	25.90	-3.39	0.04			
1814	45.00	0	549000	25.90					
1819	50.00	0	549000	25.90	-3.42	0.03	21.25	9.20	
1824	55.00	0	549000	25.90					Stop recording

INJECTION WELL NO. 2

PALM BEACH COUNTY
SOUTHERN REGION WASTEWATER
TREATMENT PLANT DIW'S
INJECTION TEST DATA
IW-2
NOVEMBER 6, 1990
SEF24770.T0

ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED	PPROXIMAT FLOW RATE	TOTALIZER x100	IW-2 WELLHEAD PRESSURE	IW-1 CHANGE IN WATER LEVEL	DUAL-ZONE MONITOR-WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
						(FEET)	(FEET)	(PSI)	
STEP 0 (BACKGROUND)									
1135	0.00				0.00	0.00	20.213	8.75	Start data logger - 1135 hrs Pressure transduceer set at 0.0 feet NGVD in IW-1 and the Lower Monitor Zones. Transducers referenced to zero to indicate change in head.
	0.25				-0.41	0.01			
	0.50				0.57	0.02			
	0.75				0.03	0.02			
1136	1.00				0.12	0.01			
	1.25				-0.29	0.01			
	1.50				-0.25	-0.01			
	1.75				-0.13	0.00			
1137	2.00				-0.22	0.00			
	2.50				0.28	0.02			
1138	3.00				-0.13	0.00			
	3.50				-0.03	0.00			
1139	4.00				0.06	0.01			
	4.50				-0.29	0.00			
1140	5.00				0.28	0.02			
	5.50				-0.41	0.02			
1141	6.00				-0.48	0.01			
	6.50				-0.38	0.02			
1142	7.00				-0.44	0.02			
	7.50				0.19	0.01			
1143	8.00				0.00	0.00			
	8.50				-0.07	0.00			
1144	9.00				0.25	0.00			
	9.50				-0.25	0.00			
1145	10.00			20.60	-0.29	0.00			
1146	11.00						20.328	8.80	
1147	12.00				-0.16	0.01			
1149	14.00				-0.22	0.02			

PALM BEACH COUNTY
SOUTHERN REGION WASTEWATER
TREATMENT PLANT DIW'S
INJECTION TEST DATA
IW-2
NOVEMBER 6, 1990
SEF24770.T0

ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED (MIN)	PPROXIMAT FLOW RATE (GPM)	TOTALIZER x100 (GALLONS)	IW-2 WELLHEAD PRESSURE (PSI)	IW-1 CHANGE IN WATER LEVEL (FEET)	DUAL-ZONE MONITOR-WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)		UPPER ZONE (1,000-1,096 ft)	
						(FEET)	(FEET)	(PSI)	
1151	16.00			20.60	-0.22	0.01	20.328	8.80	Water level in Canal: 15'11" NGVD
1153	18.00				-0.32	0.01			
1155	20.00				-0.10	0.02			
1157	22.00			20.60	-0.38	0.03	20.351	8.81	
1158	23.00				-0.03	0.00			
1200	25.00			20.60	-0.16	0.00	20.351	8.81	
STEP 1									
1200	0.00	0	552130	20.60	-0.10	-0.02	20.351	8.81	Water level in canal unchanged; Start step 1; IW-2 wellhead: Cond.: 400 uhmos/cm;temp.: 72 Approximate reading of flow rate Approximate reading of flow rate Approximate reading of flow rate Approximate reading of flow rate
	0.25			20.60	-0.41	0.01			
	0.50		552140	25.00	-0.19	-0.01			
	0.75			24.50	-0.35	-0.03			
1201	1.00		552145	24.00	-0.29	-0.01	20.397	8.83	
	1.25		552155	32.00	-0.10	-0.02			
	1.50		552165	27.00	-0.89	-0.01			
	1.75		552180	27.50	-0.41	0.01			
1202	2.00	4,200	552200	28.00	0.57	0.02	20.397	8.83	
	2.25			28.20					
	2.50			28.30	-0.07	0.00			
	2.75			28.50					
1203	3.00	5,200	552345	28.30	-0.19	0.01	20.397	8.83	
	3.25			28.30					
	3.50			28.40	-0.03	0.02			
	3.75			28.30					
1204	4.00		552300	28.40	-0.16	0.02	20.397	8.83	
	4.25			28.40					
	4.50		552323	28.40	-0.13	0.01			
	4.75			28.40					
1205	5.00	5,000		28.30	0.50	0.02	20.397	8.83	
	5.50		552385	28.30	-0.07	0.01			

PALM BEACH COUNTY
SOUTHERN REGION WASTEWATER
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INJECTION TEST DATA

IW-2

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SEF24770.T0

ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED	PPROXIMAT FLOW RATE	TOTALIZER x100	IW-2 WELLHEAD PRESSURE	IW-1 CHANGE IN WATER LEVEL	DUAL-ZONE MONITOR-WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
						(FEET)	(FEET)	(PSI)	
1206	6.00	5,300	552404	28.40	0.31	0.00	20.397	8.83	
	6.50		552435	28.40	0.03	0.02			
1207	7.00	5,300	552465	28.30	-0.10	0.01	20.397	8.83	
	7.50		552485	27.00	0.16	0.01			
1208	8.00	4,400	552503	27.00	-0.07	0.01	20.397	8.83	
	8.50			27.00	-0.03	0.00			
1209	9.00	4,400	552565	26.90	-0.25	0.01	20.397	8.83	
	9.50			26.90	0.25	0.01			
1210	10.00		552600	26.90	0.03	0.00	20.397	8.83	
1211	11.00	4,400	552650	26.90					
1212	12.00	4,400	552690	26.80	-0.16	-0.01	20.397	8.83	
1213	13.00	4,400	552730	26.70					
1214	14.00	4,400	552782	26.70	0.12	0.00	20.397	8.83	
1215	15.00	4,500	552820	26.70					
1216	16.00	4,500	552870	26.70	0.00	0.00	20.397	8.83	
1217	17.00		552913	26.70					
1218	18.00		552958	26.60	-0.10	0.01	20.397	8.83	
1219	19.00		553010	26.60					
1220	20.00			26.60	-0.16	0.01	20.420	8.84	
1222	22.00	4,500	553133	26.50	0.47	0.01			
1224	24.00	4,500	553230	26.50	0.00	0.01			
1226	26.00	4,500	553312	26.40	0.31	-0.01			
1228	28.00	4,500	553400	26.40	-0.35	-0.02			
1230	30.00		553490	26.40	-0.29	-0.02	20.397	8.83	IW-2 wellhead: Cond.: 400 uhmos/cm; temp.: 74
1235	35.00	4,300	553830	26.40					
1240	40.00	4,300	553950	26.30	-0.16	0.00			
1245	45.00	4,500	554175	26.30					
1250	50.00	4,500	554348	26.30	0.25	-0.03			
1255	55.00	4,500	554530	26.30					
1300	60.00	4,500	554773	26.30	0.03	-0.05	20.397	8.83	

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IW-2

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ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED	PPROXIMAT FLOW RATE	TOTALIZER x100	IW-2 WELLHEAD PRESSURE	IW-1 CHANGE IN WATER LEVEL	DUAL-ZONE MONITOR-WELL			COMMENTS	
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)			
						(FEET)	(FEET)	(PSI)		
1400	120.00	4,500	557300	26.30	-0.51	-0.13	20.420	8.84	IW-2 Wellhead: Cond.: 475 uhmos/cm; temp.: 74 IW-2 Wellhead: Cond.: 400 uhmos/cm; temp.: 74 IW-2 Wellhead: Cond.: 510 uhmos/cm; Temp 74 Increase flow rate; start step 2	
1500	180.00	4,300	560000	26.30	-0.70	-0.22	20.397	8.83		
1660	240.00	4,500	562580	26.30	-0.48	-0.26	20.420	8.84		
1700	300.00	4,500	565030	26.30	-0.67	-0.31	20.420	8.84		
STEP 2										
1700	0.00		565030	26.30	-0.54	-0.30	20.420	8.84	Start step 2	
		0.25		34.00	-1.24	-0.30				
	0.50		32.50	-0.29	-0.30					
	0.75		32.50	-0.44	-0.29					
1701	1.00	7,900	565100	32.50	-0.60	-0.30	20.420	8.84		
				1.25	32.60	-0.29				-0.29
				1.50	32.60	-0.92				-0.29
1702	1.75		565190	32.60	-0.41	-0.28	20.420	8.84		
		2.00		32.50	-0.67	-0.30				
		2.25		32.60						
	2.50		32.60	-0.54	-0.30					
1703	2.75	7,800	565250	32.60			20.420	8.84		
				3.00	32.60	-0.73			-0.30	
				3.25	32.60					
1704	3.50	7,800	565317	32.60	-0.44	-0.30	20.420	8.84		
				3.75	32.60					
				4.00	32.60	-0.41			-0.30	
	4.25		565343	32.60						
	4.50	7,800	565425	32.60	-0.82	-0.30	20.420	8.84		
1705	4.75			7,800	32.60					
				5.00	7,800	32.70			-0.79	-0.27
1706	5.50	7,800	565495	32.60	-0.60	-0.30	20.420	8.84		
		6.00	7,800	565495	32.60	-0.63			-0.29	
	6.50	7,800	565546	32.60	-0.38	-0.30				

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ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED	PPROXIMAT FLOW RATE	TOTALIZER x100	IW-2 WELLHEAD PRESSURE	IW-1 CHANGE IN WATER LEVEL	DUAL-ZONE MONITOR-WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
						(FEET)	(FEET)	(PSI)	
1707	7.00	7,800	565575	32.60	-0.73	-0.30	20.420	8.84	
	7.50	7,800	565615	32.60	-0.60	-0.30			
1708	8.00	7,800	565652	32.50	-0.25	-0.32	20.397	8.83	
	8.50	7,800	565690	32.50	-0.51	-0.29			
1709	9.00	7,800	565730	32.60	-0.29	-0.30	20.397	8.83	
	9.50	7,800	565773	32.60	-0.57	-0.30			
1710	10.00	7,800	565808	32.70	-0.51	-0.30	20.397	8.83	
1711	11.00	7,800	565885	32.70					
1712	12.00	7,800	565975	32.70	-0.32	-0.29	20.351	8.81	
1713	13.00	7,800	566040	32.70					
1714	14.00	7,800	566120	32.70	-0.60	-0.29	20.351	8.81	
1715	15.00	7,800	566100	32.70					
1716	16.00			32.70	-0.70	-0.28	20.351	8.81	
1717	17.00	7,800	566350	32.70					
1718	18.00	7,800	566425	32.70	-0.48	-0.29	20.351	8.81	
1719	19.00	7,800	566500	32.70					
1720	20.00	7,800	566578	32.70	0.03	-0.28	20.351	8.81	
1722	22.00	7,800	566733	32.70	-0.70	-0.28			
1724	24.00	7,800	566889	32.70	-0.92	-0.30			
1726	26.00			32.70	-0.57	-0.29			
1728	28.00	7,800	567198	32.70	-0.63	-0.29			
1730	30.00	7,800	567350	32.70	-2.22	-0.35	20.351	8.81	IW-2 Wellhead: Cond. 500 uhmos/cm; Temp. 72
1735	35.00	7,800	567730	32.70					
1740	40.00	7,800	568150	32.70	-2.22	-0.34			
1745	45.00			32.70					
1750	50.00	7,800	568900	32.70	-2.22	-0.34			
1755	55.00	7,800	566279	32.70					
1800	60.00	7,800	566668	32.70	-2.25	-0.34	20.351	8.81	IW-2 Wellhead: Cond. 500 uhmos/cm; Temp 74
1900	120.00	7,800	574310	32.70	-2.18	-0.30	20.328	8.80	Increase flow rate; Start step 3

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ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED	PPROXIMAT FLOW RATE	TOTALIZER x100	IW-2 WELLHEAD PRESSURE	IW-1 CHANGE IN WATER LEVEL	DUAL-ZONE MONITOR-WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
						(FEET)	(FEET)	(PSI)	
STEP 3									
1900	0.00		574310	32.70	-2.15	-0.30	20.328	8.80	Adjusting flow; Start step 3
	0.25			39.00	-2.15	-0.30			
	0.50			40.50	-2.15	-0.30			
	0.75		574380	40.00	-2.12	-0.30			
1901	1.00			40.00	-2.15	-0.30	20.328	8.80	
	1.25			40.00	-2.15	-0.30			
	1.50			40.00	-2.12	-0.30			
	1.75			39.50	-2.15	-0.30			
1902	2.00	10,500	574480	40.00	-2.12	-0.30	20.328	8.80	
	2.25		574535	40.00					
	2.50	10,400	574563	40.00	-2.12	-0.30			
	2.75			39.00					
1903	3.00			39.50	-2.12	-0.30	20.328	8.80	
	3.25			39.50					
	3.50			39.50	-2.15	-0.30			
	3.75	10,000	574600	39.50					
1904	4.00		574700	39.50	-2.12	-0.30	20.328	8.80	Flow stabilizing @ 10,000 gpm
	4.25								
	4.50			39.50	-2.12	-0.29			
	4.75		574890	40.00					
1905	5.00	10,100	574910	40.00	-2.15	-0.30	20.305	8.79	
	5.50			40.00	-2.12	-0.29			
1906	6.00	10,400	574915	39.50	-2.09	-0.29	20.328	8.80	
	6.50		574978	40.00	-2.12	-0.29			
1907	7.00	10,400	575280	40.00	-2.09	-0.29	20.328	8.80	
	7.50			40.00	-2.15	-0.29			
1908	8.00	10,800	575320	40.00	-2.09	-0.29	20.328	8.80	
	8.50			40.00	-2.12	-0.29			

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ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED	PPROXIMAT FLOW RATE	TOTALIZER x100	IW-2 WELLHEAD PRESSURE	IW-1 CHANGE IN WATER LEVEL	DUAL-ZONE MONITOR-WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
						(FEET)	(FEET)	(PSI)	
1909	9.00			40.00	-2.12	-0.29	20.305	8.79	
	9.50			40.00	-2.12	-0.29			
1910	10.00			40.00	-2.12	-0.29	20.305	8.79	
1911	11.00			40.00					
1912	12.00	10,600	575565	40.00	-2.12	-0.29	20.305	8.79	
1913	13.00	10,700	575670	39.50					
1914	14.00	10,700	575778	40.00	-2.12	-0.28	20.305	8.79	
1915	15.00		575865	40.00					
1916	16.00	10,500	575965	39.50	-2.12	-0.28	20.305	8.79	Water level in canal 15'11" NGVD
1917	17.00		576072	39.50					
1918	18.00		576175	39.50	-2.12	-0.28	20.305	8.79	
1919	19.00	10,500	576578	40.00					
1920	20.00	10,500	576382	40.00	-2.09	-0.28	20.305	8.79	
1922	22.00	10,600	576594	40.00	-2.12	-0.27			
1924	24.00	10,500	576798	40.00	-2.12	-0.27			
1926	26.00	10,500	577005	40.00	-2.15	-0.27			
1928	28.00	10,500	577215	40.00	-2.09	-0.27			
1930	30.00	10,500	577425	40.00	-2.09	-0.26	20.305	8.79	IW-2 Wellhead: Cond. 500 uhmos/cm; Temp 72
1935	35.00	10,500	577961	40.00					
1940	40.00	10,500	578467	39.50	-2.12	-0.26			
1945	45.00	10,500	579885	40.00					
1950	50.00	10,500	579506	40.00	-2.09	-0.24			
1955	55.00	10,500		40.00					
2000	60.00	10,500	580550	40.00	-2.06	-0.23	20.305	8.79	
2100	120.00	10,500	586915	40.00	-1.96	-0.16	20.259	8.77	Water level in canal: 15'11" NGVD; Stop step 3; Start recording Recovery (Step 4)
STEP 4 (RECOVERY)	TIME SINCE PUMP STOPPED								
2100	0.00			40.00	-1.96	-0.16	20.259	8.77	Start Step 4 (Recovery)
	0.25			35.50	-2.03	-0.16			
	0.50			32.50	-1.99	-0.16			

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IW-2

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ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED	PPROXIMAT FLOW RATE	TOTALIZER x100	IW-2 WELLHEAD PRESSURE	IW-1 CHANGE IN WATER LEVEL	DUAL-ZONE MONITOR-WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
						(FEET)	(FEET)	(PSI)	
2101	0.75			29.50	-1.99	-0.16			
	1.00			25.00	-1.99	-0.16	20.259	8.77	
	1.25			26.00	-1.99	-0.16			
	1.50			25.80	-2.03	-0.16			
	1.75			22.50	-2.03	-0.16			
2102	2.00			22.00	-1.99	-0.17	20.259	8.77	IW-2 Gauge fluctuating
	2.25								IW-2 Gauge fluctuating
	2.50				-2.03	-0.17			IW-2 Gauge fluctuating
2103	2.75								IW-2 Gauge fluctuating
	3.00			20.00	-2.06	-0.17	20.259	8.77	
	3.25			21.00					
	3.50			23.00	-2.03	-0.17			
2104	3.75			23.00					
	4.00			23.00	-2.06	-0.17	20.259	8.77	
	4.25			23.20					
2105	4.50			23.00	-2.06	-0.17			
	4.75			23.00					
	5.00			23.00	-2.03	-0.17	20.259	8.77	
	5.50			22.90	-2.03	-0.17			
2106	6.00			22.80	-2.03	-0.17	20.259	8.77	
	6.50			22.70	-2.03	-0.17			
2107	7.00			22.60	-1.99	-0.17	20.236	8.76	
	7.50			22.60	-2.06	-0.17			
2108	8.00			22.50	-2.06	-0.17	20.236	8.76	
	8.50			22.50	-2.03	-0.17			
2109	9.00			22.40	-2.03	-0.17	20.236	8.76	
	9.50				-2.06	-0.17			
2110	10.00			22.30	-2.06	-0.17	20.236	8.76	
2111	11.00			22.20					
2112	12.00			22.10	-1.99	-0.17	20.236	8.76	

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IW-2
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ACTUAL TIME (HOURS)	TIME SINCE PUMP STARTED	PPROXIMAT FLOW RATE	TOTALIZER x100	IW-2 WELLHEAD PRESSURE	IW-1 CHANGE IN WATER LEVEL	DUAL-ZONE MONITOR-WELL			COMMENTS
						LOWER ZONE (1,900-1,984 ft)	UPPER ZONE (1,000-1,096 ft)		
						(FEET)	(FEET)	(PSI)	
2113	13.00			21.90					
2114	14.00			21.80	-2.03	-0.17	20.236	8.76	
2115	15.00			21.70					
2116	16.00			21.70	-2.03	-0.17	20.236	8.76	
2117	17.00			21.70					
2118	18.00			21.70	-2.06	-0.17	20.236	8.76	
2119	19.00			21.70					
2120	20.00			21.70	-2.03	-0.17	20.236	8.76	
2122	22.00			21.70	-2.06	-0.17			
2124	24.00			21.70	-2.06	-0.17			Water level in Canal: 15'11" NGVD
2126	26.00			21.70	-2.06	-0.16			
2128	28.00			21.70	-2.06	-0.16			
2130	30.00			21.70	-2.03	-0.16	20.236	8.76	
2132	32.00			21.70	-2.06	-0.16			
2134	34.00			21.70	-2.06	-0.16			
2136	36.00			21.70	-2.03	-0.16			
2138	38.00			21.70	-2.06	-0.16			
2140	40.00			21.60	-2.03	-0.15			
2142	42.00			21.60	-2.03	-0.15			
2144	44.00			21.60	-2.06	-0.15			
2146	46.00			21.60	-2.03	-0.15			
2148	48.00			21.60	-2.03	-0.15			
2200	60.00			21.60	-2.03	-0.15	20.236	8.76	IW-2 Wellhead: Cond. 500 hmos/cm; Temp 72 F Stop recording

RADIOACTIVE TRACER SURVEYS

RADIOACTIVE TRACER SURVEY IW-1

On November 14, 1990, a Radioactive Tracer Survey (RTS) was performed on IW-1 in presence of FDER. The survey was performed by Schlumberger Wells Services (SWS).

The radioactive isotope used to trace the fluid was Iodine 131. The tracer fluid was placed in a tool equipped with an upper and lower ejector port and an upper, middle, and lower gamma ray detector. The upper detector is positioned above the upper ejector port and the middle and lower detectors are positioned below the lower ejector port. Before entering the well, each ejector port was loaded with 4 millicurie of radioactive tracer. For the static tests, the upper ejector port was located two feet below the base of the casing. For the dynamic tests, the lower ejector port was positioned 10 feet up from the base of the casing at a depth of 2,650 feet bls. Multiple ejections were made during the static and flowing conditions to establish the repeatability of the tests. A total radiation level of 1.5 millicuries was ejected during both static tests and 1.5 and 2.5 millicuries (MCI) were ejected during the first and second dynamic test, respectively. Both dynamic tests were performed at a rate of approximately 37 gpm.

A baseline natural gamma log was run before releasing any tracer from pad level to a total depth of 3,315 feet bls. This segment is listed at the bottom of the SWS geophysical log sheet as "File 1, 14-NOV-90 09:58." The SMS log sheet shows four logs across the page, as follows: Upper gamma detector (GR), casing collar locator (CCL), middle gamma detector (GRTE), and lower gamma detector (GRSG).

The baseline and tracer log horizontal scales for the upper GR range are from zero to 100 gamma API (GAPI) units and the vertical scale is 5 inches equal to 100 feet. The middle GRTE and lower GRSG detector horizontal scales range from zero to 2,000 GAPI with a vertical scale of 5 inches equal to 100 feet.

Ejection No. 1 (First Static Test)

After completion of the baseline gamma log, the tool upper ejector port was positioned at a depth of 2,662 feet bls, which is 2 feet below the total depth of the final casing (2,660 feet). The output of the three gamma detectors after ejection is displayed in "File 2, 14-NOV-90 11:30."

This segment of the log records detector output over time; the bottom of the log is 11:30 and the top is 12:32 with each division equal to 3.75 seconds. Approximately 10.25 minutes into the ejection, the middle detector (GRTE) indicated increased

gamma activity. The upper detector indicated gamma activity at approximately 19 minutes, then the lower detector responded with higher counts at approximately 28 minutes. Sixty-two minutes into the test, the tool was repositioned upwards showing no evidence of tracer above the depth of 2,630 feet bls. This geophysical log is shown in the segment "File 3, 14-NOV-90 12:33."

After the tool repositioning sequence, the injection well was flushed for 15 minutes at a flow rate of 140 gpm to remove any existing tracer slug remaining in the casing. As shown in the log segment "File 4, 14-NOV-90 13:01," the log indicates that tracer still exists at the casing depth of 2,660 feet bls indicating staining but is not of concern since tracer was not observed further up inside the casing.

The results of the first static test indicate no upward migration of radioactive tracer confirming that there are no leaks in the casing.

Ejection No. 2 (Second Static Test)

Following the logging sequence after the flush, a second static test was conducted as shown in "File 4, 14-NOV-90 13:25." The tool was lowered to the same depth as the first static test and a 1.5 MCI slug was ejected from the upper and lower ejector ports. After 2.5 minutes, the middle detector indicated increasing gamma activity. At 9.5 minutes and 17 minutes, the lower and upper detector began showing higher gamma counts, respectively. After 64 minutes, the tool was repositioned upward showing no tracer above the depth of 2,656 feet bls confirming the previous test results that indicate no leaks in the casing.

Ejection No. 1 (First Dynamic Test)

After completion of the second static test, a flow test was conducted to verify integrity of the grout seal around the 24-inch casing. Fresh water was injected into the well at an adjusted rate of approximately 37 gpm. The tool was lowered to a depth of 2,663.5 feet bls with the lower ejector port stationed at 2,650 feet bls, 10 feet above the bottom of the 24-inch casing. A 7.5 MCI tracer fluid was ejected from the upper and lower ejector ports. The output of the three gamma detectors after ejection is displayed in "File 8, 14-NOV-90 15:20."

The bottom of the log is 15:20 and the top is 16:00 with each division equal to 3.75 seconds for a total time of 40 minutes. Approximately 2.5 minutes into the ejection, the middle detector (GRTE), which is 1.8 feet below the lower ejector port, indicated high gamma activity. Seven minutes later, the lower detector (GRSG), located 12.3 feet below the lower ejector port, indicated high gamma activity. This movement of the traced fluid past the two detectors below the lower ejector port is consistent with a fluid velocity of approximately 1 ft/min, equivalent to an injection

rate of 37 gpm in a 24-inch casing. The upper detector showed no increased radio-activity during this first ejection, thus confirming that there was no upward movement of the tracer.

Forty-minutes after ejection, the tool was repositioned upward indicating no tracer activity above the depth of 2,630 feet bls. This geophysical log is shown in the segment "File 9, 14-NOV-90 16:02." No levels of radiation above background were detected around the casing above the depth of 2,630 feet bls, which confirms an adequate grout seal around the casing above the depth of 2,630 feet bls.

Ejection No. 2 (Second Dynamic Test)

The next segment, "File 10, 14-NOV-90 16:25," was a second tracer ejection during the flow test at a depth of 2,650 feet bls. As with ejection No.1, the tracer fluid moved downward past the middle detector at a time of 3 minutes and, 8 minutes later, past the lower detector. No radiation levels higher than background were detected by the upper detector. This result was consistent with the lack of upward movement around the outside of the casing.

Segment "File 11, 14-NOV-90 17:18," is the geophysical log of the tool running upward showing no gamma activity above background above the depth of 2,598 feet bls. This test confirms good cement bonding around the casing above the depth of 2,598 feet.

After completion of the four tracer surveys, the well was pumped at a flow rate of 11,100 gpm for 20 minutes. Following the flush, a final gamma log was run from pad level to the total depth of 3,311 feet bls. Segment "File 12, 14-NOV-90 17:57" displays gamma peaks above background from a depth of 2,650 to 2,660 feet bls where all ejections were made. This was attributed to a tracer stain remaining on the casing from the ejections. The survey above 2,650 feet bls showed no radiation levels above background. Evaluation of the tracer survey data confirmed that there was no upward movement of tracer around the base of the casing.

Residual traces of ejected tracer were observed in the open hole from 2,670 to 2,700 feet, and below 3,200 feet bls. Upon completion of the RTS survey, approximately 100,000 gallons of fresh water were injected to disperse the ejected tracer.

IW-2

On November 13, 1990, an RTS was performed on IW-2 by SWS. The survey was performed in both static and dynamic states to evaluate the integrity of the grout seal at the base of the final casing. The same survey tool used for the RTS on IW-1 was used for this test.

During the static ejection, the bottom of the tool was lowered to a depth where the upper ejector port would be located 2 feet below the total casing depth of 2,645 feet bls. The dynamic ejection required the bottom of the tool to be positioned 10 feet up from the bottom of the casing at a depth of 2,635 feet bls. During the testing, 1.5 MCI of tracer fluid were ejected. Two ejections were performed on the well under static conditions followed by two ejections at a pumping rate of 28 gpm. Multiple ejections during the static and flowing conditions were made to establish the repeatability of the tests.

The radioactive tracer handling was performed in accordance with Schlumberger procedures and state and federal regulations.

A baseline natural gamma log was run from pad level to a total depth of 3,452 feet bls. This segment is listed at the bottom of the geophysical log sheet as "File 1, 13-NOV-90 11:15." The log sheet shows four logs across the page, as follows: Upper gamma detector (GR), casing collar locator (CCL), middle gamma detector (GRTE), and lower gamma detector (GRSG). The CCL identified the base of the 24-inch casing at 1,647 feet. This was 2 feet lower than the casing tally indicated during installation of the casing. This difference can be attributed to cable stretch at this depth in the well.

The baseline and tracer log horizontal scales for the upper GR range are from zero to 100 gamma API (GAPI) units and the vertical scale is 5 inches equal to 100 feet. The middle GRTE and lower GRSG detector horizontal scales range from zero to 2,000 GAPI with a vertical scale of 5 inches equal to 100 feet.

Ejector No. 1 (First Static Test)

After completion of the baseline gamma log, the tool upper ejector port was positioned at a depth of 2,649 feet bls, which is 2 feet below the total depth of the final casing (2,645 feet). The output of the three gamma detectors after ejection is displayed in "File 2, 13-NOV-90 12:59."

This segment of the log records detector output over time; the bottom of the log is 12:59 and the top is 14:02 with each division equal to 3.75 seconds. Approximately 4 minutes into the ejection, the middle detector (GRTE) indicated increased gamma

activity. The upper and lower detectors both indicated gamma activity at approximately 36 minutes into the test. Sixty-three minutes into the test, the tool was repositioned upwards showing no evidence of tracer above the depth of 2,620 feet bls. This geophysical log is shown in the segment "File 3, 13-NOV-90 14:06."

After repositioning the tool, the injection well was flushed for 30 minutes at a flow rate of 130 gpm to remove any existing tracer slug remaining in the casing. As shown in the log segment "File 4, 13-NOV-90 14:32," the log indicates that tracer still exists at the casing depth of 2,642 feet bls which indicates staining but is not of concern since tracer was not observed further up inside the casing.

The results of the first static test indicate no upward migration of radioactive tracer.

Ejection No. 2 (Second Static Test)

Following the logging sequence after the flush, a second static test was conducted as shown in "File 5, 13-NOV-90 14:55." The tool was lowered to the same depth as the first static test and a 1.5 MCI slug of iodine 131 was ejected. After 3.5 minutes, the middle detector indicated a change in gamma activity. At 30.5 minutes and 31 minutes, thereafter, the lower and upper detector began showing higher gamma counts. As the logging sequence "File 6, 13-NOV-90 16:01" indicates, after 66 minutes the tool was repositioned upward showing no tracer above the depth of 2,610 feet.

After repositioning the tool, the injection well was flushed for 30 minutes at a flow rate of 126 gpm to try to remove any existing tracer slug remaining in the casing. As shown in the log segment "File 7, 13-NOV-90 16:28," the log indicates that tracer still exists at the casing depth of 2,640 feet bls indicating staining. This is not of concern, however, since tracer was not observed further up inside the casing.

Ejection No. 1 (First Dynamic Test)

After completion of the second static test, a flow test was conducted to verify integrity of the grout seal around the 24-inch casing. Fresh water was injected into the well at an adjusted rate of approximately 28 gpm. The tool was then lowered to position the lower ejector port at 2,637 feet bls, 10 feet above the bottom of the 24-inch casing. A 1.5 MCI tracer fluid was ejected from the upper and lower ejector ports. The output of the three gamma detectors after ejection is displayed in "File 9, 13-NOV-90 17:29."

The bottom of the log is 17:29 and the top is 18:03 with each division equal to 3.75 seconds. Approximately 3 minutes into the ejection, the middle detector (GRTE), which is 1.8 feet below the lower ejector port, indicated increasing gamma activity. Ten minutes later, the lower detector (GRSG), located 12.3 feet below the lower ejector port, indicated increasing gamma activity. This movement of the tracer

past the two detectors below the lower ejector port is consistent with a fluid velocity of approximately 1 ft/min, equivalent to an injection rate of 28 gpm in a 24-inch casing. The upper detector showed no increased radioactivity during this first ejection, thus confirming that there was no upward movement of the tracer.

Thirty seven-minutes after ejection, the tool was repositioned upward indicating no tracer activity on the upper detector. The lower detector was observed as stained since gamma activity was detected on the detector throughout the repositioning sequence. This geophysical log is shown in the segment "File 10, 13-NOV-90 18:06." As indicated on the middle detector, no levels of radiation above background were detected around the casing above the depth of 2,632 feet bls, which confirms an adequate grout seal around the casing above the depth of 2,632 feet bls.

Ejection No. 2 (Second Dynamic Test)

The next segment, "File 11, 13-NOV-90 18:21," was a second tracer ejection during the flow test at a depth of 2,637 feet bls. As with ejection No.1, the tracer fluid moved downward past the middle detector at a time of approximately 2.5 minutes and, 8 minutes later, past the lower detector. No radiation levels higher than background were detected by the upper detector. This result was consistent with the lack of upward movement around the outside of the casing.

Segment "File 12, 13-NOV-90 18:58," is the geophysical log of the tool running upward and also shows tracer staining on the lower detector. However, the middle and upper detectors indicated no gamma activity above background above the depth of 2,620 feet bls. This test confirms good cement bonding around the casing above the depth of 2,620 feet.

After completion of the four tracer surveys, the well was pumped at a flow rate of 10,000 gpm for 15 minutes. Following the flush, a final gamma log was run from pad level to the total depth of 3,450 feet bls. Segment "File 13, 13-NOV-90 19:50" displays gamma peaks above background at the bottom of the casing (2,636 feet bls) where all injections were made. This was attributed to a tracer stain remaining on the casing from the ejections. The survey above 2,636 feet bls showed no radiation levels above background. Evaluation of the tracer survey data confirmed that there was no upward movement of tracer around the base of the casing.

Residual traces of ejected tracer were not observed in the open hole confirming that the final flush had dispersed the tracer into the formation. However, upon completion of the RTS survey, approximately 100,000 gallons of fresh water were injected to disperse the ejected tracer.

SURFICIAL MONITOR WELL WATER QUALITY DATA

DUAL-ZONE MONITOR WELL
BACKGROUND SAMPLING LABORATORY ANALYSES

DUAL-ZONE MONITOR WELL
PBC SRWWTP DIW's
BACKGROUND PURGING
SEF24770.T0

UPPER MONITOR ZONE

LOWER MONITOR ZONE

DATE	TEMP. (C)	COND. (umhos/cm)	CHLORIDES (mg/l)	TDS (mg/l)	FECAL (Org/100ml)	pH	SULFIDE (mg/l)	TKN (mg/l)	AMMONIA (mg/l)	TEMP. (C)	COND. umhos/cm	CHLORIDES (mg/l)	TDS (mg/l)	FECAL Org/100ml	pH	SULFIDE (mg/l)	TKN (mg/l)	AMMONIA (mg/l)
10/22/90	27.5	10,830	3,800	6,941	<2	6.60	-	2.28	1.55	28.0	49,700	23,040	36,548	<2	7.10	-	0.98	0.80
11/27/90	28.0	11,000	3,750	-	-	-	-	-	-	28.0	48,000	18,500	-	-	-	-	-	-
12/04/90	27.5	8,500	3,100	-	-	-	-	-	-	28.0	47,000	18,000	-	-	-	-	-	-
12/12/90	28.0	8,000	2,800	6,180	<2	7.85	-	-	1.41	28.0	38,500	18,500	33,300	<2	7.50	-	-	1.17
12/20/90	27.0	7,900	2,550	-	-	7.70	3.00	-	-	27.0	46,500	18,450	-	-	7.58	0.00	-	-
12/31/90	27.5	8,500	2,800	-	-	-	-	-	-	28.0	39,000	18,150	-	-	-	-	-	-
01/04/91	28.0	6,900	2,600	-	-	-	-	-	-	28.0	39,500	18,350	-	-	-	-	-	-
01/10/91	28.0	8,000	2,600	-	-	-	-	-	-	28.0	41,000	18,950	-	-	-	-	-	-
01/18/91	28.0	6,500	2,550	-	-	-	-	-	-	27.5	39,200	19,250	-	-	-	-	-	-
01/29/91	28.0	7,900	2,390	4,900	<2	7.70	1.75	0.95	0.92	28.0	45,000	19,800	33,800	<2	8.95	0.00	0.91	0.90

Note: Laboratory test samples.

Samples not shaded were field analyzed.

DUAL-ZONE MONITOR WELL
PBC SRWWTP DIW's
BACKGROUND PURGING
SEF24770.T0

DATE	DURATION OF PURGE (HOURS)		COMMENTS
	UPPER ZONE	LOWER ZONE	
10/15/90	8.0	8.0	Begin purging both zones of the monitor well.
10/16/90	8.0	8.0	
10/17/90	8.0	8.0	
10/18/90	8.0	8.0	
10/18/90	8.0	8.0	
10/22/90	0.0	0.0	Stop purging monitor well temporarily to perform injection tests and RTS.
11/01/90	0.0	8.0	
11/08/90	0.0	10.0	Pump lower zone to kill IW-1.
11/09/90	0.0	6.0	
11/26/90	4.0	4.0	Upper zone producing silt, flow zone at maximum capacity.
11/27/90	10.0	8.0	
11/28/90	10.0	0.0	
11/29/90	8.0	0.0	
11/30/90	8.0	0.0	
12/03/90	8.0	0.0	Upper zone stops producing silt.
12/04/90	8.0	8.0	
12/05/90	8.0	8.0	Upper zone producing small amount of silt.
12/06/90	8.0	8.0	
12/07/90	10.0	10.0	
12/08/90	10.0	10.0	
12/12/90	7.0	7.0	
12/17/90	3.0	0.0	
12/18/90	12.0	0.0	
12/19/90	11.0	11.0	
12/20/90	9.0	4.0	
12/21/90	8.0	0.0	
12/22/90	8.0	0.0	
12/27/90	8.0	0.0	
12/31/90	9.0	9.0	
01/04/91	6.5	6.5	
01/10/91	8.0	8.0	
01/29/91	6.0	6.0	Final background samples collected. Purging discontinued.



February 22, 1991

SEF24770.T0 | AAD883

RE: Palm Beach County Water Utilities Department laboratory samples

Dear Tom McCormick/DFB:

On January 30, 1991 the CH2M Hill Gainesville Laboratory received 4 water, grab samples with a request for analysis of selected parameters.

The analytical results are enclosed. No unusual difficulties were encountered in the analyses. If you should have any questions concerning the results, please call Don Hash or Tom Emenhiser.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Don Hash', is positioned above the typed name.

Don Hash
Client Services

Enclosure(s):

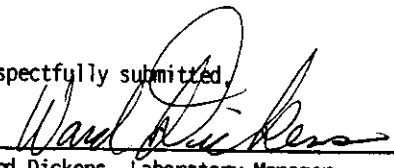
cc: Bart Ziegler/DF

Palm Beach County Water Utilities Department	CH2M HILL
Attention: Tom McCormick Address: DFB Copies to: Bart Ziegler/DFB	Project No: SEF24770.TO Received: 01/30/91 Reported: 02/22/91
Collected: 01/29/91 by Bart Ziegler Type: water, grab Location: Palm Beach County SRWWTP DIW'S	

SAMPLE NUMBER	89647	89648	89649	89650
SAMPLE DESCRIPTIONS	Upper Monitor Zone 01/29/91	Travel Blank Upper Monitor Zone	Lower Monitor Zone 01/29/91	Laboratory Method Blank
GENERAL				
pH (Units)	7.70 01/31/91	n/r n/r	8.95 01/31/91	Not Applicable 01/31/91
Alkalinity, Total (as CaCO ₃)	149 02/12/91	n/r n/r	40.0 02/12/91	<1.0 02/12/91
Color (APHA)	20 01/31/91	n/r n/r	0 01/31/91	0 01/31/91
Conductivity (umhos/cm)	7900 02/13/91	n/r n/r	45,000 02/13/91	<2.0 02/13/91
Hardness, Calcium (as CaCO ₃)	535 02/13/91	n/r n/r	2020 02/13/91	<1.0 02/13/91
Turbidity (NTU)	7.8 01/30/91	n/r n/r	0.73 01/30/91	<0.2 01/30/91
Odor (TON)	N.O.O 01/31/91	n/r n/r	N.O.O 01/31/91	N.O.O 01/31/91
SOLIDS				
Total Dissolved Solids	4900 02/04/91	n/r n/r	33,800 02/04/91	<1.0 02/04/91
METALS				
Antimony - FL	<0.2	<0.2	<0.2	<0.2

NOTE: Values are mg/l as substance unless otherwise stated.
 * Detection limit elevated due to matrix interferences.

Respectfully submitted,


 Ward Dickens, Laboratory Manager

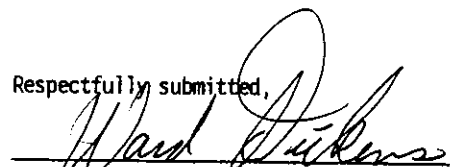
n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.

SAMPLE NUMBER	89647	89648	89649	89650
SAMPLE DESCRIPTIONS	Upper Monitor Zone 01/29/91	Travel Blank Upper Monitor Zone	Lower Monitor Zone 01/29/91	Laboratory Method Blank
Arsenic - FU	02/20/91 <0.025 *	02/20/91 <0.025 *	02/20/91 <0.025 *	02/20/91 <0.005
Barium - FL	02/12/91 1.3	02/12/91 <0.20	02/12/91 <0.20	02/12/91 <0.20
Cadmium - FU	02/12/91 <0.0002	02/12/91 <0.0002	02/12/91 <0.002 *	02/12/91 <0.0002
Chromium, Tot - FU	02/08/91 <0.002	02/08/91 <0.002	02/14/91 <0.002	02/08/91 <0.002
Copper - FL	02/11/91 <0.02	02/11/91 <0.02	02/11/91 0.06	02/11/91 <0.02
Iron, Total - FL	02/13/91 1.3	02/13/91 0.02	02/13/91 1.3	02/13/91 <0.02
Lead - FU	02/13/91 <0.002	02/13/91 <0.002	02/13/91 0.012	02/13/91 <0.002
Manganese - FL	02/13/91 0.04	02/13/91 <0.01	02/13/91 0.77	02/13/91 <0.01
Mercury - CV	02/18/91 <0.0002	02/18/91 <0.0002	02/18/91 <0.0002	02/18/91 <0.0002
Selenium	02/09/91 <0.025 *	02/09/91 <0.005 *	02/19/91 <0.025 *	02/09/91 <0.005
Silver - FL	02/22/91 <0.02	02/22/91 <0.02	02/22/91 0.05	02/22/91 <0.02
Sodium - FL	02/14/91 700	02/14/91 <0.50	02/14/91 10,700	02/14/91 <0.50
Zinc - FL	02/18/91 <0.01	02/18/91 <0.01	02/18/91 0.09	02/18/91 <0.01
	02/13/91	02/13/91	02/13/91	02/13/91
ANIONS				
Chloride	2390 02/22/91	n/r	19,800 02/22/91	<1.0 02/22/91
Fluoride	1.04	n/r	0.43	<0.01

NOTE: Values are mg/l as substance unless otherwise stated.
* Detection limit elevated due to matrix interferences.

Respectfully submitted,


Ward Dickens, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.

SAMPLE NUMBER	89647	89648	89649	89650
SAMPLE DESCRIPTIONS	Upper Monitor Zone 01/29/91	Travel Blank Upper Monitor Zone	Lower Monitor Zone 01/29/91	Laboratory Method Blank
Sulfate	02/13/91 539 02/13/91	n/r n/r n/r	02/13/91 2110 02/13/91	02/13/91 <1.0 02/13/91
NUTRIENTS				
Ammonia (as N)	0.92 02/05/91	n/r n/r	0.90 02/19/91	Not Applicable 02/05/91
Nitrate & Nitrite (as N)	<0.02 02/11/91	n/r n/r	<0.02 02/11/91	<0.02 02/11/91
Kjeldahl Nitrogen (as N)	0.95 02/06/91	n/r n/r	0.91 02/06/91	Not Applicable 02/06/91
Total Nitrogen (as N)	0.95 02/20/91	n/r n/r	0.91 02/20/91	Not Applicable 02/20/91
GENERAL ORGANICS				
Surfactants (MBAS)	<0.025 01/31/91	n/r n/r	<0.025 01/31/91	<0.025 01/31/91
Corrosivity	0.70 02/21/91	n/r n/r	1.95 02/21/91	Not Applicable 02/21/91

NOTE: Values are mg/l as substance unless otherwise stated.

* Detection limit elevated due to matrix interferences.

Respectfully submitted,


Ward Dickens, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.

LOG NO: T1-00257

Received: 01 FEB 91

Mr. Don Hash
 CH2M Hill
 7201 N.W. 11th Place
 Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY	
00257-1	Upper Monitor Zone (89647)	Client	
00257-2	Lower Monitor Zone (89649)		
PARAMETER		00257-1	00257-2
Pesticides (SDWA)			
Endrin, ug/l		<0.020	<0.020
Gamma-BHC, ug/l		<0.010	<0.010
Methoxychlor, ug/l		<0.50	<0.50
Toxaphene, ug/l		<1.0	<1.0
Herbicides (SDWA)			
2,4-D, ug/l		<0.50	<0.50
2,4,5-TP Silvex, ug/l		<0.10	<0.10

LOG NO: T1-00257

Received: 01 FEB 91

Mr. Don Hash
 CH2M Hill
 7201 N.W. 11th Place
 Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY
00257-1	Upper Monitor Zone (89647)	Client
00257-2	Lower Monitor Zone (89649)	

PARAMETER	00257-1	00257-2
601 and 602		
Bromodichloromethane, ug/l	<1.0	<1.0
Bromoform, ug/l	<5.0	<5.0
Bromomethane, ug/l	<1.0	<1.0
Benzene, ug/l	<1.0	<1.0
Carbon tetrachloride, ug/l	<1.0	<1.0
Chlorobenzene, ug/l	<1.0	<1.0
Chloroethane, ug/l	<1.0	<1.0
2-Chloroethylvinyl ether, ug/l	<10	<10
Chloroform, ug/l	<1.0	<1.0
Ethylbenzene, ug/l	<1.0	<1.0
Chloromethane, ug/l	<1.0	<1.0
Dibromochloromethane, ug/l	<1.0	<1.0
1,2-Dichlorobenzene, ug/l	<1.0	<1.0
1,3-Dichlorobenzene, ug/l	<1.0	<1.0
1,4-Dichlorobenzene, ug/l	<1.0	<1.0
Dichlorodifluoromethane, ug/l	<1.0	<1.0
1,1-Dichloroethane, ug/l	<1.0	<1.0
1,2-Dichloroethane, ug/l	<1.0	<1.0
1,1-Dichloroethene, ug/l	<1.0	<1.0
cis/trans-1,2-Dichloroethylene, ug/l	<1.0	<1.0
1,2-Dichloropropane, ug/l	<1.0	<1.0
cis-1,3-Dichloropropene, ug/l	<1.0	<1.0

SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive • Tallahassee, FL 32301 • (904) 878-3994 • Fax (904) 878-9504

LOG NO: T1-00257

Received: 01 FEB 91

Mr. Don Hash
 CH2M Hill
 7201 N.W. 11th Place
 Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY	
00257-1	Upper Monitor Zone (89647)	Client	
00257-2	Lower Monitor Zone (89649)		
PARAMETER		00257-1	00257-2
trans-1,3-Dichloropropene, ug/l		<1.0	<1.0
Methylene chloride, ug/l		<1.0	<1.0
1,1,2,2-Tetrachloroethane, ug/l		<1.0	<1.0
Tetrachloroethene, ug/l		<1.0	<1.0
Toluene, ug/l		<1.0	<1.0
1,1,1-Trichloroethane, ug/l		<1.0	<1.0
1,1,2-Trichloroethane, ug/l		<1.0	<1.0
Trichloroethene, ug/l		<1.0	<1.0
Trichlorofluoromethane, ug/l		<1.0	<1.0
Vinyl Chloride, ug/l		<1.0	<1.0
Xylenes, ug/l		<1.0	<1.0
1,2-Dibromoethane (EDB), ug/l		<0.020	<0.020
Aldrin, ug/l		<0.010	<0.010
Dieldrin, ug/l		<0.020	<0.020
Diethyl Phthalate, ug/l		<10	<10
Dimethyl Phthalate, ug/l		<10	<10
Butyl Benzyl Phthalate, ug/l		<10	<10
Naphthalene, ug/l		<10	<10
Anthracene, ug/l		<10	<10
Phenanthrene, ug/l		<10	<10
Phenol, ug/l		<10	<10
2,4,6-Trichlorophenol, ug/l		<10	<10
2-Chlorophenol, ug/l		<10	<10

LOG NO: T1-00257

Received: 01 FEB 91

Mr. Don Hash
 CH2M Hill
 7201 N.W. 11th Place
 Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY	
00257-3	Travel Blank (89648)	Client	
00257-4	Travel Blank (89651)		
PARAMETER		00257-3	00257-4
601 and 602			
Bromodichloromethane, ug/l		<1.0	<1.0
Bromoform, ug/l		<5.0	<5.0
Bromomethane, ug/l		<1.0	<1.0
Benzene, ug/l		<1.0	<1.0
Carbon tetrachloride, ug/l		<1.0	<1.0
Chlorobenzene, ug/l		<1.0	<1.0
Chloroethane, ug/l		<1.0	<1.0
2-Chloroethylvinyl ether, ug/l		<10	<10
Chloroform, ug/l		<1.0	<1.0
Ethylbenzene, ug/l		<1.0	<1.0
Chloromethane, ug/l		<1.0	<1.0
Dibromochloromethane, ug/l		<1.0	<1.0
1,2-Dichlorobenzene, ug/l		<1.0	<1.0
1,3-Dichlorobenzene, ug/l		<1.0	<1.0
1,4-Dichlorobenzene, ug/l		<1.0	<1.0
Dichlorodifluoromethane, ug/l		<1.0	<1.0
1,1-Dichloroethane, ug/l		<1.0	<1.0
1,2-Dichloroethane, ug/l		<1.0	<1.0
1,1-Dichloroethene, ug/l		<1.0	<1.0
cis/trans-1,2-Dichloroethylene, ug/l		<1.0	<1.0
1,2-Dichloropropane, ug/l		<1.0	<1.0
cis-1,3-Dichloropropene, ug/l		<1.0	<1.0

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LOG NO: T1-00257

Received: 01 FEB 91

Mr. Don Hash
CH2M Hill
7201 N.W. 11th Place
Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	SAMPLED BY	
00257-3	Travel Blank (89648)	Client	
00257-4	Travel Blank (89651)		
PARAMETER		00257-3	00257-4
trans-1,3-Dichloropropene, ug/l		<1.0	<1.0
Methylene chloride, ug/l		<1.0	<1.0
1,1,2,2-Tetrachloroethane, ug/l		<1.0	<1.0
Tetrachloroethene, ug/l		<1.0	<1.0
Toluene, ug/l		<1.0	<1.0
1,1,1-Trichloroethane, ug/l		<1.0	<1.0
1,1,2-Trichloroethane, ug/l		<1.0	<1.0
Trichloroethene, ug/l		<1.0	<1.0
Trichlorofluoromethane, ug/l		<1.0	<1.0
Vinyl Chloride, ug/l		<1.0	<1.0
Xylenes, ug/l		<1.0	<1.0

LOG NO: T1-00257

Received: 01 FEB 91

Mr. Don Hash
 CH2M Hill
 7201 N.W. 11th Place
 Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 6

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY			
00257-5	Lab Blank	Client			
00257-6	Accuracy (% Recovery)				
00257-7	Precision(% RPD)				
00257-8	Date Analyzed				
PARAMETER		00257-5	00257-6	00257-7	00257-8
Pesticides (SDWA)					
Endrin, ug/l		<0.020	108 %	4.6 %	02.06.91
Gamma-BHC, ug/l		<0.010	94 %	8.5 %	02.06.91
Methoxychlor, ug/l		<0.50	---	---	02.06.91
Toxaphene, ug/l		<1.0	---	---	02.06.91
Herbicides (SDWA)					
2,4-D, ug/l		<0.50	83 %	34 %	02.11.91
2,4,5-TP Silvex, ug/l		<0.10	86 %	13 %	02.11.91

LOG NO: T1-00257

Received: 01 FEB 91

Mr. Don Hash
 CH2M Hill
 7201 N.W. 11th Place
 Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 7

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY			
00257-5	Lab Blank	Client			
00257-6	Accuracy (% Recovery)				
00257-7	Precision(% RPD)				
00257-8	Date Analyzed				
PARAMETER		00257-5	00257-6	00257-7	00257-8
501 and 602					
Bromodichloromethane, ug/l	<1.0	---	---	---	02.05.91
Bromoform, ug/l	<5.0	---	---	---	02.05.91
Bromomethane, ug/l	<1.0	---	---	---	02.05.91
Benzene, ug/l	<1.0	95 %	---	5.2 %	02.05.91
Carbon tetrachloride, ug/l	<1.0	---	---	---	02.05.91
Chlorobenzene, ug/l	<1.0	102 %	---	0 %	02.05.91
Chloroethane, ug/l	<1.0	---	---	---	02.05.91
2-Chloroethylvinyl ether, ug/l	<10	---	---	---	02.05.91
Chloroform, ug/l	<1.0	---	---	---	02.05.91
Ethylbenzene, ug/l	<1.0	---	---	---	02.05.91
Chloromethane, ug/l	<1.0	---	---	---	02.05.91
Dibromochloromethane, ug/l	<1.0	---	---	---	02.05.91
1,2-Dichlorobenzene, ug/l	<1.0	---	---	---	02.05.91
1,3-Dichlorobenzene, ug/l	<1.0	---	---	---	02.05.91
1,4-Dichlorobenzene, ug/l	<1.0	---	---	---	02.05.91
Dichlorodifluoromethane, ug/l	<1.0	---	---	---	02.05.91
1,1-Dichloroethane, ug/l	<1.0	---	---	---	02.05.91
1,2-Dichloroethane, ug/l	<1.0	---	---	---	02.05.91
1,1-Dichloroethene, ug/l	<1.0	112 %	---	2.8 %	02.05.91
cis/trans-1,2-Dichloroethylene, ug/l	<1.0	---	---	---	02.05.91

LOG NO: T1-00257

Received: 01 FEB 91

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 Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 8

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY
00257-5	Lab Blank	Client
00257-6	Accuracy (% Recovery)	
00257-7	Precision(% RPD)	
00257-8	Date Analyzed	

PARAMETER	00257-5	00257-6	00257-7	00257-8
1,2-Dichloropropane, ug/l	<1.0	---	---	02.05.91
cis-1,3-Dichloropropene, ug/l	<1.0	---	---	02.05.91
trans-1,3-Dichloropropene, ug/l	<1.0	---	---	02.05.91
Methylene chloride, ug/l	<1.0	---	---	02.05.91
1,1,2,2-Tetrachloroethane, ug/l	<1.0	---	---	02.05.91
Tetrachloroethene, ug/l	<1.0	---	---	02.05.91
Toluene, ug/l	<1.0	98 %	1.8 %	02.05.91
1,1,1-Trichloroethane, ug/l	<1.0	---	---	02.05.91
1,1,2-Trichloroethane, ug/l	<1.0	---	---	02.05.91
Trichloroethene, ug/l	<1.0	99 %	5.0 %	02.05.91
Trichlorofluoromethane, ug/l	<1.0	---	---	02.05.91
Vinyl Chloride, ug/l	<1.0	---	---	02.05.91
Xylenes, ug/l	<1.0	---	---	02.05.91
1,2-Dibromoethane (EDB), ug/l	<0.020	80 %	1.3 %	02.05.91
Aldrin, ug/l	<0.010	115 %	8.7 %	02.06.91
Dieldrin, ug/l	<0.020	107 %	11 %	02.06.91
Diethyl Phthalate, ug/l	<10	---	---	02.20.91
Dimethyl Phthalate, ug/l	<10	---	---	02.20.91
Butyl Benzyl Phthalate, ug/l	<10	---	---	02.20.91
Naphthalene, ug/l	<10	---	---	02.20.91
Anthracene, ug/l	<10	---	---	02.20.91
Phenanthrene, ug/l	<10	---	---	02.20.91
Phenol, ug/l	<10	34 %	0 %	02.20.91

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LOG NO: T1-00257

Received: 01 FEB 91

Mr. Don Hash
 CH2M Hill
 7201 N.W. 11th Place
 Gainesville, Florida 32602

Project: Palm Beach Co.

REPORT OF RESULTS

Page 9

LOG NO	SAMPLE DESCRIPTION , REPORT FOR LIQUID SAMPLES	SAMPLED BY			
00257-5	Lab Blank	Client			
00257-6	Accuracy (% Recovery)				
00257-7	Precision(% RPD)				
00257-8	Date Analyzed				
PARAMETER		00257-5	00257-6	00257-7	00257-8
,4,6-Trichlorophenol, ug/l		<10	---	---	02.20.91
2-Chlorophenol, ug/l		<10	62 %	4.8 %	02.20.91

Method: EPA 40 CFR Part 136 & 141
 HRS Certification #'s:81291,87279,E81005,E87052

Kathy Sheffield

 Kathy Sheffield



02/11/91 16:42

TEST RESULTS BY SAMPLE

Sample: 01A #89647

Collected: 01/29/91

<u>Test Description</u>	<u>Result</u>	<u>D. L.</u>	<u>Units</u>	<u>Analyzed</u>	<u>By</u>
Gross Alpha	4+/-3*	2	pCi/liter		
Radium-226	4.9+/-1.9	0.6	pCi/liter		
Radium-228	<1	1	pCi/liter		

Sample: 02A #89649

Collected: 01/29/91

<u>Test Description</u>	<u>Result</u>	<u>D. L.</u>	<u>Units</u>	<u>Analyzed</u>	<u>By</u>
Gross Alpha	5+/-4*	2	pCi/liter		
Radium-226	6.8+/-2.0	0.6	pCi/liter		
Radium-228	3+/-1	1	pCi/liter		

CHM HILL QUALITY ANALYTICS

CHAIN OF CUSTODY RECORD

PROJECT NUMBER SEP24770.T0		PROJECT NAME PALM BEACH COUNTY SRAWWTP			CLIENT ADDRESS AND PHONE NUMBER On File										FOR LAB USE ONLY												
CLIENT NAME PALM BEACH COUNTY WATER UTILITIES DEPT					# OF CONTAINERS	ANALYSES REQUESTED										LAB# AAD 883	LAB#										
PROJECT MANAGER T. McCormick / OFB						<table border="1"> <tr> <td>601-602</td> <td>END</td> <td>MSAS</td> <td>NO2, TN, NH3</td> <td>FL: TMB, CL, SO4, TDS</td> <td>Grass 2</td> <td>BNA</td> <td>Santa Heen; Pest</td> <td>EXTRA / 2 LITER</td> <td>METALS</td> </tr> </table>										601-602	END	MSAS	NO2, TN, NH3	FL: TMB, CL, SO4, TDS	Grass 2	BNA	Santa Heen; Pest	EXTRA / 2 LITER	METALS	PROJECT NO.	
601-602	END	MSAS	NO2, TN, NH3	FL: TMB, CL, SO4, TDS												Grass 2	BNA	Santa Heen; Pest	EXTRA / 2 LITER	METALS							
REQUESTED COMP. DATE STD						<table border="1"> <tr> <td>SDWA</td> <td>NPDES</td> <td>RCRA</td> <td>OTHER</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>										SDWA	NPDES	RCRA	OTHER	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ACK	VERIFIED		
SDWA	NPDES	RCRA	OTHER																								
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																								
STA NO.	DATE	TIME	COMP	SOIL	SAMPLE DESCRIPTIONS (12 CHARACTERS)										QUOTE#	BS											
1	1/29/91		X		Upper Monitor Zone TRAVEL BLANK	12	2	2	1	1	1	1	1	1	1	89647	PLANE INCORPORATE THESE COMMENTS IN LAB RPT.										
2	1/29/91		X		Lower Monitor Zone SEPARATE COOLER TRAVEL BLANK	12	2	2	1	1	1	1	1	1	1	89649	Lower Zone Tot. Sulfide = 0.57 ppm Temp = 28°C Cond. = 49,000 Upper Zone Temp = 28°C Cond = 9,000 Tot. Sulfide = 1.0 ppm * Please include these parameters and any additional parameter contained on the attached list that are not covered in Primary & Secondary Drinking Water STDs.										
SAMPLED BY AND TITLE B. Ziegler / Probing					DATE/TIME 1/29/91 1400	RELINQUISHED BY					DATE/TIME					HAZWRAP/NEESA Y N											
RECEIVED BY:					DATE/TIME	RELINQUISHED BY:					DATE/TIME					QC LEVEL 1 2 3											
RECEIVED BY:					DATE/TIME	RELINQUISHED BY:					DATE/TIME					COC 4		ICE									
RECEIVED BY:					DATE/TIME	RELINQUISHED BY:					DATE/TIME					ANA REQ 4		TEMP									
RECEIVED BY:					DATE/TIME	RELINQUISHED BY:					DATE/TIME					CUST SEAL no		PH									
RECEIVED BY:					DATE/TIME	RELINQUISHED BY:					DATE/TIME					SAMPLE COND. good/iced											
RECEIVED BY:					DATE/TIME	RECEIVED BY:					DATE/TIME					AIR BILL#											
RECEIVED BY:					DATE/TIME	RECEIVED BY:					DATE/TIME					9610351141 - 9610381152											
RECEIVED BY:					DATE/TIME	RECEIVED BY:					DATE/TIME					ENTERED INTO LIMS			COC REVIEW								

Review Parameter List - DONE 1- 91 1525
 why for sampling is correct in files ARE WRONG

BFORM

BACTERIOLOGICAL ANALYSIS

CH2M HILL

CLIENT NAME AND ADDRESS

800 FAIRWAY DRIVE SUITE 350

DEERFIELD BEACH, FLORIDA 33441

TOTAL COLIFORM MPN

BACTERIOLOGY

PBC SRWWTP DIW

PROJECT NAME

SEF24770.TO

PROJECT NUMBER

CLIENT

SAMPLE COLLECTED BY

NO.	COLLECTED	RECEIVED	SET UP	NBR	RESULT ORG/100mL
-----	-----------	----------	--------	-----	---------------------

SAMPLE #1 UPPER MONITOR ZONE

59018	01-29	1330	01-29	1510 01-29 1530	77-235	<2
-------	-------	------	-------	-----------------	--------	----

<2

SAMPLE #2 LOWER MONITOR ZONE

59019	01-29	1400	01-29	1510 01-29 1530	77-235	<2
-------	-------	------	-------	-----------------	--------	----

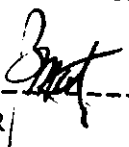
<2

DATE 02-11-91

LAB ID 86122,86109,E86048

BY

DIRECTOR





inc.

1602 CLARE AVENUE • WEST PALM BEACH, FL 33401 • 407/833-7280

MFORMA

ANALYSIS REPORT

CH2M HILL

CLIENT NAME AND ADDRESS

800 FAIRWAY DRIVE SUITE 350

DEERFIELD BEACH, FL 33441

47945

SAMPLE NUMBER

10-22-90 1000 CLIENT 10-22-90 1030

DATE TIME COLL RECD

SRWWTP UPPER ZONE

SEP240770.T0.30

ID ANALYTE	MCL DET LIMIT	METHOD	ANALYSIS DATE INITIAL NBR	RESULTS UNITS
70304 TDS	- 1	209C	10-29-90 CH 81-168	6941 MG/L
00940 CHLORIDE	250 <0.05	300.0	11-07-90 BM #0181	3800 MG/L
00095 SPEC COND		120.1	11-22-90 BM	10830 umho/cm
00400 PH		150.1	11-22-90	6.6
00625 TKN	0.02	351.2	11-07-90 BM 62-425	2.28 MG/L
00610 AMMONIA	- 0.005	350.1	10-28-90 BM 62-425	1.55 MG/L
FECAL COLIFORM			11-22-90 77-192	<2 ORG/100ML

DATE 11-22-90

LAB ID 86122,86109, E86048

BY

DIRECTOR



MFORMA

ANALYSIS REPORT

CH2M HILL

CLIENT NAME AND ADDRESS

800 FAIRWAY DRIVE SUITE 350

DEERFIELD BEACH, FL 33441

47946

SAMPLE NUMBER

10-22-90 1000 CLIENT 10-22-90 1030

DATE TIME COLL RECD

SRWWTP LOWER ZONE

SEF240770.T0.30

ID ANALYTE	MCL DET LIMIT	METHOD	ANALYSIS DATE INITIAL NBR	RESULTS UNITS
70304 TDS	- 1	209C	10-29-90 CH 81-168	36548 MG/L
00940 CHLORIDE	250 <0.05	300.0	11-07-90 BM #0183	23040 MG/L
00095 SPEC COND		120.1	11-22-90 BM	49700 umho/cm
00400 pH		150.1	11-22-90	7.1
00625 TKN	0.02	351.2	11-07-90 BM 62-425	0.92 MG/L
00610 AMMONIA	- 0.005	350.1	10-28-90 BM 62-425	0.80 MG/L
FECAL COLIFORM			11-22-90 77-192	<2 ORG/100ML

DATE 11-22-90

LAB ID 86122,86109, E86048

BY

DIRECTOR



BFORM

BACTERIOLOGICAL ANALYSIS

CH2M HILL

CLIENT NAME AND ADDRESS

800 FAIRWAY DRIVE SUITE 350

DEERFIELD BEACH, FLORIDA 33441

FECAL COLIFORM MPN

BACTERIOLOGY

PBC SRWWTP

PROJECT NAME

SEF24770.TO

PROJECT NUMBER

CLIENT

SAMPLE COLLECTED BY

NO.	COLLECTED	RECEIVED	SET UP	NBR	RESULT ORG/100mL
SAMPLE #1 STATION #1 UPPER MONITOR ZONE					
48485	12-12	N/A 12-12	1450 12-12	1730 77-212	<2
SAMPLE #2 STATION #2 LOWER MONITOR ZONE					
48486	12-12	N/A 12-12	1450 12-12	1730 77-212	<2

DATE 12-17-90

LAB ID 86122,86109,E86048

BY

DIRECTOR





January 7, 1991

SEF24770.T0 | AAD697

RE: Palm Beach County laboratory samples

Dear Tom McCormick/DFB:

On December 13, 1990 the CH2M Hill Gainesville Laboratory received 4 water, grab samples with a request for analysis of selected parameters.

The analytical results are enclosed. No unusual difficulties were encountered in the analyses. If you should have any questions concerning the results, please call Don Hash or Tom Emenhiser.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Don Hash', is positioned below the word 'Sincerely,'.

Don Hash
Client Services

Enclosure(s):

cc: Bart Ziegler/DF

Palm Beach County	CH2MHILL
Attention: Tom McCormick Address: DFB Copies to: Bart Ziegler/DFB	Project No: SEF24770.T0 Received: 12/13/90 Reported: 01/07/91
Collected: 12/12/90 by Bart Ziegler Type: water, grab Location: PBC SRWWTP DIW'S	

SAMPLE NUMBER	88014	88015	88016	88017
SAMPLE DESCRIPTIONS	Upper Monitor Zone 12/12/90 13:30	Lower Monitor Zone 12/12/90 14:00	Travel Blank 12/12/90	Laboratory Method Blank
GENERAL				
pH (Units)	7.85 12/13/90	7.50 12/13/90	n/r n/r	Not Applicable 12/13/90
Alkalinity, Total (as CaCO ₃)	144 12/24/90	104 12/24/90	n/r n/r	<1.0 12/24/90
Color (APHA)	35 12/14/90	80 12/14/90	n/r n/r	0 12/14/90
Hardness, Calcium (as CaCO ₃)	800 01/04/91	4200 01/04/91	n/r n/r	<1.0 01/04/91
Turbidity (NTU)	11.2 12/13/90	27 12/13/90	n/r n/r	<0.2 12/13/90
Odor (TON)	N.O.O 12/18/90	N.O.O 12/18/90	n/r n/r	Not Applicable 12/18/90
SOLIDS				
Total Dissolved Solids	6180 12/17/90	33,300 12/17/90	n/r n/r	<1.0 12/17/90
METALS				
Antimony - FL	<0.20 12/28/90	<0.20 12/28/90	<0.20 12/28/90	<0.20 12/28/90
Arsenic - FU	<0.005 12/18/90	0.005 12/18/90	<0.005 12/18/90	<0.005 12/18/90
Barium - FL	1.7	<0.20	1.6	<0.20

NOTE: Values are mg/l as substance unless otherwise stated.

* Detection limit elevated due to matrix interferences.

Respectfully submitted,


T. Ward Dickens, Laboratory Manager

n/r = not requested

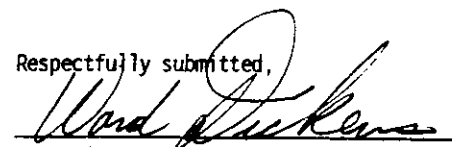
NOTE: This report contains test data and no interpretation is intended or implied.

SAMPLE NUMBER	88014	88015	88016	88017
SAMPLE DESCRIPTIONS	Upper Monitor Zone 12/12/90 13:30	Lower Monitor Zone 12/12/90 14:00	Travel Blank 12/12/90	Laboratory Method Blank
	12/28/90	12/28/90	12/28/90	12/28/90
Cadmium - FU	<0.0002	0.006	<0.0002	<0.0002
	12/19/90	12/19/90	12/19/90	12/19/90
Chromium, Tot - FU	<0.002	<0.002	<0.002	<0.002
	12/27/90	12/27/90	12/27/90	12/27/90
Copper - FL	<0.02	0.06	<0.02	<0.02
	01/02/91	01/02/91	01/02/91	01/02/91
Iron, Total - FL	2.1	3.4	<0.02	<0.02
	12/19/90	12/19/90	12/19/90	12/19/90
Lead - FU	<0.002	0.026	<0.002	<0.002
	12/28/90	12/28/90	12/28/90	12/28/90
Manganese - FL	0.06	0.13	<0.01	<0.01
	12/26/90	12/26/90	12/26/90	12/26/90
Mercury - CV	<0.0002	<0.0002	<0.0002	<0.0002
	12/21/90	12/21/90	12/21/90	12/21/90
Selenium	<0.025*	<0.025*	<0.005	<0.005
	12/18/90	12/18/90	12/18/90	12/18/90
Silver - FL	<0.02	0.07	<0.02	<0.02
	12/19/90	12/19/90	12/19/90	12/19/90
Sodium - FL	1625	10,500	<0.50	<0.50
	12/26/90	12/26/90	12/26/90	12/26/90
Zinc - FL	<0.01	0.06	<0.01	<0.01
	12/18/90	12/18/90	12/18/90	12/18/90
ANIONS				
Chloride	2800	18,500	n/r	<1.0
	01/04/91	01/04/91	n/r	01/04/91
Fluoride	0.66	0.69	n/r	<0.01
	12/14/90	12/14/90	n/r	12/14/90
Sulfate	668	2420	n/r	Not Applicable
	12/18/90	12/18/90	n/r	12/18/90
NUTRIENTS				
Ammonia (as N)	1.41	1.17	n/r	Not Applicable

NOTE: Values are mg/l as substance unless otherwise stated.

* Detection limit elevated due to matrix interferences.

Respectfully submitted,



T. Ward Dickens, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.

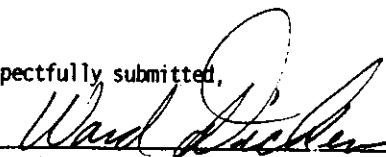
REPORT OF ANALYSIS

Florida Certification: 82112; E82124

SAMPLE NUMBER	88014	88015	88016	88017
SAMPLE DESCRIPTIONS	Upper Monitor Zone 12/12/90 13:30	Lower Monitor Zone 12/12/90 14:00	Travel Blank 12/12/90	Laboratory Method Blank
Nitrate & Nitrite (as N)	12/28/90 <0.02	12/28/90 <0.02	n/r n/r	12/28/90 <0.02
Kjeldahl Nitrogen (as N)	12/26/90 1.41	12/26/90 1.19	n/r n/r	12/26/90 Not Applicable
GENERAL ORGANICS	01/03/91	01/03/91	n/r	01/03/91
Surfactants (MBAS)	0.089 12/14/90	0.074 12/14/90	n/r n/r	<0.025 12/14/90
HAZARDOUS WASTE				
Corrosivity	1.01 01/04/91	1.24 01/04/91	n/r n/r	Not Applicable 01/04/91

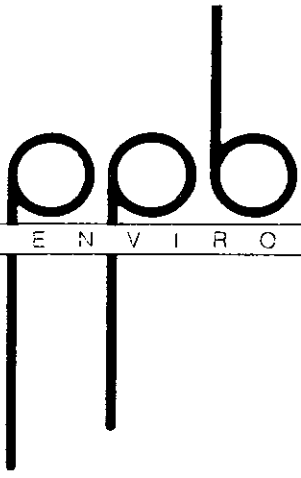
NOTE: Values are mg/l as substance unless otherwise stated.
 * Detection limit elevated due to matrix interferences.

Respectfully submitted,


 T. Ward Dickens, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.



REPORT OF ANALYSES

CH2MHILL SOUTHEAST
P.O.BOX 1647
GAINESVILLE, FL 32602-

DATE: 12/27/90
DHRS # 82282, E82001

Attn: MR.DON HASH

SAMPLES RECEIVED 12/14/90 (Page 1 of 1)

CLIENT STATION ID:	88014	88015
LAB #:	44654	44655

MBAS	mg/L	0.089	0.074
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EPA 425.1
DATE OF ANALYSIS:12/14/90
METHOD BLANK: <0.025 mg/L

PROJECT MANAGER

A handwritten signature in cursive script, reading "Kelly Bergdal", is written over a horizontal line.



Engineers
Planners
Economists
Scientists

Client: PALM BEACH COUNTY/PBC SRWWTP DIW'S
Attention: T. MCCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Sample Number: 88014-16,88018
Date Received: 12/13/90

Dear Client:

The Gainesville Organics Laboratory received your samples with a request for analysis of selected parameters.

The analytical results are enclosed. No unusual difficulties were encountered in the analyses.

If you should have any questions concerning the results please contact us. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read "Tom Emenhiser".

Tom Emenhiser
Client Services



Engineer
Supervisor
Analyst
Technician

CH2M Hill Organics Laboratory
Analytical Report

Report Contents

Sample Information

Definitions of Reporting Qualifiers

Description of Analytical Methods

Sample Quantitation Reports including Surrogate Recoveries

QA/QC Package Including:

Initial Calibration (*)

Continuing Calibration (Daily Standard) (*)

Quantitation Reports for Organic-Free Water Blanks

Matrix Spike/Matrix Spike Duplicate (*)

Surrogate Control Charts (*)

Chromatograms (*)

Copy of Chain-of-Custody

(*) Information provided where applicable or when requested.



Engineers
Planners
Economists
Scientists

SAMPLE INFORMATION

Client: PALM BEACH COUNTY/PBC SRWWTP DIW'S
Attention: T. McCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Description: WATER SAMPLES
PBC SRWWTP DIW'S
601/602 ANALYSIS

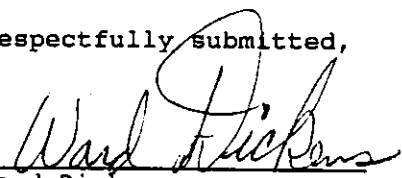
Sample Number: 88014-16,88018
Quantity: 4
Date Received: 12/13/90
Date Completed: 12/23/90
Date Reported: 12/31/90
Project Number: SEF 24770.TO
Number of Pages: 14

The information shown in this report is test data only
and no interpretation of this data is intended or implied.

State of Alabama Certification No.: 40080

State of Florida Certification No.: 82112, E82124

Respectfully submitted,


Ward Dickens
Laboratory Manager



Definitions of Reporting Qualifiers

Result Qualifiers

- (U) Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the Reporting Limit for that compound. The Reporting Limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.
- (JX) Presence indicated but less than stated Reporting Limit. In a diluted sample, a clearly defined peak was present at less than the stated Reporting Limit.

Analysis (Run) Qualifiers

- (M) Matrix interference precludes achieving lower Reporting Limit. The Reporting Limit is determined by the largest peak in the sample, and the dilution is adjusted so that neither chemical nor electronic overload of the gas chromatography system takes place. Either condition could affect the reliability of peak identification and quantitation.
- (N) Sample contains non-target compounds. Many samples, especially "fuel" samples, often contain non-target compounds. This qualifier is used to alert the client to the presence of non-target compounds in samples, even if no target compounds are detected.

Reporting Limit = 1.0 ug/l for water samples and 1.0 ug/kg for soil and sediment samples unless noted otherwise.

Note: the minimum Reporting Limit for methanol extracts of high-level soil and sediment samples is 50 ug/kg due to the effect of methanol on "purging efficiency."



Analytical Methods

Purgeable Halocarbons in Water: EPA Method 601 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Water: EPA Method 602 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Halocarbons in Soil and Sediment: EPA Method 8010 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Soil: EPA Method 8020 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Trihalomethanes in Water: EPA Method 501.1 as described in the Federal Register, Vol. 44, No. 231, Appendix C, and CH2M Hill Volatiles SOP, October, 1988.

Ethylene Dibromide in Water: EPA Method 504 (1,2-dibromomethane and 1,2-dibromo-3-chloropropane in water by microextraction and gas chromatography).

Fuel Screening: Procedure for estimation of concentration and identification of "fuel" samples; used to assist in determination of required EPA methods for subsequent analysis. This methodology is not an established EPA procedure.

State of Alabama Certification Number: 40080

State of Florida Certification Numbers: 82112 and E82124



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/12/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 88014	Date Received: 12/13/90
Proj No: SEF 24770.T0	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 12/23/90
Matrix: WATER	Instrument ID: GC#1	Analyst: SS
Sampler: B. ZIEGLER	Column: J & W DB-624	Date Reported: 12/29/90

Client Sample ID/Description: UPPER MONITOR ZONE

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
79-01-6	Trichloroethene	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
75-27-4	Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,1,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	84	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	90	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Steve Sharkey 12/30/90



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/12/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 88015	Date Received: 12/13/90
Proj No: SEF 24770.T0	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 12/23/90
Matrix: WATER	Instrument ID: GC#1	Analyst: SS
Sampler: B. ZIEGLER	Column: J & W DB-624	Date Reported: 12/29/90

Client Sample ID/Description: LOWER MONITOR ZONE

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
79-01-6	Trichloroethene	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
75-27-4	Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L
74-97-5	Bromochloromethane-SS		87	%rec
98-08-8	a,a,a-Trifluorotoluene-SS		88	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Steve Skidley 12/30/90



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/12/90
Project: P8C SRWTP DIW/S	Lab Sample Id: 88016	Date Received: 12/13/90
Proj No: SEF 24770.T0	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 12/20/90
Matrix: WATER	Instrument ID: GC#2	Analyst: SS
Sampler: B. ZIEGLER	Column: J & W DB-1	Date Reported: 12/26/90

Client Sample ID/Description: TRAVEL BLANK (LOWER ZONE)

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	99	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	93	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Jace Chang 12/27/90



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/12/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 88018	Date Received: 12/13/90
Proj No: SEF 24770.T0	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 12/20/90
Matrix: WATER	Instrument ID: GC#2	Analyst: SS
Sampler: B. ZIEGLER	Column: J & W DB-1	Date Reported: 12/26/90

Client Sample ID/Description: TRAVEL BLANK (UPPER ZONE)

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	1.8	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L
74-97-5	Bromochloromethane-SS		104	%rec
98-08-8	a,a,a-Trifluorotoluene-SS		98	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Dac Lewis 12/27/90



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/12/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 88018R	Date Received: 12/13/90
Proj No: SEF 24770.T0	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 12/21/90
Matrix: WATER	Instrument ID: GC#2	Analyst: SS
Sampler: B. ZIEGLER	Column: J & W DB-1	Date Reported: 12/26/90

Client Sample ID/Description: TRAVEL BLANK (UPPER ZONE) (RUN #2)

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	1.1	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	90	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	104	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Joan Dargatzis 12/27/90



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/19/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 2VB1219A	Date Received: N/A
Proj No: SEF 24770.T0	% Moisture: 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 12/19/90
Matrix: WATER	Instrument ID: GC#2	Analyst: SS
Sampler: N/A	Column: J & W DB-1	Date Reported: 12/26/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	93	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	100	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Jay Hargin 12/27/90



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/20/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 2VB1220A	Date Received: N/A
Proj No: SEF 24770.TD	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 12/20/90
Matrix: WATER	Instrument ID: GC#2	Analyst: SS
Sampler: N/A	Column: J & W DB-1	Date Reported: 12/26/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L
74-97-5	Bromochloromethane-SS		84	%rec
98-08-8	a,a,a-Trifluorotoluene-SS		99	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Trace Hengis 12/27/90



Engineers
Pioneers
Economists
Scientists

Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY
Project: PBC SRWWTP DIW'S
Proj No: SEF 24770.T0
Method: 601/602
Matrix: WATER
Sampler: N/A

Laboratory: GAINESVILLE
Lab Sample Id: 1VB1222A
% Moisture: 0.0
Dilution Factor: 1.0
Instrument ID: GC#1
Column: J & W DB-624

Date Sampled: 12/22/90
Date Received: N/A
Date Extracted: N/A
Date Analyzed: 12/22/90
Analyst: SS
Date Reported: 12/29/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
79-01-6	Trichloroethene	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
75-27-4	Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	97	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	94	%rec

U = Compound analyzed for but not detected
SS = Surrogate Standard reported as percent recovery

Reviewed by: Steve Shukley 12/30/90



Engineers
Planners
Economists
Scientists

Client: PALM BEACH COUNTY
Attention: TOM McCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Sample Number: 88014-15
Date Received: 12/13/90

Dear Client:

The Gainesville Organics Laboratory received your samples with a request for analysis of selected parameters.

The analytical results are enclosed. No unusual difficulties were encountered in the analyses.

If you should have any questions concerning the results please contact us. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read "Tom Emenhiser".

Tom Emenhiser
Client Services

CH2M Hill Organics Laboratory
Analytical Report

Report Contents

Sample Information

Definitions of Reporting Qualifiers

Description of Analytical Methods

Sample Quantitation Reports including Surrogate Recoveries

QA/QC Package Including:

Initial Calibration (*)

Continuing Calibration (Daily Standard) (*)

Quantitation Reports for Organic-Free Water Blanks

Matrix Spike/Matrix Spike Duplicate (*)

Surrogate Control Charts (*)

Chromatograms (*)

Copy of Chain-of-Custody

(*) Information provided where applicable or when requested.



SAMPLE INFORMATION

Client: PALM BEACH COUNTY
Attention: TOM MCCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Description: WATER SAMPLES
504 (EDB) ANALYSIS

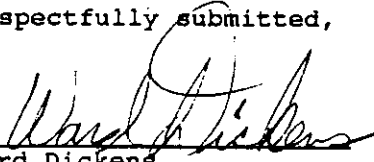
Sample Number: 88014-15
Quantity: 2
Date Received: 12/13/90
Date Completed: 12/13/90
Date Reported: 12/20/90
Project Number: SEF 24770.TO
Number of Pages: 9

The information shown in this report is test data only
and no interpretation of this data is intended or implied.

State of Alabama Certification No.: 40080

State of Florida Certification No.: 82112, E82124

Respectfully submitted,


Ward Dickens
Laboratory Manager

Definitions of Reporting Qualifiers

Result Qualifiers

- (U) Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the Reporting Limit for that compound. The Reporting Limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.
- (JX) Presence indicated but less than stated Reporting Limit. In a diluted sample, a clearly defined peak was present at less than the stated Reporting Limit.

Analysis (Run) Qualifiers

- (M) Matrix interference precludes achieving lower Reporting Limit. The Reporting Limit is determined by the largest peak in the sample, and the dilution is adjusted so that neither chemical nor electronic overload of the gas chromatography system takes place. Either condition could affect the reliability of peak identification and quantitation.
- (N) Sample contains non-target compounds. Many samples, especially "fuel" samples, often contain non-target compounds. This qualifier is used to alert the client to the presence of non-target compounds in samples, even if no target compounds are detected.

Reporting Limit = 1.0 ug/l for water samples and 1.0 ug/kg for soil and sediment samples unless noted otherwise.

Note: the minimum Reporting Limit for methanol extracts of high-level soil and sediment samples is 50 ug/kg due to the effect of methanol on "purging efficiency."

Analytical Methods

Purgeable Halocarbons in Water: EPA Method 601 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Water: EPA Method 602 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Halocarbons in Soil and Sediment: EPA Method 8010 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Soil: EPA Method 8020 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Trihalomethanes in Water: EPA Method 501.1 as described in the Federal Register, Vol. 44, No. 231, Appendix C, and CH2M Hill Volatiles SOP, October, 1988.

Ethylene Dibromide in Water: EPA Method 504 (1,2-dibromomethane and 1,2-dibromo-3-chloropropane in water by microextraction and gas chromatography).

Fuel Screening: Procedure for estimation of concentration and identification of "fuel" samples; used to assist in determination of required EPA methods for subsequent analysis. This methodology is not an established EPA procedure.

State of Alabama Certification Number: 40080

State of Florida Certification Numbers: 82112 and E82124



Report of Analytical Data - EDB and DBCP

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/12/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 88014E	Date Received: 12/13/90
Proj No: SEF 24770.TD	% Moisture 0.00	Date Extracted: 12/13/90
Method: 504	Dilution Factor: 1.00	Date Analyzed: 12/13/90
Matrix: WATER	Instrument ID: GC#3	Analyst: JEH
Sampler: B. ZIEGLER	Column: J & W DB-624	Date Reported: 12/13/90

Client Sample ID/Description: UPPER MONITOR ZONE

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
106-93-4	1,2-Dibromoethane	0.02	U	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U	ug/L

79-34-5 1,1,2,2-Tetrachloroethane-SS 109 %rec

U = Compound analyzed for but not detected
SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Jarman 12/21/90



Report of Analytical Data - EDB and DBCP

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 12/12/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 88015E	Date Received: 12/13/90
Proj No: SEF 24770.TO	% Moisture 0.00	Date Extracted: 12/13/90
Method: 504	Dilution Factor: 1.00	Date Analyzed: 12/13/90
Matrix: WATER	Instrument ID: GC#3	Analyst: JEH
Sampler: B. ZIEGLER	Column: J & W DB-624	Date Reported: 12/13/90

Client Sample ID/Description: LOWER MONITOR ZONE

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
106-93-4	1,2-Dibromoethane	0.02	U	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U	ug/L

79-34-5	1,1,2,2-Tetrachloroethane-SS	95	%rec
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U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Jarnan 12/21/90



Report of Analytical Data - EDB and DBCP

Client: PALM BEACH COUNTY
Project: PBC SRWTP DIW'S
Proj No: SEF 24770.T0
Method: 504
Matrix: WATER
Sampler: N/A

Laboratory: GAINESVILLE
Lab Sample Id: 3VB1213C
% Moisture: 0.00
Dilution Factor: 1.00
Instrument ID: GC#3
Column: J & W DB-624

Date Sampled: 12/13/90
Date Received: N/A
Date Extracted: 12/13/90
Date Analyzed: 12/13/90
Analyst: JEH
Date Reported: 12/13/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
106-93-4	1,2-Dibromoethane	0.02	U	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U	ug/L

79-34-5 1,1,2,2-Tetrachloroethane-SS 93 %rec

U = Compound analyzed for but not detected
SS = Surrogate Standard reported as percent recovery

Reviewed by: Mark W. Staff 12/13/90



January 4, 1991

SEF24770.TO

Mr. Don Hash
CH2M HILL/LGN
7201 N.W. 11th Place
Gainesville, FL 32605

RE: Analytical Data for Palm Beach County, Laboratory No. 17423

Dear Mr. Hash:

On December 14, 1990, the CH2M Hill Montgomery Laboratory received two samples with a request for analysis of selected organic parameters.

The analytical results and associated quality control data are enclosed. No unusual difficulties were encountered during the analysis of these samples.

If you should have any questions concerning the data, please inquire.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Herb Kelly', is written over the typed name.

Herb Kelly
Organics Division Manager

Enclosures

cc: Mr. Craig Vinson



Engineers
 Planners
 Environmental
 Scientists

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CH2M HILL Laboratory No. 17423

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ANALYTICAL METHODOLOGY

Organic Analysis

Priority Pollutants: Water, soil and waste samples are analyzed in accordance with procedures described in Methods 608, 624, and 625, EPA-600/4-82-057 (1982); Methods 8080, 3240, and 8270, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition; and methods outlined in the USEPA Contract Laboratory Program Statement of Work for Organics Analysis, February, 1988.

Volatile Analysis (Safe Drinking Water Act): Water samples are analyzed in accordance with procedures described in Method 524.2, Federal Register (50 FR 46902), November 13, 1985.

Chlorinated Phenoxyacid Herbicides: Samples are analyzed with procedures described in Method 8150, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Organophosphate Pesticides: Samples are analyzed in accordance with procedures described in Methods 614 and 622, EPA-600/4-79-019 (1979) and in Method 8140, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Phenol Analysis by GC: Samples are analyzed in accordance with procedures outlined in Method 604, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8040, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Polynuclear Aromatic Hydrocarbons (GC analysis): Samples are analyzed with procedures described in Method 610, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8100, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Ethylene Dibromide : Water samples are analyzed in accordance with procedures outlined in Method 504, Federal Register (50 FR 46902), November 13, 1985.

Trihalomethanes: Water samples are analyzed with procedures described in Method 501.2, Federal Register, Vol. 44, No. 231, Part II, November 29, 1979.

EPA - DEFINED QUALIFIERS

ORGANICS

Definitions for the EPA-defined qualifiers:

- U -- Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the quantitation limit for that compound. The detection limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.
- J -- Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound below the stated quantitation limit. The "J" qualifier is not used with pesticide results.
- C -- This flag applies to pesticide results only. The "C" flag indicates the presence of this compound has been confirmed by GC/MS analysis.
- B -- This flag is used when the analyte is found in the associated blank as well as the sample. This notation indicates possible blank contamination and suggests the data user evaluate these compounds and their amounts carefully.
- E -- This flag applies to GC/MS only. The "E" qualifier indicates a compound may be above or below the linear range of the instrument. If the particular compound level is deemed above the linear calibration range, then the sample should be reanalyzed at an appropriate dilution. Therefore, the "E" qualified amount is an estimated concentration. The results for the dilution will be reported on a separate Form I and will be flagged with a "D" if the dilution brings the concentration within proper calibration.
- D -- This flag identifies compounds which have been run at a dilution to bring the concentration of that compound within the linear range of the instrument. "D" qualifiers are only used for samples that have been run initially with results above acceptable ranges. For secondary dilutions the "DL" suffix is appended to the sample number on the Form I.
- A -- Indicates the Tentatively Identified Compound (TIC) is a suspected aldol-condensation product.
- X -- Indicates the compound concentration has been manually modified or the EPA qualifier has been manually modified or added.
- JX -- The compound was detected and quantitated below the Contract Required Quantitation Limit.

CLIENT SAMPLE ID QUALIFIERS

LEVEL 1

The qualifiers that GC/MS uses with the client sample ID are defined below:

- DL** -- Dilution Run
- R** -- Rerun (may be followed by a digit to indicate multiple reruns)
- RD** -- Diluted Rerun
- RX** -- Re-extraction Analysis
- MS** -- Matrix Spike (may be followed by a digit to indicate multiple matrix spikes within a sample set)
- MSD** -- Matrix Spike Duplicate (may be followed by a digit to indicate multiple matrix spike duplicates within a sample set)
- QC_BLANK** -- Method Blank (may be followed by an **S** for soils run at a low level, **W** for waters, or **SM** for soils run at a medium level) (letters may be followed by a digit to indicate multiple blanks of that type; if there are no letters the digit indicates multiple blanks).

These qualifiers allow GC/MS to have unique client sample ID's so that the client can get more accurate information from the data reported.



TABLE 1

SAMPLE CROSS-REFERENCE SUMMARY

CH2M HILL Laboratory No. 17423

<u>LMG</u> <u>Sample No.</u>	<u>LGN</u> <u>Sample No.</u>	<u>Sample Description</u>			
17423001	88014	UPPER MONITOR ZONE	12/12/90	1330	GRAB
17423002	88015	LOWER MONITOR ZONE	12/12/90	1400	GRAB



ORGANICS ANALYSIS DATA SHEET

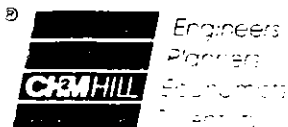
Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 12/17/90
 Lab Sample ID: 17423001 Sample Matrix: WATER Date Analyzed: 12/19/90
 Client Sample ID: UPPER MONITOR Percent Moisture: _____ Dilution Factor: 1.0

SEMIVOLATILE COMPOUNDS

CAS Number		ug/L	CAS Number		ug/L
62-75-9	N-Nitrosodimethylamine . .	10 U	100-02-7	4-Nitrophenol	50 U
108-95-2	Phenol	10 U	132-64-9	Dibenzofuran	10 U
62-53-3	Aniline	10 U	121-14-2	2,4-Dinitrotoluene	10 U
111-44-4	bis(2-Chloroethyl)Ether . .	10 U	84-66-2	Diethylphthalate	10 U
95-57-8	2-Chlorophenol	10 U	7005-72-3	4-Chlorophenyl-phenylether	10 U
541-73-1	1,3-Dichlorobenzene	10 U	86-73-7	Fluorene	10 U
106-46-7	1,4-Dichlorobenzene	10 U	100-01-6	4-Nitroaniline	50 U
100-51-6	Benzyl Alcohol	10 U	534-52-1	4,6-Dinitro-2-methylphenol	50 U
95-50-1	1,2-Dichlorobenzene	10 U	86-30-6	N-Nitrosodiphenylamine (1)	10 U
95-48-7	2-Methylphenol	10 U	122-66-7	1,2-Diphenylhydrazine . .	10 U
108-60-1	bis(2-Chloroisopropyl)Ether	10 U	101-55-3	4-Bromophenyl-phenylether	10 U
106-44-5	4-Methylphenol	10 U	118-74-1	Hexachlorobenzene	10 U
621-64-7	N-Nitroso-di-n-propylamine	10 U	87-86-5	Pentachlorophenol	50 U
67-72-1	Hexachloroethane	10 U	85-01-8	Phenanthrene	10 U
98-95-3	Nitrobenzene	10 U	120-12-7	Anthracene	10 U
78-59-1	Isophorone	10 U	84-74-2	Di-n-Butylphthalate	10 U
88-75-5	2-Nitrophenol	10 U	206-44-0	Fluoranthene	10 U
105-67-9	2,4-Dimethylphenol	10 U	129-00-0	Pyrene	10 U
65-85-0	Benzoic Acid	50 U	85-68-7	Butylbenzylphthalate	10 U
111-91-1	bis(2-Chloroethoxy)Methane	10 U	91-94-1	3,3'-Dichlorobenzidine . . .	20 U
120-83-2	2,4-Dichlorophenol	10 U	56-55-3	Benzo(a)anthracene	10 U
120-82-1	1,2,4-Trichlorobenzene . . .	10 U	218-01-9	Chrysene	10 U
91-20-3	Naphthalene	10 U	117-81-7	bis(2-Ethylhexyl)phthalate	10 U
106-47-8	4-Chloroaniline	10 U	117-84-0	Di-n-octylphthalate	10 U
87-68-3	Hexachlorobutadiene	10 U	205-99-2	Benzo(b)fluoranthene	10 U
59-50-7	4-Chloro-3-methylphenol . . .	10 U	207-08-9	Benzo(k)fluoranthene	10 U
91-57-6	2-Methylnaphthalene	10 U	50-32-8	Benzo(a)pyrene	10 U
77-47-4	Hexachlorocyclopentadiene	10 U	193-39-5	Indeno(1,2,3-cd)pyrene . . .	10 U
88-06-2	2,4,6-Trichlorophenol	10 U	53-70-3	Dibenz(a,h)Anthracene	10 U
95-95-4	2,4,5-Trichlorophenol	50 U	191-24-2	Benzo(g,h,i)perylene	10 U
91-58-7	2-Chloronaphthalene	10 U			
88-74-4	2-Nitroaniline	50 U			
131-11-3	Dimethyl Phthalate	10 U		Nitrobenzene-d5 - SS	48
208-96-8	Acenaphthylene	10 U		2-Fluorobiphenyl - SS	42
506-20-2	2,6-Dinitrotoluene	10 U		Terphenyl-d14 - SS	71
99-09-2	3-Nitroaniline	50 U		Phenol-d5 - SS	33
33-32-9	Acenaphthene	10 U		2-Fluorophenol - SS	49
51-28-5	2,4-Dinitrophenol	50 U		2,4,6-Tribromophenol - SS	47

- (1) - Cannot be separated from diphenylamine.
- U - Compound analyzed for but not detected.
- B - Compound was detected in QC blank.
- J - Reported value less than quantitation limit.
- SS - Surrogate Standard reported as percent recovery.

000001



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 12/17/90
 Lab Sample ID: W12170B1 Sample Matrix: WATER Date Analyzed: 12/19/90
 Client Sample ID: QC BLANK W Percent Moisture: _____ Dilution Factor: 1.0

SEMIVOLATILE COMPOUNDS

CAS Number	ug/L	CAS Number	ug/L
62-75-9	N-Nitrosodimethylamine . . . 10 U	100-02-7	4-Nitrophenol 50 U
108-95-2	Phenol 10 U	132-64-9	Dibenzofuran 10 U
62-53-3	Aniline 10 U	121-14-2	2,4-Dinitrotoluene 10 U
111-44-4	bis(2-Chloroethyl)Ether . . . 10 U	84-66-2	Diethylphthalate 10 U
95-57-8	2-Chlorophenol 10 U	7005-72-3	4-Chlorophenyl-phenylether 10 U
541-73-1	1,3-Dichlorobenzene 10 U	86-73-7	Fluorene 10 U
106-46-7	1,4-Dichlorobenzene 10 U	100-01-6	4-Nitroaniline 50 U
100-51-6	Benzyl Alcohol 10 U	534-52-1	4,6-Dinitro-2-methylphenol 50 U
95-50-1	1,2-Dichlorobenzene 10 U	86-30-6	N-Nitrosodiphenylamine (1) 10 U
95-48-7	2-Methylphenol 10 U	122-66-7	1,2-Diphenylhydrazine . . . 10 U
108-60-1	bis(2-Chloroisopropyl)Ether 10 U	101-55-3	4-Bromophenyl-phenylether 10 U
106-44-5	4-Methylphenol 10 U	118-74-1	Hexachlorobenzene 10 U
621-64-7	N-Nitroso-di-n-propylamine 10 U	87-86-5	Pentachlorophenol 50 U
67-72-1	Hexachloroethane 10 U	85-01-8	Phenanthrene 10 U
98-95-3	Nitrobenzene 10 U	120-12-7	Anthracene 10 U
78-59-1	Isophorone 10 U	84-74-2	Di-n-Butylphthalate 10 U
8P 75-5	2-Nitrophenol 10 U	206-44-0	Fluoranthene 10 U
67-9	2,4-Dimethylphenol 10 U	129-00-0	Pyrene 10 U
65-85-0	Benzoic Acid 50 U	85-68-7	Butylbenzylphthalate 10 U
111-91-1	bis(2-Chloroethoxy)Methane 10 U	91-94-1	3,3'-Dichlorobenzidine . . . 20 U
120-83-2	2,4-Dichlorophenol 10 U	56-55-3	Benzo(a)anthracene 10 U
120-82-1	1,2,4-Trichlorobenzene . . . 10 U	218-01-9	Chrysene 10 U
91-20-3	Naphthalene 10 U	117-81-7	bis(2-Ethylhexyl)phthalate 10 U
106-47-8	4-Chloroaniline 10 U	117-84-0	Di-n-octylphthalate 10 U
87-68-3	Hexachlorobutadiene 10 U	205-99-2	Benzo(b)fluoranthene 10 U
59-50-7	4-Chloro-3-methylphenol . . . 10 U	207-08-9	Benzo(k)fluoranthene 10 U
91-57-6	2-Methylnaphthalene 10 U	50-32-8	Benzo(a)pyrene 10 U
77-47-4	Hexachlorocyclopentadiene 10 U	193-39-5	Indeno(1,2,3-cd)pyrene . . . 10 U
88-06-2	2,4,6-Trichlorophenol 10 U	53-70-3	Dibenz(a,h)Anthracene 10 U
95-95-4	2,4,5-Trichlorophenol 50 U	191-24-2	Benzo(g,h,i)perylene 10 U
91-58-7	2-Chloronaphthalene 10 U		
88-74-4	2-Nitroaniline 50 U		Nitrobenzene-d5 - SS 59
131-11-3	Dimethyl Phthalate 10 U		2-Fluorobiphenyl - SS 54
208-96-8	Acenaphthylene 10 U		Terphenyl-d14 - SS 79
606-20-2	2,6-Dinitrotoluene 10 U		Phenol-d5 - SS 36
99-09-2	3-Nitroaniline 50 U		2-Fluorophenol - SS 59
33-32-9	Acenaphthene 10 U		2,4,6-Tribromophenol - SS . . 59
51-28-5	2,4-Dinitrophenol 50 U		

- (1) - Cannot be separated from diphenylamine.
- U - Compound analyzed for but not detected.
- B - Compound was detected in QC blank.
- Reported value less than quantitation limit.
- Surrogate Standard reported as percent recovery.

NG



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 12/17/90
 Lab Sample ID: 17423001 Sample Matrix: WATER Date Analyzed: 12/19/90
 Client Sample ID: UPPER MONITOR Percent Moisture: _____ Dilution Factor: 1.0

PESTICIDE COMPOUNDS

CAS Number		ug/L		CAS Number		ug/L
58-89-9	gamma-BHC (Lindane)	0.01	U			
309-00-2	Aldrin	0.01	U			
50-57-1	Dieldrin	0.02	U			
72-20-8	Endrin	0.02	U			
72-43-5	Methoxychlor	0.04	U			
3001-35-2	Toxaphene	0.5	U			

	Dibutylchlorendate - SS	80				

- U - Analyzed for but not detected.
- B - Detected in QC blank.
- JX - Detected, concentration estimated.
- SS - Surrogate Standard reported as percent recovery.

Form I

000003



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 12/17/90
Lab Sample ID: 17423002 Sample Matrix: WATER Date Analyzed: 12/19/90
Client Sample ID: LOWER MONITOR Percent Moisture: Dilution Factor: 1.0

PESTICIDE COMPOUNDS

Table with 4 columns: CAS Number, Compound Name, Concentration (ug/L), and Status (U). Rows include gamma-BHC (Lindane), Aldrin, Dieldrin, Endrin, Methoxychlor, Toxaphene, and Dibutylchlorendate - SS.

- U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Form I

Handwritten signature

000004



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 12/17/90
 Lab Sample ID: W12170B1 Sample Matrix: WATER Date Analyzed: 12/19/90
 Client Sample ID: QC BLANK Percent Moisture: _____ Dilution Factor: 1.0

PESTICIDE COMPOUNDS

CAS Number		ug/L		CAS Number		ug/L
58-89-9	gamma-BHC (Lindane)	0.01	U			
309-00-2	Aldrin	0.01	U			
60-57-1	Dieldrin	0.02	U			
72-20-8	Endrin	0.02	U			
72-43-5	Methoxychlor	0.04	U			
8001-35-2	Toxaphene	0.5	U			

	Dibutylchlorendate - SS	84				

- U - Analyzed for but not detected.
- B - Detected in QC blank.
- JX - Detected, concentration estimated.
- SS - Surrogate Standard reported as percent recovery.

Form I

000005

205.271.1444



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 12/17/90
Lab Sample ID: 17423001 Sample Matrix: WATER Date Analyzed: 12/22/90
Client Sample ID: UPPER MONITOR Percent Moisture: _____ Dilution Factor: 1.0

SDWA HERBICIDE COMPOUNDS

<u>CAS Number</u>		<u>ug/L</u>		<u>CAS Number</u>		<u>ug/L</u>
94-75-7	2,4-D	2.5	U			
93-72-1	Silvex	0.5	U			

	3,5-Dichlorobenzoic acid - SS	93				

- U - Analyzed for but not detected.
- B - Detected in QC blank.
- JX - Detected, concentration estimated.
- SS - Surrogate Standard reported as percent recovery.

Form I

000006



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 12/17/90
Lab Sample ID: 17423002 Sample Matrix: WATER Date Analyzed: 12/22/90
Client Sample ID: LOWER MONITOR Percent Moisture: Dilution Factor: 1.0

SDWA HERBICIDE COMPOUNDS

Table with 4 columns: CAS Number, Compound Name, Concentration (ug/L), and Detection Status. Rows include 2,4-D (2.5 U), Silvex (0.5 U), and 3,5-Dichlorobenzoic acid - SS (87).

- U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Form I

Handwritten signature

000007



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 12/17/90
 Lab Sample ID: W12170B1 Sample Matrix: WATER Date Analyzed: 12/22/90
 Client Sample ID: QC BLANK Percent Moisture: _____ Dilution Factor: 1.0

SDWA HERBICIDE COMPOUNDS

CAS Number		ug/L		CAS Number	ug/L
94-75-7	2,4-D	2.5	U		
93-72-1	Silvex	0.5	U		

	3,5-Dichlorobenzoic acid - SS	93			

- U - Analyzed for but not detected.
- B - Detected in QC blank.
- JX - Detected, concentration estimated.
- SS - Surrogate Standard reported as percent recovery.

Form I

gls

000008



December 29, 1990

LRD294.10

CH2M HILL
7201 N.W. 11th Place
Gainesville, FL 32605

Attention: Don Hash

RE: Laboratory Reference Number - 28323

Dear Mr. Hash:

The results are enclosed for your samples which were received by our laboratory on December 14, 1990.

If you have any questions please contact Ms. Mona Jones or Ms. Judy Wensloff in Client Services.

CH2M HILL stores samples for 30 days after the written report date at no charge. After 30 days, non-hazardous samples are disposed of at no charge. If you require either of the following services you need to notify us within 15 days:

- * Return of samples to the address shown above.
- * Storage of samples at \$5.00/sample/month.

If a sample is determined to be hazardous, we will contact you to discuss disposal options.

Thank you for selecting a CH2M HILL laboratory for your analytical testing needs.

Sincerely,

CH2M HILL QUALITY ANALYTICS LABORATORY

Lama Record for
Peggy A. Norton
Senior Data Package Specialist

Encl.



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Scientists

REPORT OF ANALYTICAL RESULTS

Date: 12/31/90
Page: 1 of 2

Client: CH2M HILL/LGN
7201 N.W. 11TH PLACE
GAINESVILLE, FL 32605

Project Number: SEF24770.T0
PBCR WWTP DIW`S
Laboratory Number: 28323
Date Received: 12/14/90

Atten: MR. DON HASH

=====
Sample Description: UPPER MONITOR ZONE LG88014
Laboratory Sample Number: 28323001 Date Collected: 12/12/90 Matrix: WATER
=====

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Gross Alpha	EPA900.0	----	<4.9	pCi/L	12/28/90

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: 

INRPRPT(v900202)



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REPORT OF ANALYTICAL RESULTS

Date: 12/31/90
Page: 2 of 4

Client: CH2M HILL/LGN
7201 N.W. 11TH PLACE
GAINESVILLE, FL 32605

Project Number: SEF24770.T0
PBCR WWTP DIW`S
Laboratory Number: 28323
Date Received: 12/14/90

Atten: MR. DON HASH

=====
Sample Description: LOWER MONITOR ZONE LG88015
Laboratory Sample Number: 28323002 Date Collected: 12/12/90 Matrix: WATER
=====

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Gross Alpha	EPA900.0	----	78.3 +/- 28.3	pCi/L	12/30/90

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: *E. Hawley*

INRPRPT(v900202)



Controls for Environmental
Pollution, Inc.

P. O. Box 5351
Santa Fe, NM 87502

Attn: James J. Mueller
Phone (505) 982-9841

CHEM Hill
7201 Northwest 11th Place
Gainesville, FL 32602

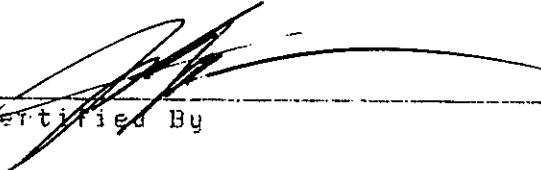
Order #: 90-12-290
Date: 12/27/90 14:15
Work ID: Environmental
Date Received: 12/14/90
Date Completed: 12/27/90

Attn: Don Hash
Invoice Number:

SAMPLE IDENTIFICATION

<u>Sample Number</u>	<u>Sample Description</u>	<u>Sample Number</u>	<u>Sample Description</u>
01	#88014	02	#88015

Remainder of sample(s) for routine analysis will be disposed of three weeks from final report date. Sample(s) for bacteria analysis only, will be disposed of immediately after analysis. This is not applicable if other arrangements have been made.


Certified By



Order # 70-12-290
12/27/90 14:15

Controls for Environmental

Page 2

TEST RESULTS BY SAMPLE

Sample: 01A #88014

Collected: 12/12/90 13:30

<u>Test Description</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>Analyzed</u>	<u>Bu</u>
Radium-226	2.6+/-1.3	0.6	pCi/liter		
Radium-228	4+/-2	1	pCi/liter		

Sample: 02A #88015

Collected: 12/12/90 14:00

<u>Test Description</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>Analyzed</u>	<u>Bu</u>
Radium-226	7.8+/-2.0	0.6	pCi/liter		
Radium-228	<1	1	pCi/liter		

INJECTION WELL
BACKGROUND SAMPLE LABORATORY ANALYSES

**PBC SRWWTP Effluent Disposal System
Background Sampling**

Injection Well No. 1	
Date	Sample Description
06/11/90	Straddle Packer Test, See Appendix F (Packer Test Data).
08/23/90	Primary and Secondary Groundwater samples collected and submitted for laboratory analysis. Sample collected during closed revers-air circulation from 3,311-feet.

Injection Well No. 2	
Date	Sample Description
07/13/90	Depth sample collected from 1,951-feet during pilot hole drilling. Sample submitted for TDS analysis, See Appendix G (Pilot Hole Drilling Water Quality Data).
10/10/90	Primary and Secondary Groundwater samples collected and submitted for laboratory analysis. Sample collected during closed revers-air circulation from 3,450-feet.

INJECTION WELL NO. 1



September 20, 1990

SEF24770.TO | AAD277

RE: Palm Beach County laboratory samples

Dear Tom McCormick/DFB:

On August 27, 1990 the CH2M Hill Gainesville Laboratory received 3 water, grab samples with a request for analysis of selected parameters.

The analytical results are enclosed. In the analysis of Arsenic and Selenium matrix interferences were encountered. In order to obtain acceptable QA/QC data the samples were diluted 1:4 and detection elevated accordingly.

If you should have any questions concerning the results, please call Don Hash or Tom Emenhiser.

Sincerely,

A handwritten signature in black ink, appearing to read 'Don Hash', is positioned below the word 'Sincerely,'.

Don Hash
Client Services

Enclosure(s):

cc: L. Drago, B. Ziegler

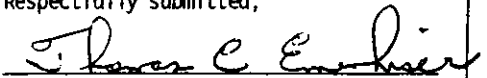
Palm Beach County	C H 2 M H i l l
Attention: Tom McCormick/DFB Address: DFB Copies to: L. Drago, B. Ziegler	Project No: SEF24770.T0 Received: 08/27/90 Reported: 09/20/90
Collected: 08/23/90 by B. Ziegler Type: water, grab	

SAMPLE NUMBER	83886	83887	83888
SAMPLE DESCRIPTIONS	IW-1 8/23/90 1300	Travel Blank	Laboratory Method Blank
GENERAL			
pH (Units)	7.80 08/27/90	n/r	Not Applicable 08/27/90
Saturation Index (pH - pHs)	1.25 09/17/90	n/r	Not Applicable 09/17/90
Alkalinity, Total (as CaCO3)	109 09/04/90	n/r	<1.0 09/04/90
Color (APHA)	5.0 08/27/90	n/r	0 08/27/90
Hardness, Calcium (as CaCO3)	2040 09/07/90	n/r	<1.0 09/07/90
Turbidity (NTU)	9.7 08/27/90	n/r	<0.2 08/27/90
Odor (TON)	N.O.O 08/27/90	n/r	Not Applicable 08/27/90
SOLIDS			
Total Dissolved Solids	37,000 08/29/90	n/r	<1.0 08/29/90
METALS			
Arsenic - FU	<0.025*	<0.005	<0.005

NOTE: Values are mg/l as substance unless otherwise stated.

* See cover letter.

Respectfully submitted,


 Thomas C. Emenhiser, Laboratory Manager

n/r = not requested

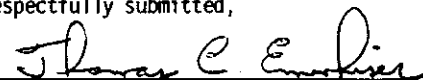
NOTE: This report contains test data and no interpretation is intended or implied.

SAMPLE NUMBER	83886	83887	83888
SAMPLE DESCRIPTIONS	IW-1 8/23/90 1300	Travel Blank	Laboratory Method Blank
Barium - FL	09/11/90 0.7	09/11/90 <0.2	09/11/90 <0.2
Cadmium - FU	09/10/90 0.0019	09/10/90 <0.0002	09/10/90 <0.0002
Chromium, Tot - FL	09/04/90 0.013	09/04/90 <0.002	09/04/90 <0.002
Copper - FL	09/04/90 0.08	09/04/90 <0.02	09/04/90 <0.02
Iron, Total - FL	09/04/90 6.9	09/04/90 0.04	09/04/90 <0.02
Lead - FU	08/30/90 <0.020*	08/30/90 <0.002	08/30/90 <0.002
Manganese - FL	09/07/90 0.26	09/07/90 <0.01	09/07/90 <0.01
Mercury - CV	08/29/90 <0.0002	08/29/90 <0.0002	08/29/90 <0.0002
Selenium	08/31/90 <0.025*	08/31/90 <0.005	08/31/90 <0.005
Silver - FL	09/13/90 0.06	09/13/90 <0.02	09/13/90 <0.02
Sodium - FL	09/05/90 14,000	09/05/90 13.3	09/05/90 <0.5
Zinc - FL	09/05/90 0.02	09/05/90 0.02	09/05/90 <0.01
ANIONS			
Chloride	09/04/90 19,200	09/04/90 n/r	09/04/90 <1.0
Fluoride	08/29/90 0.87	08/29/90 n/r	08/29/90 <0.01
Sulfate	09/06/90 2720	09/06/90 n/r	09/06/90 <1.0

NOTE: Values are mg/l as substance unless otherwise stated.

* See cover letter.

Respectfully submitted,


 Thomas C. Emenhiser, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.



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REPORT OF ANALYSIS

Florida Certification: 82112; E82124

AAD277

09/20/90

Page 3 of 7

Sample Nos: 83886 - 83888

SAMPLE NUMBER	83886	83887	83888
SAMPLE DESCRIPTIONS	IW-1 8/23/90 1300	Travel Blank	Laboratory Method Blank
NUTRIENTS	08/29/90	n/r	08/29/90
Nitrate & Nitrite (as N)	0.22 09/10/90	n/r n/r	<0.02 09/10/90
GENERAL ORGANICS			
Surfactants (MBAS)	<0.05 08/28/90	n/r n/r	<0.05 08/28/90

NOTE: Values are mg/l as substance unless otherwise stated.

* See cover letter.

Respectfully submitted,

Thomas C. Emenhiser, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.



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Client: PALM BEACH COUNTY/PBC SRWWTP DIW'S
Attention: TOM McCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Sample Number: 83886-87
Date Received: 08/27/90

Dear Client:

The Gainesville Organics Laboratory received your samples with a request for analysis of selected parameters.

The analytical results are enclosed. No unusual difficulties were encountered in the analyses.

If you should have any questions concerning the results please contact us. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read "Don Hash".

Don Hash
Client Services

CH2M Hill Organics Laboratory
Analytical Report

Report Contents

Sample Information

Definitions of Reporting Qualifiers

Description of Analytical Methods

Sample Quantitation Reports including Surrogate Recoveries

QA/QC Package Including:

Initial Calibration (*)

Continuing Calibration (Daily Standard) (*)

Quantitation Reports for Organic-Free Water Blanks

Matrix Spike/Matrix Spike Duplicate (*)

Surrogate Control Charts (*)

Chromatograms (*)

Copy of Chain-of-Custody

(*) Information provided where applicable or when requested.



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SAMPLE INFORMATION

Client: PALM BEACH COUNTY/PBC SRWWTP DIW'S
Attention: TOM MCCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Description: WATER SAMPLES
PBC SRWWTP DIW'S
601/602 ANALYSIS

Sample Number: 83886-87
Quantity: 2
Date Received: 08/27/90
Date Completed: 09/02/90
Date Reported: 09/06/90
Project Number: SEF 24770.70
Number of Pages: 10

The information shown in this report is test data only
and no interpretation of this data is intended or implied.

State of Alabama Certification No.: 40080

State of Florida Certification No.: 82112, E82124

Respectfully submitted,


Tom Emenhiser
Laboratory Manager

Definitions of Reporting Qualifiers

- (U) Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the Detection Limit for that compound. The detection limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.

- (M) Matrix interference precludes achieving lower detection limit. The detection limit is determined by the largest peak in the sample, and the dilution is adjusted so that neither chemical nor electronic overload of the gas chromatography system takes place. Either condition could affect the reliability of peak identification and quantitation.

- (F) Presence indicated but less than stated detection limit. In a diluted sample, a clearly defined peak was present at less than the stated detection limit.

- (N) Sample contains non-target compounds. Many samples, especially "fuel" samples, often contain non-target compounds. This qualifier is used to alert the client to the presence of non-target compounds in samples that may not contain any of the listed "target" compounds.

Detection Limit = 1.0 ug/l for water samples and 1.0 ug/kg for soil and sediment samples unless noted otherwise.

Note: the minimum detection limit for methanol extracts of high-level soil and sediment samples is 50 ug/kg due to the effect of methanol on "purging efficiency."

Analytical Methods

Purgeable Halocarbons in Water: EPA Method 601 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Water: EPA Method 602 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Halocarbons in Soil and Sediment: EPA Method 8010 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Soil: EPA Method 8020 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Trihalomethanes in Water: EPA Method 501.1 as described in the Federal Register, Vol. 44, No. 231, Appendix C, and CH2M Hill Volatiles SOP, October, 1988.

Ethylene Dibromide in Water: EPA Method 504 (1,2-dibromomethane and 1,2-dibromo-3-chloropropane in water by microextraction and gas chromatography).

Fuel Screening: Procedure for estimation of concentration and identification of "fuel" samples; used to assist in determination of required EPA methods for subsequent analysis. This methodology is not an established EPA procedure.

State of Alabama Certification Number: 40080

State of Florida Certification Numbers: 82112 and E82124

Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 8/23/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 83886	Date Received: 8/27/90
Proj No: SEF 24770.70	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 9/2/90
Matrix: WATER	Instrument ID: GC#1	Analyst: SS
Sampler: BZ	Column: J & W DB-624	Date Reported: 9/3/90

Client Sample ID/Description: IW-1 (N)

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
79-01-6	Trichloroethene	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
75-27-4	Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	110	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	95	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Farman 9/6/90

Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 8/23/90
Project: PBC SRWMP DIW'S	Lab Sample Id: 83887	Date Received: 8/27/90
Proj No: SEF 24770.70	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 8/31/90
Matrix: WATER	Instrument ID: GC#1	Analyst: SS
Sampler: BZ	Column: J & W DB-624	Date Reported: 9/2/90

Client Sample ID/Description: TRAVEL BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
79-01-6	Trichloroethene	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
75-27-4	Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	103	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	99	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Jarman 9/6/90

Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 8/31/90
Project: PBC SRWTP DIW'S	Lab Sample Id: 1VB0831A	Date Received: N/A
Proj No: SEF 24770.70	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 8/31/90
Matrix: WATER	Instrument ID: GC#1	Analyst: SS
Sampler: N/A	Column: J & W DB-624	Date Reported: 9/2/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
79-01-6	Trichloroethene	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
75-27-4	Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	102	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	103	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Jarman 9/6/90

Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY
 Project: PBC SRWTP DIW/S
 Proj No: SEF 24770.70
 Method: 601/602
 Matrix: WATER
 Sampler: N/A

Laboratory: GAINESVILLE
 Lab Sample Id: 1VB09018
 % Moisture: 0.0
 Dilution Factor: 1.0
 Instrument ID: GC#1
 Column: J & W DB-624

Date Sampled: 9/1/90
 Date Received: N/A
 Date Extracted: N/A
 Date Analyzed: 9/1/90
 Analyst: SS
 Date Reported: 9/3/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
79-01-6	Trichloroethene	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
75-27-4	Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5 Bromochloromethane-SS
 98-08-8 a,a,a-Trifluorotoluene-SS

103 %rec
 92 %rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Jarman 9/6/90



Engineers
Planners
Economists
Scientists

Client: PALM BEACH COUNTY/PBC SRWWTP DIW'S
Attention: TOM McCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Sample Number: 83886
Date Received: 08/27/90

Dear Client:

The Gainesville Organics Laboratory received your samples with a request for analysis of selected parameters.

The analytical results are enclosed. No unusual difficulties were encountered in the analyses.

If you should have any questions concerning the results please contact us. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read "Don Hash".

Don Hash
Client Services

CH2M Hill Organics Laboratory
Analytical Report

Report Contents

Sample Information

Definitions of Reporting Qualifiers

Description of Analytical Methods

Sample Quantitation Reports including Surrogate Recoveries

QA/QC Package Including:

Initial Calibration (*)

Continuing Calibration (Daily Standard) (*)

Quantitation Reports for Organic-Free Water Blanks

Matrix Spike/Matrix Spike Duplicate (*)

Surrogate Control Charts (*)

Chromatograms (*)

Copy of Chain-of-Custody

(*) Information provided where applicable or when requested.



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Economists
Scientists

SAMPLE INFORMATION

Client: PALM BEACH COUNTY/PBC SRWWTP DIW'S
Attention: TOM MCCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Description: WATER SAMPLE
PBC SRWWTP DIW'S
504 (EDB) ANALYSIS

Sample Number: 83886
Quantity: 1
Date Received: 08/27/90
Date Completed: 08/28/90
Date Reported: 09/10/90
Project Number: SEF 24270.70
Number of Pages: 8

The information shown in this report is test data only
and no interpretation of this data is intended or implied.

State of Alabama Certification No.: 40080

State of Florida Certification No.: 82112, E82124

Respectfully submitted,

Tom Emenhiser
Laboratory Manager



Engineers
Planners
Economists
Scientists

Definitions of Reporting Qualifiers

- (U) Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the Detection Limit for that compound. The detection limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.

- (M) Matrix interference precludes achieving lower detection limit. The detection limit is determined by the largest peak in the sample, and the dilution is adjusted so that neither chemical nor electronic overload of the gas chromatography system takes place. Either condition could affect the reliability of peak identification and quantitation.

- (F) Presence indicated but less than stated detection limit. In a diluted sample, a clearly defined peak was present at less than the stated detection limit.

- (N) Sample contains non-target compounds. Many samples, especially "fuel" samples, often contain non-target compounds. This qualifier is used to alert the client to the presence of non-target compounds in samples that may not contain any of the listed "target" compounds.

Detection Limit = 1.0 ug/l for water samples and 1.0 ug/kg for soil and sediment samples unless noted otherwise.

Note: the minimum detection limit for methanol extracts of high-level soil and sediment samples is 50 ug/kg due to the effect of methanol on "purging efficiency."



Analytical Methods

Purgeable Halocarbons in Water: EPA Method 601 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Water: EPA Method 602 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Halocarbons in Soil and Sediment: EPA Method 8010 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Soil: EPA Method 8020 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Trihalomethanes in Water: EPA Method 501.1 as described in the Federal Register, Vol. 44, No. 231, Appendix C, and CH2M Hill Volatiles SOP, October, 1988.

Ethylene Dibromide in Water: EPA Method 504 (1,2-dibromomethane and 1,2-dibromo-3-chloropropane in water by microextraction and gas chromatography).

Fuel Screening: Procedure for estimation of concentration and identification of "fuel" samples; used to assist in determination of required EPA methods for subsequent analysis. This methodology is not an established EPA procedure.

State of Alabama Certification Number: 40080

State of Florida Certification Numbers: 82112 and E82124

Report of Analytical Data - EDB and DBCP

Client: PALM BEACH COUNTY
 Project: PBC SRWTP DIW'S
 Proj No: SEF 24770.70
 Method: 504
 Matrix: WATER
 Sampler: B.ZIEGLER

Laboratory: GAINESVILLE
 Lab Sample Id: 83886E
 % Moisture: 0.00
 Dilution Factor: 1.00
 Instrument ID: GC#3
 Column: J & W D8-624

Date Sampled: 8/23/90
 Date Received: 8/27/90
 Date Extracted: 8/28/90
 Date Analyzed: 8/28/90
 Analyst: JEH
 Date Reported: 8/29/90

Client Sample ID/Description: IW-1

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
106-93-4	1,2-Dibromoethane	0.02	U	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U	ug/L

79-34-5 1,1,2,2-Tetrachloroethane-SS 112 %rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Farman 9/10/90

Report of Analytical Data - EDB and DBCP

Client: PALM BEACH COUNTY
 Project: PBC SRWTP DIW'S
 Proj No: SEF 24770.70
 Method: 504
 Matrix: WATER
 Sampler: N/A

Laboratory: GAINESVILLE
 Lab Sample Id: 3VB0828A
 % Moisture: 0.00
 Dilution Factor: 1.00
 Instrument ID: GC#3
 Column: J & W DB-624

Date Sampled: N/A
 Date Received: N/A
 Date Extracted: 8/28/90
 Date Analyzed: 8/28/90
 Analyst: JEH
 Date Reported: 8/29/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
106-93-4	1,2-Dibromoethane	0.02	U	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U	ug/L

79-34-5 1,1,1,2-Tetrachloroethane-SS

112 %rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Jarman 9/10/90



September 14, 1990

SEF24770.TO

Mr. Don Hash
CH2M HILL/LGN
7201 N.W. 11th Place
Gainesville, FL 32605

RE: Analytical Data for Palm Beach County, Laboratory No. 16669

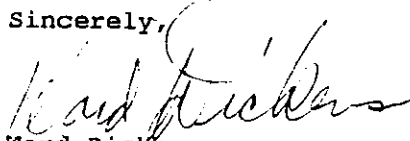
Dear Mr. Hash:

On August 28, 1990, the CH2M Hill Montgomery Laboratory received one sample with a request for analysis of selected organic parameters.

The analytical results and associated quality control data are enclosed. No unusual difficulties were encountered during the analysis of this sample.

If you should have any questions concerning the data, please inquire.

Sincerely,


Ward Dickens
Organics Division Manager

Enclosures

cc: Mr. Craig Vinson



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ANALYTICAL METHODOLOGY

Organic Analysis

Priority Pollutants: Water, soil and waste samples are analyzed in accordance with procedures described in Methods 608, 624, and 625, EPA-600/4-82-057 (1982); Methods 8080, 8240, and 8270, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition; and methods outlined in the USEPA Contract Laboratory Program Statement of Work for Organics Analysis, February, 1988.

Volatile Analysis (Safe Drinking Water Act): Water samples are analyzed in accordance with procedures described in Method 524.2, Federal Register (50 FR 46902), November 13, 1985.

Chlorinated Phenoxyacid Herbicides: Samples are analyzed with procedures described in Method 8150, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Organophosphate Pesticides: Samples are analyzed in accordance with procedures described in Methods 614 and 622, EPA-600/4-79-019 (1979) and in Method 8140, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Phenol Analysis by GC: Samples are analyzed in accordance with procedures outlined in Method 604, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8040, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Polynuclear Aromatic Hydrocarbons (GC analysis): Samples are analyzed with procedures described in Method 610, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8100, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Ethylene Dibromide : Water samples are analyzed in accordance with procedures outlined in Method 504, Federal Register (50 FR 46902), November 13, 1985.

Trihalomethanes: Water samples are analyzed with procedures described in Method 501.2, Federal Register, Vol. 44, No. 231, Part II, November 29, 1979.

EPA - DEFINED QUALIFIERS

ORGANICS

Definitions for the EPA-defined qualifiers:

- U -- Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the quantitation limit for that compound. The detection limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.
- J -- Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound below the stated quantitation limit. The "J" qualifier is not used with pesticide results.
- C -- This flag applies to pesticide results only. The "C" flag indicates the presence of this compound has been confirmed by GC/MS analysis.
- B -- This flag is used when the analyte is found in the associated blank as well as the sample. This notation indicates possible blank contamination and suggests the data user evaluate these compounds and their amounts carefully.
- E -- This flag applies to GC/MS only. The "E" qualifier indicates a compound may be above or below the linear range of the instrument. If the particular compound level is deemed above the linear calibration range, then the sample should be reanalyzed at an appropriate dilution. Therefore, the "E" qualified amount is an estimated concentration. The results for the dilution will be reported on a separate Form I and will be flagged with a "D" if the dilution brings the concentration within proper calibration.
- D -- This flag identifies compounds which have been run at a dilution to bring the concentration of that compound within the linear range of the instrument. "D" qualifiers are only used for samples that have been run initially with results above acceptable ranges. For secondary dilutions the "DL" suffix is appended to the sample number on the Form I.
- A -- Indicates the Tentatively Identified Compound (TIC) is a suspected aldol-condensation product.
- X -- Indicates the compound concentration has been manually modified or the EPA qualifier has been manually modified or added.
- JX -- The compound was detected and quantitated below the Contract Required Quantitation Limit.

CLIENT SAMPLE ID QUALIFIERS

LEVEL 1

The qualifiers that GC/MS uses with the client sample ID are defined below:

- DL -- Dilution Run
- R -- Rerun (may be followed by a digit to indicate multiple reruns)
- RD -- Diluted Rerun
- RX -- Re-extraction Analysis
- MS -- Matrix Spike (may be followed by a digit to indicate multiple matrix spikes within a sample set)
- MSD -- Matrix Spike Duplicate (may be followed by a digit to indicate multiple matrix spike duplicates within a sample set)
- QC_BLANK -- Method Blank (may be followed by an S for soils run at a low level, W for waters, or SM for soils run at a medium level) (letters may be followed by a digit to indicate multiple blanks of that type; if there are no letters the digit indicates multiple blanks).

These qualifiers allow GC/MS to have unique client sample ID's so that the client can get more accurate information from the data reported.



TABLE 1

SAMPLE CROSS-REFERENCE SUMMARY

CH2M HILL Laboratory No. 16669

<u>LMG</u> <u>Sample No.</u>	<u>LGN</u> <u>Sample No.</u>	<u>Sample Description</u>			
16669001	83886	SAMPLE IW-1	08/23/90	1300	GRAB



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 08/28/90
 Lab Sample ID: 16669001 Sample Matrix: WATER Date Analyzed: 09/06/90
 Client Sample ID: IW-1 Percent Moisture: _____ Dilution Factor: 1.0

SDWA PESTICIDE COMPOUNDS

CAS Number		ug/L	CAS Number	ug/L
58-89-9	gamma-BHC (Lindane) . . .	0.01		U
72-20-8	Endrin	0.02		U
72-43-5	Methoxychlor	0.04		U
8001-35-2	Toxaphene	0.5		U

	Dibutylchlorendate - SS	94		

- U - Analyzed for but not detected.
- B - Detected in QC blank.
- JX - Detected, concentration estimated.
- SS - Surrogate Standard reported as percent recovery.

Form I



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 08/28/90
Lab Sample ID: W08280B1 Sample Matrix: WATER Date Analyzed: 09/06/90
Client Sample ID: QC BLANK Percent Moisture: Dilution Factor: 1.0

SDWA PESTICIDE COMPOUNDS

Table with 4 columns: CAS Number, Compound Name, Concentration (ug/L), and Status (U/B/JX/SS). Rows include gamma-BHC (Lindane), Endrin, Methoxychlor, Toxaphene, and Dibutylchloroendate - SS.

- U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Form I

000002



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 08/30/90
Lab Sample ID: 16669001 Sample Matrix: WATER Date Analyzed: 09/12/90
Client Sample ID: IW-1 Percent Moisture: Dilution Factor: 1.0

SDWA HERBICIDE COMPOUNDS

Table with 4 columns: CAS Number, Compound Name, Concentration (ug/L), and Detection Status (U). Rows include 2,4-D (2.5 U), Silvex (0.5 U), and 3,5-Dichlorobenzoic acid - SS (26).

- U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Form I



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 08/30/90
 Lab Sample ID: W08300B1 Sample Matrix: WATER Date Analyzed: 09/12/90
 Client Sample ID: QC BLANK Percent Moisture: _____ Dilution Factor: 1.0

SDWA HERBICIDE COMPOUNDS

CAS Number		ug/L		CAS Number		ug/L
94-75-7	2,4-D	2.5	U			
93-72-1	Silvex	0.5	U			

	3,5-Dichlorobenzoic acid - SS	37				

- U - Analyzed for but not detected.
- B - Detected in QC blank.
- JX - Detected, concentration estimated.
- SS - Surrogate Standard reported as percent recovery.

Form I

CHM QUALITY ANALYTICS
CHAIN OF CUSTODY RECORD

LAB# 10001
PROJ# SEF247

TOLMG

PROJECT NUMBER SEP 24 770-70		PROJECT NAME PBC SAULTP Hills		CLIENT ADDRESS AND PHONE NUMBER		ANALYSES REQUESTED		LAB ID		FOR LAB USE ONLY	
CLIENT NAME PALM BEACH COUNTY				* OF CONTAINERS 601/602				LAB ID		FOR LAB USE ONLY	
PROJECT MANAGER X215 Tom McCormick / DFB		COPY TO: L DRAGO B EAGER		HAZWRAP/NEESA		COC		ICE		TEMP	
REQUESTED COMP. DATE 5/10/90		SAMPLING REQUIREMENTS SDWA <input type="checkbox"/> NPDES <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER <input type="checkbox"/>		HAZWRAP/NEESA		COC		ICE		TEMP	
STA NO.	DATE	TIME	C O M P O R A B S O I L	SAMPLE DESCRIPTIONS (12 CHARACTERS)		HAZWRAP/NEESA		COC		ICE	
1	5/23/90	1300	X	IY-1		83886001					
				Travel Blanks		83887					
				recovered samples		83888					
SAMPLED BY AND TITLE B. ELLIOTT / ENR				DATE/TIME 5/23/90 1420		RELINQUISHED BY [Signature]		DATE/TIME 8/27/90 1450		HAZWRAP/NEESA Y N	
RECEIVED BY: [Signature]				DATE/TIME 8/28/90 0845		RELINQUISHED BY: M Morgan		DATE/TIME 8-27-90 1450		QC LEVEL 1 2 3	
RECEIVED BY LAB: M Morgan				DATE/TIME 8-27-90		SAMPLE SHIPPED VIA UPS (BUS) (FED-EX) HAND OTHER		AIR BILL# 606715530		COC REVIEWED [Signature]	
REMARKS [Handwritten notes]						ENTERED INTO LIMS [Signature]			COC REVIEWED [Signature]		

000005

A8536415 REV 6/89 FORIA 311



September 14, 1990

LRD294.10

CH2M HILL
7201 N.W. 11th Place
Gainesville, FL 32605

Attention: Don Hash

RE: Laboratory Reference Number - 27442

Dear Don:

The results are enclosed for your sample which was received by our laboratory on August 29, 1990.

If you have any questions please contact Ms. Mona Jones in Client Service.

CH2M HILL stores samples for 30 days after the written report date at no charge. After 30 days, non-hazardous samples are disposed of at no charge. If you require either of the following services you need to notify us within 15 days:


- * Return of samples to the address shown above.
- * Storage of samples at \$5.00/sample/month.

If a sample is determined to be hazardous, we will contact you to discuss disposal options.

Thank you for selecting a CH2M HILL laboratory for your analytical testing needs.

Sincerely,

CH2M HILL QUALITY ANALYTICS LABORATORY


Peggy A. Norton
Senior Data Package Specialist

Encl.

CASE NARRATIVE
General Chemistry
27442

I. Holding Time: All criteria met.

II. Analysis:

- A. Calibration: Acceptance criteria met.
- B. Blanks: Acceptance criteria met.
- C. Matrix Spike: Acceptance criteria met.
- D. Duplicate Analysis: Acceptance criteria met.
- E. Lab Control Sample: Acceptance criteria met.
- F. The Nitrate results are reported as N. To convert to Nitrate as NO₃ multiply the result by 4.43.
- G. Other: None.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: Randall Wright
Randall L. Wright
General Chemistry Supervisor

DATE: 9/13/90



Engineers
 Planners
 Economists
 Scientists

REPORT OF ANALYTICAL RESULTS

Date: 09/14/90

Page: 1 of

Client: CH2M HILL/LGN
 7201 N.W. 11TH PLACE
 GAINESVILLE, FL 32605


Project Number: SEF24770.T0
 PALM BEACH COUNTY
 Laboratory Number: 27442
 Date Received: 08/29/90

Atten: MR. DON HASH

=====
 Sample Description: IW-1 LG83886
 Laboratory Sample Number: 27442001 Date Collected: 08/23/90 Matrix: WATER-
 =====

Analytical Parameter	Method	Det Limit	Result	Units	Ana Date
Gross Alpha	EPA900.0	----	43.3 +/- 27.1	pCi/L	09/08/90

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: 

INRPRPT (v900202)

INJECTION WELL NO. 2



November 14, 1990

SEF24770.TO | AAD459

RE: Palm Beach County laboratory samples

Dear Tom McCormick/DFB:

On October 11, 1990 the CH2M Hill Gainesville Laboratory received 3 water, grab samples with a request for analysis of selected parameters.

The analytical results are enclosed. In the analysis of sample 85934 (PBC SRWWTP IW-2) matrix interferences were encountered. Cadmium and Lead, the sample was diluted 1:4 but the spike recoveries were still out of in house control limits, however, positive values were obtained at this dilution and so reported. For Arsenic and Selenium a 1:4 dilution was applied to the sample to obtain acceptable QA/QC data. The values were within control limits. The detection limits were elevated by the dilution factor. Due to laboratory oversight Kjeldahl Nitrogen was performed 1 day past the specified holding time.

If you should have any questions concerning the results, please call Don Hash or Tom Emenhiser.

Sincerely,

A handwritten signature in black ink, appearing to read 'Don Hash', is positioned below the word 'Sincerely,'.

Don Hash
Client Services

Enclosure(s):

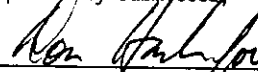
cc: Bart Ziegler/DF

Palm Beach County	CH2MHILL
Attention: Tom McCormick Address: DFB Copies to: Bart Ziegler/DFB	Project No: SEF24770.TO Received: 10/11/90 Reported: 11/14/90
Collected: 10/10/90 by Bart Ziegler Type: water, grab	

SAMPLE NUMBER	85934	85935	85936
SAMPLE DESCRIPTIONS	PBC SRWTP IW-2 10/10/90 15:00	Travel Blank 10/10/90	Laboratory Method Blank
GENERAL			
pH (Units)	8.05 10/11/90	n/r	Not Applicable 10/11/90
Alkalinity, Total (as CaCO3)	110 10/18/90	n/r	<1.0 10/18/90
Color (APHA)	35 10/12/90	n/r	Not Applicable 10/12/90
Hardness, Calcium (as CaCO3)	567 10/18/90	n/r	<1.0 10/18/90
Turbidity (NTU)	4.6 10/12/90	n/r	<0.2 10/12/90
Odor (TON)	N.O.O 10/12/90	n/r	N.O.O 10/12/90
SOLIDS			
Total Dissolved Solids	37,200 10/17/90	n/r	<1.0 10/17/90
METALS			
Arsenic - FU*	<0.025* 10/22/90	<0.005 10/22/90	<0.005 10/22/90
Barium - FL	<0.2 10/29/90	<0.2 10/29/90	<0.2 10/29/90

NOTE: Values are mg/l as substance unless otherwise stated.
 * See cover letter.

Respectfully submitted,


 T. Ward Dickens, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.



Engineers
Planners
Economists
Scientists

REPORT OF ANALYSIS

Florida Certification: 82112; E82124

AAD459

11/14/90

Page 2 of 3

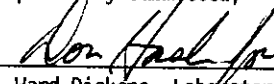
Sample Nos: 85934 - 85936

SAMPLE NUMBER	85934	85935	85936
SAMPLE DESCRIPTIONS	PBC SRWTP IW-2 10/10/90 15:00	Travel Blank 10/10/90	Laboratory Method Blank
Cadmium - FU*	0.002 10/25/90	<0.0002 10/25/90	<0.0002 10/25/90
Chromium, Tot - FU	<0.002 10/26/90	<0.002 10/26/90	<0.002 10/26/90
Copper - FL	0.07 10/19/90	<0.02 10/19/90	<0.02 10/19/90
Iron, Total - FL	1.4 10/17/90	<0.02 10/17/90	<0.02 10/17/90
Lead - FU*	0.026 11/06/90	<0.002 10/23/90	<0.002 10/23/90
Manganese - FL	0.12 10/18/90	<0.01 10/18/90	<0.01 10/18/90
Mercury - CV	0.0005 10/26/90	<0.0002 10/26/90	<0.0002 10/26/90
Selenium*	<0.025 11/02/90	<0.005 11/02/90	<0.005 11/02/90
Silver - FL	0.07 10/31/90	<0.02 10/31/90	<0.02 10/31/90
Sodium - FL	12,500 10/24/90	<0.5 10/24/90	<0.5 10/24/90
Zinc - FL	0.06 10/19/90	<0.01 10/19/90	<0.01 10/19/90
ANIONS			
Chloride	20,300 10/29/90	n/r	<1.0 10/29/90
Fluoride	0.65 10/18/90	n/r	<0.01 10/18/90
Sulfate	2840 10/29/90	n/r	Not Applicable 10/29/90
NUTRIENTS			
Ammonia (as N)	<0.04	n/r	Not Applicable

NOTE: Values are mg/l as substance unless otherwise stated.

* See cover letter.

Respectfully submitted,


T. Ward Dickens, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.

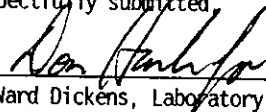
REPORT OF ANALYSIS

Florida Certification: 82112; E82124

SAMPLE NUMBER	85934	85935	85936
SAMPLE DESCRIPTIONS	PBC SRWTP IW-2 10/10/90 15:00	Travel Blank 10/10/90	Laboratory Method Blank
Nitrate & Nitrite (as N)	11/01/90 0.17	n/r n/r	11/01/90 <0.02
Kjeldahl Nitrogen (as N)*	10/24/90 <0.04	n/r n/r	10/24/90 Not Applicable
GENERAL ORGANICS	11/08/90	n/r	11/08/90
Surfactants (MBAS)	<0.1 10/12/90	n/r n/r	<0.05 10/12/90
Corrosivity	0.95 11/12/90	n/r n/r	Not Applicable 11/12/90

NOTE: Values are mg/l as substance unless otherwise stated.
 * See cover letter.

Respectfully submitted,


 T. Ward Dickens, Laboratory Manager

n/r = not requested

NOTE: This report contains test data and no interpretation is intended or implied.



Client: PALM BEACH COUNTY/PBC SRWWT P DIW
Attention: T. MCCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Sample Number: 85934-35
Date Received: 10/11/90

Dear Client:

The Gainesville Organics Laboratory received your samples with a request for analysis of selected parameters.

The analytical results are enclosed. No unusual difficulties were encountered in the analyses.

If you should have any questions concerning the results please contact us. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Tom Emenhiser', is written over a horizontal line.

Tom Emenhiser
Client Services

CH2M Hill Organics Laboratory
Analytical Report

Report Contents

Sample Information

Definitions of Reporting Qualifiers

Description of Analytical Methods

Sample Quantitation Reports including Surrogate Recoveries

QA/QC Package Including:

Initial Calibration (*)

Continuing Calibration (Daily Standard) (*)

Quantitation Reports for Organic-Free Water Blanks

Matrix Spike/Matrix Spike Duplicate (*)

Surrogate Control Charts (*)

Chromatograms (*)

Copy of Chain-of-Custody

(*) Information provided where applicable or when requested.



SAMPLE INFORMATION

Client: PALM BEACH COUNTY/PBC SRWWT P DIW
Attention: T. MCCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Description: WATER SAMPLES
PBC SRWWT P DIW
601/602 ANALYSIS

Sample Number: 85934-35
Quantity: 2
Date Received: 10/11/90
Date Completed: 10/23/90
Date Reported: 10/31/90
Project Number: SEF 24770.T0
Number of Pages: 10

The information shown in this report is test data only
and no interpretation of this data is intended or implied.

State of Alabama Certification No.: 40080

State of Florida Certification No.: 82112, E82124

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Ward Dickens', is written over a horizontal line.

Ward Dickens
Laboratory Manager

Definitions of Reporting Qualifiers

- (U) Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the Reporting Limit for that compound. The Reporting Limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.
- (JX) Presence indicated but less than stated Reporting Limit. In a diluted sample, a clearly defined peak was present at less than the stated Reporting Limit.
- (M) Matrix interference precludes achieving lower Reporting Limit. The Reporting Limit is determined by the largest peak in the sample, and the dilution is adjusted so that neither chemical nor electronic overload of the gas chromatography system takes place. Either condition could affect the reliability of peak identification and quantitation.
- (N) Sample contains non-target compounds. Many samples, especially "fuel" samples, often contain non-target compounds. This qualifier is used to alert the client to the presence of non-target compounds in samples, even if no target compounds are detected.

Reporting Limit = 1.0 ug/l for water samples and 1.0 ug/kg for soil and sediment samples unless noted otherwise.

Note: the minimum Reporting Limit for methanol extracts of high-level soil and sediment samples is 50 ug/kg due to the effect of methanol on "purging efficiency."



Analytical Methods

Purgeable Halocarbons in Water: EPA Method 601 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Water: EPA Method 602 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Halocarbons in Soil and Sediment: EPA Method 8010 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Soil: EPA Method 8020 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Trihalomethanes in Water: EPA Method 501.1 as described in the Federal Register, Vol. 44, No. 231, Appendix C, and CH2M Hill Volatiles SOP, October, 1988.

Ethylene Dibromide in Water: EPA Method 504 (1,2-dibromomethane and 1,2-dibromo-3-chloropropane in water by microextraction and gas chromatography).

Fuel Screening: Procedure for estimation of concentration and identification of "fuel" samples; used to assist in determination of required EPA methods for subsequent analysis. This methodology is not an established EPA procedure.

State of Alabama Certification Number: 40080

State of Florida Certification Numbers: 82112 and E82124



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 10/10/90
Project: PBC SRWWT P DIW	Lab Sample Id: 85934	Date Received: 10/11/90
Proj No: SEF 24770.TO	% Moisture: 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 10/23/90
Matrix: WATER	Instrument ID: GC#2	Analyst: SS
Sampler: DZ	Column: J & W DB-1	Date Reported: 10/26/90

Client Sample ID/Description: PBC SRWWTB IW-2

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	93	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	96	%rec

U = Compound analyzed for but not detected
 SS = Surrogate Standard reported as percent recovery

Reviewed by: _____



Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 10/10/90
Project: PBC SRWWT P DIW	Lab Sample Id: 85935	Date Received: 10/11/90
Proj No: SEF 24770.TO	% Moisture 0.0	Date Extracted: N/A
Method: 601/602	Dilution Factor: 1.0	Date Analyzed: 10/22/90
Matrix: WATER	Instrument ID: GC#2	Analyst: SS
Sampler: DZ	Column: J & W DB-1	Date Reported: 10/26/90

Client Sample ID/Description: TRAVEL BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethane	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS	96	%rec
98-08-8	a,a,a-Trifluorotoluene-SS	95	%rec

U = Compound analyzed for but not detected
 SS = Surrogate-Standard reported as percent recovery

Reviewed by: [Signature]



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Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY
Project: PBC SRWWT P DIW
Proj No: SEF 24770.TO
Method: 601/602
Matrix: WATER
Sampler: N/A

Laboratory: GAINESVILLE
Lab Sample Id: 2VB1022B
% Moisture: 0.0
Dilution Factor: 1.0
Instrument ID: GC#2
Column: J & W DB-1

Date Sampled: 10/22/90
Date Received: N/A
Date Extracted: N/A
Date Analyzed: 10/22/90
Analyst: SS
Date Reported: 10/26/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L

74-97-5	Bromochloromethane-SS		93	%rec
98-08-8	a,a,a-Trifluorotoluene-SS		95	%rec

U = Compound analyzed for but not detected
SS = Surrogate Standard reported as percent recovery

Reviewed by: [Signature] 10/27/90



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Report of Analytical Data - Purgeable Halocarbons/Aromatics

Client: PALM BEACH COUNTY
Project: PBC SRWWT P DIW
Proj No: SEF 24770.TO
Method: 601/602
Matrix: WATER
Sampler: N/A

Laboratory: GAINESVILLE
Lab Sample Id: 2VB1023A
% Moisture: 0.0
Dilution Factor: 1.0
Instrument ID: GC#2
Column: J & W DB-1

Date Sampled: 10/23/90
Date Received: N/A
Date Extracted: N/A
Date Analyzed: 10/23/90
Analyst: SS
Date Reported: 10/26/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
74-87-3	Chloromethane	1.0	U	ug/L
75-01-4	Vinyl Chloride	1.0	U	ug/L
74-83-9	Bromomethane	1.0	U	ug/L
75-00-3	Chloroethane	1.0	U	ug/L
75-69-4	Trichlorofluoromethane	1.0	U	ug/L
75-35-4	1,1-Dichloroethene	1.0	U	ug/L
75-09-2	Dichloromethane	1.0	U	ug/L
156-60-5	trans-1,2-Dichloroethene	1.0	U	ug/L
75-34-3	1,1-Dichloroethane	1.0	U	ug/L
67-66-3	Chloroform	1.0	U	ug/L
107-06-2	1,2-Dichloroethane	1.0	U	ug/L
71-55-6	1,1,1-Trichloroethane	1.0	U	ug/L
56-23-5	Carbon Tetrachloride	1.0	U	ug/L
78-87-5	1,2-Dichloropropane	1.0	U	ug/L
79-01-6	Trichloroethene			
75-27-4	and Bromodichloromethane	1.0	U	ug/L
10061-01-5	cis-1,3-Dichloropropene	1.0	U	ug/L
10061-02-6	trans-1,3-Dichloropropene	1.0	U	ug/L
79-00-5	1,1,2-Trichloroethane	1.0	U	ug/L
124-48-1	Dibromochloromethane	1.0	U	ug/L
127-18-4	Tetrachloroethene	1.0	U	ug/L
108-90-7	Chlorobenzene	1.0	U	ug/L
75-25-2	Bromoform	1.0	U	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	1.0	U	ug/L
541-73-1	1,3-Dichlorobenzene	1.0	U	ug/L
106-46-7	1,4-Dichlorobenzene	1.0	U	ug/L
95-50-1	1,2-Dichlorobenzene	1.0	U	ug/L
1634-04-4	tert-Butyl methyl ether	1.0	U	ug/L
71-43-2	Benzene	1.0	U	ug/L
108-88-3	Toluene	1.0	U	ug/L
100-41-4	Ethylbenzene	1.0	U	ug/L
N/A	Xylenes (Total)	1.0	U	ug/L
74-97-5	Bromochloromethane-SS			92 %rec
98-08-8	a,a,a-Trifluorotoluene-SS			94 %rec

U = Compound analyzed for but not detected
SS = Surrogate Standard reported as percent recovery

Reviewed by: [Signature]



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Client: PALM BEACH COUNTY
Attention: T. McCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Sample Number: 85934
Date Received: 10/11/90

Dear Client:

The Gainesville Organics Laboratory received your samples with a request for analysis of selected parameters.

The analytical results are enclosed. No unusual difficulties were encountered in the analyses.

If you should have any questions concerning the results please contact us. Thank you.

Sincerely,

A handwritten signature in cursive script, appearing to read "Don Hash".

Don Hash
Client Services

CH2M Hill Organics Laboratory
Analytical Report

Report Contents

Sample Information

Definitions of Reporting Qualifiers

Description of Analytical Methods

Sample Quantitation Reports including Surrogate Recoveries

QA/QC Package Including:

Initial Calibration (*)

Continuing Calibration (Daily Standard) (*)

Quantitation Reports for Organic-Free Water Blanks

Matrix Spike/Matrix Spike Duplicate (*)

Surrogate Control Charts (*)

Chromatograms (*)

Copy of Chain-of-Custody

(*) Information provided where applicable or when requested.



SAMPLE INFORMATION

Client: PALM BEACH COUNTY
Attention: T. McCORMICK
Address: CH2M HILL DEERFIELD BEACH OFFICE

Description: WATER SAMPLE
PBC SRWWTP DIW
504 (EDB) ANALYSIS

Sample Number: 85934
Quantity: 1
Date Received: 10/11/90
Date Completed: 10/11/90
Date Reported: 10/16/90
Project Number: SEF 24770.TO
Number of Pages: 8

The information shown in this report is test data only
and no interpretation of this data is intended or implied.

State of Alabama Certification No.: 40080

State of Florida Certification No.: 82112, E82124

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Tom Emenhiser', is written over a horizontal line.

Tom Emenhiser
Laboratory Manager

Definitions of Reporting Qualifiers

- (U) Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the Reporting Limit for that compound. The Reporting Limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.
- (JX) Presence indicated but less than stated Reporting Limit. In a diluted sample, a clearly defined peak was present at less than the stated Reporting Limit.
- (M) Matrix interference precludes achieving lower Reporting Limit. The Reporting Limit is determined by the largest peak in the sample, and the dilution is adjusted so that neither chemical nor electronic overload of the gas chromatography system takes place. Either condition could affect the reliability of peak identification and quantitation.
- (N) Sample contains non-target compounds. Many samples, especially "fuel" samples, often contain non-target compounds. This qualifier is used to alert the client to the presence of non-target compounds in samples, even if no target compounds are detected.

Reporting Limit = 1.0 ug/l for water samples and 1.0 ug/kg for soil and sediment samples unless noted otherwise.

Note: the minimum Reporting Limit for methanol extracts of high-level soil and sediment samples is 50 ug/kg due to the effect of methanol on "purging efficiency."

Analytical Methods

Purgeable Halocarbons in Water: EPA Method 601 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Water: EPA Method 602 as described in the Title 40 Code of Federal Regulations, Part 136, Appendix A, July, 1988, and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Halocarbons in Soil and Sediment: EPA Method 8010 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Purgeable Aromatics in Soil: EPA Method 8020 as described in Test Methods for Evaluating Solid Waste (SW-846) and CH2M Hill GC Volatiles SOP, October, 1988.

Trihalomethanes in Water: EPA Method 501.1 as described in the Federal Register, Vol. 44, No. 231, Appendix C, and CH2M Hill Volatiles SOP, October, 1988.

Ethylene Dibromide in Water: EPA Method 504 (1,2-dibromomethane and 1,2-dibromo-3-chloropropane in water by microextraction and gas chromatography).

Fuel Screening: Procedure for estimation of concentration and identification of "fuel" samples; used to assist in determination of required EPA methods for subsequent analysis. This methodology is not an established EPA procedure.

State of Alabama Certification Number: 40080

State of Florida Certification Numbers: 82112 and E82124



Report of Analytical Data - EDB and DBCP

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: 10/10/90
Project: PBC SRWWTP DIW	Lab Sample Id: 85934E	Date Received: 10/11/90
Proj No: SEF 24770.TO	% Moisture 0.00	Date Extracted: 10/11/90
Method: 504	Dilution Factor: 1.00	Date Analyzed: 10/11/90
Matrix: WATER	Instrument ID: GC#3	Analyst: JEH
Sampler: DZ	Column: J & W DB-624	Date Reported: 10/15/90

Client Sample ID/Description: PBC SRWWTP IW-2

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
106-93-4	1,2-Dibromoethane	0.02	U	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U	ug/L

79-34-5 1,1,2,2-Tetrachloroethane-SS 112 %rec

U = Compound analyzed for but not detected
SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Varman 10/16/90



Report of Analytical Data - EDB and DBCP

Client: PALM BEACH COUNTY	Laboratory: GAINESVILLE	Date Sampled: N/A
Project: PBC SRWTPDIW	Lab Sample Id: 3VB1011C	Date Received: N/A
Proj No: SEF 24770.TO	% Moisture 0.00	Date Extracted: 10/11/90
Method: 504	Dilution Factor: 1.00	Date Analyzed: 10/11/90
Matrix: WATER	Instrument ID: GC#3	Analyst: JEH
Sampler: N/A	Column: J & W DB-624	Date Reported: 10/11/90

Client Sample ID/Description: OFW BLANK

CAS Number	Compound	Reporting Limit	Sample Result	Reporting Units
106-93-4	1,2-Dibromoethane	0.02	U	ug/L
96-12-8	1,2-Dibromo-3-chloropropane	0.02	U	ug/L

79-34-5 1,1,2,2-Tetrachloroethane-SS 118 %rec

U = Compound analyzed for but not detected
SS = Surrogate Standard reported as percent recovery

Reviewed by: Charlie Korman 10/16/90



October 30, 1990

SEF24770.TO

Mr. Don Hash
CH2M HILL/LGN
7201 N.W. 11th Place
Gainesville, FL 32605

RE: Analytical Data for Palm Beach County, Laboratory No. 17021

Dear Mr. Hash:

On October 12, 1990, the CH2M Hill Montgomery Laboratory received one sample with a request for analysis of selected organic parameters.

The analytical results and associated quality control data are enclosed. Aldrin and dieldrin are reported in addition to the usual SDWA pesticides. No unusual difficulties were encountered during the analysis of this sample.

If you should have any questions concerning the data, please inquire.

Sincerely,

A handwritten signature in cursive script, appearing to read "Herb Kelly", is written over the typed name.

Herb Kelly
Organics Division Manager

Enclosures

cc: Mr. Craig Vinson



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ANALYTICAL METHODOLOGY

Organic Analysis

Priority Pollutants: Water, soil and waste samples are analyzed in accordance with procedures described in Methods 608, 624, and 625, EPA-600/4-82-057 (1982); Methods 8080, 8240, and 8270, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition; and methods outlined in the USEPA Contract Laboratory Program Statement of Work for Organics Analysis, February, 1988.

Volatile Analysis (Safe Drinking Water Act): Water samples are analyzed in accordance with procedures described in Method 524.2, Federal Register (50 FR 46902), November 13, 1985.

Chlorinated Phenoxyacid Herbicides: Samples are analyzed with procedures described in Method 8150, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Organophosphate Pesticides: Samples are analyzed in accordance with procedures described in Methods 614 and 622, EPA-600/4-79-019 (1979) and in Method 8140, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Phenol Analysis by GC: Samples are analyzed in accordance with procedures outlined in Method 604, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8040, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Polynuclear Aromatic Hydrocarbons (GC analysis): Samples are analyzed with procedures described in Method 610, Federal Register, 40 CFR, Part 136 (July 1, 1987) and in Method 8100, Test Methods for Evaluating Solid Waste, 1986, SW-846, Third Edition.

Ethylene Dibromide : Water samples are analyzed in accordance with procedures outlined in Method 504, Federal Register (50 FR 46902), November 13, 1985.

Trihalomethanes: Water samples are analyzed with procedures described in Method 501.2, Federal Register, Vol. 44, No. 231, Part II, November 29, 1979.

EPA - DEFINED QUALIFIERS

ORGANICS

Definitions for the EPA-defined qualifiers:

- U -- Indicates the compound was analyzed for but not detected. The number adjacent to the "U" qualifier indicates the quantitation limit for that compound. The detection limit can vary from sample to sample depending on dilution factors or percent moisture adjustment when indicated.
- J -- Indicates an estimated value. This flag is used when the mass spectral data indicates the presence of a compound below the stated quantitation limit. The "J" qualifier is not used with pesticide results.
- C -- This flag applies to pesticide results only. The "C" flag indicates the presence of this compound has been confirmed by GC/MS analysis.
- B -- This flag is used when the analyte is found in the associated blank as well as the sample. This notation indicates possible blank contamination and suggests the data user evaluate these compounds and their amounts carefully.
- E -- This flag applies to GC/MS only. The "E" qualifier indicates a compound may be above or below the linear range of the instrument. If the particular compound level is deemed above the linear calibration range, then the sample should be reanalyzed at an appropriate dilution. Therefore, the "E" qualified amount is an estimated concentration. The results for the dilution will be reported on a separate Form I and will be flagged with a "D" if the dilution brings the concentration within proper calibration.
- D -- This flag identifies compounds which have been run at a dilution to bring the concentration of that compound within the linear range of the instrument. "D" qualifiers are only used for samples that have been run initially with results above acceptable ranges. For secondary dilutions the "DL" suffix is appended to the sample number on the Form I.
- A -- Indicates the Tentatively Identified Compound (TIC) is a suspected aldol-condensation product.
- X -- Indicates the compound concentration has been manually modified or the EPA qualifier has been manually modified or added.
- JX -- The compound was detected and quantitated below the Contract Required Quantitation Limit.

CLIENT SAMPLE ID QUALIFIERS

LEVEL 1

The qualifiers that GC/MS uses with the client sample ID are defined below:

- DL -- Dilution Run
- R -- Rerun (may be followed by a digit to indicate multiple reruns)
- RD -- Diluted Rerun
- RX -- Re-extraction Analysis
- MS -- Matrix Spike (may be followed by a digit to indicate multiple matrix spikes within a sample set)
- MSD -- Matrix Spike Duplicate (may be followed by a digit to indicate multiple matrix spike duplicates within a sample set)
- QC_BLANK -- Method Blank (may be followed by an S for soils run at a low level, W for waters, or SM for soils run at a medium level) (letters may be followed by a digit to indicate multiple blanks of that type; if there are no letters the digit indicates multiple blanks).

These qualifiers allow GC/MS to have unique client sample ID's so that the client can get more accurate information from the data reported.



TABLE 1

SAMPLE CROSS-REFERENCE SUMMARY

CH2M HILL Laboratory No. 17021

<u>LMG</u> <u>Sample No.</u>	<u>LGN</u> <u>Sample No.</u>	<u>Sample Description</u>
17021001	85934	SAMPLE PBC SRWWTP IM-2 10/10/90 1500 GRAB



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 10/12/90
 Lab Sample ID: 17021001 Sample Matrix: WATER Date Analyzed: 10/24/90
 Client Sample ID: PBCSRWWTP IW2 Percent Moisture: _____ Dilution Factor: 1.0

SEMIVOLATILE COMPOUNDS

CAS Number		ug/L		CAS Number		ug/L
62-75-9	N-Nitrosodimethylamine . .	10	U	100-02-7	4-Nitrophenol	50
108-95-2	Phenol	10	U	132-64-9	Dibenzofuran	10
62-53-3	Aniline	10	U	121-14-2	2,4-Dinitrotoluene	10
111-44-4	bis(2-Chloroethyl)Ether .	10	U	84-66-2	Diethylphthalate	10
95-57-8	2-Chlorophenol	10	U	7005-72-3	4-Chlorophenyl-phenylether	10
541-73-1	1,3-Dichlorobenzene . . .	10	U	86-73-7	Fluorene	10
106-46-7	1,4-Dichlorobenzene . . .	10	U	100-01-6	4-Nitroaniline	50
100-51-6	Benzyl Alcohol	10	U	534-52-1	4,6-Dinitro-2-methylphenol	50
95-50-1	1,2-Dichlorobenzene . . .	10	U	86-30-6	N-Nitrosodiphenylamine (1)	10
95-48-7	2-Methylphenol	10	U	122-66-7	1,2-Diphenylhydrazine . .	10
108-60-1	bis(2-Chloroisopropyl)Ether	10	U	101-55-3	4-Bromophenyl-phenylether	10
106-44-5	4-Methylphenol	10	U	118-74-1	Hexachlorobenzene	10
621-64-7	N-Nitroso-di-n-propylamine	10	U	87-86-5	Pentachlorophenol	50
67-72-1	Hexachloroethane	10	U	85-01-8	Phenanthrene	10
98-95-3	Nitrobenzene	10	U	120-12-7	Anthracene	10
75-59-1	Isophorone	10	U	84-74-2	Di-n-Butylphthalate	10
75-5	2-Nitrophenol	10	U	206-44-0	Fluoranthene	10
106-67-9	2,4-Dimethylphenol	10	U	129-00-0	Pyrene	10
65-85-0	Benzoic Acid	50	U	85-68-7	Butylbenzylphthalate	10
111-91-1	bis(2-Chloroethoxy)Methane	10	U	91-94-1	3,3'-Dichlorobenzidine . . .	20
120-83-2	2,4-Dichlorophenol	10	U	56-55-3	Benzo(a)anthracene	10
120-82-1	1,2,4-Trichlorobenzene . .	10	U	218-01-9	Chrysene	10
91-20-3	Naphthalene	10	U	117-81-7	bis(2-Ethylhexyl)Phthalate	10
106-47-8	4-Chloroaniline	10	U	117-84-0	Di-n-octylphthalate	10
87-68-3	Hexachlorobutadiene	10	U	205-99-2	Benzo(b)fluoranthene	10
59-50-7	4-Chloro-3-methylphenol . .	10	U	207-08-9	Benzo(k)fluoranthene	10
91-57-6	2-Methylnaphthalene	10	U	50-32-8	Benzo(a)pyrene	10
77-47-4	Hexachlorocyclopentadiene	10	U	193-39-5	Indeno(1,2,3-cd)Pyrene . . .	10
88-06-2	2,4,6-Trichlorophenol . . .	10	U	53-70-3	Dibenz(a,h)Anthracene . . .	10
95-95-4	2,4,5-Trichlorophenol . . .	50	U	191-24-2	Benzo(g,h,i)perylene	10
91-58-7	2-Chloronaphthalene	10	U			
88-74-4	2-Nitroaniline	50	U		Nitrobenzene-d5 - SS	63
131-11-3	Dimethyl Phthalate	10	U		2-Fluorobiphenyl - SS	53
208-96-8	Acenaphthylene	10	U		Terphenyl-d14 - SS	70
606-20-2	2,6-Dinitrotoluene	10	U		Phenol-d5 - SS	37
99-09-2	3-Nitroaniline	50	U		2-Fluorophenol - SS	46
83-32-9	Acenaphthene	10	U		2,4,6-Tribromophenol - SS	68
51-28-5	2,4-Dinitrophenol	50	U			

- (1) - Cannot be separated from diphenylamine.
- U - Compound analyzed for but not detected.
- Compound was detected in QC blank.
- J - Reported value less than quantitation limit.
- SS - Surrogate Standard reported as percent recovery.

000001



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 10/12/90
 Lab Sample ID: W10120B1 Sample Matrix: WATER Date Analyzed: 10/15/90
 Client Sample ID: QC BLANK W Percent Moisture: _____ Dilution Factor: 1.0

SEMIVOLATILE COMPOUNDS

CAS Number	ug/L	CAS Number	ug/L
62-75-9	N-Nitrosodimethylamine . . . 10 U	100-02-7	4-Nitrophenol 50 U
108-95-2	Phenol 10 U	132-64-9	Dibenzofuran 10 U
62-53-3	Aniline 10 U	121-14-2	2,4-Dinitrotoluene 10 U
111-44-4	bis(2-Chloroethyl)Ether . . . 10 U	84-66-2	Diethylphthalate 10 U
95-57-8	2-Chlorophenol 10 U	7005-72-3	4-Chlorophenyl-phenylether 10 U
541-73-1	1,3-Dichlorobenzene 10 U	86-73-7	Fluorene 10 U
106-46-7	1,4-Dichlorobenzene 10 U	100-01-6	4-Nitroaniline 50 U
100-51-6	Benzyl Alcohol 10 U	534-52-1	4,6-Dinitro-2-methylphenol 50 U
95-50-1	1,2-Dichlorobenzene 10 U	86-30-6	N-Nitrosodiphenylamine (1) 10 U
95-48-7	2-Methylphenol 10 U	122-66-7	1,2-Diphenylhydrazine . . . 10 U
108-60-1	bis(2-Chloroisopropyl)Ether 10 U	101-55-3	4-Bromophenyl-phenylether 10 U
106-44-5	4-Methylphenol 10 U	118-74-1	Hexachlorobenzene 10 U
621-64-7	N-Nitroso-di-n-propylamine 10 U	87-86-5	Pentachlorophenol 50 U
67-72-1	Hexachloroethane 10 U	85-01-8	Phenanthrene 10 U
98-95-3	Nitrobenzene 10 U	120-12-7	Anthracene 10 U
78-59-1	Isophorone 10 U	84-74-2	Di-n-Butylphthalate 10 U
88-75-5	2-Nitrophenol 10 U	206-44-0	Fluoranthene 10 U
106-67-9	2,4-Dimethylphenol 10 U	129-00-0	Pyrene 10 U
106-85-0	Benzoic Acid 50 U	85-68-7	Butylbenzylphthalate 10 U
111-91-1	bis(2-Chloroethoxy)Methane 10 U	91-94-1	3,3'-Dichlorobenzidine . . . 20 U
120-83-2	2,4-Dichlorophenol 10 U	56-55-3	Benzo(a)anthracene 10 U
120-82-1	1,2,4-Trichlorobenzene . . . 10 U	218-01-9	Chrysene 10 U
91-20-3	Naphthalene 10 U	117-81-7	bis(2-Ethylhexyl)Phthalate 10 U
106-47-8	4-Chloroaniline 10 U	117-84-0	Di-n-octylphthalate 10 U
87-68-3	Hexachlorobutadiene 10 U	205-99-2	Benzo(b)fluoranthene 10 U
59-50-7	4-Chloro-3-methylphenol . . 10 U	207-08-9	Benzo(k)fluoranthene 10 U
91-57-6	2-Methylnaphthalene 10 U	50-32-8	Benzo(a)pyrene 10 U
77-47-4	Hexachlorocyclopentadiene 10 U	193-39-5	Indeno(1,2,3-cd)Pyrene . . . 10 U
88-06-2	2,4,6-Trichlorophenol . . . 10 U	53-70-3	Dibenz(a,h)Anthracene . . . 10 U
95-95-4	2,4,5-Trichlorophenol . . . 50 U	191-24-2	Benzo(g,h,i)perylene 10 U
91-58-7	2-Chloronaphthalene 10 U		
88-74-4	2-Nitroaniline 50 U		Nitrobenzene-d5 - SS 79
131-11-3	Dimethyl Phthalate 10 U		2-Fluorobiphenyl - SS 92
208-96-8	Acenaphthylene 10 U		Terphenyl-d14 - SS 75
606-20-2	2,6-Dinitrotoluene 10 U		Phenol-d5 - SS 30
99-09-2	3-Nitroaniline 50 U		2-Fluorophenol - SS 26
83-32-9	Acenaphthene 10 U		2,4,6-Tribromophenol - SS . . 68
51-28-5	2,4-Dinitrophenol 50 U		

- (1) - Cannot be separated from diphenylamine.
- U - Compound analyzed for but not detected.
- B - Compound was detected in QC blank.
- J - Reported value less than quantitation limit.
- SS - Surrogate Standard reported as percent recovery.



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 10/12/90
 Lab Sample ID: 17021001 Sample Matrix: WATER Date Analyzed: 10/21/90
 Client Sample ID: PBCSRWWTP IW2 Percent Moisture: _____ Dilution Factor: 1.0

SDWA PESTICIDE COMPOUNDS

CAS Number		ug/L	CAS Number	ug/L
58-89-9	gamma-BHC (Lindane) . . .	0.01		U
72-20-8	Endrin	0.02		U
72-43-5	Methoxychlor	0.04		U
8001-35-2	Toxaphene	0.5		U
309-00-2	Aldrin	0.01		U
60-57-1	Dieldrin	0.02		U

	Dibutylchlorendate - SS	87		

- U - Analyzed for but not detected.
- B - Detected in QC blank.
- JX - Detected, concentration estimated.
- SS - Surrogate Standard reported as percent recovery.

Form I



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 10/12/90
Lab Sample ID: W10120B1 Sample Matrix: WATER Date Analyzed: 10/17/90
Client Sample ID: QC BLANK Percent Moisture: Dilution Factor: 1.0

SDWA PESTICIDE COMPOUNDS

Table with 4 columns: CAS Number, Compound Name, Concentration (ug/L), and Status (U). Rows include gamma-BHC (Lindane), Endrin, Methoxychlor, Toxaphene, Aldrin, Dieldrin, and Dibutylchlorendate - SS.

- U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Form I



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 10/17/90
Lab Sample ID: 17021001 Sample Matrix: WATER Date Analyzed: 10/23/90
Client Sample ID: PBCSRWWTP IW2 Percent Moisture: Dilution Factor: 1.0

SDWA HERBICIDE COMPOUNDS

Table with 4 columns: CAS Number, Compound Name, Concentration (ug/L), and Unit. Rows include 2,4-D (2.5 U), Silvex (0.5 U), and 3,5-Dichlorobenzoic acid - SS (68).

- U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Form I



ORGANICS ANALYSIS DATA SHEET

Laboratory Name: CH2M HILL/MGM Concentration: LOW Date Extracted: 10/17/90
Lab Sample ID: W10170B1 Sample Matrix: WATER Date Analyzed: 10/23/90
Client Sample ID: QC BLANK Percent Moisture: Dilution Factor: 1.0

SDWA HERBICIDE COMPOUNDS

Table with 4 columns: CAS Number, Compound Name, ug/L, and U/B/JX/SS. Rows include 2,4-D (2.5 U), Silvex (0.5 U), and 3,5-Dichlorobenzoic acid - SS (72).

- U - Analyzed for but not detected.
B - Detected in QC blank.
JX - Detected, concentration estimated.
SS - Surrogate Standard reported as percent recovery.

Form I



Engineers
Planners
Economists
Scientists

October 30, 1990

LRD294.10

CH2M HILL
7201 N.W. 11th Place
Gainesville, FL 32605

Attention: Don Hash

RE: Laboratory Reference Number - 27809

Dear Mr. Hash:

The results are enclosed for your sample which was received by our laboratory on October 12, 1990.

If you have any questions please contact Ms. Mona Jones or Ms. Judy Wensloff in Client Services.

CH2M HILL stores samples for 30 days after the written report date at no charge. After 30 days, non-hazardous samples are disposed of at no charge. If you require either of the following services you need to notify us within 15 days:

- * Return of samples to the address shown above.
- * Storage of samples at \$5.00/sample/month.

If a sample is determined to be hazardous, we will contact you to discuss disposal options.

Thank you for selecting a CH2M HILL laboratory for your analytical testing needs.

Sincerely,

CH2M HILL QUALITY ANALYTICS LABORATORY

Peggy A. Norton
Senior Data Package Specialist

Encl.



Engineers
Planners
Economists
Scientists

CASE NARRATIVE
General Chemistry
27809

I. Holding Time: All criteria met.

II. Analysis:

- A. Calibration: Acceptance criteria met.
- B. Blanks: Acceptance criteria met.
- C. Matrix Spike: Acceptance criteria met.
- D. Duplicate Analysis: Acceptance criteria met.
- E. Lab Control Sample: Acceptance criteria met.
- F. The Nitrate results are reported as N. To convert to Nitrate as NO₃ multiply the result by 4.43.
- G. Other: None.

III. I certify that this data package is in compliance with the terms and conditions agreed to by the client and CH2M HILL, both technically and for completeness, for other than the conditions detailed above.

SIGNED: Randall Wright
Randall L. Wright
General Chemistry Supervisor

DATE: 10/30/90



REPORT OF ANALYTICAL RESULTS

Date: 10/30/90

Page: 1 of 1

Client: CH2M HILL/LGN
7201 N.W. 11TH PLACE
GAINESVILLE, FL 32605

Project Number: SEF24770.T0
PBC SRWWTP DIW
Laboratory Number: 27809
Date Received: 10/12/90

Atten: MR. DON HASH

Sample Description: PBCSRWWTPIW-2 LG85934
Laboratory Sample Number: 27809001 Date Collected: 10/10/90 Matrix: WATER

Table with 6 columns: Analytical Parameter, Method, Det Limit, Result, Units, Ana Date. Row 1: Gross Alpha, EPA900.0, ----, <22.0, pCi/L, 10/23/90

Results for non-aqueous matrices are based on dry sample weight unless noted otherwise.

Reviewed by: [Signature]

INRPRPT(v900202)



REPORT OF ANALYSES

Mr. Don Hash
CH2M Hill - Southeast
P.O. Box 1647
Gainesville, FL 32602

PROJECT NO.: 86-028-CH2

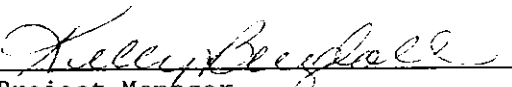
DATE: 10/22/90

DHRS#: 82282, E82001

Table 1. Sample Received 10/11/90

CLIENT STATION ID	LAB NUMBER	MBAS mg/L	EPA 425.1	Date of Analysis: 10/12/90
85934	43830	<0.1		
Method Blank	--	<0.05		

Note: Detection limit elevated due to matrix interference.


Project Manager

ENGINEER'S DAILY SHIFT REPORTS

INJECTION WELL NO. 1

ENGINEER'S DAILY REPORT

Project No.: SEF24770.T0
Client: Palm Beach County
Contractor: Youngquist Brothers
Well No.: IW-1, IW-2, & MW

Date: March 19, 1990

Weather:	Rainy		
Shift No.:	1	Time:	0800
Driller:	K. Greuel	Activity:	Site Preparations
Starting Depth:	- feet	Bit Size:	- inches
Shift No.:	-	Time:	-
Driller:	-	Activity:	-
Starting Depth:	- feet	Bit Size:	- inches

<u>Time</u>	<u>Description</u>
-------------	--------------------

1400	B. Ziegler met K. Greuel onsite. Pictures were taken of site and entrance gate.
------	---

Hyman Construction has completed their portion of site preparation (bringing site elevation up to 22.0 feet NGVD and compacting). The initial survey of the site has been completed. All corners of drilling pads and wells have been staked. Injection well C/L stakes are in alignment with tees in the 48-inch effluent line. Contractor will submit surveyors notes for Engineers review prior to vibrating surface casing.

The drilling pad submittal is not complete. K. Greuel stated that it should be completed by weeks end or first of next week.

Contractor's work area was reviewed. K. Greuel does not see a problem with the area supplied. He will review his work area boundaries with J. Chesher prior to locating the construction trailers.

1445	B. Ziegler meets with J. Chesher. J. Chesher noted that M.H. G17 will not be moved from its original position, an additional 20-foot joint of pipe will be supplied to the Drilling Contractor. As discussed in a previous meeting the General Contractor has eliminated one set of electrical junction boxes and has relocated one set opposite the monitor well pad. B. Ziegler informed J. Chesher that surface casing would be installed (vibrated) at the end of the week or beginning of next week and take approximately one day.
------	--

1530	B. Ziegler leaves site.
------	-------------------------

Recorded By: B. Ziegler

ENGINEER'S DAILY REPORT

Project No.: SEF24770.T0
Client: Palm Beach County
Contractor: Youngquist Brothers
Well No.: IW-1, IW-2, & MW

Date: March 27, 1990

Weather: Clear

Shift No.: 1 Time: 1300

Driller: K. Greuel Activity: Site Preparations

Starting Depth: NA feet Bit Size: NA inches

Shift No.: NA Time: NA

Driller: NA Activity: NA

Starting Depth: NA feet Bit Size: NA inches

<u>Time</u>	<u>Description</u>
-------------	--------------------

1400	B. Ziegler met K. Greuel onsite. Pictures were taken of site work and pad stake-out.
------	--

Sumps and drain line have been installed on all pads. K. Greuel stated sump elevations and drain line elevations were surveyed in by their surveyor. B. Ziegler reminded K. Greuel to maintain record drawings during sump, drain line, and pad installations (minor deviations, actual elevations etc.) Drain lines have been stubbed out on the north side of each pad. Contractor will run remainder of line and make connections to MH-G17 at a later date.

Dirt work is in progress. Soil samples have been collected as specified, as per K. Greuel. Submittal will be delivered beginning of next week.

Water line has been installed from fire hydrant and stubbed up at each pad.

1300	B. Ziegler met with J. Chesher. Chesher has completed his review of the survey submitted by the Drilling Contractor (Pad Layout and Staking). Layout looks correct, does not see any problems other than the mislabeling of easterly grid coordinates to southerly (coordinates are correct title is incorrect)
------	---

1600	B. Ziegler leaves site.
------	-------------------------

Recorded By: B. Ziegler

ENGINEER'S DAILY REPORT

Project No.: SEF24770.T0
Client: Palm Beach County
Contractor: Youngquist Brothers
Well No.: IW-1, IW-2, & MW

Date: April 6, 1990

Weather: Clear

Shift No.: 1

Time: 1000 hrs

Driller: K. Greuel

Activity: Pad Preparations

Starting Depth: NA feet

Bit Size: NA inches

Shift No.: NA

Time: NA

Driller: NA

Activity: NA

Starting Depth: NA feet

Bit Size: NA inches

<u>Time</u>	<u>Description</u>
-------------	--------------------

1000	B. Ziegler, T. McCormick, J. Wheeler, D. VanNote, D. Stone (C.P. Lewis Construction), and K. Greuel met at site. A review of the form work and reinforcement placement of the drilling pads was conducted for conformance with the approved shop drawings. Pictures were taken of the drilling pad construction to date.
------	--

K. Greuel submitted background soil parameters and density tests collected as per the specifications. Density tests were reviewed by TMC and WBZ. All test locations were above the 98 percent compaction of max density as per the proctor test submitted (see submittal).

Curing method was reviewed. K. Greuel stated that pads will be flooded once concrete has been placed. The testing laboratory for pulling cylinders will be Gold Coast Test Laboratory. A 4, 7, and 28-day break will be performed.

Minor adjustments to the reinforcement were required for compliance with the approved shop drawing. TMC requested that the Contractor tie every other intersection of reinforcement. Hoops along thickened section were placed one way every third bar. TMC informed K. Greuel that every hoop should alternate down into the thickened section. K. Greuel will correct. Concrete placement is scheduled for 0730 hrs Monday.

CH2M HILL representatives offsite at 1130 hrs. TMC will return to the site later today for a final inspection.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date April 9, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1, IW-2, & MW

Day Shift
 7:00 am to 6:00 pm
 Weather: Rainy
 Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected None

Night Shift
 NA pm to NA am

Weather: NA
 Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected None

Description of Operations: T. McCormick, B. Ziegler, K. Greuel, D. Stone onsite at 0700 hrs for concrete placement of drilling pads. Weather conditions are bad, however, Contractor will attempt to place concrete on the MW pad. Pour begins at 0749 hrs. Concrete supplier is Rinker. Batch plant is at the corner of Atlantic Blvd. and I-95. Batch Mix Number is B45121F (4500 psi) as approved in the mix design submittal. See attached sheet for detail information on batch times, time concrete was unloaded, and trucks used for delivery.

Placement of concrete at the MW was completed at 0950 hrs. Approximately 1 YD of concrete was place in the western thickened section of IW-1 pad. Quantity of concrete in thickened section ranged from 4 to 6-inches. Concrete was not allowed to rise above reinforcement.

Heavy rain fell during placement and continued on into the day. The Contractor covered the MW pad with visqueen to prevent further damage to the concrete surface. B. Ziegler & T. McCormick offsite at 1015 hrs.

B. Ziegler returned to the site at 1400 hrs. Still raining. Contractor performed finish work on pad between rain showers. Pour for IW-1 & IW-2 is scheduled for 0700 hrs tomorrow. B. Ziegler offsite at 1630 hrs.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEP24770.T0.30 Date April 10, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1, IW-2, & MW

Day Shift
 6:30 am to 6:00 pm

Weather: Sunny

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Description of Operations: B. Ziegler, K. Greuel onsite at 0630 hrs to begin concrete pour for IW-1 & IW-2. Placement will begin at IW-1. Concrete supplier (Rinker) arrives, placement begins at 0702 hrs. See attached sheet for detailed information during placement of concrete.

Bob with Gold Coast Testing Laboratory onsite to pull test cylinders during pour. Cylinders will be pulled for a 4, 7, & 28-day break. T. McCormick arrives site at 0730 hrs.

Placement of concrete at IW-1 was completed at 0959 hrs. Pump truck was moved to IW-2's drilling pad. Placement began at 1025 hrs. See attached sheet for detailed information during placement of concrete.

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Placement of concrete at IW-2 was completed at 1258 hrs. Finish work begins. K. Greuel will flood pads over night for curing. Water will be pumped off tomorrow morning in order to prepare form work for the elevated section used to level the drill rig substructure.

Formation Samples Collected None

A valve was broken off the 8-inch water line that passes along the north side of road adjacent to the drilling pads by one Youngquist Brothers concrete finishers. The foreman for G. Hyman Construction was notified along with J. Chesher of H&S by B. Ziegler and K. Greuel. The main was temporarily shut down while repairs were made by Youngquist Brothers and Pol & Kent. The break was minor and repairs only took a couple of hours. The break was caused by driving a pickup truck into a hole that was not barricaded or flagged.

B. Ziegler offsite at 1430 hrs.

Night Shift
 NA pm to NA am

Weather: NA

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected None

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date April 19, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1, IW-2, & MW

Day Shift
 6:30 am to 6:00 pm

Weather: Sunny

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation

Samples Collected None

Night Shift

NA pm to NA am

Weather: NA

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation

Samples Collected None

Description of Operations: B. Ziegler arrived onsite at 0800 hrs. Contractor mobilizing equipment to vibrate 60-inch surface casing at IW-1 and IW-2. Two 50-foot joints of 60-inch surface casing were prepared. International Equipment Contractors (IEC) was the vibratory equipment supplier onsite.

Mr. J. Chesher was notified by B. Ziegler that casing was going to be vibrated in place at approximately 1100 hours. J. Chesher stated that there would not be any other construction activities in the area that would be affected. J. Chesher also noted that the County (P. Feldman) has decided to dispose of drill cuttings below 1,000-feet onsite, they will be used as road base.

J. Brantley arrived onsite at 0930 hours. Surface casing at IW-1 was vibrated to 50-feet bls at 1030 hours. Contractor remobilized crane and vibratory equipment to IW-2. Approximately 25-feet of 60-inch surface casing was vibrated in place at 1330 hours. At 25-feet bls the surface casing would not penetrate. Three attempts were made to vibrate the casing past 25-feet. The vibratory equipment tore the casing at the clamping point in each attempt. J. Brantley stated that Youngquist Brothers was comfortable with the depth at which the surface casing stopped and that undermining of the pad would not be a concern. B. Ziegler stated that there may be some concern on CH2M HILL's part, we will review and advise Youngquist Brothers if there are any concerns.

J. Brantley noted that Youngquist Brothers still plans to submit a proposal to County for a time extension. They are preparing the paper work and will submit as soon as possible.

B. Ziegler offsite at 1430 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date April 21, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1, IW-2, & MW

Day Shift
 6:30 am to 6:00 pm

Description of Operations: S. Skehan arrived onsite at 0700 hours to observe Contractor's installation of the eight surficial monitor wells. Contractor began installation of SMW-1 at 0815 hours. Water table was encountered at approximately 12-feet below land surface (bls). Contractor installed screen (9-19 feet bls), gravel pack (2-19 feet bls), and cement grout (0-2 feet bls). SMW-1 was then air developed for 15 minutes. Construction details for the surficial monitor wells follow:

Weather: Sunny

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Well Number	Screened Interval	Gravel Pack	Grout
SMW-1	9-19 feet	2-19 feet	0-2 feet
SMW-2	9-19 feet	2-19 feet	0-2 feet
SMW-3	9-19 feet	2-19 feet	0-2 feet
SMW-4	8-18 feet	2-18 feet	0-2 feet
SMW-5	8-18 feet	2-18 feet	0-2 feet
SMW-6	8-18 feet	2-18 feet	0-2 feet
SMW-7	8-18 feet	2-18 feet	0-2 feet
SMW-8	8-18 feet	2-18 feet	0-2 feet

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

SMW-1 through SMW-4 are located at the northwest, northeast, southwest, and southeast corners of the drilling pad for IW-1, respectively. SMW-5 through SMW-8 are located at the northwest, northeast, southwest, and southeast corners of the drilling pad for IW-2, respectively.

Formation Samples Collected None

Contractor also continued to mobilize drill rig and equipment on IW-1. Mud tanks are being constructed and general site preparation is taking place

Light Shift
NA pm to NA am

S. Skehan offsite at 1200 hrs.

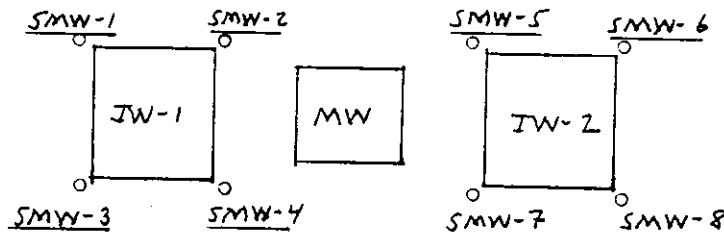
Weather: NA

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected None



Recorded By: S. Skehan

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date April 25, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1, IW-2, & MW

Day Shift
6:30 am to 6:00 pm

Description of Operations: B. Ziegler arrived onsite at 0800 hours to sample surficial monitor wells. Contractor continues to mobilize equipment for IW-1.

Weather: Sunny

All eight surficial monitor wells were sampled for background water quality data (temperature, conductivity, and chlorides). Each surficial monitor well was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	600	26.5	47.5
SMW-2	800	26.0	52.5
SMW-3	700	27.0	45.0
SMW-4	800	27.0	50.0
SMW-5	850	25.0	47.5
SMW-6	600	25.0	47.5
SMW-7	800	25.0	50.0
SMW-8	600	23.0	55.0

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected None

Night Shift
NA pm to NA am

Contractor is only working one crew during daylight hours. Will bring in second crew once drilling begins.

Weather: NA

B. Ziegler offsite at 2000 hours.

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Recorded By: B. Ziegler

Formation
 Samples
 Collected None

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date April 28, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1, IW-2, & MW

Day Shift
6:30 am to 6:00 pm

Weather: Sunny

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
 Samples
 Collected None

Description of Operations: B. Ziegler arrived onsite at 0800 hours to sample surficial monitor wells. Contractor continues to mobilize equipment for IW-1.

All eight surficial monitor wells were sampled for background water quality data (temperature, conductivity, and chlorides). Each surficial monitor well was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	600	25.0	55.0
SMW-2	850	25.0	50.0
SMW-3	700	25.0	52.5
SMW-4	850	25.0	50.0
SMW-5	700	25.0	45.0
SMW-6	600	24.0	45.0
SMW-7	700	25.5	55.0
SMW-8	650	25.0	50.0

Night Shift
NA pm to NA am

Weather: NA

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
 Samples
 Collected None

Casing for the project is being delivered to the site and stored in the appropriate storage areas allotted to the Contractor. Casing will continue to be delivered to the site for approximately the next month.

B. Ziegler offsite at 1400 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEP24770.T0.30 Date May 1, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1, IW-2, & MW

Day Shift
 6:30 am to 6:00 pm

Weather: Sunny

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation

Samples
 Collected None

Description of Operations: B. Ziegler arrives site at 1300 hours to sample surficial monitor wells and review Contractor's progress with mobilization. Contractor continues to mobilize equipment for IW-1. Plans to install the rat and mouse hole tonight. Contractor will begin running two shifts tonight and will be preparing daily drilling reports from this point on.

B. Ziegler spoke with J. Chesher regarding the use of cuttings from below approximately 1,000-feet at the plant facility. J. Chesher stated that the County has decided to use the cuttings as road subgrade for roads being constructed at the facility. B. Ziegler stated that CH2M Hill would prepare and submit a letter to the Department outlining the change of disposal method and that use of the cuttings would have to wait for Department approval.

All eight surficial monitor wells were sampled for background water quality data (temperature, conductivity, and chlorides). Each surficial monitor well was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	690	25.0	45.0
SMW-2	790	25.0	45.0
SMW-3	710	25.0	85.0
SMW-4	890	25.0	45.0
SMW-5	610	25.0	45.0
SMW-6	800	25.0	47.5
SMW-7	810	25.0	47.5
SMW-8	700	25.0	55.0

B. Ziegler offsite at 1830 hours.

Recorded By: B. Ziegler

Night Shift

NA pm to NA am

Weather: NA

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation

Samples
 Collected None

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 2, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Sunny

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected None

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>0</u>	ft
End	<u>82</u>	ft
Bit Size	<u>12 1/4</u>	in

Formation
 Samples
 Collected 50 to 80
 feet

Description of Operations: B. Ziegler arrives site at 1330 hours. Contractor has begun running a day shift and a night shift. Rat hole was installed during the night shift of May 1, 1990. Contractor installs new swivel and prepares to drill the mouse hole. Pilot hole drilling for IW-1 began 0200 hours May 2, 1990. During the nightshift, Youngquist drilled to 82 feet.

Elevation control points for drilling and logging operations were surveyed in from the bench mark located approximately 20-feet south of the dual-zone monitor well. On each well, the north edge of the concrete sump and concrete pad was used as the reference point. The elevations are as follows:

Well	Elevation (NGVD)
IW-1	21.38
IW-2	21.52
MW	21.50

Collection on drill cuttings was reviewed with the Contractor. Two sets will be collected, one for the Engineer and one for USGS. Use of the geograph was reviewed. Contractor stated that the chart will be started once drilling of the pilot hole begins. The Contractor also stated that a drill pipe tally will be maintained by the driller on the rig floor.

B. Ziegler off site at 1900 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 3, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Sunny

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	82	ft
End	<u>72</u>	ft
Bit Size	<u>12 1/4</u>	in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	172	ft
End	<u>260</u>	ft
Bit Size	<u>12 1/4</u>	in

Formation
 Samples
 Collected Yes
 feet

Description of Operations: B. Ziegler onsite 0930 hours.
 Contractor continued drilling of 12 1/4-inch pilot hole through shift. Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
5/4/90	60	26.25
5/4/90	120	26.25
5/4/90	180	22.50

Contractor reached TD of 260 feet at 1230 hours. Borehole was circulated until 0300 hours. One wiper run was performed through the end of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

<p>CH2M HILL</p>	<p>Project No. <u>SEF24770.T0.30</u> Date <u>May 4, 1990</u> Client <u>Palm Beach County SRWWTP</u> Contractor <u>Youngquist Brothers Inc.</u> Well No. <u>IW-1</u></p>
<p>Day Shift <u>7:00 am to 7:00 pm</u></p> <p>Weather: <u>Sunny</u></p> <p>Activity: Drilling..... <input type="checkbox"/> Reaming..... <input checked="" type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... <input type="checkbox"/> Testing..... <input type="checkbox"/> Waiting..... <input checked="" type="checkbox"/> Other..... <input type="checkbox"/></p> <p>Depth: Start <u>0</u> ft End <u>20</u> ft Bit Size <u>58 1/2</u> in</p> <p>Formation Samples Collected <u>none</u></p> <p>Night Shift <u>7:00 pm to 7:00 am</u></p> <p>Weather: <u>Clear</u></p> <p>Activity: Drilling..... <input type="checkbox"/> Reaming..... <input checked="" type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... <input type="checkbox"/> Testing..... <input type="checkbox"/> Waiting..... <input type="checkbox"/> Other..... <input type="checkbox"/></p> <p>Depth: Start <u>20</u> ft End <u>55</u> ft Bit Size <u>58 1/2</u> in</p> <p>Formation Samples Collected <u>none</u></p>	<p><u>Description of Operations:</u> At 0700 hours Youngquist called B. Ziegler, indicated IW-1 pilot hole is complete to 260 feet, rods are tripped out, Contractor is ready for geophysical logging. B. Ziegler advised that logger has been scheduled for 0800 hours.</p> <p>D. VanNote arrives at site 0745 hours. B. Ziegler arrives 0800 hours. Total depth of IW-1 pilot hole 260 feet. Cuttings indicated Hawthorne was encountered at 250 to 260 feet.</p> <p>CH2M Hill logger, C. Digiacom, sets up caliper tool and begins logging 0830 hours. Caliper, Gamma, and LSN logs were completed 1000 hours. Well was turned over to Youngquist 1030 hours.</p> <p>T. McCormick arrives site at 1000 hours. Reviews cuttings and logs for selection of 54-inch casing depth. Selected casing depth of 260 feet. T. McCormick off site 1100 hours.</p> <p>B. Ziegler informs Al Mueller/FDER of proposed casing setting depth of 260 feet for 54-inch casing, 1100 hours. Al Mueller agreed with selected depth of 260 feet.</p> <p>Tallies on the 54-inch casing were conducted 1330 hours. Joint no., heat no., depth below land surface and centralizer depths were reviewed with Youngquist. Joint nos. and casing lengths were marked clearly on each casing section.</p> <p>Youngquist begins reaming with 58 1/2-inch bit 1700 hours. Youngquist reams IW-1 to 55-feet with 58 1/2-inch bit through night shift.</p> <p>D. VanNote off site at 1830 hours.</p> <p align="right">Recorded By: <u>D. VanNote</u></p>

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 5, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Sunny

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 55 ft
 End 60 ft
 Bit Size 58 1/2 in

Formation
 Samples
 Collected none

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 60 ft
 End 70 ft
 Bit Size 58 1/2 in

Formation
 Samples
 Collected none

Description of Operations: D. VanNote arrives at site 0930 hours. T. McCormick arrives at site 1000 hours.

D. VanNote reviewed bit, sub, stabilizer, and drill collar lengths with Youngquist 1000 hours. T. McCormick leaves site 1100 hours.

At 0700 hours Youngquist encountered valve trouble on rig pump system. Valve repaired and pump system operating at 1300 hours. Condition and mix mud to 70 second viscosity, 9.0 lbs/gal. 1530 hours.

Youngquist reamed to 60 feet, then encountered additional pump problems at 1800 hours. Pump system problem was repaired during night shift at 2300 hours. Mud mixing and conditioning was conducted until 2400 hours. Resume reaming through end of night shift to 70 feet.

D. VanNote leaves site 1630 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date May 6, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Sunny

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 70 ft
 End 104 ft
 Bit Size 58 1/2 in

Formation
 Samples
 Collected none

Description of Operations: D. VanNote arrives at site 0900 hours, 58 1/2-inch reamed hole is down to 85 feet.

Youngquist arrives on site with second drill rig for IW-2 at 1000 hours. Contractor damaged phone cable on site during entry with second rig. Cable will be repaired by 1200 hours 5/7/90.

Youngquist continues reaming at IW-1, down to 97 feet at 1330 hours. Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
5/6/90	60	15.0

Day shift crew finishes shift down 104 feet, 1900 hours.

Night shift crew reamed to 115 feet. Spent most of the night reconditioning mud and servicing rig and equipment.

D. VanNote off site at 1730 hours.

Recorded By: D. VanNote

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 104 ft
 End 115 ft
 Bit Size 58 1/2 in

Formation
 Samples
 Collected none

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date May 7, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Sunny

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 115 ft
 End 132 ft
 Bit Size 58 1/2 in

Formation
 Samples
 Collected none

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 132 ft
 End 206 ft
 Bit Size 58 1/2 in

Formation
 Samples
 Collected none

Description of Operations: D. VanNote arrives at site 0800 hours, Youngquist down to 115 feet with 58 1/2-inch reamed hole.

Youngquist superintendent said night shift driller will be replaced with new driller starting tonight.

Youngquist down to 121 feet 1330 hours. Driller is maintaining slow drilling rate drilling to assure a plumb hole. Cuttings indicate increasing coquina and arenaceous limestone layers with depth.

The Contractor's first payment application has been processed by the Engineer and will be delivered to the PBCWUD by 1700 hours.

Youngquist down to 130 feet 1800 hours.

Drilling rate increased during the night shift due to change in formation. Cuttings indicate increasing shell and arenaceous limestone with depth. Night shift drilled from 132 feet to 209 feet.

D. VanNote off site at 1800 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 8, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Sunny

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 206 ft
 End 246 ft
 Bit Size 58-1/2 in

Formation
 Samples
 Collected none

Description of Operations: D. VanNote arrived site at 0800 hours. Contractor reaming at 209-feet. B. Ziegler arrived on site at 0830 hours.

Additional drilling equipment arrived at site 0900 for IW-2. Copper rig was parked on IW-2 drilling pad, Contractor will mobilize rig for drilling at a later date.

K. Greuel stated that he anticipates reaching total depth (260-feet) on the 58 1/2-inch reamed hole at the end of the day shift. Once total depth has been reached, the borehole will be conditioned until early morning. Will be ready to set casing at approximately 0730 hours tomorrow.

A sample of dilling fluid was pulled for background data while Contractor was reaming at 236-feet. Conductivity of the sample was 1,400 umhos/cm.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
5/7/90	120	7.5
5/8/90	180	15.0
5/8/90	240	15.0

B. Ziegler off site at 1430 hours.

D. VanNote off site at 1700 hours.

Contractor completed 58 1/2-inch borehole during the night shift. Borehole was completed to 270-feet bls to allow 10-feet of open hole for cuttings to settle. Casing will be set to 260-feet bls.

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 246 ft
 End 270 ft
 Bit Size 58-1/2 in

Formation
 Samples
 Collected none

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 9, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Sunny

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected None

Description of Operations: B. Ziegler arrived site at 0730 hours. Contractor installed 54-inch casing to a depth of 260 feet below land surface (bls). Centralizers were placed 5, 20, & 40 feet from the bottom of the casing.

B. Ziegler reviewed cement volume and header pressure with J. Brantley, K. Greuel, T. Nolan, and T. McCormick. It was agreed upon that neat cement will be pumped until header pressure reach 50 to 60 psi. Header pressure any higher would risk overloading of the substructure.

The 54-inch casing was then pressure grouted with neat cement until header pressure reached 62 psi. Eighty barrels of neat cement were pumped. Contractor will let well sit over night and tag cement at approximately 0900 hours tomorrow. Second stage of cementing was tentatively scheduled for 1200 hours tomorrow.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each surficial monitor well was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	610	26.5	55.0
SMW-3	790	27.0	55.0
SMW-6	900	28.0	47.0
SMW-8	700	29.0	57.0

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected None

B. Ziegler off site at 1800 hours.

There was not a second shift. K. Greuel monitored the header pressure during the night. Header pressure was bled off as pressure increased due to curing of cement.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date May 10, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected None

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected None

Description of Operations: B. Ziegler arrived site at 1040 hours. Contractor tagged cement around 54-inch casing at 96-feet below land surface (bls). Cement quantities for the annulus and collapse pressure of the 54-inch casing were reviewed by B. Ziegler, S. Skehan, and K. Greuel. Theoretical collapse pressure for the casing was 50 psi. Pressures due to cement were calculated to be 30 psi. The 54-inch casing will be pressurized to 50 psi for additional safety during the cementing operation.

Two tremie lines were installed 180 degrees apart to a depth of 94-feet bls, 2-feet above the cement tag. The 54-inch casing was pressurized to 50 psi. Dowell pumped 47 barrels of neat cement. Circulation was observed immediately at the surface. Contractor pulled tremie lines back for placement of 4 percent cement. A total of 20 barrels of 4 percent cement were pumped. Traces of cement were observed at the surface when pumping equipment was shut down.

Remainder of shift was spent monitoring pressure on header.

Contractor continued to mobilize rig and equipment over IW-2.

During the night shift the contractor continued to bleed header not allowing internal pressure to increase above 50 psi.

B. Ziegler off site at 1600 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

<p>CH2M HILL</p>	<p>Project No. <u>SEF24770.T0.30</u> Date <u>May 11, 1990</u> Client <u>Palm Beach County SRWTP</u> Contractor <u>Youngquist Brothers Inc.</u> Well No. <u>IW-1</u></p>
<p>Day Shift <u>7:00 am to 7:00 pm</u> Weather: <u>Cloudy</u></p> <p>Activity: Drilling..... X Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing.....<input type="checkbox"/> Testing..... <input type="checkbox"/> Waiting..... <input type="checkbox"/> Other..... <input type="checkbox"/></p> <p>Depth: Start <u>270</u> ft End <u>270</u> ft Bit Size <u>12 1/4</u> in</p> <p>Formation Samples Collected <u>None</u></p>	<p>Description of Operations: B. Ziegler arrived site at 0800 hours. Pressure was bled off of 54-inch casing header at 0800 hours. Contractor begins fabricating drill through header assembly for drilling the 12-1/4 inch pilot hole to 1,000-feet.</p> <p>B. Ziegler informed K. Greuel that submittals for the surge system, electric, and I&C should be submitted within the next couple of weeks to meet the review and construction schedule. B. Ziegler also requested that the construction window for the surge system be reviewed and confirmed at the beginning of next week. Hazen & Sawyer is coordinating other construction activities in the area of the surge system.</p> <p>The remainder of the day shift was spent rigging up header and mud system to drill the pilot hole to 1,000 feet.</p> <p>B. Ziegler off site at 1300 hours.</p> <p>The cement plug at the base of the 54-inch casing was drilled out during the night shift. Drilling of the 12-1/4 inch pilot was also initiated during the night shift. The pilot hole was drilled to 293-feet at the shift change.</p>
<p>Night Shift <u>7:00 pm to 7:00 am</u> Weather: <u>Clear</u></p> <p>Activity: Drilling..... X Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... <input type="checkbox"/> Testing..... <input type="checkbox"/> Waiting..... <input type="checkbox"/> Other..... <input type="checkbox"/></p> <p>Depth: Start <u>270</u> ft End <u>293</u> ft Bit Size <u>12 1/4</u> in</p> <p>Formation Samples Collected <u>Yes</u></p>	<p>Recorded By: B. Ziegler</p>

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 12, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 293 ft
 End 473 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived site at 0930 hours. Drilling of the 12-1/4 inch pilot hole continued through the day shift.

K. Greuel requested that geophysical logging of the pilot hole be scheduled for mid-day Monday, May 14, 1990. B. Ziegler informed C. DiGiacomo that geophysical logging has tentatively been scheduled for Monday afternoon.

B. Ziegler off site at 1930 hours.

Drilling of the 12-1/4-inch pilot hole continued through the night shift.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min.)
05/12/90	300	18.75
05/12/90	360	22.50
05/12/90	420	15.00

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 473 ft
 End 654 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 13, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Overcast

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 654 ft
 End 774 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 774 ft
 End 894 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived site at 0900 hours. Drilling of the 12-1/4-inch pilot hole continued through the day shift.

Contractor is drilling pilot hole at a slow rate to insure a plumb borehole. Drill weight on the bit has been kept between 1,500 and 2,000 pounds.

Geophysical logging was rescheduled for 0900 hours tomorrow.

B. Ziegler off site at 1600 hours.

Drilling of the 12-1/4-inch pilot hole continued through the night shift. However, drilling was shut down from 1900 hours to 2300 hours for repair of the mud pump.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min.)</u>
05/13/90	540	7.50
05/13/90	600	15.00
05/13/90	660	15.00
05/13/90	720	18.75

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 14, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Cloudy

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 894 ft
 End 1008 ft
 Bit Size 12 1/4 in

Formation
 Samples

Collected Yes

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming..... X
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 271 ft
 End 291 ft
 Bit Size 52 1/2 in

Formation
 Samples

Collected N/A

Description of Operations: T. McCormick and B. Ziegler arrived on site 0700 hours, Contractor down to 894 feet with pilot hole. D. VanNote arrived 0745 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min.)</u>
05/14/90	780	7.50
05/14/90	840	26.25
05/14/90	900	15.00
05/14/90	960	15.00

Review geophysical logging schedule. Geophysical logging tentatively scheduled for late afternoon. T. McCormick offsite 0900 hours.

Paul Feldman/PBCWUD, John Chessher/Hazen and Sawyer, and Saddi Chibani/Hazen and Sawyer arrived on site 1000 hours, discuss upcoming events. Off site 1020 hours.

B. Ziegler off site 1400 hours. C. Digiacoimo scheduled for logging at 1800 hours. Contractor completes pilot hole to 1,008 feet at 1600 hours.

Contractor tripped out of hole, 1900 hours. C. Digiacoimo arrived on site 1800 hours.

Start logging with caliper tool 1900 hours. Start gamma and LSN 2100 hours. Logging completed 2200 hours.

C. Digiacoimo produced logs for field use and is off site 2230 hours. D. VanNote off site 2245 hours.

Contractor begins reaming with 52 1/2-inch bit 0300 hours. Contractor reams from 271 to 291-feet through end of night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 15, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 291 ft
 End 356 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 356 ft
 End 416 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected N/A

Description of Operations: D. VanNote arrived at site 1430 hours, Contractor reaming with 52-1/2-inch bit at 328 feet. Reaming continued through day shift and into the night shift.

Contractor was requested to include more complete information on the geograph strip chart. Information should include times when each 10-foot interval is cut and times when deviation surveys are performed.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
05/15/90	330	3.75

T. McCormick, B. Ziegler, and D. VanNote reviewed geophysical log and drill cuttings for selection of a casing setting depth for the 44-inch casing. A casing setting depth of 1,000 feet was selected. T. McCormick advised A. Mueller/FDER of the selected casing setting depth. Mr. Mueller agreed with the selected depth and asked that they continue to kept up to date with consturction progress.

Contractor drilled from 356 feet to 416 feet on the reamed hole through the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 16, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 416 ft
 End 477 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 477 ft
 End 525 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected N/A

Description of Operations: B. Ziegler arrived site 0700 hours, Contractor down to 416 feet with the 52-1/2-inch reamed hole at shift change.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min.)</u>
05/16/90	390	18.75
05/16/90	450	15.00

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

<u>Well Number</u>	<u>Conductivity (umhos/cm)</u>	<u>Temperature (C)</u>	<u>Chlorides (mg/l)</u>
SMW-1	700	26	48
SMW-3	750	27	53
SMW-6	800	27	42
SMW-8	700	27	50

SMW-1 was hit with a loader while moving equipment around the pad. The top 2 feet of riser was bent. Contractor had repaired the well by the end of the shift.

B. Ziegler reviewed start of construction of the surge system with R. Cape and K. Greuel. The Contractor stated that construction would start between June 25, 1990, and July 9, 1990, and continue through the end of the project. B. Ziegler informed J. Chesher of this information as he requested. J. Chesher also commented that the 48-inch effluent line leading to the injection wells did not pass the hydrostatic test which is the reason for the tees being excavated south of the pads.

Reaming of the 52-1/2-inch reamed hole continued through the night shift. Contractor performed a wiper run from 506 feet to the surface to insure that borehole was clean.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 17, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 525 ft
 End 576 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 576 ft
 End 582 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote and B. Ziegler arrived at site 0745 hours. Contractor reamed to 538-feet 0830 hours. B. Ziegler offsite 1030 hours.

Tallies on the 44-inch casing were conducted 1100 hours. Joint no., heat no., depth below land surface and centralizer depths were reviewed with the Contractor. Joint nos., and casing lengths were marked clearly on each casing section.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft.)</u>	<u>Deviation (min.)</u>
05/17/90	510	15.0

D. VanNote completed lithologic descriptions to 1000-feet 1400 hours. D. VanNote offsite 1700 hours.

Contractor encountered very hard drilling at 577-feet during the night shift. Large chert fragments were observed in the cuttings of the reamed hole along with very dense olive green clay.

At a depth of 582-feet, the Contractor superintendent instructed driller to trip out of the hole to check bit 0430 hours. Reamer assembly out of hole 0600 hours. Reamer assembly was damaged from drilling the hard formation. Remainder of shift was spent repairing the bits on the 42-1/2 inch and 52-1/2 reamers.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 18, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 582 ft
End 582 ft
Bit Size 52 1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 582 ft
End 603 ft
Bit Size 52 1/2 in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived at site 0800 hours. Contractor continued to rebuild reamer assembly. Five new roller bits were installed on the 52-1/2-inch reamer and three were installed on the 42-1/2-inch reamer. D. VanNote offsite 1100 hours.

The weekly report was prepared and distributed to members of the TAC.

Reconditioning of the reamer assembly was completed and was tripped back in hole at 2230 hours.

Drilling on the 52-1/2 inch reamed hole resumed at 2300 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEP24770.T0.30 Date May 19, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
 Start 603 ft
 End 641 ft
 Bit Size 52 1/2 in

Formation

Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
 Start 641 ft
 End 700 ft
 Bit Size 52 1/2 in

Formation

Samples
 Collected No

Description of Operations: D. VanNote arrived at site 0930 hours, Contractor reaming 52-1/2 inch borehole at 608-feet. Contractor stated that drilling is slow and very hard.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft.)</u>	<u>Deviation (min.)</u>
05/19/90	570	7.5
05/19/90	630	15.0

D. VanNote offsite 1330 hours.

Contractor encountered very hard drilling through the night shift. Contractor reamed to 700-feet at end of night shift. Total reaming was 97-feet in 24-hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 20, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 700 ft
 End 745 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 745 ft
 End 781 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at site 0930 hours. Contractor reaming at 703-feet with 52-1/2 borehole. Formation is hard and drilling rate remains slow.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
05/20/90	690	7.5

D. VanNote offsite 1330 hours.

Reaming of the 52-1/2 inch borehole continued through the night shift. Contractor had reamed to 781-feet at the conclusion of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date May 21, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 781 ft
 End 813 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 813 ft
 End 851 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite 1230 hours. Reamed hole down to 800-feet. Drilling rate remains very slow. Cuttings from reamed hole consisted of very hard limestone with clay.

T. McCormick arrived onsite 1440 hours. Reviewed progress at site and upcoming activities with B. Ziegler.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
05/21/90	750	15.0

B. Ziegler offsite 1730 hours.

Contractor continued reaming through the night shift to a depth of 851-feet.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 22, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 851 ft
 End 919 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 919 ft
 End 961 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at site 0815 hours. Reaming of 52-1/2 inch borehole down to 856-feet. Formation is still very hard, drilling rate remains slow. Cuttings from the reamed hole still indicated very hard limestone fragments.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
05/22/90	810	15.0
05/22/90	870	15.0

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	700	28	57.0
SMW-3	800	28	49.0
SMW-6	800	28	45.0
SMW-8	725	28	54.0

J. Brantley arrived onsite 1045 hours. Contractor raised mast on drilling rig over IW-2. Substructure and doghouse also in place at IW-2. Brantley offsite 1500 hours.

Reamed hole on IW-1 down to 896-feet 1400 hours. Drilling rate has increased through the day. D. VanNote offsite 1700 hours.

Contractor encountered very hard drilling at 929-feet during the night shift. Cuttings from the reamed hole indicate limestone and chert fragments.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 23, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 961 ft
 End 1010 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1010 ft
 End 1010 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite 0800 hours. Contractor down to 964-feet with 52-1/2 inch reamed hold. Drilling rate slow due to hard formation. Cuttings from the reamed hole reveal limestone and chert fragments.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
05/23/90	930	7.5

Dowell arrived at site 1000 hours. Spent most of the day setting up for cementing. Contractor's superintendent said casing installation may commence early tomorrow morning.

D. VanNote offsite 1600 hours.

The Contractor completed the reamed hole to 1,010-feet at 1800 hours. During the night shift at 2000 hours, the Contractor ran one wiper trip from the surface to total depth. The Contractor spent the rest of the night shift circulating and reconditioning the borehole for proper installation of the 44-inch casing.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 24, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Rainy

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing... X
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 961 ft
 End 1010 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rainy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing... X
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1010 ft
 End 1010 ft
 Bit Size 52 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 0700 hours. T. McCormick and D. VanNote arrived on site 0730 hours. Review running of 44-inch casing with Contractor.

Contractor began setting 44-inch casing at 0830 hours. T. McCormick of site at 0930 hours. Weekly summary prepared. B. Ziegler off site at 1200 hours.

Heavy rains started a 1400 hours just before installing joint No. 7 of the 44-inch casing. The Contractor discontinued work until 1530 hours when the rains stopped.

B. Ziegler on site at 1800 hours, D. VanNote off site. Running of the 44-inch casing continued through the shift change and was completed at 0048 hours. Total weight of casing in hole, as measured by rig weight indicator, was 207,000 pounds. Contractor placed 1,000-feet of 44-inch casing below land surface with 20.5-feet of riser up to the substructure. Contractor began rigging up to pump cement.

B. Ziegler off site at 0130 hours.

B. Ziegler and D. VanNote on sit at 0400 hours. Cement calculations were reviewed by B. Ziegler and J. Brantley. It was agreed to place 200-feet of neat cement and 400-feet of 4 percent cement. Four percent cement would be pumped until header pressure reached 105 psi (theoretical pressure for 400-feet 4 percent) then neat cement would be pumped until header pressure reached 165 psi (theoretical pressure for 400-feet 4 percent and 200-feet neat cement). Contractor did not want to stress the header at a pressure higher than 170 psi.

Pressure grouting of the 44-inch casing began at 0445 hours. Cementing was started by pumping fresh water until circulation was observed at the surface. Dowell pumped 1012 sacks (274 barrels) of 4 percent followed by 381 sacks (80 barrels) of neat. Header pressure was 111 psi when Contractor switched from 4 percent to neat. Final header pressure was 165 psi when Contractor stopped pumping neat and chased tremie line with water (0719 hours). Contractor then pulled approximately 30-feet of tremie line to prevent cementing line in place.

B. Ziegler and D. VanNote off site 0745 hours. Header pressure at 0800 hours down to 30 psi.

Shift ended while cementing.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL	Project No. SEF24770.TO.30 Date <u>May 25, 1990</u> Client <u>Palm Beach County SRWWTP</u> Contractor <u>Youngquist Brothers Inc.</u> Well No. <u>IW-1</u>
Day Shift <u>7:00</u> am to <u>7:00</u> pm Weather: <u>Rainy</u> Activity: Drilling..... <input type="checkbox"/> Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... <input type="checkbox"/> Testing..... <input checked="" type="checkbox"/> Waiting..... <input type="checkbox"/> Other..... <input type="checkbox"/> Depth: Start <u>NA</u> ft End <u>NA</u> ft Bit Size <u>NA</u> in Formation Samples Collected <u>No</u>	Description of Operations: B. Ziegler arrived on site 1810 hours. Contractor spent most the shift waiting on the first stage of cement on the 44-inch casing to set. Tremie line was removed from the center of the 44-inch casing at 1800 hours in preparation for geophysical logging. Geophysical logger (C. DiGiacomo) arrived on site at 1930 hours and began a temperature log of the 44-inch casing at 2000 hours. Geophysical logging was completed at 2300 hours. Temperature log indicates that top of cement is approximately 500 to 600 feet below land surface. Contractor installed two tremie lines 180 degrees apart between the 54-inch and 44-inch casing. Some delay was encountered with tremie line hitting centralizers on the south side of the 44-inch casing. Contractor tagged cement at 495-feet with one tremie line 496-feet with the other. Cement volumes and pressure calculations were reviewed by J. Brantley, T. Nolan, and B. Ziegler. It was agreed to place 250-foot (768 sacks) of 4 percent bentonite cement with the casing pressurized to 100 psi. Cementing began at 0304 hours after the 44-inch casing header was pressurized to 100 psi. Dowell pumped approximately 2.5 barrels of water until circulation was observed at the surface. A total of 783 sacks (212 barrels) of 4 percent bentonite cement were pumped. Each tremie line was flushed with fresh water and pulled to prevent cementing of lines in the annulus. Cementing was concluded at 0414 hours. B. Ziegler off site at 0500 hours. Remainder of shift was spent monitoring the header pressure. Header pressure was maintained at 100 psi.
Night Shift <u>7:00</u> pm to <u>7:00</u> am Weather: <u>Rainy</u> Activity: Drilling..... <input type="checkbox"/> Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... <input checked="" type="checkbox"/> Testing..... <input checked="" type="checkbox"/> Waiting..... <input type="checkbox"/> Other..... <input type="checkbox"/> Depth: Start <u>NA</u> ft End <u>NA</u> ft Bit Size <u>NA</u> in Formation Samples Collected <u>No</u>	Recorded By: <u>B. Ziegler</u>

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 26, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Rainy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler and T. McCormick arrived on site 1430 hours. Contractor installed both tremie lines in the annulus between the 44-inch casing and 54-inch casing. The second stage of cement was tagged at 218-feet with the north tremie line 217-feet with the south tremie line.

Cement volumes and pressure calculations were reviewed by J. Brantley, T. Nolan, T. McCormick, and B. Ziegler. It was agreed to bring cement to the surface with this stage. Theoretical volume of 12 percent cement was calculated to be 472 sacks (184 barrels).

T. McCormick off site at 1540 hours.

The third stage of cementing of the 44-inch casing began at 1627 hours. Header pressure had remained at 100 psi since stage 2 was pumped. Dowell pumped 3 barrels of fresh water until circulation was observed at the surface. A total of 357 sacks (140 barrels) of 12 percent bentonite cement were pumped. Cement was observed at the surface. No water was pumped to flush tremie lines. All lines were flushed on the surface to prevent pumping excess cement on the drilling pad. Cementing was concluded at 1710 hours.

B. Ziegler off site 1830 hours.

The night shift was spent waiting on cement to set and monitoring the header pressure of the 44-inch casing. Header pressure was maintained at 100 psi through the shift.

Night Shift
 7:00 pm to 7:00 am

Weather: Rainy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 27, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Rainy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Rainy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site at 1215 hours. Contractor bled the pressure off of the 44-inch casing at 0730 hours. Pressure had been maintained at 100 psi through the night shift.

No crews on site, Contractor waiting on cement to set. Will resume drilling Monday night.

B. Ziegler off site at 1630 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 28, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Rainy

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1010 ft
 End 1010 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site at 1300 hours. Contractor spent shift preparing drill rig for reverse air drilling. Plumbing between wellhead riser and mud tanks was modified to accomodate reverse air.

A letter has been prepared by the Contractor which requests the drill cuttings from below 1,000-feet be stored on site which will be used as a road based material. Letter will be mailed tomorrow.

Contractor's tanker, used to haul drillings fluids, was observed disposing of fluids at the approved disposal site, the Boynton Pit off of SR 441, north of Boynton Beach Boulevard.

B. Ziegler off site at 1630 hours.

The night shift drilled out the cement plug at the base of the 44-inch casing with a 42 1/2-inch bit. The 12 1/4-inch pilot bit was assembled and tripped to the bottom of the 44-inch casing. The shift ended while circulating the heavy drilling fluids and cement out of the casing.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 29, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 1010 ft
 End 1045 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1045 ft
 End 1243 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: T. McCormick, B. Ziegler, and D. VanNote arrived on site at 1220 hours. A. Muniz arrived on site at 1245 hours. Discussed upcoming construction of pilot hole, 1,000 to 2,200 feet. Reviewed logging and packer testing procedures.

A. Muniz, T. McCormick, and D. VanNote leave site 1330 hours.

Contractor drilled pilot hole down to 1,350-feet on reverse air, 1330 hours. Formation not taking any mud. Mud is being pumped from mud tanks back down the well.

B. Ziegler spoke with J. Chesher 1345 hours. B. Ziegler requested that hole to the south side of IW-2 be filled by Pipe Line Contractor. J. Chesher said it will be done tomorrow.

Water pump blew out on rig 1530 hours. Contractor continued rigging up at IW-2. Should be drilling within 1 to 1.5 weeks.

B. Ziegler off site 1845 hours.

Contractor changed out water pump 2000 hours. Contractor encountered soft drilling, down 1,243-feet by end of night shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date May 30, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Description of Operations: D. VanNote arrived on site 0800 hours, Contractor at 1,255-feet on reverse air. Contractor drilling rate increased due to soft crystalline limestone formation.

Weather: Clear

Deviation surveys were conducted as follows:

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Date	Depth (ft)	Deviation (min)
05/29/90	1,075	15.0
05/30/90	1,135	7.5
05/30/90	1,195	15.0
05/30/90	1,255	15.0
05/30/90	1,315	15.0
05/30/90	1,375	15.0
05/30/90	1,435	15.0

Depth:
 Start 1243 ft
 End 1375 ft
 Bit Size 12 1/4 in

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

Formation
 Samples
 Collected Yes

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	750	27	58.0
SMW-3	600	28	50.4
SMW-6	750	26	40.0
SMW-8	700	25	57.5

Night Shift
 7:00 pm to 7:00 am

B. Ziegler arrived at site 1500 hours. D. VanNote and B. Ziegler leave site 1730 hours.

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

During the night shift, Contractor encountered fluid loss at 1,495-feet, 0330 hours. Drilling became very hard at 1,500-feet.

Depth:
 Start 1375 ft
 End 1504 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEP24770.T0.30 Date May 31, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1504 ft
 End 1611 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1611 ft
 End 1676 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived onsite 0900 hours, Contractor at 1,510-feet drilling reverse air with closed circulation. The formation began taking fluid at 1,495-feet. Drilling became very hard at 1,500-feet due to presence of dolomite.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
05/31/90	1,496	18.75
05/31/90	1,555	26.25
06/1/90	1,615	15.0

Water samples taken from reverse air drilling were collected at 30-foot intervals and were analyzed for conductivity, temperature, and chlorides. The results are as follows:

Well Number	Depth	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
IW-1	1,075	1850	22	417.0
IW-1	1,105	1900	20	375.0
IW-1	1,135	1800	20	425.0
IW-1	1,165	1700	20	400.0
IW-1	1,195	1800	20	422.0
IW-1	1,225	1650	20	369.0
IW-1	1,236	1900	19	372.0
IW-1	1,266	1850	19	372.0

T. McCormick, G. McIntyre, and J. Foess arrived at site 1300 hours, conduct site visit and leave 1330 hours.

Drilling rate increased at 1,572-feet, 1630 hours, due to softer formation.

D. VanNote offsite 1730 hours.

Contractor drilled to 1,676-feet at end of night shift. Contractor added less water to borehole due to slightly increased yield.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 1, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1676 ft
 End 1756 ft
 Bit Size 12 1/8 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Cloudy

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1756 ft
 End 1807 ft
 Bit Size 12 1/8 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived onsite 0800 hours, Contractor at 1,678-feet drilling reverse air with closed circulation.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/1/90	1675	7.5
06/2/90	1735	15.0

Water samples taken from reverse air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Well Number	Depth	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
IW-1	1,315	1800	22	447.4
IW-1	1,345	1700	20	372.4
IW-1	1,375	1700	20	372.4
IW-1	1,405	1675	20	397.4
IW-1	1,435	1625	19	422.4
IW-1	1,465	1675	20	397.4
IW-1	1,495	1625	20	372.0
IW-1	1,526	1800	21	447.0
IW-1	1,586	1700	21	369.0
IW-1	1,616	1750	21	349.0
IW-1	1,646	2700	21	669.0

Drilling rate increased at 1,572-feet, 01630 hours, due to softer formation.

D. VanNote offsite 1730 hours.

Contractor observed substantial increase in yield of the borehole at 1,754-feet. Contractor discontinued adding water to formation, formation yield sufficient for drilling without adding water.

Contractor encountered hard drilling, 95 percent dolomite during night shift. Drilled to 1,807-feet at end of night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 2, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1807 ft
 End 1881 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1881 ft
 End 1909 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived onsite 0930 hours, Contractor at 1,820-foot drilling reverse air with closed circulation. Contractor continued to encounter increasing artesian head with depth. Dolomite still predominant.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
06/2/90	1795	7.5
06/2/90	1855	15.0

Water samples taken from reverse air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

<u>Well Number</u>	<u>Depth</u>	<u>Conductivity (umhos/cm)</u>	<u>Temperature (C)</u>	<u>Chlorides (mg/l)</u>
IW-1	1675	3700	22	1,049
IW-1	1706	15000	21	4,671
IW-1	1736	15000	21	4,821
IW-1	1766	15000	21	5,095
IW-1	1796	15000	21	5,120
IW-1	1856	15000	21	5,470

D. VanNote offsite, 1630 hours.

During the night shift, Contractor encountered dredging at 1,904-feet, 0300 hours. Contractor drilled through dredging zone 0700 hours. Contractor continued drilling through very hard dolomite to 1,909-feet.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEP24770.T0.30 Date June 3, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1909 ft
 End 1967 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1967 ft
 End 2006 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived onsite 0900 hours, Contractor at 1,916-feet with 12 1/4-inch pilot hole (reverse air). Very hard Dolomite still predominant during drilling. Penetration rate remains slow.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/3/90	1915	7.5

Water samples taken from reverse air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Well Number	Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
IW-1	1,886	22,000	24	8,297
IW-1	1,916	44,000	24	17,795
IW-1	1,946	44,000	24	20,593
IW-1	1,976	45,000	24	20,993

D. VanNote conducted steel casing inventory onsite for Contractor's second request for payment. However, after further review, the Contractor chose to make request for payment for stored materials at a later date.

Contractor drilled to 1,941-feet, 1530 hours.

D. VanNote offsite, 1600 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 4, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Rainy

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2006 ft
 End 2076 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2076 ft
 End 2129 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: T. McCormick arrived at site 0800 hours. Contractor down to 2,006-feet with pilot hole. B. Ziegler onsite 1030 hours.

Mr. Paul Feldman/PBCWUD arrived at the site, 1100 hours. Discussed various items and reviewed site progress. Mr. Dick Tuttle/PBCWUD, Saddi Chibani/Hazen and Sawyer and John Chesher/Hazen and Sawyer arrived at site, 1115 hours. T. McCormick conducted site visit. PBCWUD and Hazen and Sawyer representatives left site, 1140 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/4/90	2035	18.75

Water samples taken from reverse air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Well Number	Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
IW-1	2006	45,500	24	20,593
IW-1	2036	46,000	24	20,993
IW-1	2066	35,000	24	14,196
IW-1	2096	36,000	24	15,095

Very heavy rains fell from 1600 hours to 1700 hours. Very high winds were also present during this period. No damage to drilling equipment occurred.

B. Ziegler offsite, 1730 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 5, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2129 ft
 End 2198 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2198 ft
 End 2216 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived on site, 0800 hours. Contractor down to 2,141-feet with 12 1/4-inch pilot hole, estimate that 2,200-foot (TD) will be reached at 1700 hours. Informed C. DiGiacomo (Geophysical Logger) that logging will begin tonight or tomorrow morning.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/5/90	2095	26.25
06/5/90	2155	7.50

Water samples taken from reverse air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Well Number	Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
IW-1	2126	46,000	24	20,693
IW-1	2156	47,000	24	20,993
IW-1	2186	47,000	24	20,993
IW-1	2216	47,000	24	20,193

B. Ziegler reviewed drill pipe tally with K. Greuel at 1100 hours and confirmed the drilling depth of 2,176 feet.

B. Ziegler off site, 1145 hours.

Contractor encountered a dredging zone 2,200-feet during the night shift. Several hours were spent unplugging the drill bit and cleaning the pilot hole.

A total depth of 2,216-feet was reached at 2130 hours. Hole was reamed and circulated until 0200 hours. Night shift ended while tripping drill pipe in preparation for geophysical logging.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEP24770.T0.30 Date June 6, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting..... X
 Other..... X

Depth:
 Start 2216 ft
 End 2216 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start 2216 ft
 End 2216 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler received a phone call at 0500 hours from J. Branley. Pilot hole to 2,216-feet was complete. Would be ready to log at 0700 hours.

B. Ziegler arrived at site 0600 hours. C. Digiacoimo arrived on site at 0630 hours. C. Digiacoimo set up logger while Contractor tripped out of hole.

T. McCormick arrived on site, 0745 hours.

Engineer began geophysical logging at 0730 hours (Caliper, Gamma, Temperature, Fluid Res., and LSN electric logs). First phase of geophysical logging complete at 1115 hours. Schlumberger mobilized to site and began geophysical logging (Dual-Induction log) at 1115 hours. Schlumberger completes logging at 1400 hours.

Florida Geophysical logging arrived on site, 1415 hours and set up for TV video survey. TV video survey began at 1530 hours. Pilot hole very cloudy from surface to 1,900-feet. Pilot hole cleared at approximately 1,900-feet (recording began) and remained clear to 2,212-feet (TD). Contractor installed drill pipe to 1,700-feet and flushed hole with fresh water, 1900 hours. TV camera was lowered through the drill pipe and placed just below base of drill pipe to wait on pilot hole to clear.

Albert Muniz arrived on site, 2030 hours. Initial video (1,900 to 2,212-feet) was reviewed. It was decided to conduct straddle-packer test between 1,880 to 1,950-feet below land surface. Flushing of the pilot hole was terminated. Begin tripping drill pipe out of hole.

Packer set up was reviewed with Contractor. Distance between packers needs to be approximately 67-feet center to center, or as close as possible. Contractor stated that packer testing should be ready to begin 0800 hours tomorrow. Contractor set packers during the remainder of the night shift.

T. McCormick, A. Muniz, B. Ziegler, and D. VanNote of site, 2300 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 7, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing..... X
 - Waiting.....
 - Other.....

Depth:

Start	NA	ft
End	NA	ft
Bit Size	NA	in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing..... X
 - Waiting.....
 - Other..... X

Depth:

Start	NA	ft
End	NA	ft
Bit Size	NA	in

Formation Samples Collected No

Description of Operations: B. Ziegler and D. VanNote arrived on site, 0800 hours. Contractor installed packers across the interval from 1,882 feet to 1,950 feet during night shift and installed a submersible 5 hp pump to 173 feet below land surface, 0900 hours. Packer test was started at 0956 and pumping was terminated at 1800 hours. A pumping rate of 71 gpm was maintained throughout the test. Engineer calculated 44 minutes to purge 1 volume of water including pipe string and volume of open borehole between packers. Engineer recorded drawdown data within the pipe string and the casing during the full duration of the test. Data was collected with pressure transducer and confirmed manually. Packer test was terminated at 1800 hours. Recovery data was recorded from 1757 to 2007 hours. A total of 11 volumes were purged during the 8-hour packer test.

T. McCormick and A. Muniz arrived at site, 1700 hours.

To confirm that the packers had taken a test against the formation walls, the Contractor was instructed to unseat and then reinflate the packers in the same location. The pump was reinserted and drawdown data and water quality was again recorded. Shortly before this abbreviated pump test was to end, the pump circuit breaker tripped and the pump motor shorted out. As drawdown and water quality data matched that was collected during the first test, it was decided that sufficient data had been collected and no further packer testing would be necessary.

During the packer testing, water samples were collected at various intervals and were analyzed for water quality (conductivity, temperature, and chlorides), see attached table "IW-1 Packer Test/Water Quality Data". Temperature and conductivity readings stabilized after approximately one hour of pumping and were consistent throughout the remainder of the test with readings of 26°C and 48,000 umhos/cm, respectively.

To approximate Total Dissolved Solids (TDS) of the packer zone formation water, a factor of 0.65 was multiplied by the conductivity. From this calculation, TDS was approximated at 31,200 mg/l. Laboratory analysis of the final sample collected will be performed as a confirmation.

A. Muniz off site, 2300 hours. T. McCormick, B. Ziegler, and D. VanNote leave site, 2445 hours.

Recorded By: D. VanNote

PROJECT: PBC SRWWTP DIW'S
 PROJECT NO.: SEF24770.T0
 DATE: JUNE 7, 1990
 WELL NO.: IW-1

WATER QUALITY FROM PACKER TEST IW-1 PACKER TEST/WATER QUALITY DATA

DATE	TIME	DEPTH	TEMPERATURE (C)	CONDUCTIVITY (UMHOS/CM)	CHLORIDE (MG/L)	COMMENTS
6/7	0958	1,900	28	47,000	--	FRESH WATER FROM TV
6/7	1015	--	26	16,000	--	
6/7	1028	1,900	26	42,000	--	
6/7	1056	1,900	26	48,000	--	
6/7	1120	1,900	26	48,000	--	
6/7	1136	1,900	26	48,000	--	
6/7	1137	--	24	200	37.5	SAMPLE COLLECTED FROM CITY WATER SUPPLY
6/7	1220	1,900	26	48,000	--	
6/7	1305	1,900	27	48,000	--	
6/7	1330	1,900	27	47,500	--	
6/7	1345	1,900	27	47,500	--	
6/7	1400	1,900	27	47,500	19,044	
6/7	1415	1,900	27	47,500	--	
6/7	1430	1,900	27	47,000	--	
6/7	1445	1,900	27	47,000	--	
6/7	1500	1,900	27	47,500	18,094	
6/7	1515	1,900	27	47,500	--	
6/7	1530	1,900	27	47,500	--	
6/7	1545	1,900	27	47,500	--	
6/7	1600	1,900	26.5	47,000	19,294	
6/7	1615	1,900	27.5	47,000	--	
6/7	1630	1,900	26	48,000	--	
6/7	1645	1,900	26	48,000	--	
6/7	1700	1,900	26.5	48,000	18,694	
6/7	1715	1,900	26	48,000	--	
6/7	1730	1,900	26	48,000	--	
6/7	1745	1,900	26	48,000	--	
6/7	2304	1,900	25	48,000	--	
6/7	2330	1,900	26	48,000	20,793	

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 8, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Rainy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start N/A ft
 End N/A ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rainy

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,010 ft
 End 1,076 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site, 1130 hours. Contractor started tripping down hole with 42 1/2-inch reamer assembly, 0800 hours.

A tentative setting depth for the intermediate casing was selected at 1,890-feet. Final determination of setting depth will be reviewed with FDER.

Very heavy rains fell throughout the day.

Contractor continued tripping down hole with 42-inch reamer assembly, 1545 hours.

D. VanNote off site, 1600 hours.

Contractor began reaming the pilot hole from 1,010-feet, 1900 hours. Contractor reamed to 1,076-feet through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 9, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming..... X
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 1,076 ft
 End 1,136 ft
 Bit Size 42 1/2 in

Formation

Samples

Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming..... X
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 1,136 ft
 End 1,222 ft
 Bit Size 42 1/2 in

Formation

Samples

Collected No

Description of Operations: D. VanNote arrived on site, 1000 hours. Contractor had reamed to 1,091 feet with 42 1/2-inch bit, 1030 hours.

Contractor down to 1,096 feet, 1245 hours.

D. VanNote off site 1300 hours.

Contractor continued reaming through the night shift to 1,222 feet. Formation remained a very porous, biomicritic limestone, moderately hard drilling.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 10, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,222 ft
 End 1,256 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,256 ft
 End 1,267 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site, 1000 hours. Contractor had reamed to 1,233 feet with 42 1/2-inch reamer. Drilling still moderately hard. Formation is a very porous biomicritic limestone.

J. Brantley arrived on site 1000 hours. Continued set up of equipment on IW-2. Contractor stated that drilling will start on IW-2 no later than next week.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/09/90	1,050	7.5
06/09/90	1,110	22.5
06/10/90	1,170	22.5

D. VanNote off site 1330 hours.

Contractor reamed to 1,260 feet during the night shift when bit plugged off at 2030 hours. Bit was unplugged and reaming resumed, 0300 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 11, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm
 Weather: Clear
 Activity:
 Drilling.....
 Reaming..... X
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 1,267 ft
 End 1,294 ft
 Bit Size 42 1/2 in
 Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site, 0745 hours. Contractor reamed to 1,270 feet with 42 1/2-inch bit. Drilling rate decreased, dolomitic limestone encountered.
 Contractor at 1,280 feet, 1230 hours.
 Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/11/90	1,230	30.0
06/11/90	1,290	22.5

J. Chesher, J. Brantley, K. Greuel, and D. VanNote reviewed on-site disposal of drill cuttings from below 1,000 feet. Cuttings will be washed with water over the mud tanks and stored in a mobile pan for use as road material by Hardrives Inc.
 T. McCormick and B. Ziegler discussed the 34-inch intermediate casing setting depth with Mr. Al Mueller of FDER. A setting depth of 1,890 feet was selected by the Engineer and will be reviewed by FDER.

Night Shift
 7:00 pm to 7:00 am
 Weather: Clear
 Activity:
 Drilling.....
 Reaming..... X
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 1,294 ft
 End 1,347 ft
 Bit Size 42 1/2 in
 Formation
 Samples
 Collected No

D. VanNote off site 1715 hours.
 Contractor reamed to 1,347-feet through the night shift.
 Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 12, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,347 ft
 End 1,388 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,388 ft
 End 1,436
 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site, 1215 hours. Contractor had reamed to 1,368 feet with 42 1/2-inch bit.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
06/12/90	1,350	7.5
06/12/90	1,436	7.5

B. Ziegler recieved verbal on Total Dissolved Solids (TDS) analysis (Geotech Laboratory/WPB) performed on sample pulled at conclusion of packer test of IW-1. Sample contained 36,477 mg/l of TDS.

Contractor at 1,380 feet, 1700 hours. D. VanNote off site 1700 hours.

Contractor encountered harder drilling during the night shift. Contractor reamed to 1,436 feet through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 13, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,436 ft
 End 1,480 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,480 ft
 End 1,494 ft
 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite at 0730 hours. D. VanNote arrived onsite, 0800 hours. Reamed hole (42 1/2-inch) down to 1,436-feet.

The weekly summary was prepared for T. McCormick's review.

B. Ziegler informed J. Brantley that the request for quotation (additional electrical work) has not been received. Would like to include with the change order for additional geophysical logging. J. Brantley stated that the quote would be ready sometime tomorrow.

The surficial monitor wells were sampled on June 12, 1990, for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. Chloride titrations were performed June 13, 1990. The data collected are as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,200	27.0	67.5
SMW-3	800	27.0	47.5
SMW-6	900	26.0	55.0
SMW-8	1,000	27.0	50.0

The water samples collected from the surficial monitor wells on June 6, 1990, were analyzed again for chlorides. Analysis with new titrant and indicator indicate parameters consistent with previous sample dates. See Water Quality Data sheets. Results from last analysis were uncharacteristically high. It was determined that the indicator and titrant used in the chloride titrations were bad.

Contractor continues mobilizing equipment for IW-2, plans to install rat and mouse hole tonight or tomorrow.

B. Ziegler offsite at 1430 hours. Reamed hole down to 1,466-feet IW-1.

Goose neck for reverse air drilling on the kelly bar broke at 0145 hours during the night shift. Repairs were still being made at shift change.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 14, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,494 ft
 End 1,507 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site at 0830 hours. Reamed hole (42-1/2 inch) down to 1,494 feet. Penetration rate is slow, drilling dolomite.

Polikof Electric reviewed electrical change order. Does not see any problems. Will have a quote to Youngquist Brothers tomorrow.

Drill cuttings continue to be hauled to the Boynton Pit. Mud tanks still contain some drilling mud at the bottom. Once tanks have been cleaned the cuttings from below 1,000 feet will be washed and stored on site.

Al Mueller/FDER phoned T. McCormick. Would like to meet at 1400 hours tomorrow and review the selected intermediate casing setting depth of 1,890 feet for IW-1.

B. Ziegler off site 1900 hours.

Reaming of the 42-1/2 inch hole continued through the night shift. Depth at shift change was 1,518 feet.

Night Shift
 :00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,507 ft
 End 1,518 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 15, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
 Start 1,518 ft
 End 1,580 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
 Start 1,580 ft
 End 1,597 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site at 1030 hours. Reamed hole (42-1/2 inch) down to 1,524 feet. Drill string plugged off, Contractor working to unplug. Penetration rate remains slow, still drilling dolomite. Rate should increase at approximately 1,530 feet where limestone begins again.

B. Ziegler off site at 1230 hours to meet with Al Mueller/FDER.

B. Ziegler on site 1600 hours. Reamed hole down to 1,565 feet. Penetration rate has increased. Encountered limestone at 1,530 feet.

Deviation Surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/15/90	1,470	22.50
06/15/90	1,530	7.50

Rat and Mouse hole installed on IW-2. Drilling of 12-inch pilot hole will begin tomorrow.

Reaming of the 42-1/2 inch hole continued through the night shift. Air line was dropped at 2230 hours. Contractor tripped out of hole, retrieved air line and resumed reaming at 0530 hours. Depth at shift change was 1,597 feet.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 16, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,597 ft
 End 1,624 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,624 ft
 End 1,646 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site at 0915 hours. Reamed hole (42-1/2 inch) down to 1,616 feet. Penetration rate should remain slow until TD (1,890 feet) for 34-inch intermediate casing.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/16/90	1,590	15.00

J. Brantley on site at 1200 hours. Will begin drilling pilot hole to 260 feet on IW-2.

B. Ziegler off site at 1300 hours.

B. Ziegler on site at 0200 hours. Reamed hole (42-1/2 inch) down to 1,635 feet.

B. Ziegler off site 0600 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 17, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,646 ft
 End 1,674 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,674 ft
 End 1,697 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site at 1200 hours. Reamed hole (42-1/2 inch) down to 1,650 feet. Penetration rate approximately 2-feet per hour, should remain slow until TD (1,890 feet) for 34-inch intermediate casing.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/17/90	1,650	26.25

Conducted geophysical logging (Caliper, Gamma, and LSN) at IW-2, 1730 hours.

B. Ziegler off site 2030 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 18, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,697 ft
 End 1,713 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site at 0815 hours. Contractor reamed to 1,703 feet, 0830 hours. Reamer assembly bridged on edges of annulus at 1,703 feet. Contractor rereamed affected area from 1000 to 1400 hours.

Paul Feldman/PBWUD arrived at site 1000 hours. Mr. Feldman asked if approval was granted for disposal of drilling fluid and cuttings. D. VanNote advised that letters of approval from FDER were received and copies will be delivered to Mr. Feldman.

D. VanNote off site, 1715 hours.

During the night shift, Contractor had to shut down rig temporarily from 2100 to 0400 hours. Poole and Kent, Inc. conducted leak location testing on pipeline running adjacent to both drill rigs. Poole and Kent, Inc. requested that Contractor stop all drilling operations until leak location was completed. Contractor commenced reaming at 0400 hours and reamed to 1,725 feet through the end of the night shift.

Night Shift
 :00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,713 ft
 End 1,725 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 19, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,725 ft
 End 1,749 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,749 ft
 End 1,767 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site at 0815 hours. Contractor reamed to 1,727 feet, 0830 hours. Contractor encountered very hard drilling.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
06/19/90	1,710	26.25

Contractor reamed to 1,745 feet, 1700 hours. Drilling still very hard.

D. VanNote off site, 1730 hours.

Contractor lost air-line down drill pipe during the night shift, 0430 hours. Contractor began tripping out drill rods from 1,767 feet, 0500 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 20, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 1,767 ft
 End 1,767 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 1,767 ft
 End 1,778 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site, 0715 hours. Contractor continued tripping out of hole due to lost air-line in drill string, 0800 hours. Contractor began tripping out last night at 0500 hours from a depth of 1,767 feet. Contractor will check the 42-1/2-inch bit assembly after tripping out of hole.

Contractor encountered artesian flow while tripping rods out of borehole. Contractor added 25 sacks of barite to kill the artesian flow.

Contractor continued tripping rods out of borehole, 1530 hours.

Contractor tripped rods and 42-1/2-inch bit assembly out of borehole, 1700 hours. Contractor retrieved air-line and replaced lead bit due to damage while drilling. Contractor tripped back in borehole, 1900 hours.

D. VanNote off site, 1930 hours.

D. VanNote arrived on site, 0300 hours. Contractor tripped down borehole during the night shift and began reaming at 0200 hours. Contractor reamed to 1,769 feet, 0400 hours. Contractor encountered very hard drilling during the night shift due to very hard dolomite formation.

Recorded By: D.VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 21, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 1,767 ft
 End 1,778 ft
 Bit Size 42 1/2 in

Formation

Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 1,778 ft
 End 1,808 ft
 Bit Size 42 1/2 in

Formation

Samples
 Collected No

Description of Operations: D. VanNote arrived onsite during the night shift, 0300 hours. Contractor reamed to 1,771 feet, 0530 hours. Drilling continued to be very hard.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
06/21/90	1,770	22.5

Contractor continued reaming through the night shift to a depth of 1,808 feet.

D. VanNote offsite, 1800 hours.

Recorded by: D.VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 22, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,808 ft
 End 1,836 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,836 ft
 End 1,852 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at site 0700 hours. Contractor reamed to 1,810 feet, 0800 hours. Contractor encountered continued hard drilling in dolomite. Contractor anticipates TD at 1,890 feet late Sunday afternoon, June 24, 1990.

Contractor reamed to 1,818 feet, 1300 hours. Drilling still very hard.

Contractor reamed to 1,833 feet, 1830 hours. D. VanNote offsite 1830 hours.

Recorded by: D.VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 23, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,852 ft
 End 1,874 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,874 ft
 End 1,888 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at 0845 hours, Contractor reamed to 1,855 feet. Contractor anticipates TD by tomorrow afternoon.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
06/23/90	1,830	15.0

Contractor reamed to 1,865 feet, 1500 hours. D. VanNote offsite at 1530 hours.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEP24770.T0.30 Date June 24, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,888 ft
 End 1,900 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,900 ft
 End 1,904 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at 0900 hours, Contractor reamed to the total depth of 1,890 feet. Contractor will overdrill to 1,904 feet bls.

Called T. McCormick at 1045 hours to advise that Contractor was close to T.D. Mr. McCormick requested that D. VanNote remind the Contractor that a drillable bridge plug is to be put in place between 1910 and 1900 feet bls before commencing the casing installation. Contractor is to tag cuttings, then pump a minimum of 10 feet of neat cement from 1910 to 1900 feet. Contractor will install 34-inch casing after bridge plug has set and depth is confirmed at or above 1,900 feet. Contractor shall not pump cement around casing until bridge plug is set.

Engineer conducted inventory on 34-inch casing on job site. Engineer noticed that some casing lengths did not have mill certificates and/or heat Nos. on them. A total of nine mill certificates are missing for the 34-inch casing. Of 81 casing lengths, 38 did not match the mill certificates on hand. Informed Kevin Greuel\Contractor of the situation 1415 hours.

T. McCormick arrived on site 1300 hours. Reiterated need for bridge plug from 1,910 to 1,900 feet. T. McCormick informed J. Brantley\Contractor that bridge plug will be installed before installation of the 34-inch casing. J. Brantley said he will ream to 1,904 feet (bottom of lead bit, 1,910 feet) then trip out of the hole. Tag at 1,910 feet will be confirmed with tremie line immediately after rods are tripped out of borehole.

T. McCormick offsite 1410 hours. Contractor reamed to 1,904 feet, 1800 hours.

T. McCormick returned on site and conducted site visit, 1730 hours. T. McCormick advised that heat Nos. and mill certificates would have to be correctly accounted for before casing installation could commence. T. McCormick offsite 1745 hours.

D. VanNote offsite 1830 hours.

Recorded by: D.VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 25, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Description of Operations: D. VanNote arrived at site, 0900 hours. Contractor began tripping out of hole during the night shift, 0500 hours.

Contractor began running tremie line to tag total depth of borehole, 1400 hours. Contractor tagged bottom of borehole at 1,908 feet, 1630 hours.

Cement calculations were reviewed by D. VanNote/Engineer, J. Brantley/Contractor, and T. Nolan/Cement Contractor to determine total volume of neat cement for a 10-foot bridge plug. Eleven barrels of neat cement were calculated for a bridge plug from 1,908 to 1,898 feet. Four percent calcium was added to the neat cement as an accelerator. Pumping of cement was conducted from 1700 hours to 1710 hours. Contractor will let cement set for 4 hours before tagging.

Contractor delivered the necessary mill certificates for the 34-inch casing to the engineer, 1600 hours. All 34-inch casing onsite is accounted for.

Tallies were conducted on the 34-inch casing. Joint No., heat No., depth below land surface, and centralizer depths were reviewed with the Contractor. Joint Nos., and casing lengths were marked clearly on each casing section.

D. VanNote offsite, 1950 hours.

D. VanNote returned onsite, 2100 hours. Contractor tagged bridge plug at 1,905 feet (3-feet of fill). Contacted T. McCormick and discussed next procedure. Contractor is to place another 10 barrels of neat cement to yield.

Contractor pumped 10 barrels neat cement, 2249 hours. Four percent calcium was added to the neat as an accelerator. Contractor will tag at 0300 hours.

Contractor tagged bridge plug at 1,901 feet, 0300 hours. Another 10 barrels of neat cement was estimated to reach the required depth of 1,898 feet. Contractor pumped 10 barrels neat cement, 0428 hours. Contractor will tag at 0900 hours.

D. VanNote offsite, 0515 hours.

Remainder of shift was spent waiting on bridge plug to set.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 26, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Cloudy

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation

Samples
 Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Cloudy

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation

Samples
 Collected No

Description of Operations: B. Ziegler arrived on site, 0900 hours. Tag is made on third stage of bridge plug for installation of 34-inch casing. Tag at 1,899 feet below land surface (9 feet of neat cement plug). Contractor removed tremie line and began setting up to install 34-inch casing.

Contractor began setting 34-inch casing at 1330 hours. Centralizers were placed as specified at 5, 20, 40, and every 100 feet from the bottom of the casing.

Heavy rain and lightning from 1700 hours to 1830 hours. Light rain continued until 2000 hours.

Cement types and quantities were reviewed with J. Brantley, T. McCormick, and B. Ziegler. It was agreed to pump a nominal 50 feet of calculated borehole volume of 12 percent bentonite cement followed by 300 feet of neat cement.

Running of casing continued through shift change and through night shift. A total of 1,710 feet of 34-inch casing had been installed at end of shift report, 0700 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 27, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Description of Operations: B. Ziegler remained on site through shift change. T. McCormick arrived site 0800 hours.

Contractor completed installation of 34-inch casing to 1,890 feet below land surface at 0950 hours. Contractor then began preparing casing for pressure grout.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the conductivity and temperature stabilized. Chloride titrations were performed on June 27, 1990. The data collected are as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,360	26	71
SMW-3	820	26	50
SMW-6	1,000	26	45
SMW-8	1,000	26	38

Cement calculations were reviewed by J. Brantley, T. Nolan, and B. Ziegler. It was agreed to place 81 sacks of 12 percent cement followed by 984 sacks of neat cement.

Pressure grouting of the 34-inch casing began at 1520 hours. Cementing was started by pumping 25 barrels of fresh water. Dowell then pumped 79 sacks of 12 percent followed by 990 sacks of neat cement. Header pressure was 5 psi when Contractor switched from 12 percent to neat. Final header pressure was 98 when cement pumping was stopped and fresh water flush began. Grouting was completed at 1648 hours. Approximately 30 feet of tremie was then pulled to prevent cementing line in place.

Remainder of shift was spent waiting of cement to set and monitoring header pressure.

B. Ziegler off site at 1830 hours.

Recorder by: B. Ziegler

DAILY SHIFT REPORT

<p>CH2M HILL</p>	<p>Project No. SEF24770.T0.30 Date <u>June 28, 1990</u> Client <u>Palm Beach County SRWWTP</u> Contractor <u>Youngquist Brothers Inc.</u> Well No. <u>IW-1</u></p>
<p>Day Shift <u>7:00 am to 7:00 pm</u> Weather: <u>Fair</u> Activity: Drilling..... <input type="checkbox"/> Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... <input type="checkbox"/> Testing..... <input checked="" type="checkbox"/> Waiting..... <input type="checkbox"/> Other..... <input type="checkbox"/> Depth: Start <u>NA</u> ft End <u>NA</u> ft Bit Size <u>NA</u> in Formation Samples Collected <u>No</u></p>	<p>Description of Operations: B. Ziegler and C. DiGiacomo arrived onsite 0645 hours. C. DiGiacomo set up geophysical logging equipment to perform temperature log on first stage of cement (34-inch casing). Contractor had not pulled tremie line from casing. In order to expedite logging, Contractor cut hole in header to allow access for logging equipment. Geophysical logging (temperature log) began at 0800 hours and was completed at 0930 hours. B. Ziegler offsite 1135 hours. B. Ziegler arrived site 1930 hours. Contractor tagged first stage of cement on 34-inch casing with north tremie at 1,684-feet below land surface (bls). Contractor could not set south tremie line to depth. South tremie was moved to a different position around annulus. Contractor tagged cement with south tremie line at 1,680-feet bls, 0230 hours. Theoretical fill for first stage of cement was 300-feet, actual fill was 206-feet. Cement quantities and casing collapse pressure were reviewed by J. Brantley, T. Nolan, and B. Ziegler. It was agreed to place enough 4 percent cement to fill 230-feet of annulus (536 sacks).</p>
<p>Night Shift <u>7:00 pm to 7:00 am</u> Weather: <u>Fair</u> Activity: Drilling..... <input type="checkbox"/> Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... <input checked="" type="checkbox"/> Testing..... <input type="checkbox"/> Waiting..... <input checked="" type="checkbox"/> Other..... <input type="checkbox"/> Depth: Start <u>NA</u> ft End <u>NA</u> ft Bit Size <u>NA</u> in Formation Samples Collected <u>No</u></p>	<p>The second stage of cementing began at 0300 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 105 psi for additional safety. Cementing was started by pumping 5 barrels of fresh water to clear tremie lines. Dowell then pumped 536 sacks (145 barrels) of 4 percent bentonite cement. Tremie lines were then partially displaced with fresh water, pulled 120-feet above theoretical fill, and then completely flushed with fresh water. Grouting was completed at 0349 hours. Remainder of shift was spent waiting of cement to set and monitoring header pressure. B. Ziegler offsite at 0415 hours. Recorded by : <u>B. Ziegler</u></p>

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 29, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Fair

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Fair

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived site at 1800 hours. Contractor tagged second stage of cement on 34-inch casing at 1,533 feet below land surface (bls). Theoretical fill for second stage was 230 feet, actual fill was 151 feet.

Cement quantities and casing collapse pressure were reviewed by J. Brantley, T. Nolan, and D. VanNote. It was agreed to place enough 4 percent cement to fill 200 feet of annulus (462 sacks).

The third stage of cementing began at 1835 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Cementing was started by pumping 9 barrels of fresh water to clear tremie lines. Dowell then pumped 462 sacks (125 barrels) of 4 percent bentonite cement. Tremie lines were then partially displaced with fresh water, pulled 120 feet above theoretical fill, and then completely flushed with fresh water. Grouting was completed at 1917 hours.

D. VanNote offsite at 2000 hours.

Remainder of shift was spent waiting of cement to set and monitoring header pressure.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 30, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Fair

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Fair

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Description of Operations: B. Ziegler arrived site at 0645 hours. Contractor unable to tag third stage of cement on 34-inch casing. Tremie elevators on different job. Should be ready to tag by 1300 hours.

B. Ziegler offsite 0745 hours.

B. Ziegler arrived site at 1300 hours. Contractor tagged third stage of cement on 34-inch casing at 1,419-feet below land surface (bls). Theoretical fill for third stage was 200 feet, actual fill was 114 feet.

Cement quantities and casing collapse pressure were reviewed by J. Brantley, T. Nolan, and B. Ziegler. It was agreed to place 536 sacks of 4 percent bentonite cement.

The fourth stage of cementing began at 1433 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 90 psi for additional safety. Cementing was started by pumping 4 barrels of fresh water to clear tremie lines. Dowell then pumped 536 sacks (145 barrels) of 4 percent bentonite cement. Tremie lines were then partially displaced with fresh water, pulled 120 feet above theoretical fill, and then completely flushed out with fresh water. Grouting was completed at 1520 hours.

B. Ziegler offsite at 1630 hours.

Remainder of shift was spent waiting of cement to set and monitoring header pressure.

B. Ziegler arrived site 2300 hours for installation of 44-inch casing on IW-2. Remained onsite through shift change.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 1, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....X
 Testing.....
 Waiting..... X
 Other.....

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing..... X
 Testing.....
 Waiting..... X
 Other.....

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler onsite through shift change. Contractor tagged fourth stage of cement on 34-inch casing at 1,244 feet below land surface (bls). Theoretical fill for fourth stage was 230 feet, actual fill was 175 feet.

Cement quantities and casing collapse pressure were reviewed by J. Brantley, T. Nolan, and B. Ziegler. It was agreed to pump a minimum of 536 sacks of 4 percent bentonite cement and monitor circulation. If circulation is constant may pump up to 584 sacks.

The fifth stage of cementing began at 0730 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 90 psi for additional safety. Cementing was started by pumping 4 barrels of fresh water to clear tremie lines. Dowell then pumped 584 sacks (155 barrels) of 4 percent bentonite cement. Circulation while pumping was steady. Tremie lines were then partially displaced with fresh water, pulled 120 feet above theoretical fill, and then completely flushed with fresh water. Grouting was completed at 0821 hours.

Remainder of shift was spent waiting on cement to set and monitoring header pressure.

B. Ziegler offsite 1845 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 2, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Description of Operations: D. VanNote arrived onsite 0800 hours. Contractor tagged fifth stage of cement on 34-inch casing at 1,100 feet below land surface (bls), 0930 hours.

Cement quantities and casing collapse pressure for the sixth stage were reviewed by J. Brantley, T. Nolan, and D. VanNote. It was agreed to pump a minimum of 465 sacks (126 barrels) of 4 percent bentonite cement to a theoretical depth of 900 feet bls.

The sixth stage of cementing began at 1002 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 90 psi for additional safety. Cement Contractor pumped 465 sacks (126 barrels) of 4 percent bentonite cement. Circulation while pumping was steady. Tremie lines were partially displaced with fresh water, pulled 120 feet above theoretical fill, and then completely flushed with fresh water. Grouting was completed at 1039 hours.

Contractor tagged sixth stage on the 34-inch casing at 940-foot bls. J. Brantley, T. Nolan, and D. VanNote reviewed cement quantities and collapse pressure. A total of 222 barrels (567 sacks) of 12 percent bentonite cement pumped was pumped for the seventh stage.

Peggy Highsmith and Bowo Okome/FDER/WPB arrived site at 1945 hours and observed cementing of IW-1 and IW-2. Ms. Highsmith and Mr. Okome left site at 2100 hours.

The seventh stage of cementing began 2022 hours. Tremie lines were placed 180 degrees apart and casing was pressurized to 90 psi. Grouting was completed at 2127 hours. A total of 222 barrels (567 sacks) of 12 percent were pumped.

D. VanNote offsite, 2230 hours.

Remainder of shift was spent waiting of cement to set and monitoring header pressure.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 3, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. LW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start	NA	ft
End	NA	ft
Bit Size	NA	in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start	NA	ft
End	NA	ft
Bit Size	NA	in

Formation Samples Collected No

Description of Operations: D. VanNote arrived onsite 0730 hours. Contractor tagged seventh stage of cement on 34-inch casing at 612 feet below land surface (bls), 0830 hours.

Cement quantities and casing collapse pressure for the eight stage were reviewed by J. Brantley, T. Nolan, and D. VanNote. It was agreed to pump a minimum of 567 sacks (222 barrels) of 12 percent bentonite cement to a theoretical depth of 302 feet bls.

The eighth stage of cementing began at 0849 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 90 psi for additional safety. Cement Contractor pumped 567 sacks (222 barrels) of 4 percent bentonite cement. Circulation while pumping was steady. Grouting was completed at 0952 hours.

D. VanNote offsite, 1530 hours. Returned 1930 hours.

Contractor tagged eighth stage on the 34-inch casing at 300 feet bls, 2015 hours. J. Brantley, T. Nolan, and D. VanNote reviewed cement quantities and collapse pressure. A total of 189 barrels (482 sacks) of 12 percent bentonite cement were pumped to ground surface for the ninth and final stage.

The ninth and final stage of cementing began 2028 hours. Tremie lines were placed 180 degrees apart and casing was pressurized to 90 psi. Grouting was completed for the ninth and final stage at 2121 hours.

D. VanNote offsite, 2200 hours.

Remainder of shift was spent waiting of cement to set and rigging up for drilling the 12-1/4-inch pilot hole.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 4, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite 1000 hours. Contractor continued to rig up 12-1/4-inch bit and prepare to drill pilot hole from 1,900 feet to 3,300 feet.

Contractor tripped 12-1/4-inch bit to cement plug at bottom of 34-inch casing, 1630 hours. Contractor anticipated drilling of the pilot hole at 1900 hours. Engineer informed Contractor that water samples and formation samples are to be collected as specified in the contract documents.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,750	27.0	165.0
SMW-3	800	31.0	55.0
SMW-6	725	29.0	30.0
SMW-8	900	27.5	45.0

D. VanNote offsite, 1400 hours. Returned 2100 hours.

Contractor encountered mechanical problem with swivel apparatus. Contractor spent remainder of the night shift repacking and greasing swivel. Drilling of the pilot hole delayed until tomorrow afternoon.

D. VanNote offsite, 2200 hours.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 5, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start 1,856 ft
 End 1,928 ft
 Bit Size 32 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site 0800 hours. Contractor continued to repair leaking swivel. Reverse air drilling of the pilot hole is expected to begin this afternoon.

Contractor still having problems with swivel, 1400 hours.

D. VanNote off site 1630 hours.

Contractor decided to remove swivel apparatus from IW-2 for use on IW-1. Contractor began drilling the duck's nest with 32-1/2-inch reamer assembly at 1,856 feet, 2400 hours.

Contractor completed drilling of the duck's nest to 1,928 feet. The 12-1/4-inch pilot bit was tripped in to a depth of 1,934 feet at the end of the night shift.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 6, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,934 ft
 End 2,097 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,097 ft
 End 2,216 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived on site 0800 hours. Contractor began drilling of the 12-1/4-inch pilot hole to 3,300 feet at the beginning of the shift. Pilot bit tracked the old pilot hole to 2,200 feet. Contractor circulated cuttings out that had fallen during reaming of the 42-1/2-inch borehole. Contractor had cleaned old pilot hole to 2,097 feet by the end of the shift.

D. VanNote off site 1500 hours.

Drilling of the pilot hole continued through the night shift. Contractor began drilling new hole at 2,210 feet, 0315 hours. A dredging zone was encountered at 2,216 feet. Dredging continued through end of shift report.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 7, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,216 ft
 End 2,290 ft
 Bit Size 12-1/4 in

Formation Samples Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,290 ft
 End 2,378 ft
 Bit Size 12-1/4 in

Formation Samples Collected Yes

Description of Operations: B. Ziegler arrived on site 1030 hours. Contractor continued drilling of the 12-1/4 inch pilot hole. Dredging stopped at 2,217-feet.

Contractor encountered limestone from 2,250 to 2,270 feet. Penetration rate increased. Dolomite from 2,270 to 2,290 feet.

Drilling of the 12-1/4 inch pilot hole continued through the end of the shift report. A total depth of 2,378-feet had been reached at the end of the shift. Drill cuttings indicated limestone from 2,290 to 2,378 feet.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/07/90	2,240	15.00

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,247	30,000	24	17,594
2,277	48,000	24	19,693
2,307	47,000	24	13,745
2,337	47,000	23	17,994

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL Project No. SEF24770.T0.30 Date July 8, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm
 Weather: Clear
 Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 2,378 ft
 End 2,517 ft
 Bit Size 12-1/4 in
 Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived on site 1200 hours. Contractor continued drilling of the 12-1/4-inch pilot hole. Pilot hole down to 2,456 feet, 1200 hours.
 Pilot hole encountered limestone from 2,290 feet to 2,500 feet where formation changed to dolomite.
 Drilling of the 12-1/4-inch pilot hole continued through the end of the shift report. A total depth of 2,580 feet had been reached at the end of the shift. Pilot hole remained in dolomite from 2,500 feet to 2,580 feet.
 Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/08/90	2,300	7.50
07/08/90	2,360	15.00
07/08/90	2,420	15.00
07/08/90	2,480	7.50

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Night Shift
7:00 pm to 7:00 am
 Weather: Clear
 Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 2,517 ft
 End 2,758 ft
 Bit Size 12-1/4 in
 Formation
 Samples
 Collected Yes

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,397	47,000	24	13,495
2,427	48,000	24	16,994
2,456	48,000	24	20,693
2,486	48,000	24	14,495
2,517	48,000	24	14,995
2,547	48,000	24	20,993

B. Ziegler off site at 1700 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 9, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,580 ft
 End 2,680 ft
 Bit Size 12-1/4 in

Formation Samples Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,680 ft
 End 2,756 ft
 Bit Size 12-1/4 in

Formation Samples Collected Yes

Description of Operations: B. Ziegler arrived on site 1200 hours. Contractor continued drilling of the 12-1/4-inch pilot hole. Formation samples indicated dolomite from 2,580 feet to 2,630 feet where formation changed to limestone from 2,630 feet to 2,680 feet. Dolomite was encountered from 2,680 feet to 2,740 feet. Paul Feldman/PBCWUD arrived on site at 0945 hours. Mr. Feldman received an update on drilling progress and reviewed Change Order No. 1 and the third pay request. Mr. Feldman off site at 1030 hours. B. Ziegler met with J. Chesher/Hazen & Sawyer at 1100 hours. Coordination of the Drilling Contractor's electrician with finishing dates of MCC and Electrical buildings was reviewed. Mr. Chesher stated that the schedule indicates that the plant electrician should be in both buildings by mid August, did not see a problem with Drilling Contractor's electrician having access to the buildings before their finishing date of October 20, 1990.

Drilling of the 12-1/4 inch pilot hole continued through the end of the shift report. A total depth of 2,756 feet had been reached at the end of the shift. Formation samples indicate limestone from 2,740 feet to 2,756 feet.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/09/90	2,540	7.50
07/09/90	2,600	26.25
07/09/90	2,660	22.50

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,577	48,000	24	15,245
2,605	48,000	24	13,995
2,638	47,500	24	14,245
2,668	48,000	23	14,245
2,697	48,000	23	16,494
2,728	48,250	24	18,994

B. Ziegler off site 1900 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 10, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2,756 ft
 End 2,862 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2,862 ft
 End 2,968 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived on site 0930 hours. Contractor continued drilling of the 12-1/4 inch pilot hole.

B. Ziegler off site at 1200 hours to deliver the Contractor's third pay request to the County.

B. Ziegler on site 1400 hours. Off site at 2000 hours.

Drilling of the 12-1/4 inch pilot hole continued through the end of the shift report. A total depth of 2,968-feet had been reached at the end of the shift.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/10/90	2,720	7.50
07/10/90	2,780	22.50
07/10/90	2,840	26.25

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

<u>Depth (ft)</u>	<u>Conductivity (umhos/cm)</u>	<u>Temperature (C)</u>	<u>Chlorides (mg/l)</u>
2,758	48,000	23	12,496
2,788	47,500	24	21,993
2,818	47,250	23	13,995
2,848	47,250	22	17,244
2,879	47,500	24	21,243
2,909	48,800	23	16,994

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 11, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2,968 ft
 End 3,025 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 3,025 ft
 End 3,084 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived on site 0930 hours. Contractor continued drilling of the 12-1/4-inch pilot hole.

Surficial monitor wells were not sampled as scheduled. Centrifugal pump was not functioning. However, the surficial monitor wells were sampled the following day (July 12, 1990) and recorded in this daily shift report as scheduled. Results were as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,800	27	168
SMW-3	1,200	28	72
SMW-6	750	28	24
SMW-8	1,100	28	43

B. Ziegler off site 1400 hours. On site at 1600 hours.

Drilling of the 12-1/4-inch pilot hole continued through the end of the shift report. A total depth of 3,084 feet had been reached at the end of the shift report.

Bart Ziegler off site at 2000 hours.

Deviation survey were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/11/90	2,900	11.25
07/12/90	2,960	26.25
07/12/90	3,020	15.00

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,939	48,250	23	28,191
2,968	48,000	24	14,495
2,998	48,000	23	17,744

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 12, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 3,084 ft
 End 3,112 ft
 Bit Size 12-1/4 in

Formation

Samples
 Collected Yes

Description of Operations: D. VanNote arrived on site 0800 hours. Contractor drilled 12-1/4-inch pilot hole to a depth 3,088 feet.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/12/90	3,080	26.25
07/13/90	3,140	22.50

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

<u>Depth (ft)</u>	<u>Conductivity (umhos/cm)</u>	<u>Temperature (C)</u>	<u>Chlorides (mg/l)</u>
3,028	31,000	25	15,595
3,056	33,000	24	16,745
3,088	41,000	24	16,995
3,119	41,000	24	15,745

Night Shift
7:00 pm to 7:00 am

Weather: Rain

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 3,112 ft
 End 3,143 ft
 Bit Size 12-1/4 in

Formation

Samples
 Collected Yes

Contractor drilled to 3,119-feet, 2150 hours. Contractor encountered dredging and small cavernous zones below 3,070-feet. Contractor encountered large cavernous zone between 3,135 to 3,137 feet.

D. VanNote off site after logging at IW-2 was completed, 0630 hours.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 13, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 3,143 ft
 End 3,176 ft
 Bit Size 12-1/4 in

Formation Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 3,176 ft
 End 3,208 ft
 Bit Size 12-1/4 in

Formation Samples
 Collected Yes

Description of Operations: D. VanNote arrived on site 1330 hours. Contractor continued to drill the 12-1/4-inch pilot hole to a depth 3,143 feet.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/14/90	3,200	15.00

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,148	40,000	24	13,750
3,179	39,000	24	16,245
3,208	33,000	24	13,746

D. VanNote off site, 1600 hours.

Contractor drilled to 3,208 feet through the night shift. Drilling in very hard dolomite, rate is between 2 to 3 feet per hour. TD is anticipated to be reached Sunday evening, 07/15/90.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 14, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Rain

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,208 ft
 End 3,236 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,236 ft
 End 3,267 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived on site 1015 hours. Contractor still encountering very hard dolomite, with a drilling rate of 2 to 3 feet per hour. Contractor drilled pilot hole to 3,214 feet, 1100 hours.

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,230	34,000	24	16,995

Contractor encountered cavernous zone and dredging at 3,225 feet, 1300 hours. Kelly dropped 9 feet to 3,234 feet. Then when bit plugged off, 1330 hours. Contractor circulated out cuttings and continued dredging from 1330 to 1430 hours. Contractor resumed very hard drilling, 1430 hours.

D. VanNote off site, 1600 hours.

Contractor drilled to 3,236 feet through the night shift. Drilling continued to be very hard with rate at 2 to 3 feet per hour. Contractor anticipated TD at 3,300 feet late tomorrow evening.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 15, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start 3,267 ft
 End 3,300 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Rain

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting..... X
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site 0800 hours. Contractor still encountering very hard dolomite, at drilling rate of 2 to 3 feet per hour at the pilot hole. Contractor drilled to 3,269 feet, 0830 hours. Contractor anticipated TD to 3,300 feet during the night shift.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/15/90	3,260	15.00
07/15/90	3,300	15.00

D. VanNote contacted C. Digiaco and scheduled logging tentatively for 2400 hours. Informed C. Digiaco that Schlumberger will conduct logging first.

T. McCormick arrived on site 0815 hours. D. VanNote and T. McCormick conducted site visit and reviewed geophysical logs of IW-2 to determine the 34-inch casing setting depth. T. McCormick off site at 0945 hours.

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,268	34,000	24	15,995
3,300	34,000	24	14,995

D. VanNote off site, 1100 hours. D. VanNote returned to site, 2100 hours.

Contractor reached a TD of 3,300 feet on the pilot hole, 1700 hours. One wiper run was conducted and completed at 2000 hours. Rods and 12-1/4-inch bit were tripped out of hole 0200 hours.

Schlumberger began logging, 0230 hours. Schlumberger ran Borehole Compensated Sonic Tool to 2,220 feet when they hit obstruction, 0300 hours. Schlumberger raised tool and lowered again to 1,960 feet, 0315 hours. Contractor indicated that the walls of the borehole had bridged at approximately 1,970 feet. Contractor spent remainder of the night shift tripping rods to clear the well bore.

D. VanNote off site 0330 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 16, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting..... X
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected NA

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Description of Operations: D. VanNote on site from 0630 to 0830 hours. D. VanNote returned on site 1330 hours. Contractor decided to trip rods to 3,300 feet and clean entire borehole, 1300 hours. Contractor indicated that a piece of cement may have fallen into borehole. Contractor began tripping out 12 1/4-inch bit and rods, 1330 hours. Cleaning of the pilot hole was complete at 1715 hours.

D. VanNote contacted C. Digiaco, 1800 hours. Scheduled logging for 2300 hours.

Schlumberger began logging, 1745 hours. Schlumberger performed three runs with the sonic tool. The second and third run reached a final depth of 3,286 and 3,240, respectively. The total depth reached on the Dual-Induction and Dip Meter was 3,220 feet. D. VanNote contacted T. McCormick and informed him that the total depth of 3,300 feet was not reached and the annulus at 3,220 feet had bridged off, 2130 hours. T. McCormick contacted at 2200 hours. Discussed apparent bridging or fill-in at bottom of well bore. Since the bottom 80 feet of well bore is below the area of interest (injection zone and confining intervals), T. McCormick advised to continue logging as planned. D. VanNote contacted C. Digiaco and scheduled logging for 2300 hours.

Schlumberger ran Borehole Compensated Sonic, Dual Induction, and High Resolution Dip Meter and completed logging at 2330 hours.

C. Digiaco arrived on site, 2300 hours. Set up for Caliper, Gamma, Fluid Resistivity, and Temperature logging. C. Digiaco began logging at 2430 hours, reached total depth of 3,230 feet with Caliper and Gamma tools. Reviewed with T. McCormick, considered the total depth adequate for this series of logging. C. Digiaco completed logging at 0430 hours.

D. VanNote and C. Digiaco off site, 0445 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 17, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Description of Operations: D. VanNote arrived onsite 1330 hours. Contractor continued rigging up to ream 32-1/2-inch borehole.

Weather: Clear

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the temperature and conductivity stabilized. Grab samples were then collected for chloride titrations. Results were as follows:

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,300	23	64
SMW-3	850	23	80
SMW-6	600	23	77
SMW-8	1,000	23	90

Depth:
 Start 1,890 ft
 End 1,896 ft
 Bit Size 32-1/2 in

Reaming of the 32-1/2-inch borehole began at 1600 hours. Reaming continued through the night shift. A total depth of 1,919 feet had been reached at the end of the shift.

Formation Samples Collected No

D. VanNote offsite at 1600 hours.

Night Shift
7:00 pm to 7:00 am

Weather: Cloudy

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,896 ft
 End 1,919 ft
 Bit Size 32-1/2 in

Formation Samples Collected No

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 18, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,919 ft
 End 1,939 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,939 ft
 End 1,949 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite 1400 hours. Reaming of the 32-1/2-inch borehole continued through the day shift.

B. Ziegler offsite at 1500 hours.

Reaming continued through the night shift. A total depth of 1,949 feet had been reached at the end of the shift.

Geophysical logs of IW-1 (1,890 feet to 3,300 feet) were reviewed in the Deerfield Beach office by T. McCormick, B. Ziegler, A. Muniz, and D. VanNote for the selection of the final casing setting depth. A setting depth will be selected by week's end.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 19, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,949 ft
 End 1,979 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,979 ft
 End 1,996 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite 1130 hours. Reaming of the 32-1/2-inch borehole continued through the day shift.

Contractor experiencing dredging and caving of the borehole. Penetration rate is slow.

Deviation surveys were collected as follows:

Date	Depth (ft)	Deviation (min)
07/19/90	1,960	15.00

B. Ziegler met with J. Cheshier/Hazen & Sawyer. Cheshier stated drawings indicate that slab of surge tank is at 21.75 feet NGVD, grade in area will be 22.0 feet. Ziegler stated that this was brought to our attention in an earlier letter from Hazen & Sawyer. Raising the slab 0.75 feet should not be a problem. Cheshier will have area graded to 22.0 feet in preparation for construction of surge system.

B. Ziegler informed R. Cape/Youngquist Brothers of the need to raise the surge tank slab. R. Cape stated he did not see this as much of a problem. Would like to have Pump & Equipment (Surge System Contractor) meet onsite next week to review construction and scheduling of the surge system.

P. Highsmith and Bowo Okome/FDER onsite 1500 hours. Reviewed construction progress. Offsite 1530 hours.

B. Ziegler offsite at 1800 hours.

Reaming continued through the night shift until 0300 hours. Reamer assembly was tripped out to inspect. Shift ended while tripping out of hole. A total depth of 1,996 feet had been reached before tripping out of hole.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 20, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 1,996 ft
 End 2,003 ft
 Bit Size 32-1/2 in

Formation
 Samples

Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,003 ft
 End 2,027 ft
 Bit Size 32-1/2 in

Formation

Samples

Collected No

Description of Operations: B. Ziegler arrived onsite 1100 hours. Contractor finished tripping the reamer assembly at 1100 hours. Reamer assembly was inspected and tripped in hole at 1330 hours. Reaming of the 32-1/2-inch borehole continued through the remainder of the day shift.

Contractor continued to experience dredging and caving of the borehole.

Deviation surveys were collected as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/19/90	1,960	15.00

B. Ziegler offsite at 1200 hours to deliver Change Order No. 1 to the County. B. Ziegler also delivered geophysical logs of IW-1 (1,900 feet to 3,300 feet) and IW-2 (1,000 feet to 1,950 feet) to P. Highsmith/FDER. B. Ziegler informed FDER that chlorides in SMW-1 had increased since construction started while the other surficial monitor wells have remained fairly constant. Increase may have been related to washing drill cuttings which takes place next to the SMW-1 were splashing could occur. As a precautionary measure, the Contractor pumped the well for 8 hours disposing of the purged water in the mud tanks. After pumping, the chlorides were within 19 mg/l of background. Will continue to monitor and inform FDER if the higher readings return. P. Highsmith stated that she was not overly concerned with the increase and appreciated the situation being brought to FDER's attention.

B. Ziegler onsite 1530 hours.

B. Ziegler offsite at 1800 hours.

Reaming continued through the night shift. A total depth of 2,027 feet had been reached at the end of the shift.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 21, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start 2,027 ft
 End 2,047 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start 2,047 ft
 End 2,069 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 1030 hours. Reaming of the 32-1/2-inch borehole continued through the day shift.

Contractor continued to experience caving of the borehole. Penetration rate increased to approximately 1 foot per hour.

Deviation surveys were collected as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/21/90	2,035	18.75

B. Ziegler off site at 1715 hours.

Reaming continued through the night shift. A total depth of 2,069 feet had been reached at the end of the shift.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 22, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,069 ft
 End 2,074 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,074 ft
 End 2,095 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite 1030 hours.
 Reaming of the 32-1/2-inch borehole continued through the day shift.

Penetration rate continued at approximately 1 foot per hour.

B. Ziegler offsite at 1715 hours.

Reaming continued through the night shift. A total depth of 2,095 feet had been reached at the end of the shift.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 23, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,095 ft
 End 2,117 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,117 ft
 End 2,155 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite 0800 hours. Contractor repaired leaky swivel, 0830 hours. Reaming of the 32-1/2-inch borehole continued through the day shift and into the night shift. Contractor continued dredging while reaming during both shifts.

Penetration rate continued at approximately 1 foot per hour.

D. VanNote offsite at 1600 hours.

Reaming continued through the night shift to a total depth of 2,155 feet.

Recorded by: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 24, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,155 ft
End 2,178 ft
Bit Size 32-1/2 in

Formation

Samples
Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,178 ft
End 2,184 ft
Bit Size 32-1/2 in

Formation

Samples
Collected No

Description of Operations: D. VanNote arrived on site 0800 hours. Contractor reamed to 2,157 feet, continued dredging while reaming, 0900 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/23/90	2,095	11.25
07/24/90	2,155	15.00

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the temperature and conductivity stabilized. Grab samples were then collected for chloride titrations. Results were as follows:

Well No.	Conductivity (µmhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,550	24	175
SMW-3	1,100	23	85
SMW-6	600	22	25
SMW-8	1,100	23	40

D. VanNote offsite at 1600 hours.

Reaming was very slow through the night shift. Contractor reamed from 2,178 to 2,184 feet, 0430 hours. Contractor repaired rotary table drive shaft through the remainder of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 25, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,184 ft
 End 2,184 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,184 ft
 End 2,184 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite 0800 hours. Penetration rate remains very slow. Contractor began tripping reamer assembly to check for possible damage, 0700 hours.

Reamer assembly on the surface at 1130 hours. Reamer assembly worn out. Contractor begins reconditioning, 1200 hours.

Drill rig for the dual-zone monitor well arrived onsite 1200 hours.

D. VanNote offsite at 1130 hours. Returned onsite 1745 hours.

Contractor began mobilization of the monitor well rig at 1530 hours.

Reconditioning of the reamer assembly was complete at 0400 hours. Contractor began tripping back into borehole which continued through the end of the shift report.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 26, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,184 ft
 End 2,208 ft
 Bit Size 32-1/2 in

Formation

Samples
 Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,208 ft
 End 2,239 ft
 Bit Size 32-1/2 in

Formation

Samples
 Collected No

Description of Operations: Contractor commenced reaming pilot hole to 32 1/2-inches from a depth of 2,184 feet, after reconditioning reamer assembly and tripping back into hole. B. Ziegler on site 1630 hours. Contractor reamed to 2,208 feet, 1900 hours.
 B. Ziegler off site, 1900 hours.
 Contractor continued reaming during the night shift to a depth of 2,239 feet.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 27, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,239 ft
 End 2,266 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,266 ft
 End 2,279 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: Contractor continued reaming pilot hole to 32 1/2-inches. Contractor tripped rods out of hole to retrieve airline, 1215 hours. Contractor fixed airline, tripped back in hole and commenced reaming, 1530 hours.

B. Ziegler and A. Muniz arrive on site, 1500 hours.

B. Ziegler and A. Muniz off site, 1600 hours.

Contractor continued reaming during the night shift to a depth of 2,279 feet.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 28, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,279 ft
 End 2,279 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,279 ft
 End 2,332 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site, 0630 hours. Contractor tripped rods out to retrieve airline, 1500 hours. Contractor fixed airline, tripped back in hole and resumed reaming, 2030 hours.

D. VanNote off site, 0630 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth(ft)</u>	<u>Deviation (min)</u>
07/27/90	2,215	15.00
07/28/90	2,240	22.50

Contractor reamed to 2,332 feet through the end of the night shift.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 29, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,332 ft
 End 2,434 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,434 ft
 End 2,505 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site, 0900 hours. Contractor reamed to 2,346 feet, 0915 hours. Contractor encountered easier drilling due to limestone formation.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth(ft)</u>	<u>Deviation (min)</u>
07/29/90	2,300	26.25
07/29/90	2,360	22.50
07/29/90	2,420	22.50

Contractor continued reaming and reached 2,505 feet by the end of the night shift.

D. VanNote off site, 1900 hours.

Recorded by: D.VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 30, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,506 ft
 End 2,559 ft
 Bit Size 32-1/2 in

Formation
 Samples

Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,559 ft
 End 2,592 ft
 Bit Size 32-1/2 in

Formation
 Samples

Collected No

Description of Operations: D. VanNote arrived on site, 0800 hours. Contractor reamed to 2,510 feet, 0830 hours. Penetration rate has increased.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/30/90	2,480	22.50

B. Ziegler hand delivered the Engineer's recommendation for the final casing setting depth to Al Mueller/FDER, 1400 hours.

D. VanNote off site 1330 hours.

D. VanNote off site 2330 hours.

Contractor continued reaming through end of shift. A total depth of 2,592 feet had been reached at shift change.

Recorded by: D.VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 31, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,592 ft
 End 2,639 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,639 ft
 End 2,670 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite 0900 hours. Penetration rate remained high at approximately 4 feet per hour.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/31/90	2,540	15.00
07/31/90	2,600	15.00

B. Ziegler offsite at 1600 hours.

Reaming of the 32-1/2-inch borehole was completed to 2,670 feet at 0200 hours. Remainder of shift was spent circulating the borehole.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 1, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,670 ft
 End 2,670 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,670 ft
 End 2,670 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite 0950 hours. The 32-1/2-inch reamed hole was completed to 2,670 during the night shift. Contractor tripped reamer assembly out and ran 2-3/8-inch tremie line.

Received memo from FDER approving final casing setting depth of 2,660 to 2,670 feet, 1000 hours.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the temperature and conductivity stabilized. Grab samples were then collected for chloride titrations. Results were as follows:

Well No.	Conductivity (µmhos/cm)	Temperature (c)	Chlorides (mg/l)
SMW-1	1,200	25	77
SMW-3	875	25	81
SMW-6	600	25	45
SMW-8	1,000	25	48

B. Ziegler offsite at 1200 hours. Returned to site at 1530 hours. Contractor continues to install 2-3/8-inch tremie line. Placement of bridge plug scheduled for 2200 hours.
 B. Ziegler offsite 1700 hours.

B. Ziegler onsite 2100 hours. Tremie line installation complete.
 B. Ziegler observed tag of 2,674-feet.

Cement quantity was reviewed by J. Brantley and B. Ziegler. Agreed to pump 33 sacks (7 barrels) of neat.

Pumping of the first stage of the bridge plug began at 2232 hours. Dowell pumped 168 gallons of water to clear the tremie line followed by 33 sacks (7 barrels) of neat cement. Tremie line was then partially displaced with fresh water, pulled 30 feet above the theoretical fill, and then completely flushed with fresh water. Grouting was completed at 2252 hours.

The remainder of the shift was spent waiting on cement to set.

B. Ziegler offsite 2315 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date August 2, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 0830 hours. Bridge plug for final casing string was tagged at 2,667 feet below land surface (bls). Contractor removed tremie line and prepared for geophysical logging.

C. DiGiacomo on site at 1143 hours and set up to perform caliper log on 32-1/2-inch reamed hole. Logging began at 1200 hours and was completed at 1600 hours. Caliper log reached a total depth of 2,667-feet bls.

The 24-inch casing tallie was reviewed by B. Ziegler and J. Brantley. Contractor began installing the 24-inch casing at 1600 hours and continued through the night shift until 2330 hours when installation was stopped. Welding crews were exhausted. A total of 1,051 feet of casing had been installed.

Installation of 24 inch casing scheduled to continue at 0700 hours.

B. Ziegler remained on site until 0045 hours for temperature log on first cement stage of 44-inch casing (IW-2).

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 3, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 0745 hours. Installation of the 24-inch casing began again at 0700 hours. Centralizers were placed as specified.

B. Ziegler met with J. Chesher. Sonic testing of effluent line has tentatively been scheduled for 2200 hours on August 6, 1990. B. Ziegler informed J. Brantley of scheduling. Brantley did not see it as a problem, should be cementing on both wells at that time.

T. McCormick and T. Sharp arrive site at 1200 hours and review construction progress. Off site 1245 hours.

Heavy rain hits at 1515 hours. Stop installation of 24-inch casing until 1630 hours.

T. McCormick and E. Pomar arrive site 1720 hours and review construction progress. McCormick reviewed pressure grout procedures with B. Ziegler and J. Brantley. It was agreed to pump 174 sacks 4 percent bentonite cement followed by 443 sacks of neat. McCormick off site 1800 hours.

B. Ziegler E. Pomar off site 2000 hours.

B. Ziegler on site 0100 hours. Installation of 24-inch casing complete to total depth of 2,660 feet, 2330 hours. Contractor secured header and ran tremie through 24-inch casing for pressure grout.

The pressure grout began at 0335 hours and was completed at 0450 hours. Dowell pumped 1,890 gallons of fresh water to clear the tremie line followed by 174 sacks (47 barrels) of 4 percent bentonite cement followed by 443 sacks (93 barrels) of neat. The tremied line was then displaced with fresh water and pulled 30 feet through the stripper assembly. The remainder of the shift was spent monitoring the header pressure.

B. Ziegler off site 0530 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 4, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Description of Operations: Contractor completed first stage pressure grout during yesterday's night shift, 0450 hours.

Weather: Clear

B. Ziegler arrived on site 1300 hours.

Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting..... X
 Other..... X

C. Digiacomo ran temperature log on first stage pressure grout from 1520 to 1745 hours. Contractor will tag first stage and pump second stage at IW-1 tomorrow, 0900 hours.

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 5, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....X
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing..... X
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 0700 hours. AT 0808 hours, Contractor tagged first stage pressure grout at 2,504 and 2,500 feet (24-inch casing) on the east and west tremie lines, respectively.

The second stage began at 1038 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell pumped 623 sacks (170 barrels) of 4% bentonite cement. Grouting was completed at 1200 hours.

Contractor tagged second stage 2,251 and 2,259 feet on tremie lines east and west, respectively.

Contractor started pumping third stage, 1915 hours. Two tremie lines were placed eight feet from bottom 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell pumped 380 sacks (103 barrels) 4% bentonite cement. Grouting of stage three was completed at 2016 hours.

B. Ziegler off site, 0300 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 6, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....X
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation

Samples Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing..... X
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation

Samples Collected No

Description of Operations: B. Ziegler arrived on site, 0800 hours. Contractor tagged third stage of cement on 24-inch casing at 2,204 and 2,195 feet on the east and west tremie lines, respectively.

P. Feldman\PBWUD arrived on site for update on construction progress, 1100 hours.

The fourth stage of cement began at 1220 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell pumped sacks 369 sacks (100 barrels) of 4 percent bentonite cement. Grouting was completed at 1335 hours.

B. Ziegler off site, 1345 hours.

B. Ziegler returned on site, 2000 hours. Contractor tagged stage 4 at 2,150 east and 2,160 west.

Contractor began fifth stage at 2024 hours. Two tremie lines were installed 180 degrees apart and placed 8 feet off bottom. Casing was pressurized to 100 psi for additional safety. Dowell pumped 369 sacks (100 barrels) of 4 percent bentonite cement. Cementing was completed 2133 hours.

B. Ziegler off site, 2145 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 7, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived on site, 0600 hours. Contractor tagged fifth stage of cement on 24-inch casing at 2,058 and 2,063 feet on the east and west tremie lines, respectively.

Pumping of the sixth stage of cement began at 0741 hours. Two tremie lines were placed 180 degrees apart and set 5 feet above tagged bottom. Casing was pressurized to 100 psi for additional safety. Dowell pumped 369 sacks (100 barrels) of 4 percent bentonite cement. Stage 6 was completed at 0834 hours.

E. Pomar arrived on site, 0800 hours.

Contractor began drilling dual-zone monitor well, 0815 hours.

Contractor tagged sixth stage of cement at 2,005 east and 2,009 west. Cement fill was 54 feet or 25 percent of theoretical (215 feet). The seventh stage of cementing began at 1622 hours. Two tremie lines were installed 180 degrees apart and were set 8 feet above cement tag. Casing was pressurized to 100 psi for additional safety. Dowell pumped 369 sacks (100 barrels) of 4 percent bentonite cement. The seventh stage of cementing was completed at 1700 hours.

E. Pomar off site at 1630 hours. D. VanNote off site, 1845 hours.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 8, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site, 0730 hours. E. Pomar on site 0800 hours. At 0745 hours, Contractor tagged seventh stage on 24-inch casing at 1,970 and 1,975 feet on the east and west tremie lines, respectively. Cement fill on stage 7 was 34 feet or 16 percent of theoretical (215 feet).

Stage 8 began at 0804 hours. Two tremies lines were placed 180 degrees apart and set 8 feet above tagged bottom. Casing maintained 100 psi for additional safety. Dowell pumped sacks 369 sacks (100 barrels) of 4% bentonite cement. Stage 8 was completed at 0916 hours.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the temperature and conductivity stabilized. Results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,100	26	75
SMW-3	950	24	85
SMW-6	700	25	60
SMW-8	900	24	60

D. VanNote requested that Contractor submit the certification information on the pressure gauges that will be used on the pressure test of IW-1. Mr. Greuel said that the information will be provided within a couple of days.

At 1630 hours, Contractor tagged eighth stage at 1,948 feet east and 1,945 feet west. Cement fill on stage 8 was 27 feet or 13 percent of theoretical (215 feet). The ninth stage began at 1718 hours. Two tremie lines were installed 180 degrees apart and were placed 7 feet from top of cement. Casing was pressurized to 100 psi during pumping for additional safety. Dowell pumped 432 sacks (117 barrels) of 4% bentonite cement. The ninth stage of cementing was completed at 1758 hours.

D. VanNote off site, 1900 hours.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 9, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: E. Pomar arrived at site, 0800 hours. B. Ziegler onsite, 0830 hours. Meet with Cherry Pough\Pump and Equipment and discussed shipment schedule for surge tank due the middle of September and other equipment which is in storage.

At 1230 hours, Contractor tagged stage 9 at 1,943 feet east and 1,940 feet west. Cement fill on stage 8 was 5 feet.

Stage 10 began at 1312 hours. Two tremie lines were placed 180 degrees apart. Casing maintained 100 psi for additional safety. Circulation to surface was observed. Dowell pumped 369 sacks (100 barrels) of 4% bentonite cement. Stage 10 was completed at 1415 hours. The Contractor spent the remainder of the shift monitoring header pressure.

E. Pomar offsite, 1500 hours.

T. McCormick arrived onsite 1630 hours. Core depths to be retrieved at IW-2, were selected based on the geophysical logs, lithologic logs and cuttings samples. A letter indicating the core depths were submitted to FDER for final approval on August 9, 1990.

T. McCormick and B. Ziegler offsite at 1800 hours. B. Ziegler returned onsite 2030 hours.

Contractor tagged stage 10 at 1,800 feet on both tremies. Cement fill on stage 10 was 143 feet or 67 percent of theoretical (215 feet).

Stage 11 began at 2305 hours. Two tremie lines were placed 180 degrees apart. Tremie lines were flushed with water and circulation to surface was observed. Dowell pumped sacks (225 barrels) of 4% bentonite cement. Contractor pulled 600 feet of tremie from each side. Stage 11 was completed at 0045 hours.

The remainder of the shift was spent monitoring header pressure.

B. Ziegler offsite 0055 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 10, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Description of Operations: E. Pomar arrived at site, 0800 hours.
D. VanNote onsite, 0900 hours.

Weather: Clear

At 1130 hours, Contractor tagged stage 11 at 1,348 feet on both tremie lines. Cement fill on stage 11 was 452 feet.

- Activity:
- Drilling.....
- Reaming.....
- Running Casing...
- Cementing..... X
- Testing.....
- Waiting.....
- Other..... X

Mr. Bowo Okome/FDER/WPB called and confirmed pressure test schedule at IW-1 for Monday, August 13, 1990, between 1000 and 1200 hours. D. VanNote faxed memo of conversation to FDER at 1315 hours.

Depth:
Start NA ft
End NA ft
Bit Size NA in

Stage 12 began at 1210 hours. Two tremie lines were placed 180 degrees apart. Casing maintained 120 psi for additional safety during cementing. Circulation to surface was observed. Dowell pumped 831 sacks (225 barrels) of 4% bentonite cement. Stage 12 was completed at 1317 hours. The Contractor spent the remainder of the shift monitoring header pressure.

Formation Samples Collected No

E. Pomar offsite, 1430 hours. D. VanNote offsite 1725 hours.

Night Shift
7:00 pm to 7:00 am

D. VanNote returned onsite 0015 hours. Contractor tagged stage 12 at 896 feet east and 895 feet west, 0020 hours. Contractor began stage 13 at 0045 hours. Contractor maintained 115 psi at header during cementing and circulation was observed to surface. Dowell pumped 831 sacks (225 barrels) of 4% percent bentonite cement. Stage 13 was completed at 0150 hours. The Contractor spent the remainder of the shift monitoring header pressure.

Weather: Clear

D. VanNote offsite 0200 hours.

- Activity:
- Drilling.....
- Reaming.....
- Running Casing...
- Cementing..... X
- Testing.....
- Waiting.....
- Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation Samples Collected No

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 11, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote onsite, 1200 hours.
 At 1220 hours, Contractor tagged stage 13 at 441 feet east and 442 feet west. Cement fill on stage 13 was 454 feet.

Stage 14 began at 1227 hours. Two tremie lines were placed 180 degrees apart. Casing maintained 120 psi for additional safety during cementing. Circulation to surface was observed. Dowell pumped 794 sacks (215 barrels) of 4% bentonite cement to surface. The 14th and final stage was completed at 1326 hours.

The pressure test on the final casing string at IW-1 is scheduled for Monday, August 13, 1990 between 1000 and 1200 hours.

D. VanNote offsite 1600 hours.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 12, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote onsite, 0800 hours.
 Contractor indicated that pressure test will need to be postponed until tuesday, August 14, 1990, at 1000 hours.

Contractor tripped rods in borehole to 2,610 feet (top of cement plug) from 0800 to 1800 hours. Contractor installed airline and started circulating in the 24-inch casing, 2000 hours.

Contractor spent remainder of the night shift circulating water in 24-inch casing.

D. VanNote offsite, 2135 hours.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 13, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote onsite, 0800 hours.
 Pressure test will be rescheduled for tuesday, August 14, 1990 at 1200 hours.

D. VanNote contacted P. Highsmith\FDER\WPB at 1100 hours and informed her of schedule change. Ms. Highsmith said Mr. Bowo Okome\FDER\WPB will be onsite for the test.

Contractor continued circulating water through the 24-inch casing during the day and throughout most of the night shift.

D. VanNote offsite, 1730 hours.

Contractor stopped circulation and began tripping rods out of casing, 0530 hours.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 14, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing..... X
- Waiting.....
- Other..... X

Depth:

Start 2,610 ft
 End 2,610 ft
 Bit Size 22 1/2 in

Formation

Samples

Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming..... X
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,610 ft
 End 2,682 ft
 Bit Size 22 1/2 in

Formation

Samples

Collected No

Description of Operations: D. VanNote onsite, 0530 hours.
 Contractor stopped circulating borehole and began tripping rods out from 0530 to 0700 hours.

Contractor set up for pressure test, 01100 hours.

T. McCormick and B. Ziegler arrived onsite to observe test start up, 1145 hours.

Bowo Okome\FDER\WPB and John Petronio\FDER\WPB arrived onsite to observe pressure test, 01200 hours.

T. McCormick and B. Ziegler offsite, 1245 hours.

Contractor pressurized casing to 165 psi then bled down to testing pressure of 150 psi. The pressure test began at 1230 hours and was completed at 1330 hours. Total decrease in pressure for entire test was 3.5 psi or 3.5 percent. Contractor then bled back pressure gauge to zero.

Bowo Okome\FDER\WPB and John Petronio\FDER\WPB offsite at 1345 hours. D. VanNote offsite 1720 hours.

Contractor tripped back in borehole with 22 1/2-inch reamer assembly to top of cement plug (2,610 feet), 2030 hours. Contractor drilled through cement and bridge plug to 2,670 feet, 0045 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/15/90	2,660	11.25

Contractor drilled to 2,682 feet through the end of the night shift.

Recorded by: D. VanNote



HEADER PRESSURE DURING CEMENTING CASING Pressure Test

WELL 1W-1

Date 8/14/90

Time start 1230

Time finish 1330

Time	Total minutes	Header Pressure (PSIG)	Comments
1219	0	0	START Pressurizing CASING To 170 PSI
1220	1	40	
1221	2	50	
1222	3	70	
1223	4	90	
1224	5	120	
1228	8	165	STOP Pressurizing @ 165 PSI
1230	0	150	Bleed back To 150 PSI; START TEST
1235	5	150	No change
1240	10	149	Down 2 PSI
1245	15	149	No change
1250	20	148.5	Down 1.5 PSI
1255	25	148	Down 2.0 PSI
1300	30	148	No change
1305	35	147.5	Down 2.5 PSI
1310	40	147.5	No change
1315	45	147.5	No change
1320	50	147	Down 3.0 PSI
1325	55	147	No change
1330	60	146.5	Down 3.5 PSI; STOP TEST

~~Inspectors~~ OBSERVERS
D. VANNOYE / CH2M-Hill
B. Ziesler / CH2M-Hill
T. McCormick / CH2M-Hill
B. Okome / FDER / WPA
J. Petronio / FDER / WPB

BARFIELD INSTRUMENT CORPORATION
4101 N.W. 29th Street
P.O. Box 420-537
Miami, Florida 33142

RECORD OF INSTRUMENT CALIBRATION COMPARISON

For: YOUNGQUIST BROTHERS, INC.

BIC W.O.: 47144

Mfr: AMETEK/U.S. GAUGE DIVISION

Model: 0-300 PSI

Type: PRESSURE GAUGE

S/N: 92668BIC

BIC TEST UNIT

CUSTOMER UNIT

0	0
20	19
40	39
60	59
80	79
100	99
120	119
140	139
160	159
180	179
200	200
220	220
240	240
260	260
280	280
300	300

For pressure test of 24-inch casing on IW-1

The above calibration comparison was made by BARFIELD INSTRUMENT CORPORATION
Miami, Florida using an approved BIC Test Unit.

Date: JULY 18, 1990

Temperature: 24°C.

Tested By: M. ROSS

Inspected By: *[Signature]*

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 15, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm
 Weather: Clear
 Activity:
 Drilling.....
 Reaming..... X
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 2,682 ft
 End 2,730 ft
 Bit Size 22 1/4 in
 Formation
 Samples
 Collected No

Description of Operations: D. VanNote onsite, 1000 hours.
 Contractor reamed to 2,690 feet, 1030 hours.
 Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/15/90	2,720	22.50

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). each well sampled was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,300	23	110
SMW-3	900	25	120
SMW-6	600	24	70
SMW-8	1,050	24	90

Night Shift
 7:00 pm to 7:00 am
 Weather: Clear
 Activity:
 Drilling.....
 Reaming..... X
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 2,730 ft
 End 2,806 ft
 Bit Size 22 1/4 in
 Formation
 Samples
 Collected No

D. VanNote offsite, 1845 hours.
 Contractor drilled to 2,806 feet through the end of the night shift.

Recorded by: D.VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 15, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm
 Weather: Clear
 Activity:
 Drilling.....
 Reaming..... X
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 2,682 ft
 End 2,730 ft
 Bit Size 22 1/4 in
 Formation
 Samples
 Collected No

Description of Operations: D. VanNote onsite, 1000 hours.
 Contractor reamed to 2,690 feet, 1030 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/15/90	2,720	22.50

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). each well sampled was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,300	23	110
SMW-3	900	25	120
SMW-6	600	24	70
SMW-8	1,050	24	90

Night Shift
 7:00 pm to 7:00 am
 Weather: Clear
 Activity:
 Drilling.....
 Reaming..... X
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 2,730 ft
 End 2,806 ft
 Bit Size 22 1/4 in
 Formation
 Samples
 Collected No

D. VanNote offsite, 1845 hours.

Contractor drilled to 2,806 feet through the end of the night shift.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 16, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,806 ft
 End 2,914 ft
 Bit Size 22 1/2 in

Formation

Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,914 ft
 End 2,976 ft
 Bit Size 22 1/2 in

Formation

Samples
 Collected No

Description of Operations: B. Ziegler on site during yesterday's night shift, 0640 hours.

B. Ziegler met with J. Cheshier\Hazen and Sawyer, Inc. and discussed location of the surge control system, 0845 hours.

Contractor reamed to 2,780 feet, 0900 hours.

B. Ziegler off site, 0900 hours. Returned at 1200 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/16/90	2,780	26.25
08/16/90	2,840	26.25
08/16/90	2,900	15.00

B. Ziegler reviewed the IW-1 injection test schedule with J. Brantley\Contractor. J. Brantley said injection test will be conducted at IW-1 within approximately 30 days.

B. Ziegler off site, 1730 hours.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 17, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm
 Weather: Clear

Description of Operations: D. VanNote on site at 0815 hours.
 Contractor reamed to 2,890 feet, 0830 hours. Contractor drilling
 at a rate of approximately 2-3 feet per hour.

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/17/90	2,960	22.50
08/18/90	3,020	15.00

Depth:
 Start 2,976 ft
 End 3,015 ft
 Bit Size 22 1/2 in

D. VanNote off site, 1600 hours.

Contractor reamed to a depth of 3,057 feet through the end of the night shift.

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,015 ft
 End 3,057 ft
 Bit Size 22 1/2 in

Recorded by: D. VanNote

Formation Samples Collected No

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 18, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,057 ft
 End 3,095 ft
 Bit Size 22 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,095 ft
 End 3,126 ft
 Bit Size 22 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote on site at 1000 hours.
 Contractor reamed to 3,075 feet, 0830 hours. Contractor
 continued drilling at a rate of approximately 2-3 feet per hour.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
08/18/90	3,080	15.00

D. VanNote off site, 1330 hours.

Contractor reamed to a depth of 3,126 feet through the end of the night shift.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 19, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,126 ft
 End 3,150 ft
 Bit Size 22 1/2 in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,150 ft
 End 3,183 ft
 Bit Size 22 1/2 in

Formation Samples Collected No

Description of Operations: D. VanNote on site at 0730 hours. Contractor reamed to 3,128 feet, 0815 hours. Contractor continued drilling at a rate of approximately 2-3 feet per hour.

Contractor indicated that 22 1/2-inch drill bit is worn. Contractor will try to drill to TD with worn bit.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/19/90	3,140	15.00

D. VanNote off site, 1830 hours.

Contractor reamed to a depth of 3,183 feet through the end of the night shift.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 20, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,183 ft
 End 3,219 ft
 Bit Size 22 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,219 ft
 End 3,239 ft
 Bit Size 22 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler on site at 0945 hours. D. VanNote of site at 0945 hours, had been on site observing coring on IW-2. Reaming of the 22-1/2-inch borehole continued through the shift. A total depth of 3,219-feet had been reached at shift change.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
08/21/90	3,200	15.00

P. Feldman on site at 1045 hours. Received update on construction proposed schedule. B. Ziegler informed Feldman that the injection test for IW-1 had been tentatively scheduled for within the next 20 days and that the Contractor would need to clear a path through the Brazilian Pepper trees along the L-30 canal for access and would this be a problem. P. Feldman stated clearing a path would not

B. Ziegler off site, 1730 hours.

Contractor reamed to a depth of 3,239 feet through the end of the night shift.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 21, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,239 ft
 End 3,276 ft
 Bit Size 22 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,276 ft
 End 3,308 ft
 Bit Size 22 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler on site at 0400 hours to observe coring on IW-2. Reaming of the 22-1/2-inch borehole continued through the shift. A total depth of 3,276 feet had been reached at shift change.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
08/21/90	3,260	30.00

B. Ziegler off site, 0800 hours.

Contractor reamed to a depth of 3,308 feet through the end of the night shift.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 22, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,308 ft
 End 3,311 ft
 Bit Size 22 1/4 in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,311 ft
 End 3,311 ft
 Bit Size 22 1/4 in

Formation Samples Collected No

Description of Operations: B. Ziegler on site, 0300 hours to observe coring on IW-2. Contractor continued to ream 22-1/2-inch borehole through shift. Contractor reached TD of 3,311 feet at 0730 hours and began to circulate and develop the well.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,200	23	105
SMW-3	950	23	102
SMW-6	600	23	73
SMW-8	950	23	87

B. Ziegler off site, 0745 hours.

B. Ziegler on site, 2000 hours.

Contractor continued to circulate (develop) borehole through remainder of shift.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 23, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 3,311 ft
 End 3,311 ft
 Bit Size 22 1/4 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 3,311 ft
 End 3,311 ft
 Bit Size 22 1/4 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler on site 1200 hours. Contractor continued circulation of borehole through shift. Water samples were collected from the well after 30 hours of circulation. Samples were sent to the CH2M HILL laboratory in Gainesville for analysis of Primary and Secondary Groundwater Standards, as requested by FDER.

As required in FAC 17-28, five gallons of formation water were also collected for analysis by USGS.

Contractor stopped circulation and began tripping out of hole, 1300 hours. J. Brantley informed Engineer that a the wellhead would be modified for the injection test and to accept formation waters produced during reverse-air drilling on the dual-zone monitor well.

Heavy rains set in, 1700 hours.

B. Ziegler off site, 1830 hours. Rains stop.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 24, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 3,311 ft
 End 3,311 ft
 Bit Size 22 1/4 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 3,311 ft
 End 3,311 ft
 Bit Size 22 1/4 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote on site 0800 hours.
 Contractor continued to assembly temporary wellhead through day shift.

D. VanNote off site 1715 hours.

Wellhead preparation complete and drilling below 1,000 feet on the monitor well begins. Formation waters produced from monitor well are being disposed of in IW-1.

No further activity on IW-1 through August 27, 1990.

Recorded by: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 28, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,311 ft
 End 3,311 ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,311 ft
 End 3,311 ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler on site 0800 hours.
 Contractor completes 14-3/4-inch borehole to 1,902 feet on the
 monitor well 1100 hours. Disposal of formation waters from the
 monitor well stopped 1300 hours.

No further activity on IW-1 through August 29, 1990.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 12, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: No further work was performed on the well from August 28, 1990, to September 8, 1990.

On September 8, 1990, a temporary wellhead was constructed in order for the Contractor to flush the well with fresh water. County water would be used with a backflow preventer in place.

Contractor was unable to flush the well continuously due to cementing operations and other construction activities on site. The well has been flushed at a rate of 110 gpm with fresh water as follows:

Date\Time On (hrs)	Date/Time Off (hrs)	Duration of Flush (hrs)
9/9/90 - 0100	9/9/90 - 1500	14
9/9/90 - 2400	9/10/90 - 0700	7
9/10/90 - 2400	9/11/90 - 1900	19
9/11/90 - 2300	9/12/90 - 0800	9
9/12/90 - 1100	9/12/90 - 1800	7

No further work has been performed on the well.

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Recorded By: E. Pomar

Revised: October 1, 1990

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date September 19, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-1

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler on site at 1320 hours.

No further work was performed on the well from September 8, 1990, to September 19, 1990, other than flushing of the well in preparation for the TV survey.

On September 17, 1990, Contractor began flushing the well again at a rate of approximately 60 gpm.

Schlumberger Well Services arrived on site at 1430 hours to perform TV survey.

T. McCormick arrived site at 1440 and reviewed construction progress. Off site 1530 hours.

Schlumberger setup equipment and began running the TV survey at 1630 hours. Well continued to be flushed at approximately 60 gpm. Contractor completed TV survey at 2230 hours. Flushing of the well was stopped.

B. Ziegler off site 2230 hours.

Contractor began to demobilize the drill rig and equipment through the remainder of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 25, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Description of Operations: Contractor continued setting up for injection test at IW-1 scheduled for Wednesday, October 31, 1990. Demobliizing at IW-2 also continued throughout the day.

No other activity.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 26, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start N/A

End N/A

Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start N/A

End N/A

Bit Size N/A

Formation
Samples
Collected N/A

Description of Operations: Contractor continued setting up for injection test at IW-1 scheduled for Wednesday, October 31, 1990. Demobilizing at IW-2 also continued throughout the day.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 27, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Description of Operations:

Weather: Clear

No crew onsite.

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start N/A

End N/A

Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start N/A

End N/A

Bit Size N/A

Formation
Samples
Collected N/A

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 28, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Description of Operations:

No crew onsite.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 29, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Description of Operations: B. Ziegler arrived on site 1330 hours. Preliminary injection test was conducted on IW-1 at a pumping rate of 11,000 gpm from 1400 to 1415 hours. All piping and connections were tight and pump appeared to be operating adequately.

D. VanNote arrived on site at 1500 hours. Data logger and transducers were tested and determined to be operable.

Geophysical logging was scheduled for tomorrow, October 30, 1990. Logs will be performed on IW-1 under static conditions.

B. Ziegler and D. VanNote off site at 1630 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 30, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Description of Operations: C. DiGiacomo arrived on site at 0730 hours and prepared to perform geophysical logging on IW-1 under static conditions.

D. VanNote arrived on site, 0800 hours. C. DiGiacomo performed Temperature, LSN, Gamma Ray, and Fluid Res. logs from 0800 to 1400 hours.

D. VanNote and C. DiGiacomo off site at 1430 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date October 31, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing..... X
 - Waiting.....
 - Other.....

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Description of Operations: T. McCormick, B. Ziegler, E. Pomar, and D. VanNote arrived on site at 0630 hours.

Monitoring equipment was set up and tested. An in situ data logger was used to monitor water levels in the lower monitor zone and IW-2. Heise pressure gauges were used to monitor the upper monitor zone and IW-1. A flow meter/totalizer was installed to monitor flow at IW-1.

The injection test commenced at 0830 hours and was completed at 1830 hours. The test was conducted in three steps with pumping rates of 4,200 gpm, 7,200 gpm, and 10,500 gpm for 5 hours, 2 hours, and 2 hours, respectively.

Geophysical logging was conducted during the first stage of the injection test. Fluid res., temperature, and flow meter logs were performed.

A shut-in pressure of 25.9 psi was recorded at IW-1 1 hr after the injection test was terminated. Water levels in the canal increased 0.08 feet during the injection test, rising from 15.83 feet NGVD to 15.92 feet NGVD.

The surficial monitor wells were sampled for water quality data (Temperature, Conductivity, and Chlorides). Each well was purged with a centrifugal pump until temperature and conductivity stabilized. The results are as follows:

Well No.	Conductivity (hmos/cm)	Temperature (T)	Chlorides (mg/l)
SMW-1	700	24	49.9
SMW-2	750	24	117.0
SMW-3	800	24	133.0
SMW-4	750	24	117.0
SMW-5	600	24	67.0
SMW-6	600	24	83.0
SMW-7	625	24	67.0
SMW-8	650	24	100.0

No further samles will be collected from the surficial monitor wells through the remainder of the project. Drilling operations are complete.

T. McCormick, B. Ziegler, and D. VanNote off site at 1930 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date November 14, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-1

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing..... X
 - Waiting.....
 - Other.....

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

B. Ziegler, D. VanNote, and G. Rahrig/FDER arrived site at 0800 hours. T. McCormick arrived site at 0830 hours. Well was charged with fresh water during the night. Schumberger Well Services set up onsite to perform RTS on IW-1. Background surveys were performed in accordance with the specifications.

A background gamma ray was performed on the complete well. The RTS began at 1122 hours. Two static ejections and two dynamic ejections were conducted. The test was successfully completed at 1600 hours. The well was then flushed with approximately 100,000 gallons of canal water to displace any tracer that may have remained in the well.

Recorded By: B. Ziegler

INJECTION WELL NO. 2

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 16, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 0 ft
 End 60 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 60 ft
 End 60 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected No

Description of Operations: Drilling construction of Injection Well IW-2 commenced on June 16, 1990. B. Ziegler arrived on site at 0915 hours. Crew waiting on J. Brantley to begin drilling pilot hole to 260 feet.

J. Brantley on site at 1200 hours. Will begin drilling pilot hole to 260 feet on IW-2. Tentatively scheduled geophysical logging of pilot hole for 0900 hours tomorrow. Contractor will advise if schedule changes.

B. Ziegler off site at 1300 hours. J. Wyatt stated that pilot hole of IW-2 was down to 60 feet. Drive shaft broke on table. Repairs were made until 2100 hours. Drilling will commence at 0900 hours.

B. Ziegler off site 0600 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 17, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 60 ft
 End 270 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site at 1200 hours. Contractor down to 90 feet with pilot hole. Geophysical logging was tentatively scheduled for 2100 hours.

B. Ziegler off site, 1330 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/17/90	60	26.25
06/17/90	120	22.50
06/17/90	180	26.25
06/17/90	240	22.50

Contractor at 270 feet with pilot hole, 1600 hours. Contractor conditioned pilot hole. B. Ziegler contacted C. DiGiacomo and scheduled geophysical logging for 1730 hours.

Contractor tripped out of hole and geophysical logging began 1730 hours. Caliper, Gamma, and LSN logs were completed 1900 hours.

Contractor rigged up 58-1/2-inch bit assembly during the night shift.

B. Ziegler off site 2030 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 18, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected NA

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Description of Operations: D. VanNote arrived on site at 0815 hours. Reviewed 54-inch casing depth with B. Ziegler, and T. McCormick. Target depth for the 54-inch casing was determined to be 260 feet b/s target.

Poole and Kent, Inc., requested that the drilling contractor shut down his equipment while the pipe construction crew used listening devised to locate a leak on the piping adjacent to the drilling site. Youngquist Brothers agreed and were placed on standby with both rigs from 2100 hours to 0400 hours.

J. Brantley indicated that the Contractor will begin reaming immediately after leak location efforts are completed by Poole and Kent, Inc. Contractor will begin reaming with the 58-1/2-inch bit assembly tomorrow morning, 0800 hours. Installation of the 54-inch casing to 260 feet b/s was tentatively scheduled for the morning of June 20, 1990.

Tallies on the 54-inch casing were conducted 1120 hours. Joint No., heat No., and depth below land surface were reviewed with the Contractor. The Engineer indicated heat Nos. were missing on three casing joints. Contractor will check on it and review casing tally again tomorrow.

D. VanNote off site, 1715 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 19, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 0 ft
 End 115 ft
 Bit Size 58 1/2 in

Formation

Samples
 Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 115 ft
 End 155 ft
 Bit Size 58 1/2 in

Formation

Samples
 Collected No

Description of Operations: D. VanNote arrived on site at 0815 hours. Contractor commenced reaming with the 58-1/2-inch bit assembly at 0915 hours. Installation of the 54-inch casing is tentatively scheduled for tomorrow afternoon, June 20, 1990.

Contractor reamed to 88 feet, 1700 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
06/19/90	62	26.25
06/19/90	120	26.25

D. VanNote off site 1730 hours.

Contractor encountered increasingly harder drilling with depth. Contractor reamed to 155 feet through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 20, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 155 ft
 End 216 ft
 Bit Size 58 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 216 ft
 End 272 ft
 Bit Size 58 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site at 0715 hours. Contractor reamed to 158 feet, 0800 hours. Contractor encountered continued harder drilling with depth.

T. McCormick arrived on site, 0800 hours. Briefed T. McCormick on activities at site. T. McCormick off site 1030 hours.

The 54-inch casing was retallied, 1500 hours. Joint No., heat No., depth below land surface, and centralizer depths were reviewed with the Contractor. Joint Nos. and casing lengths were marked clearly on each casing section.

The surficial monitor wells were sampled on June 20, 1990, for water quality data (temperature, conductivity, and chlorides). Each well sampled was purged with a centrifugal pump until the conductivity and temperature stabilized. Grab samples were then collected for chloride titrations. The data collected are as follows:

Well Number	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,350	26	69.9
SMW-3	850	26	49.9
SMW-6	1,150	27	42.5
SMW-8	1,050	26	29.9

Contractor reamed to 216 feet, 1900 hours. Contractor anticipated target depth to be reached during the night shift.

D. VanNote off site, 1930 hours.

D. VanNote arrived on site, 0300 hours. Contractor reamed to a total depth of 272 feet during the night shift, 2200 hours. Contractor reconditioned borehole and thinned-out mud to 9.0 lbs./gal before tripping out, 0230 hours. Contractor tripped rods and 58-1/2-inch bit assembly out of hole 0430 hours. Contractor spent remainder of the night shift preparing rig for 54-inch casing installation to 260 feet.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 21, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....X
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite at, 0300 hours. Contractor installed 54-inch casing to a depth of 260 feet below land surface (bls), 0600 hours. Centralizers were placed 5, 20, 40, and 100 feet from the bottom of the casing.

T. McCormick arrived onsite 0715 hours and conducted site visit. D. VanNote reviewed cement volume and header pressure with J. Brantley/Contractor and T. McCormick. A limit of 60 psi during pressure grouting was arrived at based on casing uplift considerations. T. McCormick offsite, 0830 hours.

Contractor conducted first stage pressure grout on 54-inch casing from 1410 to 1557 hours. Casing was pressure grouted with neat cement until header pressure reached 51 psi. One-hundred and twenty-two (122) barrels of neat were pumped. Contractor will allow for 12 hours curing time on the cement before second stage of 4 percent is pumped. Contractor will tag cement at approximately 0700 hours tomorrow.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/20/90	180	22.50
06/20/90	240	22.50

D. VanNote offsite, 1800 hours.

Contractor monitored the header pressure and strapped tremie pipe during the night shift. Contractor will use two tremie lines for cementing, 180° apart.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date June 22, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	NA	ft
End	NA	ft
Bit Size	NA	in

Formation Samples Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	273	ft
End	393	ft
Bit Size	12 1/4	in

Formation Samples Collected Yes

Description of Operations: D. VanNote arrived onsite at 0700 hours. Contractor tagged cement around 54-inch casing at 98 feet below land surface (bls), 1020 hours. Cement quantities for the annulus and collapse pressure of the 54 inch were reviewed by D. VanNote, T. McCormick, J. Brantley, and T. Nolan. Theoretical collapse pressure for the casing (54 inch O.D. 0.500 wall) is 52 psi. Theoretical pressure due to cement were calculated to be 31 psi. The 54 inch casing will be pressurized to 50 psi for additional safety during the cementing operation.

Two tremie lines were installed 180 degrees apart to a depth of 96.5 feet, 1.5 feet above the cement tag. The 54-inch casing was pressurized to 50 psi. Dowell/Schlumberger pumped 30 barrels of 4 percent cement then 26 barrels of neat cement. Circulation to surface was observed in the annulus. Actual pressure due to cementing was calculated to be 35 psi. Traces of cement were observed at the surface when pumping equipment was shut down. The second cementing stage was completed 1038 hours.

Contractor monitored header pressure for remainder of the shift. Contractor continued to bleed header not allowing internal pressure above 50 psi. Contractor anticipated starting the pilot hole below the 54-inch casing tomorrow morning.

D. VanNote offsite at 1830 hours.

During the night shift the Contractor commenced drilling of the pilot hole below the 54-inch casing to 12 1/4-inches, 0300 hours. Contractor drilled to 393 feet through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 23, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 393 ft
 End 583 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Rain

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 583 ft
 End 748 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived onsite at 0845 hours. Contractor began drilling of the pilot hole during the night shift at 0300 hours. Contractor drilled to 423 feet, 0900 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
06/23/90	420	11.25
06/23/90	480	11.25
06/23/90	540	15.00
06/23/90	600	22.50
06/23/90	660	15.00

Drilling rate is approximately 15 feet per hour to 560 feet, 1530 hours.

D. VanNote offsite, 1530 hours.

Contractor drilled to 748 feet through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 24, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Rain

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 748 ft
 End 964 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting..... X
 Other.....

Depth:
 Start 964 ft
 End 1,010 ft
 Bit Size 12 1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived onsite at 0900 hours, Contractor drilled pilot hole to 753 feet. Drilling rate still 15 feet per hour.

J. Brantley\Contractor indicated that TD will be reached during the night shift. One wiper trip will be run before tripping out of hole. Tentatively scheduled logging with C. Digiacomo for tomorrow morning, 0800 hours. Will contact Mr. Digiacomo if anything changes.

Contractor drilled to 815 feet, 1700 hours.

D. VanNote offsite, 1830 hours.

Contractor reached TD of 1,010 feet, 2000 hours. Contractor ran one wiper trip from 200 feet. Contractor will be ready for logging 2400 hours.

D. VanNote\Engineer contacted C. Digiacomo and scheduled logging for 2400 hours.

C. Digiacomo arrived onsite 2345 hours. D. VanNote returned onsite, 2400 hours.

Contractor tripped out of hole and geophysical logging began 0100 hours. Caliper, Gamma, and LSN logs were completed 0300 hours.

D. VanNote and C. Digiacomo offsite, 0330 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
06/24/90	720	15.00
06/24/90	780	15.00
06/24/90	840	15.00
06/24/90	900	11.25
06/24/90	960	7.50

Contractor rigged up 52 1/2-inch bit assembly during the remainder of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 25, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 240 ft
 End 264 ft
 Bit Size 52-1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 264 ft
 End 379 ft
 Bit Size 52-1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite at 0900 hours. Contractor continued to make up 52 1/2-inch bit assembly.

Contractor commenced reaming the pilot hole to 52 1/2 inches, 1430 hours. Contractor had completed reaming the cement plug at the base of the casing at the end of the shift.

D. VanNote offsite, 1950 hours.

Reaming of the 52-1/2-inch borehole continued through the night shift.

Recorded By: D.VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 26, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 379 ft
 End 508 ft
 Bit Size 52-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 508 ft
 End 580 ft
 Bit Size 52-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite at 0900 hours. Contractor continued to ream with 52-1/2 inch bit assembly. Borehole down to 406 feet at 0900 hours.

Reaming of the 52-1/2-inch borehole continued through shift change and through the end of the shift report.

Deviation surveys were conducted on the 52-1/2 inch borehole as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
6/26/90	360	15.00
6/26/90	420	15.00
6/26/90	480	26.25
6/26/90	540	26.25

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 27, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 580 ft
 End 620 ft
 Bit Size 52-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 620 ft
 End 717 ft
 Bit Size 52-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler remained on site through shift change. Contractor continued to ream with 52-1/2 inch bit assembly.

Reaming of the 52-1/2-inch borehole continued through shift change and through the end of the shift report.

Deviation surveys were conducted on the 52-1/2 inch borehole as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
6/27/90	600	15.0
6/27/90	660	7.5

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 28, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Fair

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 717 ft
 End 786 ft
 Bit Size 52-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Fair

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 786 ft
 End 850 ft
 Bit Size 52-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite at 0700 hours to perform temperature log on IW-1. Contractor continued to ream 52-1/2-inch borehole.

B. Ziegler offsite at 1135 hours.

B. Ziegler onsite at 1930 hours. Reaming of the 52-1/2-inch borehole continued through night shift and through the end of the shift report.

Deviation surveys were conducted on the 52-1/2-inch borehole as follows:

Date	Depth (ft)	Deviation (min)
6/28/90	720	22.50
6/28/90	780	30.00

B. Ziegler offsite at 0415 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 29, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Fair

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 850 ft
 End 997 ft
 Bit Size 52-1/2 in

Formation
 Samples

Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Fair

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 997 ft
 End 1,010 ft
 Bit Size 52-1/2 in

Formation
 Samples

Collected No

Description of Operations: D. VanNote arrived onsite at 1800 hours to perform grouting on IW-1. Contractor continued to ream 52-1/2-inch borehole on IW-2.

D. VanNote offsite at 2000 hours.

Reaming of the 52-1/2-inch borehole continued through night shift. Borehole was completed to total depth of 1,010 feet at 2000 hours. One wiper trip was performed at 2200 hours. Borehole was circulated through remainder of shift to insure proper conditioning of borehole fluids before installation of the 44-inch casing.

Deviation surveys were conducted on the 52-1/2-inch borehole as follows:

Date	Depth (ft)	Deviation (min)
6/29/90	840	15.00
6/29/90	900	22.50

B. Ziegler onsite at 0645 hours. Contractor continued to circulate borehole.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date June 30, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm
 Weather: Fair
 Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 1,010 ft
 End 1,010 ft
 Bit Size 52-1/2 in
 Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite at 0645 hours to perform grouting on IW-1. Contractor continued to circulate 52-1/2-inch borehole.
 B. Ziegler offsite 0745 hours.
 B. Ziegler arrived site 1300 hours. Contractor plans to begin installation of 44-inch casing at 2300 hours. Welders came off all night shift and needed rest. B. Ziegler tallied 44-inch casing and reviewed heat numbers with Contractor.
 B. Ziegler offsite 1630 hours.
 B. Ziegler arrived site 2300 hours. Contractor begins installation of 44-inch casing. Centralizers were placed as specified in contract documents.
 Installation of 44-inch casing continued through the shift. A total of 725 feet had been installed at shift change.

Night Shift
7:00 pm to 7:00 am
 Weather: Fair
 Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start NA ft
 End NA ft
 Bit Size NA in
 Formation
 Samples
 Collected No

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 1, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation

Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation

Samples
 Collected No

Description of Operations: B. Ziegler remained onsite through shift change. Contractor continued running 44-inch casing.

Installation of 44-inch casing was completed at 1000 hours. Casing was run to a total depth of 1,000 feet below land surface. Contractor setup header assembly to circulate drilling fluid with 8-inch kelly hose and rig mud pumps to move heavy mud from the bottom of the borehole to produce an improved grout job.

Contractor begins circulating drilling fluid through 44-inch casing using the 8-inch kelly hose and rig mud pump, 1350 hours. Mud pump produced approximately 1,200 gpm. Estimated turnover time was 27 minutes. Drilling fluid ran low and circulation was terminated at 1430 hours. Contractor finalized set up for pressure grouting 44-inch casing.

Cement quantities and pressures were reviewed by J. Brantley, T. Nolan, and B. Ziegler. It was agreed to pump 4 percent bentonite cement until header pressure reached 97 psi (400 feet of theoretical fill) then switch to neat and pump until header pressure reaches 160 psi (200 feet of theoretical fill).

The pressure grout on the 44-inch casing began at 1611 hours. Cementing began by pumping 6 barrels of fresh water flush (good circulation). Dowell then pumped 4 percent bentonite cement until header pressure reached 100 psi, a total of 1,023 sacks (277 barrels) were pumped. The 4 percent was followed by neat until the header pressure reached 170 psi, a total of 761 sacks (160 barrels) were pumped. The Contractor then flushed the tremie with 7 barrels of fresh water and pulled up 20 feet to prevent cementing line in place.

B. Ziegler offsite 1845 hours.

The remainder of the shift and the night shift was spent waiting on cement to set and monitoring header pressure.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

<p>CH2M HILL</p>	<p>Project No. SEF24770.T0.30 Date <u>July 2, 1990</u> Client <u>Palm Beach County SRWWTP</u> Contractor <u>Youngquist Brothers Inc.</u> Well No. <u>IW-2</u></p>
<p>Day Shift <u>7:00</u> am to <u>7:00</u> pm Weather: <u>Clear</u> Activity: Drilling..... <input type="checkbox"/> Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing.....X Testing..... <input type="checkbox"/> Waiting..... X Other..... <input type="checkbox"/> Depth: Start <u>NA</u> ft End <u>NA</u> ft Bit Size <u>NA</u> in Formation Samples Collected <u>No</u></p>	<p>Description of Operations: D. VanNote arrived at site 0800 hours. Contractor assisted logger in preparation for temperature log. C. Digiacomio/logger arrived onsite 0900 hours. Logging began at 0915 hours and was completed 1115 hours. Contractor tripped out pressure-grout tremie line at 1100 hours and tallied tremie line for first stage, 1600 hours. Contractor tagged first stage on 44-inch casing at 443 feet below land surface (bls), 1830 hours. Cement quantities and collapse pressure were reviewed by J. Brantley, T. Nolan, and D. VanNote. It was decided that a total of 160 barrels (591 sacks) of 4 percent bentonite cement would be pumped. The second stage of cementing began 1852 hours. Casing was pressurized to 90 psi for additional safety. Contractor only pumped 140 barrels (517 sacks) of 4 percent. Cement Contractor ran out of 4 percent at 140 barrels, the original agreed upon quantity (160 barrels) was not pumped. Grouting was completed at 1937 hours.</p>
<p>Night Shift <u>7:00</u> pm to <u>7:00</u> am Weather: <u>Clear</u> Activity: Drilling..... <input type="checkbox"/> Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... X Testing..... <input type="checkbox"/> Waiting..... X Other..... <input type="checkbox"/> Depth: Start <u>NA</u> ft End <u>NA</u> ft Bit Size <u>NA</u> in Formation Samples Collected <u>No</u></p>	<p>Peggy Highsmith and Bowo Okome/FDER/West Palm Beach arrived onsite and conducted site visit and observed cementing at IW-2 and IW-1. Ms. Highsmith and Mr. Okome were onsite from 1945 to 2100 hours. D. VanNote offsite, 2230 hours. The remainder of the shift was spent waiting on cement to set and monitoring header pressure.</p>

Recorded by: D. VanNote

DAILY SHIFT REPORT

<p>CH2M HILL</p>	<p>Project No. <u>SEF24770.T0.30</u> Date <u>July 3, 1990</u> Client <u>Palm Beach County SRWTP</u> Contractor <u>Youngquist Brothers Inc.</u> Well No. <u>IW-2</u></p>
<p>Day Shift <u>7:00 am to 7:00 pm</u></p> <p>Weather: <u>Clear</u></p> <p>Activity: Drilling..... <input type="checkbox"/> Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing.....X Testing..... <input type="checkbox"/> Waiting..... X Other..... <input type="checkbox"/></p> <p>Depth: Start <u>NA</u> ft End <u>NA</u> ft Bit Size <u>NA</u> in</p> <p>Formation Samples Collected <u>No</u></p> <p>Night Shift <u>7:00 pm to 7:00 am</u></p> <p>Weather: <u>Clear</u></p> <p>Activity: Drilling..... <input type="checkbox"/> Reaming..... <input type="checkbox"/> Running Casing... <input type="checkbox"/> Cementing..... <input type="checkbox"/> Testing..... <input type="checkbox"/> Waiting..... X Other..... X</p> <p>Depth: Start <u>NA</u> ft End <u>NA</u> ft Bit Size <u>NA</u> in</p> <p>Formation Samples Collected <u>No</u></p>	<p>Description of Operations: D. VanNote arrived at site 0730 hours. Contractor needed additional tremie line from IW-1.</p> <p>Contractor tagged second stage on 44-inch casing with west tremie line at 225 feet below land surface (bls), 1221 hours. East tremie line hit obstruction at 180 feet. Contractor made several attempts to get through obstruction without success.</p> <p>Cement quantities and collapse pressure were reviewed by J. Brantley, T. Nolan, and D. VanNote. It was decided that a total of 180 barrels (459 sacks) of 12 percent bentonite cement would be pumped for the third and final stage. It was also decided that Contractor would pump 15 barrels through west tremie, then pump both tremies after 15 barrels.</p> <p>The third and final stage of cementing began 1232 hours. Casing was pressurized to 55 psi for additional safety. Grouting was completed at 1317 hours.</p> <p>D. VanNote offsite, 1530 hours.</p> <p>The remainder of the shift was spent waiting on cement to set and rigging up for the 12 1/4-inch pilot hole. Contractor tripped 42-1/2-inch reamer assembly to cement plug which was tagged at 992 feet (8 feet of cement plug at base of 44-inch casing). Contractor will begin drilling ducks nest tomorrow, 1900 hours.</p>
	<p>Recorded By: <u>D. VanNote</u></p>

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 4, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at site 1000 hours. Contractor tripped 42-1/2-inch reamer assembly to cement plug (992 feet) at base of 44-inch casing during yesterday's night shift. Contractor anticipated drilling of the pilot hole at 1900 hours. Engineer informed Contractor that water samples are to be collected at 30-foot intervals along with cuttings samples at 10-foot intervals as specified in the contract documents.

D. VanNote offsite, 1400 hours. Returned at 2100 hours.

Contractor did not run night shift. Drilling delayed until tomorrow afternoon.

D. VanNote offsite 2200 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEP24770.TO.30 Date July 5, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Rain

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at site 0800 hours. Contractor continued rigging up for reverse-air drilling. Drilling of the duck's nest was scheduled for late this afternoon.

Contractor encountered unexpected mechanical problems with swivel apparatus at IW-1. Contractor removed swivel from IW-2 and transferred to IW-1, 1700 hours.

D. VanNote off site, 1630 hours.

Contractor did not run night shift. Crew performed service on rig.

NOTE: No drilling was performed from July 5, 1990, through July 7, 1990. Contractor waiting on new swivel.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 6, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at site 0800 hours. Contractor waiting on new swivel to arrive. Contractor expects new swivel on site this afternoon.

Note: No drilling performed from July 5, 1990 through July 7, 1990. Contractor waiting on new swivel.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 7, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived at site 0800 hours. Contractor still waiting on new swivel. Contractor expects new swivel late this evening.

Note: No drilling performed from July 5, 1990, through July 7, 1990. Contractor waiting on new swivel.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 8, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 992 ft
 End 998 ft
 Bit Size 42-1/2 in

Formation

Samples
 Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 995 ft
 End 1,186 ft
 Bit Size 12-1/4 in

Formation

Samples
 Collected Yes

Description of Operations: B. Ziegler arrived on site 1200 hours. Contractor had installed new swivel during the night. Drilling of the duck's nest began at the beginning of the day shift. Cement plug was tagged at 992 feet, 8 feet from the base of the 44-inch casing. Duck's nest was drilled to 998 feet.

Reamer assembly was removed and the 12-1/4-inch pilot bit was tripped in to 995 feet. Drilling of the pilot hole began at the beginning of the night shift.

B. Ziegler off site at 1900 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/08/90	1,020	7.50
07/08/90	1,080	7.50

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

<u>Depth (ft)</u>	<u>Conductivity (umhos/cm)</u>	<u>Temperature (C)</u>	<u>Chlorides (mg/l)</u>
995	1,600	30	178
1,025	1,200	30	182
1,055	800	30	89
1,085	2,800	26	519
1,115	2,500	25	394
1,145	800	25	101
1,185	2,300	25	385

A total depth of 1,186 feet had been reached with the pilot hole at the end of the night shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 9, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,186 ft
 End 1,414 ft
 Bit Size 12-1/4 in
 Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,414 ft
 End 1,444 ft
 Bit Size 12-1/4 in
 Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived on site 0800 hours. Drilling of the 12-1/4-inch pilot hole continued.

See comments on IW-1 daily shift report.

B. Ziegler reviewed logging schedule with J. Brantley. Geophysical logging is tentatively scheduled for Friday or Saturday of this week.

B. Ziegler off site at 1900 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/09/90	1,140	15.00
07/09/90	1,200	22.50
07/09/90	1,260	15.00
07/09/90	1,320	22.50

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,203	600	25	87
1,233	2,250	25	500
1,263	2,225	25	365
1,293	2,100	25	442
1,323	2,300	25	788
1,353	2,200	25	750
1,380	2,400	25	288
1,414	2,200	24	208
1,443	2,000	24	256

At the beginning of the night shift the Contractor tripped six joints of drill pipe and stopped drilling to repair the swivel, 1900 hours. Contractor resumed drilling at 0400 hours. A total depth of 1,444 feet had been reached with the pilot hole at the end of the night shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 10, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,444 ft
 End 1,615 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,615 ft
 End 1,697 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived on site 0930 hours. Drilling of the 12-1/4 inch pilot hole continued.

The 34-inch casing was tallied. Joint lengths and heat numbers were recorded. Heat numbers were reviewed for consistency with mill certificates submitted by the Contractor.

B. Ziegler off site at 2000 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/10/90	1,380	15.00
07/10/90	1,440	22.50
07/10/90	1,500	7.50
07/10/90	1,560	15.00
07/10/90	1,620	15.00

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,472	1,300	24	240
1,504	1,300	24	80
1,533	2,250	24	320
1,564	2,800	26	558
1,596	2,400	24	529
1,625	2,400	24	449
1,655	2,400	24	416

Drilling of the pilot hole continued through the night shift. A total depth of 1,697 feet had been reached with the pilot hole at the end of the night shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 11, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,697 ft
 End 1,830 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived on site 0900 hours. Drilling of the 12-1/4 inch pilot hole continued.

The 34-inch casing that was tallied yesterday was moved and will have to be tallied again once a casing setting depth has been determined.

B. Ziegler off site at 1400 hours. On site at 1600 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/10/90	1,380	26.25
07/10/90	1,440	22.50
07/10/90	1,500	7.50
07/10/90	1,560	11.25
07/10/90	1,620	15.00
07/11/90	1,680	22.50
07/11/90	1,740	15.00
07/11/90	1,800	26.25

B. Ziegler off site 2000 hours.

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,830 ft
 End 1,924 ft
 Bit Size 12-1/4 in

Formation
 Samples
 Collected Yes

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,685	2,200	25	586
1,715	2,200	25	403
1,744	2,400	25	538
1,774	2,800	25	625
1,803	3,600	25	731

Drilling of the pilot hole continued through the night shift. A total depth of 1,924-feet had been reached with the pilot hole at the end of the night shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 12, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,923 ft
 End 1,953 ft
 Bit Size 12-1/4 in

Formation Samples Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting..... X
 - Other..... X

Depth:
 Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Description of Operations: D. VanNote arrived onsite 0800 hours. Contractor drilled 12-1/4-inch pilot hole to 1,932 feet, 0815 hours. Contractor requested that geophysical logging be scheduled for 2000 hours. D. VanNote informed C. DiGiacomo that logging activities will take place tonight between 2000 and 2400 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/12/90	1,860	11.25

B. Ziegler arrived on site, 1100 hours. A. Muniz arrived onsite 1200 hours and reviewed general site progress. A. Muniz off site 1330 hours. B. Ziegler off site, 1430 hours.

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,835	6,000	25	1,730
1,865	6,500	25	1,654
1,895	5,500	24	1,596
1,925	5,500	24	1,400
1,950	22,000	24	7,197
1,953	40,500	24	13,162

Contractor indicated that borehole was not taking water and encountered minimal artesian flow.

Contractor reached total depth of 1,953-feet, 1700 hours. Contractor ran one wiper pass and tripped out of borehole, 2100 hours. Heavy rains delayed activities between 2100 to 2230 hours. Schlumberger began running Dual-Induction Log, 2230 hours. Schlumberger completed logging at 2330 hours. C. DiGiacomo arrived on site 2400 hours, and set up for geophysical logging. C. DiGiacomo began logging at 2430 hours. The Caliper, Gamma, Fluid Resistivity, and Temperature logs were performed. In addition, one depth sample was collected at 1,950 feet. Logging was completed at 0530 hours. D. VanNote and C. DiGiacomo off site, 0630 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 13, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 1,010 ft
 End 1,010 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start 1,010 ft
 End 1,010 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite 1330 hours. Contractor began tripping in 44 1/2-inch reamer assembly, 0700 hours. Contractor tripped in air-line for reverse air drilling, 1430 hours. Contractor began drilling out cement, at 1,010 feet, 1500 hours.

A water sample was collected at a depth of 1,951 feet last night using the logger's depth sampler. The depth sample was collected to confirm the water quality values for conductivity and chlorides at 1,951 feet. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,951	47,000	24	17,161

This conductivity reading is approximately equivalent to a Total Dissolved Solids (TDS) of 39,000, the same as encountered during packer testing of IW-1 at this depth.

A portion of the depth sample was forwarded for laboratory determination of TDS. Engineer will receive verbal confirmation on TDS results within a couple of days.

D. VanNote offsite, 1600 hours.

Contractor indicated reamer bit plugged off due to large pieces of cement, 1900 hours. Contractor spent remainder of the night shift unplugging reamer bit and cleaning out hole.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 14, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>1,010</u>	ft
End	<u>1,010</u>	ft
Bit Size	<u>42 1/2</u>	in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>1,010</u>	ft
End	<u>1,035</u>	ft
Bit Size	<u>42 1/2</u>	in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite 1015 hours.
 Contractor continued to drill cement at the base of the 44-inch casing, 1100 hours.

Reamer assembly plugged off several times while reaming.
 Contractor tried to unplug bit without success at a depth of 1,035 feet, 1900 hours. During the night shift, Contractor proceeded to trip rods and reamer assembly in an effort to remove obstruction, 0600 hours.

D. VanNote off site, 1600 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 15, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,035 ft
 End 1,035 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite 0800 hours. Contractor continued to trip rods and reamer assembly to remove obstruction in bit, 0830 hours. T. McCormick arrived at site, 0815 hours. D. VanNote and T. McCormick conducted site visit and reviewed geophysical logs to determine the 34-inch casing setting depth. After reviewing the logs, it was determined that 1,890 feet was a suitable depth for the 34-inch casing. A telephone message was left by D. VanNote for Al Mueller/FDER notifying him that a setting depth of 1,890 feet had been selected for the upper intermediate casing.

T. McCormick offsite, 0945 hours. D. VanNote offsite, 1100 hours. D. VanNote returned onsite 2100 hours.

Tripping of the rods and reamer assembly was completed at 1600 hours. Contractor removed obstruction and tripped rods and reamer assembly back in hole 2000 hours. Contractor resumed reaming at 1,035 feet, 2030 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/15/90	1,020	22.50
07/16/90	1,160	15.00

Contractor's deviation survey depths out of sequence. Additional surveys will be performed at 1,060 feet and 1,120 feet during the next wiper run.

D. VanNote offsite at 0330 hours.

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,035 ft
 End 1,089 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.TO.30 Date July 16, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm
 Weather: Cloudy
 Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 1,089 ft
 End 1,244 ft
 Bit Size 42 1/2 in
 Formation
 Samples
 Collected No

Description of Operations: D. VanNote onsite from 0630 hours to 0830 hours. Contractor continued reaming with 42-1/2-inch reamer assembly to 1,089 feet, 0700 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/16/90	1,200	15.00
07/16/90	1,260	15.00
07/17/90	1,320	22.50

D. VanNote returned onsite at 1330 hours. Reminded Contractor that cuttings need to be collected from 1,300 to 1,400 feet, since they were not collected on pilot hole.

Contractor reamed to 1,249 feet, 2300 hours. Contractor continued reaming through the end of the night shift.

Night Shift
7:00 pm to 7:00 am
 Weather: Rain
 Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....
 Depth:
 Start 1,224 ft
 End 1,306 ft
 Bit Size 42 1/2 in
 Formation
 Samples
 Collected No

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 17, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,306 ft
 End 1,401 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,401 ft
 End 1,444 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived onsite 1330 hours.
 Reaming of the 42-1/2-inch continued through the day shift.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/17/90	1,320	22.50
07/18/90	1,380	15.00

D. VanNote offsite at 1600 hours.

Reaming continued through the night shift. A total depth of 1,444 feet had been reached at the end of the shift report.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 18, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,444 ft
 End 1,480 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Cloudy

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,480 ft
 End 1,490 ft
 Bit Size 42 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite 1400 hours.
 Reaming of the 42-1/2-inch continued through the day shift.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/17/90	1,380	15.00
07/18/90	1,440	7.50

B. Ziegler offsite at 1500 hours.

Reaming continued through the night shift. A total depth of 1,490 feet had been reached at the end of the shift report.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 19, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,490 ft
 End 1,545 ft
 Bit Size 42-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,545 ft
 End 1,607 ft
 Bit Size 42-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 1130 hours. Reaming of the 42-1/2-inch borehole continued through the day shift. Contractor experiencing some caving of the borehole.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/19/90	1,500	15.00
07/20/90	1,560	15.00

See notes from IW-1 daily shift report.

B. Ziegler off site at 1800 hours.

Reaming continued through the night shift. A total depth of 1,607 feet had been reach at the end of the shift report.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date July 20, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,607 ft
End 1,640 ft
Bit Size 42-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,640 ft
End 1,661 ft
Bit Size 42-1/2 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler arrived on site 1100 hours. Reaming of the 42-1/2-inch borehole continued through the day shift. Contractor continues to experience caving of the borehole.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
07/20/90	1,620	15.00

See notes from IW-1 daily shift report.

B. Ziegler off site at 1800 hours.

Reaming continued through the night shift. A total depth of 1,661 feet had been reached at the end of the shift report.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 21, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,661 ft
 End 1,699 ft
 Bit Size 42-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,699 ft
 End 1,717 ft
 Bit Size 42-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 1030 hours. Reaming of the 42-1/2-inch borehole continued through the day shift. Caving of the borehole has stopped. Penetration rate has increased.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/21/90	1,680	15.00

B. Ziegler off site at 1715 hours.

Reaming continued through the night shift. A total depth of 1,717 feet had been reached at the end of the shift report.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date July 22, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,717 ft
End 1,745 ft
Bit Size 42-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,745 ft
End 1,765 ft
Bit Size 42-1/2 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler arrived on site 1030 hours. Reaming of the 42-1/2-inch borehole continued through the night shift.

B. Ziegler off site at 1715 hours.

Reaming continued through the night shift. A total depth of 1,765 feet had been reach at the end of the shift report.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 23, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 1,765 ft
End 1,800 ft
Bit Size 42-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 1,800 ft
End 1,819 ft
Bit Size 42-1/2 in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived on site 0800 hours. Contacted T. McCormick and confirmed 34-inch casing setting depth to 1,890 feet, 0900 hours. Reaming of the 42-1/2-inch borehole continued through the day and into the night shift.

D. VanNote received verbal on Total Dissolved Solids (TDS) analysis (Geotech Laboratory/WPB) performed on depth sample pulled at 1,951 feet. Sample contained 38,190 mg/l of TDS.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/23/90	1,740	11.25

D. VanNote off site at 1600 hours.

Reaming continued through the night shift to a total depth of 1,819 feet.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 24, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,819 ft
End 1,853 ft
Bit Size 42-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,853 ft
End 1,875 ft
Bit Size 42-1/2 in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived on site 0800 hours. Contractor reamed to 1,822 feet, 0900 hours. D. VanNote tallied 34-inch casing and reviewed heat numbers with mill certificates. All heat numbers on the 34-inch casing match numbers on mill certificates.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
07/24/90	1,800	7.50

D. VanNote offsite at 1600 hours.

Reaming continued through the night shift to a total depth to 1,875 feet.

Recorded By: D. VanNote

DAILY SHIFT REPORT

//////////
 CH2M HILL
 //////////

Project No. SEF24770.T0.30 Date July 25, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,875 ft
 End 1,883 ft
 Bit Size 42-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,883 ft
 End 1,883 ft
 Bit Size 42-1/2 in

Formation
 Samples
 Collected No

Description of Operations: D. VanNote arrived on site
 0800 hours. Contractor reamed to 1,879 feet, 0800 hours.
 Contractor started dredging from 1,875 feet and continued reaming
 in very hard dolomite formation.

Contractor began tripping rods out of hole from a depth of
 1,883 feet to check reamer assembly for possible damage, 1130 to
 1430 hours. Reamer assembly worn out. Contractor began
 reconditioning reamer assembly 1500 hours.

D. VanNote off site 1130 hours. Returned on site 1745 hours.

Contractor continued fabricating new roller cones on reamer
 assembly through the end of the shift report.

D. VanNote off site at 1900 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 26, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,883 ft
 End 1,896 ft
 Bit Size 42-1/2 in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 1,896 ft
 End 1,907 ft
 Bit Size 42-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 1630 hours. Contractor tripped back into hole and commenced reaming to 42-1/2-inches from a depth of 1,883 feet, 1700 hours. Contractor reamed to 1,896 feet, 1900 hours.

B. Ziegler off site, 1900 hours. Returned on site 0100 hours to checked night shift activities, Contractor reamed to 1,899 feet. Night shift crew confirmed that the missing deviation surveys from 1,080 and 1,140 feet will be run on wiper run.

B. Ziegler off site 0400 hours.

Contractor reached TD of 1,907 feet during the end of the night shift, 0700 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date July 27, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Description of Operations: Contractor reconditioned hole and conducted wiper run from 0700 to 1300 hours. Contractor ran missing deviation surveys at 1,080 and 1,140 feet during wiper run. Contractor began tripping out of hole, 1300 hours. Reamer assembly at the surface, 1500 hours. Contractor encountered artesian flow immediately after reamer assembly was removed. Contractor killed flow with barite (50 sacks), 1600 hours.

B. Ziegler off site, 1600 hours. Returned on site, 1800 hours. Contractor tallied tremie rods and began running tremie line to tag total depth of borehole, 1900 hours. B. Ziegler off site, 1930 hours.

D. VanNote arrived on site at 2130 hours. Contractor tagged bottom of borehole at 1,907 feet, 2200 hours.

Cement calculations were reviewed by D. VanNote/Engineer, J. Brantley/Contractor, and T. Nolan/Cement Contractor to determine total volume of neat cement for bridge plug from a depth of 1,907 to 1890 feet. Thirty barrels (143 sacks) of neat were calculated for a total theoretical cement thickness of 17 feet. Four percent calcium was added to the neat cement as an accelerator. Pumping of cement was conducted from 2229 to 2246 hours. Contractor will let cement set for a minimum of 4 hours before tagging.

D. VanNote off site, 2330 hours.

Deviation survey was conducted as follows:

Date	Depth (ft)	Deviation (min)
7/27/90	1,080	26.25
7/27/90	1,140	11.25
7/27/90	1,860	22.50

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 28, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....X
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples

Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing..... X
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples

Collected No

Description of Operations: D. VanNote arrived on site 0630 hours. Contractor tagged Bridge plug at 1,898 feet below land surface (9 feet of neat cement plug), 0700 hours. Contractor removed tremie line and began setting up to install 34-inch casing.

D. VanNote off site, 0730 hours. Returned onsite, 1100 hours. Contractor began setting 34-inch casing at 1130 hours. Centralizers were placed as specified at 5, 20, 40, and every 100 feet, thereafter.

Cement types and quantities were reviewed with T.McCormick/Engineer, J. Brantley/Contractor, and T. Nolan/Cement Contractor. It was agreed to pump a nominal 60 feet (97 sacks) of calculated borehole volume of 12 percent bentonite cement followed by 300 feet (899 sacks) of neat cement.

Contractor completed installation of the 34-inch casing to 1,890 feet below land surface, 1300 hours. Contractor began setting up for pressure grout.

Pressure grouting of the 34-inch casing began at 0400 hours. Cementing was started by pumping 37 barrels of fresh water to load the casing. Dowell then pumped 97 sacks of 12 percent followed by 809 sacks of neat cement. Header pressure continued to read zero on the pressure gauge throughout cementing activities. Engineer and Contractor agreed to stop pumping neat cement at 809 sacks since pressure remained at zero and there was no apparent fill of the annular space occurring. Grouting was halted at 0523 hours. The tremie line was then pulled to prevent cementing line in place.

D. VanNote off site, 0630 hours.

Remainder of the shift was spent waiting on cement to set. Contractor will tag 1200 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 29, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing..... X
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived on site 0900 hours. Contacted T. McCormick, discussed last night's cementing activities, 0915 hours. Informed T. McCormick that tag to bottom inside casing is scheduled for 1200 hours.

Contacted C. Digiaco and informed him that Contractor will tag to bottom inside the casing, 1200 hours. Told C. Digiaco that if tag indicated cement inside bottom of casing, a temperature log will be needed today. C. Digiaco said he would be on call for logging this afternoon.

T. McCormick arrived on site 1130 hours. Contractor tagged bottom to 1,889 feet (1 foot inside casing). Contractor added water in casing under pressure. Pressure held at 40 psi. Engineer decided to run temperature log.

C. Digiaco on site, 1300 hours. Completed temperature log at 1430 hours. B. Ziegler arrived on site from 1330 to 1500 hours.

Contractor pressurized casing to 75 psi before adding more neat cement. When pressure held at 75 psi the Engineer and Contractor agreed to pump 10 feet of neat cement inside casing for additional plug at bottom. Contractor pumped 52 sacks neat cement from 1515 to 1528 hours.

Contractor spent the night shift rigging up to install tremie lines. D. Vannote offsite 1900 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date July 30, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived on site 0800 hours. Contractor tagged first stage of cement on 34-inch casing, 0915 hours. The north and south tremie lines tagged at 1,894 and 1,893 feet bls, respectively. D. VanNote reviewed second stage cementing with T. McCormick and J. Brantley. Engineer and Contractor agreed to pump 32 feet (20 barrels) of Thixotropic cement in an attempt to plug void from 1,875 to 1,885 feet bls.

The third stage of cementing began at 1002 hours and was completed 1035 hours. Two tremie lines were placed approximately 8 feet above their respective cement tags, 180 degrees apart, and casing was pressurized to 100 psi for additional safety. Dowell pumped 45 sacks (20 barrels) of thixotropic cement. Tremie lines were partially displaced with fresh water, pulled 120 feet above theoretical fill, and then completely flushed with fresh water. North tremie line was plugged off. Contractor pulled entire north tremie to removed plug. A piece of limestone approximately 1-1/4-inches in diameter was removed from stand No. 29.

Remainder of shift was spent waiting for cement to set. Contractor anticipated tag on second stage, 2100 hours.

D. VanNote off site, 1300 hours. Returned 2000 hours.
B. Ziegler arrived on site, 2100 hours.

Contractor tagged third stage at 1,890 feet on both tremie lines, 2100 hours. Engineer reviewed cementing procedure with K. Greuel/Contractor and T. Nolan/Cement Contractor and agreed on pumping 50 feet of 12 percent cement for third stage.

Contractor set both tremie lines 4 feet above cement tags and maintained 100 psi header pressure within casing. Dowell pumped 82 sacks (32 barrels) 12 percent cement from 2132 to 2149 hours. Tremie lines were partially displaced with fresh water, pulled 120 feet above theoretical fill, and then completely flushed with fresh water.

B. Ziegler off site, 2245 hours. D. VanNote off site, 2330 hours.

Contractor spent remainder of night shift waiting for 12 percent to set and monitoring header pressure.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date July 31, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start N/A ft

End N/A ft

Bit Size in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start N/A ft

End N/A ft

Bit Size in

Formation
Samples
Collected No

Description of Operations: B. Ziegler arrived onsite 0900 hours and observed tag of cement stage number 4. Cement was tagged at 1,875 feet and 1,872 feet on the north and south tremie lines, respectively. Cementing for stage number 5 was reviewed by J. Brantley and B. Ziegler. It was agreed to pump 51 sacks (20 barrels) of 12 percent bentonite cement.

The fifth stage of cementing began at 0958 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 65 psi for additional safety. Dowell pumped 51 sacks (20 barrels) of 12 percent cement. Tremie lines were partially displaced with water, pulled 240 feet and above theoretical fill and then completely flushed with water. Grouting was completed at 1029 hours.

B. Ziegler offsite at 1600 hours.

Remainder of shift was spent waiting for cement to set and monitoring header pressure.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

H2M HILL

Project No. SEF24770.T0.30 Date August 1, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start N/A ft
 End N/A ft
 Bit Size _____ in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
 Start N/A ft
 End N/A ft
 Bit Size _____ in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived onsite 0950 hours. Contractor continued to wait on cement to set through the day shift.

B. Ziegler offsite 1200 hours. Returned to site 1530 hours to observe operations on IW-1. Cement stage number 6 scheduled for 2300 hours. B. Ziegler offsite 1700 hours.

B. Ziegler onsite 2100 hours. Observed tag of cement stage number 5. Cement was tagged at 1,865 feet and 1,861 feet on the north and south tremie lines, respectively. Cementing for stage number 6 was reviewed by J. Brantley and B. Ziegler. It was agreed to pump 46 sacks (10 barrels) of neat cement.

The sixth stage of cementing began at 2140 hours. Two tremie lines were placed 180 degrees apart. Dowel pumped 48 sacks (10 barrels) of neat cement. Tremie lines were partially displaced with water, pulled 60 feet and above theoretical fill and then completely flushed with water. Grouting was completed at 2206 hours.

B. Ziegler offsite at 2115 hours.

Remainder of shift was spent waiting for cement to set and monitoring header pressure.

Recorded by: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 2, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler arrived on site 0830 hours. Contractor tagged sixth stage on the 34-inch casing at 1,848 and 1,846 feet on the north and south tremie lines, respectively.

The seventh stage of cementing began at 1013 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 90 psi for additional safety. Dowel pumped 902 sacks (189 barrels) of neat cement. Tremie lines were then completely flushed with water. Grouting was completed at 1143 hours.

B. Ziegler off site at 2100 hours. Returned on site 2200 hours.

C. DiGiacomo ran temperature log after seventh stage from 0130 to 0300 hours.

B. Ziegler off site, 0300 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 3, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler arrived on site 0745 hours. Contractor tagged seventh stage on the 34-inch casing at 1,642 feet on the north and south tremie lines.

The eighth stage of cementing began at 1819 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Circulation was observed while flushing tremie lines with water. Dowell pumped 477 sacks (129 barrels) of 4 percent bentonite cement. Tremie lines were then completely flushed with water. Grouting was completed at 0927 hours.

B. Ziegler received message from J. Chessher/Hazen and Sawyer that sonic testing of the effluent line would take place at 1,000 hours, Monday, August 5, 1990. J. Brantley stated that there would be no problem with coordinating sonic test on Monday.

T. McCormick and T. Sharp on site from 1200 to 1230 hours.

T. McCormick and E. Pomar on site from 1720 to 2000 hours. Contractor tagged eighth stage at 1,503 and 1,518 feet on the north and south tremies, respectively.

The ninth stage of cementing began at 1805 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 90 psi for additional safety. Circulation was observed while flushing tremie lines with water. Dowell pumped 465 sacks (126 barrels) of 4% bentonite cement. Tremie lines were then completely flushed with water. Grouting was completed at 1907 hours.

B. Ziegler off site, 2000 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 4, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing..... X
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler arrived on site 1300 hours. At 1745 hours, Contractor tagged ninth stage on the 34-inch casing at 1,353 and 1,358 feet on the north and south tremie lines, respectively.

The tenth stage of cementing began at 1811 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 95 psi for additional safety. Circulation was observed while flushing tremie lines with water. Dowell pumped 516 sacks (140 barrels) of 4% bentonite cement. Tremie lines were then completely flushed with water. Grouting was completed at 1947 hours.

B. Ziegler off site at 1950 hours.

The remainder of the shift was spent waiting on cement to set and monitoring header pressure.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
 CR2M HILL
 ///////////

Project No. SEF24770.T0.30 Date August 5, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler arrived on site 0700 hours. Contractor tagged tenth stage on the 34-inch casing at 1,162 and 1,158 feet on the north and south tremie lines, respectively.

The eleventh stage of cementing began at 0808 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 95 psi for additional safety. Circulation was observed while flushing tremie lines with water. Dowell pumped 669 sacks (181 barrels) of 4% bentonite cement. Cement truck pump No.1 failed during cementing stage eleven. Pumping of cement resumed after Dowell switched to auxiliary pump No. 2. Tremie lines were then completely flushed with water. Grouting was completed at 0947 hours.

B. Ziegler off site at 1215 hours. Returned on site 1830 hours.

Contractor tagged stage eleven at 2016 hours. North and south tremie lines were tagged at 987 and 978 feet, respectively.

Stage twelve began at 2125 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Circulation was observed while flushing tremie lines with water. Dowell pumped 572 sacks (224 barrels) of 12% bentonite cement. Tremie lines were then completely flushed with water. Grouting was completed at 0300 hours.

B. Ziegler off site at 0315 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date August 6, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler arrived on site 0800 hours. Contractor tagged twelfth stage on the 34-inch casing at 715 and 721 feet on the north and south tremie lines, respectively.

The thirteenth stage of cementing began at 0840 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Circulation was observed while flushing tremie lines with water. Dowell pumped 572 sacks (224 barrels) of 12% bentonite cement. Grouting was completed at 1033 hours.

P. Feldman/PBCWUD arrived on site and reviewed site progress from 1100 to 1130 hours. B. Ziegler off site 1330 hours.

B. Ziegler returned on site, 2000 hours. Contractor tagged stage 4 and pumped fifth stage at IW-1, 2133 hours.

B. Ziegler off site, 2145 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 7, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived on site 0730 hours. E. Pomar on site, 0800 hours. At 0945 hours, Contractor tagged stage 13 at 387 feet north and 388 feet south.

The fourteenth and final stage began at 1008 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 95 psi for additional safety. Circulation was observed while flushing tremie lines with water before cementing. Dowell pumped 641 sacks (251 barrels) of 12 percent bentonite cement to surface. Cementing of final stage was completed at 1125 hours.

Contractor will wait a minimum of 24 hours before drilling duck's nest with 32 1/2-inch reamer assembly.

E. Pomar off site, 1700 hours. D. VanNote off site, 1845 hours.

D. VanNote returned on site 2400 hours. Contractor rigging up for drilling duck's nest with 32 1/2-inch reamer assembly. Contractor placed reamer assembly inside 34-inch casing at 2400 hours and spent the remainder of the night shift welding and fabricating casing header.

D. VanNote off site 0100 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date August 8, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived on site 0730 hours. E. Pomar on site, 0800 hours. Contractor continued to fabricate seal at header of 34-inch casing and prepare for drilling duck's nest with 32 1/2-inch reamer assembly, 1000 hours.

Contractor began tripping in hole with 32-1/2-inch reamer assembly, 1300 hours.

E. Pomar off site, 1630 hours.

Contractor began drilling duck's nest with 32 1/2-inch reamer assembly at 1,864 feet, 1700 hours.

D. VanNote off site, 1900 hours.

Contractor continued drilling of the duck's nest through the remainder of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 9, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth: Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Description of Operations: E. Pomar arrived onsite 0800 hours. B. Ziegler onsite, 0830 hours. Contractor drilled duck's nest to 1910 feet, 0900 hours.

E. Pomar offsite 1500 hours.

T. McCormick arrived onsite at 1630 hours. Core depths to be taken at IW-2 were selected based on geophysical logs, lithologic logs, and cuttings samples. T. McCormick sent a letter to FDER referencing the selected core depths for their approval. The selected core depths are as follows:

Core No.	Interval	Description
1	1942-1954	Dolomite
2	2061-2076	Dolomite
3	2092-2110	Dolomite
4	2190-2214	Dolomite
5	2290-2310	Limestone
6	2390-2410	Limestone
7	2496-2510	Limestone
8	2620-2660	Dolomitic Limestone

Core interval No. 1 will be taken at the monitor well since the pilot hole at IW-2 was drilled to 1,950 feet.

T. McCormick and B. Ziegler offsite, 1800 hours. B. Ziegler returned onsite, 2030 hours.

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth: Start NA ft
 End NA ft
 Bit Size NA in

Formation Samples Collected No

Contractor drilled duck's nest to 1919 feet, 0100 hours. Contractor tripped out of hole and connected 12 1/4-inch bit, 0530 hours. Contractor spent remainder of the night shift tripping back in hole with 12 1/4-inch bit.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 10, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 1,950 ft
End 1,950 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 1,950 ft
End 1,980 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Description of Operations: E. Pomar arrived onsite 0800 hours.
D. VanNote onsite, 0900 hours. Contractor tripping in hole with
12 1/4-inch pilot bit, 0930 hours.

E. Pomar offsite 1430 hours.

Contractor dredged cuttings out of old pilot hole to 1,950 feet,
1900 hours. Contractor drilled the pilot hole to 1,980 feet
through the end of the night shift.

D. VanNote offsite 0200 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

CH2M HILL

Project No. SEF24770.T0.30 Date August 11, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Description of Operations: D. VanNote onsite, 1220 hours.
 Contractor drilled to 2,015 feet, 1300 hours.

Weather: Clear

Deviation surveys were conducted as follows:

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Date	Depth (ft)	Deviation (min)
08/10/90	1,920	11.25
08/11/90	1,980	22.50
08/12/90	2,040	15.00

Depth:
 Start 1,980 ft
 End 2,039 ft
 Bit Size 12 1/4 in

D. VanNote offsite, 1600 hours.

Contractor drilled the pilot hole to 2,061 feet through the end of the night shift.

Formation Samples Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2,039 ft
 End 2,061 ft
 Bit Size 12 1/4 in

Formation Samples Collected Yes

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 12, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,061 ft
End 2,065 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Night Shift
7:00- pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,065 ft
End 2,065 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote onsite, 0800 hours. Contractor drilled to 2,061 during yesterday's night shift. Contractor tripped out of hole at 0800 hours and connected 4-inch-diameter core barrel and tripped back in borehole, 1200 hours.

D. VanNote offsite, 1200 hours. Returned onsite 1900 hours.

Contractor cored in dolomite from 2061 to 2065 feet until core bit and barrel could not be advanced any further due to very hard dolomite, 1700 hours. Contractor tripped out of borehole from 1700 to 1930 hours. Engineer observed core removal from barrel. Total recovery was 3 feet. Contractor is required to recover a minimum of 10 feet per core interval as written in the specifications.

D. VanNote offsite, 2135 hours.

Contractor tripped back in borehole with 12 1/4-inch bit and drilled to top of next core sequence (2,065 feet) through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 13, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 2,061 ft
End 2,065 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 2,065 ft
End 2,071 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote onsite, 0800 hours.
Contractor drilled to 2,065 feet and tripped out of borehole with
12 1/4-inch bit, 0815 hours. Contractor waited on new diamond
core bit from 0815 to 1530 hours.

Contractor began tripping in borehole with new diamond core bit,
1530 hours and began coring from a depth of 2,061 feet at
1600 hours.

D. VanNote offsite, 1730 hours. Returned onsite at 0530 hours.

Contractor completed coring from 2,061 to 2,071 feet during the
night shift, 0200 hours. Contractor tripped core barrel out of
borehole, 0600 hours. Engineer observed removal of core from
4-inch core barrel. Total recovery was 7 feet.

The Contractor recovered 10 feet of hard dolomite from a depth
interval of 2,061 to 2,071 feet.

D. VanNote offsite, 0630 hours.

Recorded By: D. VanNote

Revised: September 21, 1990

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date August 14, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,075 ft
End 2,075 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,075 ft
End 2,092 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote onsite, 0530 hours.
Contractor tripped in 12 1/4-inch drill bit and started drilling
from a depth of 2,075 feet, 0900 to 1830 hours.

D. VanNote offsite, 1720 hours.

Contractor drilled to the core interval no. 2 starting depth of
2,092 feet, 2345 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
08/14/90	2,092	7.50

Contractor tripped out of hole at 0600 hours and spent remainder
of the night shift rigging up new core pump.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 15, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:
Start 2,092 ft
End 2,092 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:
Start 2,092 ft
End 2,092 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote onsite, 1000 hours.
Contractor tripped in with core barrel to a depth of 2,092 feet
and began coring, 1630 hours.

Water samples were taken from the reverse-air drilling at 30-foot
intervals and analyzed for conductivity, temperature, and
chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,985	30,000	28	15,328
2,045	31,000	25	19,160
2,075	30,000	25	19,327
2,105	49,000	28	18,827
2,135	48,000	28	19,135
2,165	50,000	29	16,662

D. VanNote offsite, 1845 hours.

Contractor finished coring dolomite to a depth of 2,102 feet
during the night shift, 0415 hours. Contractor spent remainder
of the night shift tripping out core barrel from borehole.

Recorded By: D. VanNote

DAILY SHIFT REPORT

//////////
 CH2M HILL
 //////////

Project No. SEF24770.T0.30 Date August 16, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start 2,102 ft
 End 2,102 ft
 Bit Size 12 1/4in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2,102 ft
 End 2,160 ft
 Bit Size 12 1/4in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler onsite during yesterday's night shift at 0640 hours. Contractor tripped out core barrel at 0700 hours. Engineer observed removal of core from core barrel. Total recovery was 7 feet from a coring interval of 2,092 to 2,102.5 feet.

B. Ziegler offsite, 0900 hours. Returned onsite at 1200 hours.

Contractor tripped in 12 1/4-inch bit and resumed drilling of the pilot hole to the next core interval, 1330 hours.

B. Ziegler offsite, 1730 hours.

Contractor drilled to 2,160 feet through the end of the night shift.

Recorded By: B. Ziegler

Revised: November 19, 1990

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 17, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start 2,160 ft
End 2,190 ft
Bit Size 12 1/4in

Formation
Samples

Collected Yes

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start 2,190 ft
End 2,190 ft
Bit Size 12 1/4in

Formation
Samples

Collected Yes

Description of Operations: D. VanNote onsite at 0815 hours. Contractor drilled to next coring depth of 2,190 feet, 1000 hours. Contractor tripped out of hole with pilot bit from 1100 to 1330 hours. Contractor then tripped back in hole with core barrel to 2,190 feet and began coring, 1545 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/17/90	2,160	7.50

D. VanNote offsite, 1600 hours. Returned onsite at 0200 hours.

Contractor cored from 2,190 to 2,200 feet, 2400 hours. Contractor indicated softer zone on last 3 feet of coring. Contractor tripped out core, 0215 hours. Engineer observed total recovery of 7.5 feet of core. Engineer informed contractor that core was acceptable. Remainder of shift was spent tripping 12 1/4-inch bit in hole.

D. VanNote offsite 0430 hours.

Recorded By: D. VanNote

Revised: November 19, 1990

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 18, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,190 ft
End 2,216 ft
Bit Size 12 1/4in

Formation
Samples

Collected Yes

Night Shift

7:00 pm to 7:00 am

Weather: Rain

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start 2,216 ft
End 2,290 ft
Bit Size 12 1/4in

Formation
Samples

Collected Yes

Description of Operations: D. VanNote on site at 0900 hours. Contractor tripped in rods and 12 1/4-inch bit and began drilling from a depth of 2,190 feet, 0930 hours.

D. VanNote off site, 1330 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/19/90	2,220	22.50

Contractor drilled to 2,216 feet, 1900 hours.

Contractor drilled to the next core depth of 2,290 feet during the night shift at 0500 hours. Contractor spent the remainder of the night shift tripping out of borehole with bit.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 19, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,290 ft
End 2,290 ft
Bit Size 12 1/2in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Rain

Activity:

Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,290 ft
End 2,340 ft
Bit Size 12 1/2in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote on site at 0730 hours.
Contractor tripped out rods and laid down drill bit, 0830 hours.

Contractor tripped back in borehole with core barrel and began coring from a depth of 2,290 feet, 1530 hours.

Contractor cored 10 feet from 2,290 to 2,300 feet and tripped out core barrel, 2130 hours. Engineer observed removal of cores from core barrel, 2145 hours. Total recovery was 8 feet. Contractor then prepared to trip back in with drill bit and drill to the next core interval.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/20/90	2,280	7.50

Contractor drilled to 2,340 feet through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 20, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm
Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,340 ft
End 2,390 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,290 ft
End 2,290 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote on site at 0715 hours. Contractor drilled to 2,350 feet, 0730 hours. Next coring interval is 2,390 to 2,410 feet. B. Ziegler arrived on site, 0915 hours. D. VanNote off site at 0945 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/20/90	2,340	7.50

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,196	48,000	26	20,993
2,226	47,000	25	19,327
2,256	47,000	25	20,327
2,286	46,000	27	19,994
2,316	48,000	25	19,161
2,347	48,000	27	16,662
2,376	47,000	26	17,161

B. Ziegler off site 1100 hours. Returned on site 1300 hours.

Contractor reached core depth of 2,390 feet at 1430 hours. Contractor circulated out cuttings then tripped out 12 1/4-inch bit, 1900 hours. B. Ziegler off site, 1930 hours. Returned on site 0400 hours.

Contractor cored over the depth interval from 2,390 to 2,400 feet from 2300 to 0300 hours. Engineer observed the removal of core 0400 hours. Cores were comprised of fragmented limestone of which no 8-inch sections could be obtained. Contractor was informed that core was not acceptable and that another core was to be pulled from 2,400 to 2,410 feet. Contractor spent remainder of the night shift tripping 12 1/4-inch bit into the borehole.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 21, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,390 ft
End 2,400 ft
Bit Size 12 1/4in

Formation
Samples

Collected Yes

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start 2,400 ft
End 2,400 ft
Bit Size 12 1/4in

Formation
Samples

Collected Yes

Description of Operations: B. Ziegler off site, 0800 hours.
Contractor tripped 12 1/4-inch bit into borehole to 2,390 feet,
1100 hours. Contractor drilled to 2,400 feet at 1245 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
08/22/90	2,400	15.00

Contractor removed 12 1/4-inch bit and tripped core barrel to 2,400 feet, 2030 hours. Contractor cored the from 2,400 to 2,411 feet and tripped core barrel out at 0215 hours.

B. Ziegler returned on site 0300 hours and observed removal of core, 0330 hours. Cores were comprised of limestone with five 6 to 8-inch sections that could be used in laboratory tests. Total recovery from the core interval of 2,400 to 2,411-feet was 11 feet (100 percent).

Contractor spent remainder of the night shift tripping 12 1/4-inch bit into borehole.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 22, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 2,400 ft
 End 2,496 ft
 Bit Size 12 1/4in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling.....
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start 2,496 ft
 End 2,496 ft
 Bit Size 12 1/4in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler off site, 0745 hours.
 Contractor tripped 12 1/4-inch bit to 2,400 feet and began
 drilling, 1000 hours. Contractor drilled to the next core depth
 of 2,496 feet, 1830 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/22/90	2,460	15.00

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,406	48,000	26	16,662
2,436	48,000	27	17,495
2,465	47,000	26	17,328
2,496	48,000	26	19,661

B. Ziegler returned on site at 2000 hours.

Contractor removed 12 1/4-inch bit at 2100 hours. The core barrel was then tripped in to 2,496 feet. Coring began at 2330 hours.

B. Ziegler off site, 2230 hours.

Contractor cored the depth interval of 2,496 to 2,506 feet from 2330 to 0530 hours. Contractor spent the remainder of the night shift tripping the core barrel to the surface.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 23, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,496 ft
End 2,496 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,496 ft
End 2,570 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote on site 0700 hours and observed removal of core (interval: 2,496 to 2,506 feet). Core was broken in several pieces and was not acceptable. Contractor tripped core barrel in to retrieve core from 2,506 to 2,516 feet.

D. VanNote off site 0730 hours.

B. Ziegler on site at 1200 hours.

B. Ziegler observed removal of core from 2,506 to 2,519 feet (100% recovery), 1500 hours. Core had three sections over 8 inches that could be used in laboratory analysis, core accepted.

Heavy rains began, 1700 hours.

B. Ziegler off site at 1830 hours. Rains stop.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.TO.30 Date August 24, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Description of Operations: D. VanNote on site, 0800 hours.
Contractor continued drilling pilot hole through day shift.

Weather: Clear

Deviation surveys were conducted as follows:

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Date	Depth (ft)	Deviation (min)
08/24/90	2,510	15.00
08/24/90	2,580	7.50

Depth:
Start 2,570 ft
End 2,620 ft
Bit Size 12 1/4in

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Formation
Samples
Collected Yes

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,527	39,000	26°	19,994
2,557	40,000	26°	16,662
2,587	40,500	26°	19,161
2,617	42,500	26°	19,327

Night Shift
7:00 pm to 7:00 am

D. VanNote off site, 1715 hours.

Weather: Clear

Contractor began coring at 2,620 feet, 2145 hours.

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

D. VanNote returned to site at 0630 hours and observed removal of core from 2,620 to 2,633 feet. Contractor retrieved three 6- to 8-inch sections that could be used in laboratory analysis. Core was accepted.

D. VanNote off site, 0715 hours.

Depth:
Start 2,620 ft
End 2,620 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 25, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. 1W-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,620 ft
End 2,690 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,690 ft
End 2,743 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Description of Operations: B. Ziegler on site, 1200 hours.
Contractor continued drilling pilot hole through day shift.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/25/90	2,640	15.00

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,648	43,000	26	16,662
2,678	41,000	26	17,328
2,708	42,000	26	17,328
2,738	42,000	26	17,328

Geophysical logging was tentatively schedule for 1200 hours tomorrow.

B. Ziegler off site, 1630 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 26, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,743 ft
End 2,810 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,810 ft
End 2,810 ft
Bit Size 12 1/4in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site, 1400 hours. Contractor completed pilot hole to 2,810 feet, 1545 hours. Bit was tripped out and borehole was prepared for geophysical logging, 1900 hours. Schlumberger and CH2M HILL logging personnel arrive site 2130 hours. CH2M HILL logger off site 2230 hours. Contractor requested that CH2M HILL logger return to site at 0600 hours after Schlumberger completed logging.

Schlumberger began logging 1030 hours. B. Ziegler off site 2330 hours. Logger encountered bridge at 2,000 feet. Schlumberger removed logging equipment and was off site 0100 hours.

No further work was performed through the end of the shift.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/26/90	2,700	7.50
08/26/90	2,760	15.00

Water samples were taken from the reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,768	42,000	26	18,827
2,798	42,000	26	19,661
2,810	43,000	26	20,327

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 27, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,810 ft
End 2,810 ft
Bit Size 12 1/4in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,810 ft
End 2,810 ft
Bit Size 12 1/4in

Formation
Samples
Collected No

Description of Operations: B. Ziegler spoke with K. Greuel at 0830 hours, Contractor tripped pilot bit assembly in hole to clear bridge and tentatively scheduled geophysical logging (CH2M HILL) for 1500 hours.

B. Ziegler on site, 1130 hours. Pilot bit assembly reached bottom of borehole (2,810 feet) without difficulty. Began tripping out 1200 hours.

B. Ziegler received phone call from Greg Rawl/SFWMD, 1430 hours. G. Rawl stated that the District would not be able to approve the withdrawal of water from the L-30 canal with letter agreement and that a general-use permit would have to be prepared. He stated that he did not see this as an emergency issue and that the District would process the permit as efficiently as possible once received, estimated turn around was October 11, 1990. B. Ziegler stated that he would follow up on the issue and be in touch.

C. DiGiacomo arrived on site at 1500 hours and prepared to log IW-2 from 1,890 to 2,810 feet. Geophysical logging (Temperature, Gamma Ray, Fluid Resistivity, and Electric logs) began 1530 hours and was completed without difficulty at 1830 hours. Logging equipment and B. Ziegler off site 1900 hours.

Contractor waited on Schlumberger to arrive until 2245 hours. D. VanNote on site 2330 hours. Schlumberger began logging (Dual-Induction, Sonic, and Dipmeter logs) at 2345 hours. Logging was completed without difficulties at 0530 hours. Logging equipment off site 0600 hours.

No further activities were performed through remainder of shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date August 28, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Rain

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 1,890 ft
End 1,915 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site at 0800 hours.
Contractor spent the day shift rigging up for drilling with the
32 1/2-inch reamer assembly.

Contractor began tripping in 32 1/2-inch bit at 0215 hours.
Reamer assembly on bottom 0500 hours. The remainder of the shift
was spent reaming the pilot hole.

B. Ziegler remained on site.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 29, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,915 ft
End 1,950 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,950 ft
End 1,963 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler remained on site through shift change. Contractor continued to install 6-inch casing on the monitor well.

T. McCormick on site 0800 hours. D. VanNote on site 0830 hours.

Cores obtained during pilot hole drilling were reviewed for laboratory analysis. Several sections of core were identified and marked accordingly for analysis.

T. McCormick off site 1000 hours.

B. Ziegler off site 1500 hours. D. VanNote off site 1745 hours.

The remainder of the day shift and night shift were spent reaming the pilot hole. A total depth of 1,963 feet had been reached at the end of this report.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 30, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 1,963 ft
End 1,999 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 1,999 ft
End 2,019 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler onsite at 1030 hours.
Contractor reaming 32- 1/2" borehole at 1,983 feet, 1030 hours.
B. Ziegler offsite 1245 hours. B. Ziegler onsite at 1736 hours to pump stage No. 3 on monitor well 6-inch casing.
B. Ziegler offsite at 2015 hours.
Contractor continued to ream pilot hole through end of shift. A total depth of 2,019 feet had been reached at the end of the shift.

Recorded By: B.Ziegler

DAILY SHIFT REPORT

//////////
 CH2M HILL
 //////////

Project No. SEF24770.T0.30 Date August 31, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Hot

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,019 ft
 End 2,038 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Hot

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,038 ft
 End 2,068 ft
 Bit Size 32-1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler onsite 0800 hours.
 E. Pomar onsite at 1030 hours. Contractor reaming 32-1/2-inch borehole at 2,022 feet.

Contractor reaming 2,038 feet at 1930 hours.

B. Ziegler offsite 1200 hours.

A deviation survey was conducted as follows:

Date	Depth (ft.)	Deviation (min.)
08/31/90	2,040	15.00

E. Pomar offsite 1700 hours. Returned to site 1900 hours.

Contractor continued through remainder of shift.

E. Pomar offsite at 2330 hours.

Reaming continued through remainder of shift.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 1, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Description of Operations: E. Pomar onsite at 0600 hours to tag cement on monitor well.

Weather: Clear

Contractor reaming at 2,070 feet, 0600 hours.

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

A deviation survey was conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
09/01/90	2,040	15.00

E. Pomar offsite at 1430 hours.

Depth:
Start 2,068 ft
End 2,089 ft
Bit Size 32-1/2 in

Contractor continued to ream pilot hole through remainder of day shift and night shift.

Formation Samples Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Hot

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,089 ft
End 2,101 ft
Bit Size 32-1/2 in

Formation Samples Collected No

Recorded By: B.Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 2, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 2,101 ft
End 2,103 ft
Bit Size 32 1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Hot

- Activity:
- Drilling.....
 - Reaming..... X
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 2,103 ft
End 2,128 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Description of Operations: E. Pomar onsite at 0815 hours.
Contractor dropped air line at 0900 hours. Began tripping out to retrieve air line.

Air line retrieved; resumed drilling at 2100 hours.

A deviation survey was conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
09/02/90	2,100	15.00

E. Pomar offsite at 1500 hours. Reaming continued through remainder of shift report.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 3, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming..... X
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 2,128 ft
End 2,161 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming..... X
Running Casing...
Cementing.....
Testing..... X
Waiting.....
Other.....

Depth:
Start 2,161 ft
End 2,197 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Description of Operations: E. Pomar onsite at 1045 hours.
Contractor reaming 32-1/2-inch hole at 2,132 feet.

Site operating at skeleton crew (Labor Day).

A deviation survey was conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
09/03/90	2,160	15.00

E. Pomar off-site at 1600 hours.

Reaming continued through remainder of shift report.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 4, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 2,197 ft
End 2,221 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 2,221 ft
End 2,287 ft
Bit Size 32-1/2 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler and T. McCormick onsite at 1300 hours. E. Pomar onsite at 1345 hours to observe pressure test on final casing string of the monitor well.

See Daily Shift Report for Monitor Well. Representatives from FDER onsite.

A deviation survey was conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
09/03/90	2,220	15.00

Contractor reaming through most of first and second shift.

T. McCormick offsite at 1600 hours. B. Ziegler offsite at 1900 hours. E. Pomar offsite at 1800 hours.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 5, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Description of Operations: E. Pomar onsite at 0830 hours.
Deviation surveys were conducted as follows:

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Date	Depth (ft.)	Deviation (min.)
09/05/90	2,280	15.00
09/05/90	2,340	7.50
09/05/90	2,400	15.00

Contractor reaming through most of first and second shift.
During first shift, contractor picked up and circulated pipe clean to repair flow line from kelly.

Depth:
Start 2,287 ft
End 2,411 ft
Bit Size 32-1/2 in

Depth for IW-2 were as follows:
• 2,307 ft. at 1030 hours
• 2,312 ft. at 1133 hours

Formation Samples Collected No

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Night Shift
7:00 pm to 7:00 am

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chloride (mg/l)
SMW-1	1,200	24	98
SMW-3	400	26	85
SMW-6	1,000	25	60
SMW-8	960	26	92

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

E. Pomar offsite at 1630 hours.

Depth:
Start 2,411 ft
End 2,539 ft
Bit Size 32-1/2 in

Formation Samples Collected No

Recorded By: E. Pomar

DAILY SHIFT REPORT

//////////
 CH2M HILL
 //////////

Project No. SEF24770.T0.30 Date September 6, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,539 ft
 End 2,613 ft
 Bit Size 32 1/2 in

Formation
 Samples
 Collected No

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 2,613 ft
 End 2,634 ft
 Bit Size 32 1/2 in

Formation
 Samples
 Collected No

Description of Operations: B. Ziegler on site at 0830 hours.
 E. Pomar on site at 0900 hours.

B. Ziegler reviewed compaction data for surge control footers. Compaction data submitted exceeded minimum requirements and was accepted. Footers on surge tank were inspected and pictures were taken.

A deviation survey was conducted as follows:

Date	Depth (ft)	Deviation (min)
09/06/90	2,580	7.50

Contractor begins placement of concrete footers for surge tank, 1130 hours. Pour completed at 1230 hours.

E. Pomar off site at 1530.
 B. Ziegler off site at 1900.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 7, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming..... X
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:

Start 2,634 ft
End 2,655 ft
Bit Size 32 1/2 in

Formation

Samples
Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start 2,655 ft
End 2,655 ft
Bit Size 32 1/2 in

Formation

Samples
Collected No

Description of Operations: B. Ziegler on site at 1300 hours.

Contractor prepared surge tank supports for pouring. Contractor began placement of concrete at 1322 hours, Goldcoast Testing Labs pulled cylinders for testing. Pour complete at 1400.

P. Highsmith from FDER called at 1415 hours stated that final casing set of 2640-2650 feet had been approved, should receive Fax before end of day. Received Fax at 1430 hours.

C. DiGiacomo on site at 1600 to begin running caliper on MW.

B. Ziegler off-site at 1740 hours.

A deviation survey was conducted as follows:

Date	Depth (ft.)	Deviation (min.)
09/06/90	2,580	7.50

Contractor reamed T.D. (2,655 feet) with 32-1/2-inch reamer at 1825 hours.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 8, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing..... X
Testing.....
Waiting..... X
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing..... X
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site at 1015 hours.
E. Pomar on site at 1020 hours. Contractor tagged bottom of
32-1/2-inch borehole at 2,673 feet. Approximately 18 feet of
pilot hole remained open during reaming.

Contractor attempted to pump cement for bridge plug, 1030 hours.
Tremie line was plugged. Tremie was pulled at 1100 hours and
plug was removed.

At 1115 hours Contractor started pumping cement for bridge plug.
After flushing tremie line with 65 barrels of fresh water,
2.4 sacks (5 barrels) of neat cement were pumped. Cement was
then flushed with 11 barrels of water. Contractor then pulled a
total of 150 feet of tremie was pulled. Tremie line was then
completely flushed with 10 barrels of water. Cementing of bridge
plug was completed at 1210 hours.

Contractor tagged bridge plug at 2,651 feet, 1640 hours.
Contractor then pulled tremie in preparation for logging
(caliper).

At 1911 hours C. DiGiacomo on site to run caliper log on
32-1/2-inch borehole. 2000 hours, C. DiGiacomo begins running
caliper log.

E. Pomar off site at 2200 hours.

Caliper tool not functioning properly, logger off site 2230.

B. Ziegler informs contractor to contact Schlumberger to perform
caliper on 32-1/2-inch borehole.

Contractor tentatively scheduled to perform logging at
0700 hours.

B. Ziegler off site at 2400 hours.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date September 9, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site at 0800 hours.

Schlumberger Well Services arrived on site 0830 hours and began geophysical logging (caliper of 32 1/2-inch reamed hole). Logging complete 1000 hours.

Contractor begins running 24-inch casing at 1130 hours. Welders on site: Terry Hill and Arly Thompson.

E. Pomar on site at 1200 hours.

B. Ziegler off site 1300 hours.

Contractor stopped running casing at 1155 hours. A total of 1,815 feet of casing had been installed. Weight indicator 219,000 pounds.

E. Pomar off site at 1245 hours.

Recorded By: E.Pomar

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date September 10, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing... X
 - Cementing.....X
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation

Samples

Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start _____ ft

End _____ ft

Bit Size 32 1/2 in

Formation

Samples

Collected No

Description of Operations: B. Ziegler on site at 0700 hours.
Contractor begins running 24-inch casing on IW-2, started with joint No. 46. Contractor begins demobilizing monitor well rig.
Contractor setting up to pump cement tentatively scheduled for 1700 hours.
Installation of 24-inch casing complete to 2,645 feet below land surface, 1230 hours. B. Ziegler off site at 1300 hours.
T. McCormick, B. Ziegler and E. Pomar on site at 1600 hours.
B. Ziegler off site at 1645 and T. McCormick off site at 1700 hours.
P. Highsmith and Ed Rahrig from FDER visited the site for approximately 30 minutes.
B. Ziegler on site 1830 hours. Cement volume and header pressure was reviewed with J. Brantley, K. Greuel, T. Nolan and T. McCormick. It was agreed upon that 115 barrels of 4% bentonite cement and 115 barrels of neat cement will be pumped.
Pressure grouting of the 24-inch casing began at 1836 hours. Cementing was started by pumping 11 barrels of fresh water to load the casing. Dowell then pumped 425 sacks (115 barrels) of 4 percent followed by 547 sacks (115 barrels) of neat cement. Header pressure rose to 21 psi after pumping the 4% cement and to 79 psi after pumping neat. Tremie line was partially displaced with water, and pulled 61 feet above theoretical fill.
B. Ziegler off site at 2015 and E. Pomar at 2040 hours.
Remainder of shift was spent waiting on cement to set and monitoring header pressure.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date September 11, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing..... X
Waiting.....
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting..... X
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: E. Pomar on site at 0750 hours.
C. DiGiacomo on-site at 0806 hours to run temperature log on IW-2 pressure grout of 24-inch casing. At 0858 finished running temperature log. Top of cement estimated at approximately 2,375 - 2,400 feet.

Dick Tuttle from Palm Beach County visited the site at 1030 hours for approximately 30 minutes. Construction progress was reviewed.

B. Ziegler on site at 1300 hours. Reviewed steel placement in surge tank pad. Forms were removed from tank support walls, honeycombing occurred on face of walls, contractor will dress up walls with Portland tomorrow.

Contractor began placing surge tank pad at 1400 hours. Goldcoast testing pulled cylinders for testing from first truck.

E. Pomar offsite at 1800 hours. B. Ziegler off site at 1830 hours.

B. Ziegler on site at 2000 hours.

Tagged stage 1 at 2,341 feet South tremie and 2,336 feet North.

The second stage of cementing began at 2100 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 99 psi for additional safety. Dowell began by pumping 15 barrels of fresh water to clear the tremie lines. Dowell then pumped 368 sacks (100 barrels) of 4% bentonite cement. The cement was followed by flushing 9 barrels of fresh water on the South tremie and 8 barrels on the North tremie line. Following this flushing, 240 feet of tremie line was pulled from both sides. Both tremie lines were then completely flushed with 8 barrels of water each. Grouting was completed at 2200 hours.

B. Ziegler off site at 2330 hours.

Remainder of shift was spent waiting on cement to set and monitoring header pressure.

Recorded By: E. Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 12, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting.....
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing..... X
Testing.....
Waiting..... X
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site at 0800 hours. Contractor tagged second stage of cement on IW-2 (24-inch casing) at 2,193 feet north and 2,196 feet south.

The third stage of cementing began at 0912 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 98 psi for additional safety. Dowell began by pumping 15 barrels of fresh water to clear the tremie lines. Dowell then pumped 368 sacks (100 barrels) of 4% bentonite cement. The cement was followed by flushing 8.5 barrels of water down the north tremie and 7 barrels down the south tremie line. Following this flushing, 240 feet of tremie line was pulled from both sides. Both tremie lines were then completely flushed with 8 barrels of water each. Grouting was completed at 1042 hours.

B. Ziegler off site at 1100 hours, returned at 1200 hours.
B. Ziegler off site at 1400 hours.

E. Pomar on site at 1500 hours.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhös/cm)	Temperature (C)	Chloride (mg/l)
SMW-1	1,200	23	95
SMW-3	800	25	96
SMW-6	900	25	63
SMW-8	875	25	89

Contractor tagged the third stage cement at 2,108 feet on the south tremie and 2,112 feet on the north, 1845 hours.

The fourth stage of cementing began at 1900 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell began by pumping 15 barrels of fresh water to clear the tremie lines. Dowell then pumped 277 sacks (75 barrels) of 4% bentonite cement. The cement was followed by flushing 8.5 barrels of water down the north tremie and 8 barrels down the south tremie line. Following this flushing, 240 feet of tremie line was pulled from both sides. Both tremie lines were then completely flushed with 8 barrels of water each. Grouting was completed at 1950 hours.

E. Pomar offsite at 2100 hours.

Remainder of the shift was spent waiting on cement to set and monitoring header pressure.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 13, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting.....
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing..... X
Testing.....
Waiting..... X
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site at 0730 hours. Contractor tagged cement from stage 4 on 24-inch casing at 2,040 feet North and 2,042 feet South.

The fifth stage of cementing began at 0738 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell began by pumping 20 barrels of fresh water to clear the tremie lines. Dowell then pumped 185 sacks (50 barrels) of 4% bentonite cement. The cement was followed by 6.5 barrels of fresh water down the North tremie and 7.5 barrels down the South tremie line. Following this flushing, 240 feet of tremie line were pulled from both sides. Both tremie lines were then completely flushed with 7 barrels of water each. Grouting was completed at 0829 hours.

Dr. J. I. Garcia-Bengochea and T. McCormick on-site at 1130 hours. Progress on the project was discussed. Dr. Garcia-Bengochea, T. McCormick, B. Ziegler and E. Pomar off-site at 1200 hours.

B. Ziegler and E. Pomar on-site at 1300 hours.
B. Ziegler off-site at 1415 and E. Pomar at 1440 hours.
E. Pomar on-site at 1730 hours.

At 1827 Contractor tagged stage 5 on 24-inch casing at 2,010 feet South and 2,012 feet North.

Cement truck broken down in transit. Reached the site at 1950 hours.

The sixth stage of cementing began at 2012 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell began by pumping 15 barrels of fresh water to clear the tremie lines. Dowell then pumped 185 sacks (50 barrels) of 4% bentonite cement. The cement was followed by 8.0 barrels of fresh water down the North tremie and 7.5 barrels down the South tremie line. Following this flushing, 330 feet of tremie line were pulled from both sides. Both tremie lines were then completely flushed with 7 barrels of water each. Grouting was completed at 2103 hours.

E. Pomar off-site at 2130 hours.

Recorded By: E. Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date September 14 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....X
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing..... X
 - Testing.....
 - Waiting..... X
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: E. Pomar on site at 0750 hours.
Contractor tagged stage 6 on 24-inch casing at 1,976 feet North
and 1,976 feet South.

The seventh stage of cementing began at 0822 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell began by pumping 15 barrels of fresh water to clear the tremie lines. Dowell then pumped 368 sacks (100 barrels) of 4% bentonite cement. The cement was followed by 7.5 barrels of fresh water down the North tremie and 7 barrels down the South tremie line. Following this flushing, 360 feet of tremie line were pulled from both sides. Both tremie lines were then completely flushed with 7 barrels of fresh water each. Grouting was completed at 0918 hours.

At 1810 Contractor tagged stage 7 on 24-inch casing at 1,901 feet South and 1,900 feet North.

The eighth stage of cementing began at 1834 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell began by pumping 10 barrels of fresh water to clear the tremie lines. Dowell then pumped 358 sacks (100 barrels) of 4% bentonite cement. Circulation at the surface was observed during pump. The cement was followed by 7.0 barrels of fresh water down the North tremie and 6.0 barrels down the South tremie line. Following this flushing, 360 feet of tremie line were pulled from both sides. Both tremie lines were then completely flushed with 6 barrels of fresh water each. Grouting was completed at 1929 hours.

E. Pomar off-site at 2000 hours.

Recorded By: E. Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 15 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting..... X
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting..... X
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: E. Pomar on site at 0740 hours.
Contractor tagged stage 8 on 24-inch casing at 1,791 feet North and 1,791 feet South.

The ninth stage of cementing began at 0816 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell began by pumping 10.5 barrels of fresh water to clear the tremie lines. Dowell then pumped 823 sacks (223 barrels) of 4% bentonite cement. Circulation at the surface was observed. The cement was followed by 5 barrels of fresh water down the North tremie and 5 barrels down the South tremie line. Following this flushing, 600 feet of tremie line were pulled from both sides. Both tremie lines were then completely flushed with 5 barrels of fresh water each. Grouting was completed at 1011 hours.

E. Pomar off-site at 1100 hours.

No cementing occurred during the evening shift.

Recorded By: E. Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 16, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Description of Operations: E. Pomar on site at 0730 hours.
Contractor tagged stage 9 on 24-inch casing at 1,473 feet North and 1,473 feet South.

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting..... X
Other.....

The tenth stage of cementing began at 0810 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell began by pumping 10 barrels of fresh water to clear the tremie lines. Dowell then pumped 823 sacks (223 barrels) of 4% bentonite cement. Circulation was observed. The cement was followed by 4 barrels of fresh water down the North tremie and 3 barrels down the South tremie line. Following this flushing, 600 feet of tremie line were pulled from both sides. Both tremie lines were then completely flushed with 5 barrels of fresh water each. Grouting was completed at 1015 hours.

Depth:
Start NA ft
End NA ft
Bit Size in

E. Pomar off-site at 1115 hours.

Formation
Samples
Collected No

Contractor tagged stage 10 on 24-inch casing at 896 feet North and 895 feet South, 1700 hours.

Night Shift
7:00 pm to 7:00 am

The eleventh stage of cementing began at 1805 hours. Two tremie lines were placed 180 degrees apart. Casing was pressurized to 100 psi for additional safety. Dowell began by pumping 12 barrels of fresh water to clear the tremie lines. Dowell then pumped 823 sacks (223 barrels) of 4% bentonite cement. Circulation was observed. The cement was followed by 2 barrels of fresh water down the North tremie and 2.5 barrels down the South tremie line. Following this flushing, 600 feet of tremie line were pulled from both sides. Both tremie lines were then completely flushed with 3 barrels of water each. Grouting was completed at 2012 hours.

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing..... X
Testing.....
Waiting..... X
Other.....

The remainder of the evening shift was spent waiting for cement to set and monitoring header pressure.

Depth:
Start NA ft
End NA ft
Bit Size in

Formation
Samples
Collected No

Recorded By: E. Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 17, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting..... X
Other.....

Depth:
Start NA ft
End NA ft
Bit Size _____ in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting..... X
Other.....

Depth:
Start NA ft
End NA ft
Bit Size _____ in

Formation
Samples
Collected No

Description of Operations: E. Pomar on site at 0730 hours.
Contractor tagged stage II on 24-inch casing at 445 feet North
and 446 feet South.

The twelfth stage of cementing began at 0810 hours. Two tremie
lines were placed 180 degrees apart. Casing was pressurized to
100 psi for additional safety. Dowell began by pumping 10 barrels
of fresh water to clear the tremie lines. Dowell then pumped 835
sacks (226 barrels) of 4% bentonite cement. Both tremie lines
were entirely pulled out. The final stage of grouting was
completed at 0950 hours. Cement was observed to have reached the
surface.

B. Ziegler on-site at 1000 hours.

FDER notified of last cementing stage being complete, pressure
test tentatively scheduled for 1000 hours on Wednesday,
September 19th.

E. Pomar off-site at 1600 hours.

The remainder of the evening shift was spent waiting for cement
to set and monitoring header pressure.

Recorded By: E. Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 18, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site at 0800 hours.
Contractor continues to demobilize equipment from the monitor well pad. Block retaining walls were removed from the perimeter of the pad. Curb will be constructed at the completion of the project.
Flushing of IW-1 continues in preparation of TV survey. FDER notified that the TV survey would be performed by Schlumberger and was tentatively scheduled for tomorrow.
Contractor removed 24-inch header assembly and tripped 22 1/2-inch bit to 2,340-feet, 1230 hours. Circulation of the 24-inch casing was begun in preparation for the pressure test tentatively scheduled for September 20, 1990, at 0900 hours. Water retained in the mud tanks used for closed circulation drilling was used for circulating the casing.
B. Ziegler off site at 1700 hours.
The remainder of the day shift and night shift were spent circulating the casing.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 19, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site at 1320 hours.

Circulation of the 24-inch casing in preparation for the pressure test continued through the day shift and into the night shift.

Contractor continued preparing the General Water Use Permit Application for withdrawal of water from the L-30 canal for the injection tests.

T. McCormick on site 1440 to review construction progress. Off site 1530 hours.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,100	24	95
SMW-3	750	25	90
SMW-6	875	25	65
SMW-8	850	25	85

B. Ziegler off site at 2230 hours. TV survey on IW-1 complete.

Contractor stopped circulation of the 24-inch casing at 0100 hours and welded the header in place for the pressure test through the remainder of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date September 20, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing..... X
 - Waiting.....
 - Other..... X

Depth:
Start NA ft
End 22-1/2 ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 2,655 ft
End 2,663 ft
Bit Size 22-1/2 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler onsite at 8000 hours. The Contractor had completed preparation of the 24-inch casing and header assembly for the pressure test. A preliminary pressure test was performed from 0810 hours to 0910 hours. Casing lost 4 psi of pressure.

Bowo Okome/FDER arrived site at 0920 hours to observe pressure test.

The 24-inch casing pressure test began at 0924 hours. Pressure in the casing was built up to 154 psi and bled back to 150 psi. The test was successfully completed at 1045 hours. Total decrease in pressure through test was 4 psi (3 percent). Contractor bled pressure from casing (approximately 30 gallons of water) and began removing the header in preparation to drill remainder of borehole to 3,300 feet.

B. Okome/FDER offsite 1045 hours.

B. Ziegler offsite 1240 hours.

Contractor began drilling the cement plug at the base of the 24-inch casing, 1945 hours. Cement was tagged at 2,610 feet. Remainder of shift was spent drilling 22-1/2-inch borehole. A total depth of 2,663 feet had been reached at the end of the shift. Contractor began collecting formation samples, water quality samples, and deviation surveys as specified.

Recorded By: B. Ziegler

//////////
CH2M HILL
//////////

PBC SRWWTP DIW's
SEF24770.T0
PAGE 1 OF 2

DATE: SEPTEMBER 20, 1990

HEADER PRESSURE DURING TESTING
IW-2 (24-INCH CASING)

<u>TIME</u> (hours)	<u>TOTAL</u> <u>MINUTES</u>	<u>HEADER PRESSURE</u> (psi)	<u>COMMENTS</u>
0924	0	0.00	BEGIN PRESSURIZING 24-INCH CASING
0934	0	154.00	CASING PRESSURIZED TO 154 PSI, PRESSURE BLED BACK TO 150 PSI
0935	0	150.00	BEGIN PRESSURE TEST
0940	5	149.50	
0945	10	149.00	
0950	15	149.00	
0955	20	148.50	
1000	25	148.00	
1005	30	148.00	
1010	35	147.50	
1015	40	147.00	
1020	45	147.00	
1025	50	146.50	
1030	55	146.00	
1035	60	146.00	TEST SUCCESSFULLY COMPLETED

OBSERVERS B. OKOME/FFDER
B. ZIEGLER/CH2M HILL
K. GREUEL/YBWD

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 21, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. 1W-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,663 ft
End 2,747 ft
Bit Size 22-1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,747 ft
End 2,846 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

Drilling of the 22-1/2-inch borehole continued through the shift.

Deviation surveys were collected as follows:

<u>Date</u>	<u>Depth (feet)</u>	<u>Deviation (min)</u>
9/21/90	2,700	7.50
9/22/90	2,760	15.00
9/22/90	2,820	7.50

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

<u>Depth (feet)</u>	<u>Conductivity (umhos/cm)</u>	<u>Temperature (C)</u>	<u>Chlorides (mg/l)</u>
2,829	37,000	25	13,995

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 22, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 2,846 ft
End 2,909 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

Drilling of the 22-1/2-inch borehole continued through the shift.

Deviation surveys were collected as follows:

Date	Depth (feet)	Deviation (min)
9/22/90	2,880	15.00

Water samples taken from reverse-air drilling were collected at 30 feet intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,859	38,000	25	15,495
2,889	39,000	25	15,764
2,919	40,000	25	16,894

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 2,909 ft
End 2,934 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date September 23, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,934 ft
End 2,980 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 2,980 ft
End 3,007 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations: B. Ziegler arrived onsite at 1530 hours.

Drilling of the 22-1/2-inch borehole continued through the shift.

Deviation surveys were collected as follows:

Date	Depth (feet)	Deviation (min)
9/23/90	2,940	7.50

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
2,949	42,000	25	17,994
2,979	46,000	25	20,092

B. Ziegler offsite at 1830 hours.

Remainder of shift was spent drilling the 22-1/2-inch borehole. A total depth of 3,007 feet had been reached at the end of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 24, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,007 ft
End 3,022 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,022 ft
End 3,037 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations: B. Ziegler arrived onsite at 1130 hours.

Drilling of the 22-1/2-inch borehole continued through the shift.

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,009	50,000+	25	20,092

B. Ziegler offsite at 1640 hours.

Remainder of shift was spent drilling the 22-1/2-inch borehole. A total depth of 3,037 feet had been reached at the end of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date September 25, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,037 ft
End 3,059 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,059 ft
End 3,069 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (feet)</u>	<u>Deviation (min)</u>
9/25/90	3,000	15.00

Drilling of the 22-1/2 inch borehole continued through the shift.

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

<u>Depth (feet)</u>	<u>Conductivity (umhos/cm)</u>	<u>Temperature (C)</u>	<u>Chlorides (mg/l)</u>
3,039	50,000+	25	20,246

Remainder of shift was spent drilling the 22-1/2 inch borehole. A total depth of 3,069-feet had been reached at the end of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 26, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,069 ft
End 3,081 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,081 ft
End 3,099 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

Drilling of the 22-1/2-inch borehole continued through the shift.
Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,039	50,000+	25	20,246
3,069	50,000+	25	20,444

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,100	24	90
SMW-3	820	25	94
SMW-6	880	25	68
SMW-8	875	25	84

Remainder of shift was spent drilling the 22-1/2-inch borehole. A total depth of 3,099 feet had been reached at the end of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date September 27, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. LW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,099 ft
 End 3,104 ft
 Bit Size 22-1/2 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
 Start 3,104 ft
 End 3,122 ft
 Bit Size 22-1/2 in

Formation
 Samples
 Collected Yes

Description of Operations: B. Ziegler arrived site 1400 hours.
 Drilling of the 22-1/2 inch borehole continued through the shift.

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,099	49,000	25	19,894
3,092	49,000	25	20,193

B. Ziegler off site 1700 hours.

Remainder of shift was spent drilling the 22-1/2 inch borehole. A total depth of 3,122 feet had been reached at the end of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 28, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 3,122 ft
End 3,122 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 3,122 ft
End 3,130 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

Penetration rate with the 22-1/2 reamer assembly has been very slow. Contractor concerned that bit may be worn. Crew begins tripping reamer assembly out of hole from 3,122 feet, 0700 hours.

New reamer assembly installed and tripped to bottom of hole, 3,122 feet. Began drilling new hole at 2400 hours.

Water samples taken from reverse-air drilling were collected at 30 feet intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,122	48,000	25	20,293

Remainder of shift was spent drilling the 22-1/2 inch borehole. A total depth of 3,130 feet had been reached at the end of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date September 29, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 3,130 ft
End 3,130 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 3,130 ft
End 3,130 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

Drilling of the 22-1/2 hole continued at a very slow rate.

Weight indicator lost 49,000 pounds at 0745 hours. Contractor began tripping drill pipe from hole. Contractor finished tripping pipe out of hole at 0930 hours. Drill pipe was broken off at the transition collar. Nine drill collars and the reamer assembly remain at the bottom of the hole.

Contractor began fabricating overshot with slips (fishing tool) to retrieve lost drill pipe.

Fishing tool tripped in hole at 0300 hours. Top of transition collar was tagged. Slips were too large and would not hold the transition collar. Tool was tripped out of hole 0400 hours.

Remainder of shift was spent waiting on set of smaller slips to arrive at site.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 30, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 3,130 ft
End 3,130 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 3,130 ft
End 3,130 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

Contractor spent most of shift waiting on new set of slips to retrieve lost drill pipe.

B. Ziegler arrived site 1400 hours. New slips arrived on site 1430 hours.

New fishing assembly was tripped to the top of the transition collar at 1800 hours. B. Ziegler off site, 1800 hours.

Contractor set slips on broken collar at 1900 hours. Collars and reamer assembly were tripped out of hole at 2200 hours.

A new transition collar was installed. Remainder of shift was spent tripping reamer assembly in hole.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date October 1, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start 3,130 ft

End 3,137 ft

Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start 3,137 ft

End 3,151 ft

Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations: Contractor tripped 22-1/2 inch reamer assembly to 3,130 feet and began drilling at 0700 hours.

B. Ziegler arrived on site 1100 hours.

Drilling of the 22-1/2 inch borehole continued through the remainder of the day shift and night shift. B. Ziegler off site 1630 hours. A total depth of 3,151 feet had been reached at the end of the night shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 2, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,151 ft
End 3,163 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,163 ft
End 3,176 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

Drilling of the 22-1/2 inch borehole continued through most of the day shift.

D. VanNote arrived on site at 1130 hours.

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,153	48,000	25	19,894

D. VanNote off site 1715 hours.

Remainder of shift was spent drilling the 22-1/2 inch borehole. A total depth of 3,176 feet had been reached at the end of the night shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date October 3, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,176 ft
End 3,194 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 3,194 ft
End 3,215 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations: B. Ziegler arrived on site 0900 hours. Drilling of the 22-1/2 inch borehole continued through the shift.

B. Zeigler informed J. Brantley that total depth of IW-2 would now be 3,400 feet (100 feet deeper than originally planned) and that the County had approved the modification.

D. VanNote arrived site 1200 hours.

Water samples taken from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,184	50,000+	25	19,994

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,000	24	94
SMW-3	800	24	94
SMW-6	900	24	64
SMW-8	890	24	94

Remainder of shift was spent drilling the 22-1/2 inch borehole. A total depth of 3,099 feet had been reached at the end of the shift.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 4, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Depth:
Start 3,215 ft
End 3,236 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Depth:
Start 3,236 ft
End 3,250 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations: Drilling continued throughout the day and into the night shift. Through the end of the night shift the Contractor reached a depth of 3,250 feet.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (feet)</u>	<u>Deviation (min)</u>
10/4/90	3,180	15.00

Water samples from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

<u>Depth (feet)</u>	<u>Conductivity (umhos/cm)</u>	<u>Temperature (C)</u>	<u>Chlorides (mg/l)</u>
3,214	48,000	26	19,294

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 5, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm
Weather: Clear

Description of Operations: Very hard drilling in dolomite continued throughout the day and into the night shift. Through the end of the night shift the Contractor reached a depth of 3,282 feet.

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Water samples from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,274	47,000	26	19,994

Depth:
Start 3,250 ft
End 3,267 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Depth:
Start 3,267 ft
End 3,282 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 6, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Description of Operations: D. VanNote arrived onsite at 1700 hours. Contractor drilled to 3,282 feet, 1700 hours.

Weather: Clear

Deviation surveys were conducted as follows:

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Date	Depth (feet)	Deviation (min)
10/6/90	3,240	15.00

D. VanNote offsite at 1800 hours.

Very hard drilling in dolomite continued throughout the night shift to a depth of 3,324 feet.

Depth:
Start 3,282 ft
End 3,300 ft
Bit Size 22-1/2 in

Formation Samples Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Depth:
Start 3,300 ft
End 3,324 ft
Bit Size 22-1/2 in

Formation Samples Collected Yes

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 7, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Depth:
Start 3,324 ft
End 3,341 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Depth:
Start 3,341 ft
End 3,361 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote arrived onsite at 1830 hours. Contractor drilled to 3,350 feet, 1845 hours.

Deviation surveys were conducted as follows:

Date	Depth (feet)	Deviation (min)
10/7/90	3,300	15.00

D. VanNote offsite at 2000 hours.

Water samples from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,304	48,000	26	18,238
3,335	48,000	26	17,661

Very hard drilling in dolomite continued throughout the night shift to a depth of 3,361 feet.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 8, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Depth:
Start 3,361 ft
End 3,405 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Depth:
Start 3,405 ft
End 3,420 ft
Bit Size 22-1/2 in

Formation
Samples
Collected Yes

Description of Operations: B. Ziegler arrived onsite at 0945 hours. Contractor continued with drilling of the 22-1/2-inch borehole.

Deviation surveys were conducted as follows:

Date	Depth	Deviation
10/8/90	3,360	15.00

J. Brantley/Contractor indicated that surge tank would arrive today.

Surge tank arrived on site 1200 hours.

B. Ziegler offsite at 1630 hours.

Water samples from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,365	48,000	26	19,661
3,395	50,000+	26	18,661

Contractor continued drilling throughout the night shift to a depth of 3,420 feet.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
 SH2M HILL
 //////////

Project No. SEF24770.T0.30 Date October 9, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Rain

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... \

Depth:
 Start 3,420 ft
 End 3,446 ft
 Bit Size 22-1/2 in

Formation
 Samples
 Collected Yes

Description of Operations: Contractor continued with drilling of the 22-1/2-inch borehole during the day shift and into part of the night shift. Contractor reached TD of 3,450 feet during the night shift at 2030 hours.

Deviation surveys were conducted as follows:

Date	Depth	Deviation
10/9/90	3,420	15.00

Contractor tripped the bottom hole assembly up to 2,645 feet to insure that borehole was open, 2100 hours. Bottom hole assembly hit loose formation at 4,040 feet on the trip up. Bottom hole assembly was tripped back to TD after having reached the casing at 2,645 feet. No difficulty was encountered tripping in. Contractor began circulating at 0430 hours and continued through the end of the shift. There was approximately 6 feet of fill at the bottom prior to starting circulation.

Night Shift
 7:00 pm to 7:00 am

Weather: Rain

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start 3,446 ft
 End 3,450 ft
 Bit Size 22-1/2 in

Formation
 Samples
 Collected Yes

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 10, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Description of Operations: Contractor continued circulation of borehole. D. VanNote and B. Ziegler on site 1400 hours, formation water very clear, well appears to be developed.

Weather: Rain

Primary and secondary groundwater standard samples were collected while contractor continued circulating borehole with reverse air drilling techniques, 1500 hours.

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... \

Water samples from reverse-air drilling were collected at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth:
Start 3,420 ft
End 3,446 ft
Bit Size 22-1/2 in

Depth (feet)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
3,425	50,000+	26	16,661
3,450	50,000+	26	19,162

Formation Samples Collected Yes

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Night Shift
7:00 pm to 7:00 am

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	1,100	24	110
SMW-3	1,100	24	98
SMW-6	900	24	80
SMW-8	800	24	80

Weather: Rain

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 3,446 ft
End 3,450 ft
Bit Size 22-1/2 in

Formation Samples Collected Yes

Recorded By: B. Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date October 11, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected NA

Description of Operations: Contractor tripped 22-1/2 bit assembly out of hole during the last shift. Demobilization of equipment and materials began. Contractor began set up of temporary header to inject fresh water in preparation for the TV survey.

No further work was performed during the day and no night shift was run.

Recorded By: B.Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date October 12, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected NA

Description of Operations: Contractor continued installation of the casing header assembly in preparation of the TV survey.

No further work was performed during the day other than site clean up. No night shift was run.

Recorded By: B.Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 13, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected N/A

Description of Operations: Contractor continued to demobilize equipment and fabricate casing header assembly to inject fresh water for the TV survey.

No further work was performed during the day and no night shift was run.

Recorded By: B.Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 14, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected N/A

Description of Operations: Contractor continued to demobilize equipment. Injection of fresh water began to increase visability in the casing and borehole for the TV survey.

No further work was performed during the day and no night shift was run.

Recorded By: B.Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 15, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation

Samples
Collected NA

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation

Samples
Collected NA

Description of Operations: B. Ziegler arrived on site, 0830 hours. Contractor rigged up Dual-Zone Monitor Well for temporary sampling. Discharge water from both zones of the monitor well will be diverted to the monitor well sump and disposed of to IW-1 with a separate pump.

B. Ziegler offsite at 1100 hours.

The upper and lower monitor zones were purged for 8 hours during the day. Water quality data will be collected on a weekly basis to establish a baseline.

No night shift was run.

Recorded By: B.Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 16, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Description of Operations: B. Ziegler arrived on site, 1100 hours.

B. Ziegler met with J. Chesher/Hazen & Sawyer to discuss project close out and coordination of electrical. Chesher advised that electrical tie-in with general contractor will have to be delayed until early November. Mr. Chesher also asked that injection testing be completed by November 9, 1990, so that there will not be any conflicts with FP&L's work on the ductbank.

P. Feldman and T. McCormick met with the SFWMD to discuss the status of the General Use Permit for withdrawal of water from the L-30 canal for the injection test. SFWMD stated that the permit would be completed tomorrow.

B. Ziegler informed J. Brantley of the District's comments. He will contact them tomorrow regarding completion of the permit.

J. Brantley/Contractor rescheduled TV survey for Friday, October 19, 1990.

T. McCormick arrived on site at 1145 hours to review construction progress. T. McCormick offsite, 1300 hours.

B. Ziegler offsite at 1500 hours.

Recorded By: B.Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date October 17, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected NA

Description of Operations: Contractor continued to demobilize equipment. Injection of fresh water continues in preparation of TV survey.

Both zones on the monitor well will continue to be purged for 8 hours each day to establish a water quality base line.

J. Brantley/Contractor spoke with Pat Martin/LWDD who indicated that the canal bank can not be excavated for injection test. Brantley will set up a meeting with the LWDD inspector to determine other alternatives for installing pumps at the L-30 canal.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	950	26	105
SMW-2	1,000	26	100
SMW-3	950	26	80
SMW-4	850	26	70
SMW-5	1,050	26	160
SMW-6	725	26	65
SMW-7	700	26	65
SMW-8	675	26	60

Recorded By: B.Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 18, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
Samples
Collected NA

Description of Operations: Contractor continued purging the upper and lower zone of the Dual-Zone Monitor Well (MW) 8-hours a day. The Contractor also prepared for the TV Survey on IW-2 scheduled for Friday, October 19, 1990. Water is being injected into IW-2 so as to ensure a clear picture during the TV survey.

Contractor continued mobilizing injection equipment at the L-30 canal bank and began running the 24-inch pipeline from the canal to the injection wells.

Recorded By: B.Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date October 19, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Description of Operations: D. VanNote arrived onsite at 1000 hours. Contractor scheduled video survey at IW-2 for 1030 hours.

Started video survey at 1030 hours. Video tool was advanced into annulus at a rate of approximately 35 feet per minute. At 2,645 feet (base of casing) visibility began to decrease. Picture became very cloudy with zero visibility below 2,645 feet.

Contractor removed video tool and rescheduled survey for tomorrow. Fresh water will continue to be pumped to clear well bore.

B. Ziegler arrived onsite, 1330 hours. B. Ziegler offsite, 1500 hours.

Dual-Zone Monitor Well (MW) was purged from 1000 to 2000 hours.

Contractor continued working on temporary pipeline from L-30 canal to the injection wells.

D. VanNote offsite at 1600 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 20, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
Samples
Collected NA

Description of Operations: D. VanNote arrived onsite at 1000 hours. Contractor started video survey on IW-2 at 1000 hours.

T. McCormick arrived onsite at 1100 hours to discuss performance of the video survey. T. McCormick offsite, 1130 hours.

Video survey indicated very large caverns from a depth interval of 2,941 to 2,975 feet and from 2,984 to 3,045 feet. Vertical and horizontal fractures were encountered from 3,045 to 3,200. Below 3,300 feet the annulus appeared smooth to the total depth of 3,450 feet.

Cavernous zones were rerun at various interval on return pass for additional observation.

The Video survey was completed on 1400 hours.

D. VanNote offsite at 1415 hours.

Contractor continued working on temporary pipeline and injection test equipment.

Recorded By: D. VanNote

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date October 21, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation

Samples

Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation

Samples

Collected NA

Description of Operations: Contractor continued working on temporary pipeline and injection test equipment through the day.

Sampling of the Dual-Zone Monitor Well will commence on Monday, October 22, 1990, and will continue for approximately 2 months. The initial samples will be analyzed for TDS, chlorides, conductivity, fecal coliform, Ph, temperature, TKN, and ammonia. Samples will be analyzed for chlorines, conductivity, Ph, and temperature on a weekly basis after October 22. At the conclusion of the 2-month sampling period, analyses will be performed on the full parameter list.

MW was purged from 0800 to 1800 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 22, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Description of Operations: D. VanNote onsite at 0845 hours.
Contractor continued working on temporary pipeline from L-30 canal to IW-2 during the day.

Water samples were collected from the upper zone and lower zone of the Dual-Zone Monitor Well (MW) for background water quality. The samples were analyzed for TDS, Chlorides, Conductivity, fecal colliform, Ph, Temperature, TKN, and Ammonia.

MW was purged from 0500 to 0800 hours. An excess of three casing volumes were purged from both zones prior to sampling.

D. VanNote offsite at 0930 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

//////////
 CH2M HILL
 //////////

Project No. SEF24770.TO.30 Date October 23, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. IW-2

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected NA

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft
 End NA ft
 Bit Size NA in

Formation
 Samples
 Collected NA

Description of Operations: Contractor continued working on temporary pipeline from L-30 canal. The Contractor tentatively scheduled the injection test for October 29, 1990.

Contractor also continued demobilizing equipment at IW-2.

Purging of the monitor well has been discontinued through the end of injection testing. Contractor is unable to dispose purged water to IW-1 due to the temporary well head setup.

No further activity today.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date October 24, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Description of Operations: Contractor continued working on temporary pipeline from L-30 canal. Artesian head on IW-2 was bled down to ground level in preparation of the injection test. Water was disposed of to IW-1.

Contractor also continued demobilizing equipment at IW-2.

No further activity today.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date November 6, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing..... X
 - Waiting.....
 - Other.....

Depth:

Start N/A

End N/A

Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start N/A

End N/A

Bit Size N/A

Formation
Samples
Collected N/A

Description of Operations: T. McCormick, B. Ziegler, R. Martinez, and D. VanNote arrived onsite at 0630 hours.

Monitoring equipment was set up and tested. An in situ data logger was used to monitor water levels in the lower monitor zone and IW-1. Heise pressure gauges were used to monitor the upper monitor zone and IW-2. IW-1 was under artesian head prior to testing. Delays were encountered with installation of the pressure transducer in IW-1 due to the artesian pressure. A flow meter/totalizer was installed to monitor flow at IW-2.

The injection test commenced at 1200 hours and was completed at 2100 hours. The test was conducted in three steps with pumping rates of approximately 4,500 gpm, 7,800 gpm, and 10,500 gpm for 5 hours, 2 hours, and 2 hours, respectively.

Geophysical logging was conducted during the first step of the injection test. Fluid res., temperature, and flow meter logs were performed.

A shut-in pressure of 266 psi was recorded at IW-2 1 hour after the injection test was terminated. The maximum injection pressure observed was 40.0 psi during the third step of the test. Water level in the canal at the start of the test was 15.92 feet NGVD and did not fluctuate during the test.

T. McCormick, B. Ziegler, R. Martinez, and D. VanNote offsite at 2230 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date November 13, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. IW-2

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing..... X
 - Waiting.....
 - Other.....

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start N/A
End N/A
Bit Size N/A

Formation
Samples
Collected N/A

T. McCormick and G. Rahrig/FDER arrived site at 0800 hours. Well was charged with fresh water during the night. Schumberger Well Services onsite at 0830 hours and set up to perform RTS on IW-2. A brief safety meeting was conducted and sequence of test was reviewed. Testing began at 0900 hours. Background geophysical logs were performed in accordance with the specifications.

A background gamma ray was performed on the complete well. Two static ejections and two dynamic ejections were conducted. The test was successfully completed at 2030 hours. The well was then flushed with approximately 100,000 gallons of canal water to displace any tracer that may have remained in the well.

Recorded By: D. VanNote

DUAL-ZONE MONITOR WELL

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 7, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start 0 ft
 End 100 ft
 Bit Size 30 in

Formation
 Samples
 Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start 100 ft
 End 180 ft
 Bit Size 30 in

Formation
 Samples
 Collected Yes

Description of Operations: D. VanNote arrived on site 0600 hours. E. Pomar on site, 0800 hours.

Contractor began drilling of the dual-zone monitor well with a 28-1/2-inch reamer assembly to 270 feet, 0815 hours.

Tallies were conducted on the 24-inch casing, 1300 hours. Joint no., heat no., depth below land surface and centralizer depths were reviewed with the Contractor. Joint nos. and casing lengths were marked clearly on each casing section.

Contractor drilled to 75 feet, 1700 hours. Contractor anticipated TD to 270 feet late tomorrow afternoon. Contacted C. Digiacombo and tentatively scheduled logging for 1800 hours tomorrow afternoon. Confirmed with T. McCormick that Gamma ray will be the only log that will be run, 1730 hours.

Deviation surveys were conducted as follows:

<u>Date</u>	<u>Depth (ft)</u>	<u>Deviation (min)</u>
08/07/90	60	22.50
08/07/90	120	15.00

E. Pomar off site, 1700 hours. D. VanNote off site, 1845 hours

D. VanNote returned on site, 2400 hours. Contractor drilled to 105 feet, 2415 hours. Contractor drilled to 180 feet through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 8, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 180 ft
End 270 ft
Bit Size 30 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting..... X
Other..... X

Depth:
Start 270 ft
End 270 ft
Bit Size 30 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote arrived on site 0730 hours. E. Pomar on site, 0800 hours. Contractor drilled with 28-1/2-inch reamer assembly to 200 feet, 0800 hours. Contractor encountered harder drilling at 200 feet due to hard sandstone and siltstone formations.

At 1245 hours, D. VanNote left message for Al Mueller\FDER\WPB that drilling of the dual-zone monitor well began Tuesday, August 7, 1990, at 0815 hours.

Contractor replaced burned out shell shaker motor from 1300 to 1530 hours. Contractor drilled to 230 feet, 1545 hours

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/08/90	210	26.25
08/09/90	270	15.00

Contractor reached total depth of 270 feet, 1630 hours. Contractor conducted one wiper run and thinned out mud to 9.3 lbs/gallon before tripping out of hole.

Contractor circulated and reconditioned borehole from 1630 hours to 0130 hours. Contractor tripped out of hole, 0230 hours.

D. VanNote off site, 1900 hours. Returned on site 0200 hours.

C. Digiacomo arrived on site at 0300 hours to conduct geophysical logging. A gamma ray log was performed from 0330 to 0415 hours.

C. Digiacomo off site, 0430 hours.

Contractor began installing the 24-inch casing at 0530 hours. Installation of the casing continued through the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 9, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: Contractor completed installation of the 24-inch casing to 260-feet at 0820 hours.

E. Pomar arrived onsite 0800 hours. B. Ziegler onsite 0830 hours. Met with Cherry Pough\Pump and Equipment and discussed shipment schedule for surge tank due the middle of September and other equipment which is in storage.

Reviewed cement quantities for the pressure grout of the 24-inch casing with J. Brantley\Contractor and T. Nolan\Cement Contractor. The pressure grout began at 1119 hours and was completed at 1206 hours. Dowell flushed tremie lines with fresh water and observed circulation. Mud weight in annulus before pumping was 9.2 lbs/gal. Dowell pumped 63 sacks (17 barrels) of 4% bentonite cement followed by 366 sacks (77 barrels) of neat cement. Final header pressure at conclusion of pumping was 65 psi. The tremie lines were then displaced with fresh water.

The remainder of the shift was spent repairing rig pump and shell shaker apparatus.

B. Ziegler offsite, 1800 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 10, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Description of Operations: E. Pomar onsite, 0800 hours.
D. VanNote arrived onsite 0900 hours.

At 1200 hours, Mr. Bowo Okome/FDER/WPB called and confirmed pressure test schedule at IW-1 for Monday, August 13, 1990, between 1000 and 1200 hours. Mr. Okome also confirmed receiving notification of drilling start-up at the monitor well (MW). D. VanNote faxed memo of conversation to FDER at 1315 hours.

Contractor spent the day and night shift repairing mud pump and shell shaker apparatus.

E. Pomar offsite 1430 hours. D. VanNote offsite, 1725 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date August 11, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Description of Operations: D. VanNote arrived onsite 1220 hours.

Contractor spent the day and night shift doing general maintenance on the drill rig.

Shell shaker was removed from rig during the night shift and will be replaced.

D. VanNote offsite, 1600 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 12, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Description of Operations: D. VanNote arrived onsite 0800 hours.

Weather: Clear

Contractor waiting for delivery of new shell shaker.

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

- No activity -

D. VanNote offsite 2135 hours.

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 13, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 270 ft
End 320 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 320 ft
End 630 ft
Bit Size 12 1/4in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote arrived onsite 0800 hours. Contractor continued repairing shell shaker and prepared for drilling.

Contractor began drilling 12 1/4-inch pilot hole at 1700 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/13/90	330	11.25
08/13/90	390	11.25
08/13/90	454	15.00
08/14/90	517	15.00
08/14/90	578	7.50

D. VanNote offsite, 1730 hours.

Contractor drilled to 630 feet through the end of the night shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date August 14, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 630 ft
End 1,005 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting..... X
Other..... X

Depth:
Start 1,005 ft
End 1,050 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote arrived onsite 0530 hours.
Contractor drilled to 850 feet, 1000 hours.

Contacted C. Digiacommo and scheduled logging for 0000 hours.

D. VanNote offsite 1720 hours.

Contractor drilled 12 1/4-inch pilot hole to a depth of 1,005 feet, 1900 hours. The total depth of 1,050 was reached at 2000 hours. Contractor reconditioned borehole and tripped out rods from 2000 to 2300 hours.

D. VanNote returned onsite, 2315 hours. C. Digiacommo arrived onsite at 0030 hours.

C. Diagiacommo began logging at 0100 hours. Caliper tool would not penetrate below 378 feet, 0130 hours. After repeated efforts to lower Caliper tool past obstruction, Contractor decided to redrill borehole to the total depth of 1,050 feet.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/14/90	640	26.25
08/14/90	700	26.25
08/14/90	760	7.50
08/14/90	820	15.00
08/14/90	883	22.50
08/14/90	945	15.00
08/14/90	1,005	22.50

D. VanNote and C. Digiacommo offsite, 0200 hours.

Contractor spent remainder of the night shift redrilling borehole.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 15, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 1,050 ft
End 1,050 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 1,050 ft
End 1,050 ft
Bit Size 12 1/4 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote arrived onsite 1000 hours. Contractor redrilled 12 1/4-inch pilot hole to a total depth of 1,050 feet, 1100 hours. Contractor circulated and reconditioned borehole and tripped out rods, 1430 hours.

C. Digiacoimo arrived onsite at 1550 hours and conducted logging from 1615 to 1830 hours. C. Digiacoimo and D. VanNote offsite, 1845 hours.

Contractor spent remainder of the night shift rigging up for reaming pilot hole with 22 1/2-inch reamer assembly.

Recorded By: D. VanNote

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date August 16, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 260 ft
End 395 ft
Bit Size 22 1/2 in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 395 ft
End 540 ft
Bit Size 22 1/2 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler on site 1200 hours.
Contractor began reaming 22 1/2-inch borehole, 0800 hours.

Contractor reamed to 380 feet, 1300 hours. B. Ziegler off site, 1330 hours. Returned on site at 1500 hours.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/16/90	330	15.00
08/16/90	390	26.25
08/17/90	454	15.00
08/17/90	517	15.00

Received Fax from P. Highsmith/FDER approving the upper monitor interval from 1,000 feet to 1,050 feet, 1630 hours.

B. Ziegler off site, 1730 hours.

Contractor performed one wiper trip at 2200 hours and continued reaming during the night shift to a depth of 530 feet, 0630 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 17, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Description of Operations: D. VanNote on site 0815 hours.
Contractor reamed to a depth of 600 feet, 0900 hours.

Weather: Clear

Deviation surveys were conducted as follows:

Activity:	Date	Depth (ft)	Deviation (min)
Drilling..... <input type="checkbox"/>			
Reaming..... X			
Running Casing... <input type="checkbox"/>	08/17/90	578	15.00
Cementing..... <input type="checkbox"/>	08/17/90	640	22.50
Testing..... <input type="checkbox"/>	08/18/90	700	22.50
Waiting..... <input type="checkbox"/>	08/18/90	760	22.50
Other..... <input type="checkbox"/>			

D. VanNote off site, 1600 hours.

Depth:
Start 540 ft
End 735 ft
Bit Size 22 1/2 in

Contractor reamed to a depth of 850 feet through the end of the night shift.

Formation Samples Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

Drilling..... <input type="checkbox"/>
Reaming..... X
Running Casing... <input type="checkbox"/>
Cementing..... <input type="checkbox"/>
Testing..... <input type="checkbox"/>
Waiting..... <input type="checkbox"/>
Other..... <input type="checkbox"/>

Depth:
Start 735 ft
End 850 ft
Bit Size 22 1/2 in

Formation Samples Collected No

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 18, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 850 ft
End 1,010 ft
Bit Size 22 1/2 in

Formation

Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 1,010 ft
End 1,010 ft
Bit Size 22 1/2 in

Formation

Samples
Collected No

Description of Operations: D. VanNote on site 1000 hours.
Contractor reamed to a depth of 880 feet, 1030 hours.

Tallies were conducted on the 16-inch casing, 1100 hours. Joint no., heat no., depth below land surface and centralizer depths were reviewed with the Contractor. Joint nos. and casing lengths were clearly marked on each casing section.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/18/90	823	22.50
08/18/90	880	7.50
08/18/90	940	22.50
08/18/90	1,000	15.00

D. VanNote off site, 1330 hours.

Contractor reamed to a total depth of 1,010 feet, 1700 hours. Contractor spent the remainder of the night shift circulating and conditioning borehole to ensure proper installation of 16-inch casing.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date August 19, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,010 ft
End 1,010 ft
Bit Size 22 1/2in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,010 ft
End 1,010 ft
Bit Size 22 1/2in

Formation
Samples
Collected No

Description of Operations: D. VanNote on site 0730 hours.
Contractor tripped rods out of borehole, 0745 hours.

Contractor began installing the 16-inch casing at 1035 hours. A total of 1,000 feet of 16-inch casing was installed, 1650 hours. Casing centralizers were placed as specified.

Cement quantities for the pressure grout of the 16-inch casing were reviewed with J. Brantley\Contractor and T. Nolan\Cement Contractor.

The pressure grout began at 1958 hours and was completed at 2117 hours.

Mud weight in annulus before pumping was 9.0 lbs/gal. Dowell began the pressure grout by flushing this tremmie line with fresh water, circulation was observed at the surface. Dowell then pumped 665 sacks (180 barrels) of 4 percent bentonite cement followed by 262 sacks (55 barrels) of neat cement. The tremmie line was then displaced with water. Final header pressure was 260 psi.

The remainder of the night shift was spent monitoring the header pressure. The temperature log was tentatively scheduled for 0700 hours tomorrow morning.

D. VanNote off site, 2245 hours.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 20, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: D. VanNote on site 0715 hours.
C. Digiacomo arrived on site at 0745 hours. Geophysical logging (temperature log) was conducted from 0815 hours to 0945 hours.

B. Ziegler on site, 0915 hours. D. VanNote and C. Digiacomo off site at 1000 hours.

B. Ziegler off site at 1100 hours. Returned on site, 1300 hours.

B. Ziegler and T. McCormick were informed (in phone conversation) by P. Highsmith/FDER that drilling below 1,000 feet shall not commence until the department has approved the lower monitor zone. P. Highsmith also requested that copies of the laboratory reports for water quality samples collected during packer testing of IW-1 and the depth sample from IW-2 be forwarded to FDER along the hydrogeologic data (transmissivity) obtained during packer testing of IW-1.

B. Ziegler informed K. Greuel\Contractor that drilling crew at the monitor well will go on standby starting tomorrow morning once the crew has completed its preparations for drilling below 1,000 feet.

B. Ziegler off site at 1730 hours.

Contractor spent the remainder of the day and night shift setting up and tripping in to 960 feet (top of cement plug).

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 21, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: B. Zeigler on site 0400 hours to observe boring on IW-2. Contractor stated that crew would have rig ready to drill below 1,000 feet between 0900 hours and 1000 hours. B. Ziegler informed K. Greuel to contact the engineer once he was ready to commence drilling. B. Ziegler off site 0800 hours.

B. Ziegler received phone call from K. Greuel at 0900 hours, ready to drill. B. Ziegler informed contractor that monitor well would have to stand by until lower monitor interval was approved by FDER.

No Further Activity Today

Recorded By: B. Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date August 22, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Description of Operations: Contractor set up equipment for direct discharge to IW-1. No drilling activity. Waiting on approval of lower monitor interval by FDER.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 23, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: D. VanNote on site to observe coring on IW-2. Off site 0730 hours.

B. Ziegler on site 1200 hours. Contractor had installed piping between monitor well and IW-1 for direct discharge during reverse-air drilling and was working on the header assembly. No other work had been performed on the monitor well, waiting on approval from FDER on lower monitor zone.

B. Ziegler receives phone call from P. Highsmith/FDER approving lower monitor interval (1,900 feet to 1,950 feet), 1650 hours. Contractor informed that FDER had approved lower monitor interval and that drilling below 1,000 feet could begin.

Heavy rains began, 1700 hours.

B. Ziegler off site, 1830 hours. Rain stopped.

The night shift was spent conditioning drilling fluids in mud tanks.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 24, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start 1,000 ft
End 1,036 ft
Bit Size 14-3/4 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote on site 0800 hours.
Contractor circulated casing through the day shift to balance
fluid weight in the mud system.

D. VanNote off site 0900 hours. Returned to site 1000 hours.

D. VanNote off site 1715 hours.

Drilling of the 14-3/4-inch borehole began at 0200 hours and
continued through remainder of shift.

Recorded By: D. VanNote

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 25, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,036 ft
End 1,290 ft
Bit Size 14-3/4 in

Formation
Samples
Collected Yes

Description of Operations: D. VanNote on site 0630 hours to observe removal of core on IW-2. Off site 0715 hours.

B. Ziegler on site 1200 hours. Borehole (14-3/4-inch) down to 1,120 feet. Formation waters remained cloudy, direct discharge to IW-1 in use. Waters pumped to IW-1 were screened to prevent cuttings from reaching well.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/25/90	1,060	15.00
08/25/90	1,120	15.00
08/25/90	1,180	15.00
08/25/90	1,240	18.75
08/26/90	1,360	22.50

Water samples were taken from reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,004	6,000	26	1,099
1,033	6,000	25	1,791
1,090	6,000	25	2,150
1,120	6,000	26	2,099
1,150	6,000	26	2,099
1,180	5,500	26	1,900
1,210	5,500	27	2,000
1,243	5,500	26	1,979
1,273	6,500	27	2,000
1,303	5,500	27	1,900

B. Ziegler off site, 1630 hours.

Drilling of the 14-3/4-inch borehole continued through night shift.

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,290 ft
End 1,390 ft
Bit Size 14-3/4 in

Formation
Samples
Collected Yes

Recorded By: B. Ziegler

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date August 26, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 1,390 ft
End 1,610 ft
Bit Size 14-3/4 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 1,610 ft
End 1,690 ft
Bit Size 14-3/4 in

Formation
Samples
Collected Yes

Description of Operations: B. Ziegler on site 1400 hours.
Borehole (14-3/4-inch) down to 1,550 feet. Formation waters remained cloudy, direct discharge to IW-1 in use.

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/26/90	1,360	22.50
08/26/90	1,420	15.00
08/26/90	1,480	15.00
08/26/90	1,540	15.00
08/26/90	1,600	7.50
08/27/90	1,660	15.00

Water samples were taken from reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,333	5,500	27	1,899
1,363	5,500	27	1,910
1,390	6,000	28	2,099
1,420	6,000	28	1,900
1,450	6,000	28	2,050
1,480	6,000	28	2,079
1,512	6,000	29	2,150
1,543	6,000	29	2,150
1,574	6,000	28	2,050
1,610	6,000	29	2,050
1,640	6,000	29	2,050
1,670	6,000	29	2,100

B. Ziegler off site, 2000 hours. Returned 2100 hours for geophysical logging of IW-2.

Drilling of the 14-3/4-inch borehole continued through night shift.

B. Ziegler off site 2300 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date August 27, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 1,690 ft
End 1,784 ft
Bit Size 14-3/4 in

Formation

Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling..... X
- Reaming.....
- Running Casing...
- Cementing.....
- Testing.....
- Waiting.....
- Other.....

Depth:
Start 1,784 ft
End 1,880 ft
Bit Size 14-3/4 in

Formation

Samples
Collected Yes

Description of Operations: B. Ziegler on site 1130 hours. Borehole (14-3/4-inch) down to 1,723 feet. Formation waters remained cloudy, direct discharge to IW-1 in use. Received FAX from FDER approving lower monitor interval (1,900 feet to 1,950 feet).

Deviation surveys were conducted as follows:

Date	Depth (ft)	Deviation (min)
08/27/90	1,720	18.75
08/26/90	1,780	15.00
08/26/90	1,840	22.05
08/26/90	1,900	22.50

Water samples were taken from reverse-air drilling at 30-foot intervals and analyzed for conductivity, temperature, and chlorides. The results are as follows:

Depth (ft)	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
1,701	6,000	29	2,179
1,733	6,500	29	2,349
1,763	6,500	29	2,249
1,794	7,500	29	2,749
1,825	7,500	29	2,449
1,855	10,000	29	3,598
1,885	13,500	29	5,149

B. Ziegler off site, 1630 hours. Returned 1830 hours for geophysical logging of IW-2.

Drilling of the 14-3/4-inch borehole continued through night shift.

B. Ziegler off site 1900 hours. Returned to site 2130 hours for geophysical logging of IW-2. Off site 2200 hours.

D. VanNote on site 0130 hours for geophysical logging of IW-2. Off site 0245 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date August 28, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm
Weather: Clear

Activity:
Drilling..... X
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 1,880 ft
End 1,902 ft
Bit Size 14-3/4 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing... X
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start 1,902 ft
End 1,902 ft
Bit Size 14-3/4 in

Formation
Samples
Collected Yes

Description of Operations: B. Ziegler on site 0800 hours.
Contractor reamed with the 14 3/4-inch bit to 1,885 feet and
encountered very hard drilling.

Plant construction labor union workers held an informational
strike at the front gate. Nobody has been stopped or refused
entry thus far.

Contractor reached TD of 1,902 feet and began circulating.

B. Ziegler off site, 1145 hours. Returned on site at 1245 hours.

Tallies were conducted on the 6-inch casing, 1300 hours. Joint
numbers, mill certificates, heat numbers, depth below land
surface and centralizer depths were reviewed with the Contractor.
Joint numbers and casing lengths were marked clearly on each
casing section.

B. Ziegler off site at 1500 hours. C. Digiacomo arrived on site,
1700 hours.

Contractor stopped circulating and began tripping out bit from
borehole. Heavy rains lasted from 1700 to 1900 hours.

B. Ziegler returned on site at 2030 hours. C. Digiacomo
conducted logging (gamma, LSN, caliper, fluid resistivity, and
temperature) from 2100 to 2345 hours. C. Digiacomo off site,
2400 hours.

Contractor began installation of the 6-inch casing at 0215 hours.
The remainder of the night shift was spent installing the 6-inch
casing to 1,900 feet.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 29, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start 1,902 ft
End 1,902 ft
Bit Size 14-3/4 in

Formation
Samples
Collected No

Description of Operations: B. Ziegler remained on site through shift change. T. McCormick on site 0800 hours. D. VanNote on site 0830 hours.

Installation of the 6-inch casing was completed at 0900 hours to a total depth of 1,900 feet below land surface. Contractor installed tremie line to 1,838 feet within the 6-inch casing and prepared header for pressure grout.

T. McCormick off site 1000 hours.

The surficial monitor wells were sampled for water quality data (temperature, conductivity, and chlorides). Each well was purged with a centrifugal pump until the temperature and conductivity stabilized. The results were as follows:

Well No.	Conductivity (umhos/cm)	Temperature (C)	Chlorides (mg/l)
SMW-1	900	23	110
SMW-3	900	23	95
SMW-6	650	24	76
SMW-8	900	24	89

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other.....

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected NA

Cement quantities and pressures were reviewed by T. Nolan, J. Brantley, and B. Ziegler.

The pressure grout began at 1340 hours and was completed at 1448 hours. Cementing began by pumping 40 barrels of fresh water to load the casing. Dowell then pumped 256 sacks (70 barrels) of 4 percent bentonite cement followed by 190 sacks (40 barrels) neat cement. The cement was then followed by 5.5 barrels of fresh water flush. Contractor pulled 30 feet of tremie line to prevent cementing in place.

B. Ziegler off site 1500 hours.

Remainder of day shift and night shift were spent monitoring header pressure and waiting on cement to set.

D. VanNote off site 1745 hours.

Recorded By: B. Ziegler

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 30, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Hot

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing.....X
- Testing.....
- Waiting..... X
- Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation

Samples
Collected No

Night Shift

7:00 pm to 7:00 am

Weather: Clear

Activity:

- Drilling.....
- Reaming.....
- Running Casing...
- Cementing..... X
- Testing.....
- Waiting..... X
- Other..... X

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation

Samples
Collected No

Description of Operations: B. Ziegler onsite at 1030 hours.

Contractor tagged cement in annulus of 6-inch x 16-inch casings at 1030 hours. Stage 1 was tagged at 1617-feet East and 1616-feet West. Pumping of the second stage of cement began at 1133 hours. Two tremie lines were placed 180 degrees apart and set approximately 2-3 feet above tagged bottom. Casing was not pressurized. Cementing began by pumping 5.5 barrels of fresh water to flush the tremie lines. Dowell then pumped 185 sacks (50 barrels) of 4-percent bentonite cement. The cement was then followed by three barrels of fresh water flush on the East tremie and two barrels on the West. Contractor pulled 180 feet of tremie line from both sides to prevent cementing in place. The remainder of cement was then flushed from tremie lines. Stage 2 was finished at 1230 hours.

Contractor tagged cement in annulus of 6-inch x 16-inch casings at 1730 hours. Stage 2 was tagged at 1516-feet East and 1517-feet West.

Pumping of the third stage of cement began at 1730 hours. Two tremie lines were placed 180 degrees apart and set approximately 2-3 feet above tagged bottom. Casing was not pressurized. Cementing began by pumping seven barrels of fresh water to flush the tremie lines. Dowell then pumped 296 sacks (80 barrels) of 4-percent bentonite cement. The cement was then followed by 3.5 barrels of fresh water flush on the East tremie and 2.5 barrels on the West. Contractor pulled 180 feet of tremie line from both sides to prevent cementing in place. The remainder of cement was then flushed from tremie lines. Stage 3 was finished at 1710 hours.

B. Ziegler offsite at 2015 hours.

Plant construction labor union workers continue informational strike at the front gate.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date August 31, 1990
Client Palm Beach County SRWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Hot

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....X
Testing.....
Waiting..... X
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing..... X
Testing.....
Waiting..... X
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations: E. Pomar onsite 1030 hours. Contractor tagged cement in annulus of 6-inch x 16-inch casings at 0700 hours at 1313 feet. Pumping of the fourth stage of cement began at 1320 hours. Two tremie lines were placed 180 degrees apart and set 2 to 3 feet above tagged bottom. Casing was not pressurized. Cementing began by pumping 10 barrels of fresh water to flush tremie lines. Dowell then pumped 148 sacks (42 barrels) of 4 percent bentonite cement. The cement was then followed by 3 barrels of flush on the East side and 2 barrels on West. Contractor pulled 300 feet of tremie line on both sides to prevent cementing in place. The remainder of cement was then flushed from tremie lines. Stage 4 was finished at 1415 hours.

E. Pomar offsite at 1700 hours.

Plant construction labor union workers continue informational strike at the front gate.

E. Pomar onsite at 1900 hours.

Pumping of the fifth stage of cement began at 2016 hours. Two tremie lines were placed 180 degrees apart and set 2 to 3 feet above tagged bottom. Casing was not pressurized. Cementing began by pumping 10 barrels of fresh water to flush the tremie lines. Dowell pumped 151 sacks (42 barrels) of 4 percent bentonite cement. The cement was then followed by 3 barrels of flush on the East side and 2 barrels on West. Contractor pulled 240 feet of tremie on both sides to prevent cementing in place. Contractor pulled 240 feet of tremie line when the annulus began to flow at a low rate, 2105 hours. Contractor stopped artesian flow by introducing barite at 2219 hours. No formation waters escaped from the pad. Contractor then pulled an additional 90 feet of tremie line from both sides. The remainder of the cement was then flushed from the tremie lines. Stage 5 was completed at 0130 hours.

E. Pomar offsite at 2330 hours.

Remainder of shift was spent monitoring annulus and waiting for cement to set.

Recorded By: E. Pomar

Revised: November 19, 1990

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.T0.30 Date September 1, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Hot

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
Samples
Collected No

Description of Operations:

T. McCormick onsite at 0600 hours. Contractor tagged Stage 5 at 1,096 feet. Pulled tubing and re tallied to check depth. Upper monitor interval shall remain over the interval from 1,000 to 1,096 feet.

E. Pomar onsite 0715 hours.

T. McCormick offsite at 1000 hours.

Remainder or shift was spent waiting for loggers.

E. Pomar offsite at 1630 hours.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 2, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing..... X
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

Activity:
Drilling.....
Reaming.....
Running Casing...
Cementing.....
Testing.....
Waiting.....
Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations:

T. McCormick and E. Pomar onsite at 0845 hours.

Schlumberger Well Services arrived at 0922 hours, and started the cement bond logging on 6-inch casing at 1100 hours. Logging finished at 1135 hours.

E. Pomar offsite at 1430 hours.

Recorded By: E.Pomar

DAILY SHIFT REPORT

//////////
CH2M HILL
//////////

Project No. SEF24770.TO.30 Date September 3, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:

Start NA ft

End NA ft

Bit Size NA in

Formation
Samples
Collected No

Description of Operations:

E. Pomar onsite at 1045 hours.

Site operating on skeleton crew (Labor Day).

Both shifts were spent circulating the monitor well to prepare for pressure test tentatively scheduled for September 4, 1990.

E. Pomar offsite at 1600 hours.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 4, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations:

B. Ziegler and T. McCormick onsite at 1300 hours. E. Pomar onsite at 1345 hours.

Contractor completed preliminary pressure test at 1330 hours. Lost 5 pounds of pressure from 100 psi in one hour.

At 1420 hours Contractor received word that FDER would be late for pressure test.

At 1518 hours FDER staff P. Highsmith, T. Powell and S. Benyon arrived onsite to observe pressure test. B. Okeme from FDER arrived at approximately 1545 hours. T. Powell, S. Denyon and B. Okeme left site at 1620 hours.

The 6-inch casing pressure test was started at 1522 hours. Pressure in the casing was built up to 180 PSIG and bled off to 100 PSIG. Test was not successful; loss of 5.5 pounds in one hour. Appeared that warm water may have been used in pressurizing the casing with the steam cleaner. Warm waters were bled off of casing and out of steam cleaner lines prior to repressurizing the casing. Test was repeated at 1646 hours. Casing was pressurized to 120 PSIG and bled off to 100 PSIG. Second test ran successfully, loss of 3.8 PSIG over one hour (100 PSIG to 96.2 PSIG).

P. Highsmith offsite at 1830 hours.

Contractor rigged down from pressure test at 1800 hours. Remainder of shift was spent preparing to drill 6-inch borehole from 1,900 feet to 1,980 feet.

T. Mc Cormick offsite at 1645 hours.

B. Ziegler offsite at hours.

E. Pomar offsite at 1900 hours.

Recorded By: E.Pomar

//////////
CH2M HILL
//////////

PBC SRWWTP DIW's
SEF24770.T0
PAGE 1 OF 2

DATE: SEPTEMBER 4, 1990

HEADER PRESSURE DURING TESTING
MW (6-INCH CASING)

<u>TIME</u> (hours)	<u>TOTAL</u> <u>MINUTES</u>	<u>HEADER PRESSURE</u> (psi)	<u>COMMENTS</u>
1646	0	100.00	6-INCH CASING WAS PRESSURIZED
1651	5	99.90	TO 120 PSI AND THEN BLED BACK
1656	10	99.22	TO 100 PSI AT START OF TEST
1701	15	99.00	
1706	20	98.50	
1711	25	98.00	
1716	30	98.00	
1712	35	97.80	
1726	40	97.20	
1731	45	97.00	
1736	50	96.80	
1741	55	96.80	
1746	60	96.20	TEST SUCCESSFULLY COMPLETED

OBSERVERS: P. HIGHSMITH\FDER
T. POWELL\FDER
S. BENYON\FDER
T. MCCORMICK\CH2M HILL
E. POMAR\CH2M HILL
B. ZIEGLER\CH2M HILL

BARFIELD INSTRUMENT CORPORATION

101 N.W. 29th Street
P.O. Box 420-537
Miami, Florida 33142

RECORD OF INSTRUMENT CALIBRATION COMPARISON

For: YOUNGQUIST BROTHERS BIC W.O.: 9055650
Mfr: AMETEK/US GAUGE Model: 0-300 PSI
Type: PRESSURE GAUGE S/N: 900124BIC

BIC TEST UNIT

0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300

CUSTOMER UNIT

0
20
40
60
80
100
120
140
160
180
200
220
240
262
282
300

- NO EXCEPTIONS NOTED
- MAKE CORRECTIONS NOTED
- REJECTED REVISE AND RESUBMIT
- SUBMIT SPECIFIED ITEM

Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the plans and specifications. Contractor is responsible for: dimensions which shall be confirmed and correlated at the job site; fabrication processes and techniques of construction, coordination of his work with that of all other trades and the satisfactory performance of his work.

By Bart. Zeafer (NN)
Date 8/31 19 90

CH2M HILL
ENGINEERS

For pressure test on 6-inch casing of the dual-zone monitor well

The above calibration comparison was made by BARFIELD INSTRUMENT CORPORATION Miami, Florida using an approved BIC Test Unit.

Date: 8/30/90

Temperature: 24 DEGREES C

Tested By: T. SABOLEWSKI

Inspected By: [Signature]

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.T0.30 Date September 5, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:
Start 1,980 ft
End 1,928 ft
Bit Size 5-1/2 in

Formation
Samples
Collected Yes

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling..... X
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start 1,928 ft
End 1,956 ft
Bit Size 5-1/2 in

Formation
Samples
Collected Yes

Description of Operations:

E. Pomar onsite at 0830 hours.

Contractor began drilling out 6-inch casing at 1000 hours. Fresh water was added to well in order to drill with reverse-air techniques until formation began producing water. IW-1 online for disposal of formation water produced.

Formation began producing water at 1,910 feet. Addition of fresh water was stopped.

Remainder of day shift and night shift were spent drilling 5-1/2-inch borehole.

E. Pomar offsite at 1630 hours.

Recorded By: E.Pomar

DAILY SHIFT REPORT

//////////
 CH2M HILL
 //////////

Project No. SEF24770.T0.30 Date September 6, 1990
 Client Palm Beach County SRWWTP
 Contractor Youngquist Brothers Inc.
 Well No. MW

Day Shift
 7:00 am to 7:00 pm

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other.....

Depth:
 Start 1,956 ft
 End 1,976 ft
 Bit Size 5-1/2 in

Formation
 Samples
 Collected Yes

Night Shift
 7:00 pm to 7:00 am

Weather: Clear

- Activity:
 Drilling..... X
 Reaming.....
 Running Casing...
 Cementing.....
 Testing.....
 Waiting.....
 Other..... X

Depth:
 Start 1,976 ft
 End 1,984 ft
 Bit Size 5-1/2 in

Formation
 Samples
 Collected Yes

Description of Operations:

B. Ziegler onsite at 0830 hours. E. Pomar onsite at 0900 hours.

Contractor continued drilling 5-1/2-inch borehole through end shift. IW-1 remained online for disposal of formation water.

B. Ziegler offsite at 1700 hours.

E. Pomar offsite at 1530 hours.

Contractor reamed to 1,976 feet at 2200 hours. A specific capacity test was performed at 35 gpm and 45 gpm while on reverse-air. No drawdown was detected with an electric tape.

Contractor tripped out of hole, replaced bit and tripped in hole. Borehole was reamed with new bit from 1,976 feet to 1,984 feet from 0300 hours to 0600 hours. Remainder of shift was spent circulating well.

Recorded By: E.Pomar

DAILY SHIFT REPORT

//////////
 CH2M HILL
 //////////

Project No. SEF24770.T0.30 Date September 7, 1990
 Client Palm Beach County SRWTP
 Contractor Youngquist Brothers Inc.
 Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other.....

Depth:

Start	<u>NA</u>	ft
End	<u>NA</u>	ft
Bit Size	<u>NA</u>	in

Formation
 Samples
 Collected No

Description of Operations: At 0700 hours, Contractor tripped bit out of 6-inch borehole.

B. Ziegler onsite at 1300 hours.

C. DiGiacomo onsite, begin running caliper log on 6-inch borehole of monitor well at 1600 hours. Logging complete, 1720 hours.

B. Ziegler offsite at 1740 hours.

No further work was performed on the monitor well through September 10, 1990.

Recorded By: E.Pomar

DAILY SHIFT REPORT

/////////
CH2M HILL
/////////

Project No. SEF24770.TO.30 Date September 10, 1990
Client Palm Beach County SRWWTP
Contractor Youngquist Brothers Inc.
Well No. MW

Day Shift
7:00 am to 7:00 pm

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Night Shift
7:00 pm to 7:00 am

Weather: Clear

- Activity:
- Drilling.....
 - Reaming.....
 - Running Casing...
 - Cementing.....
 - Testing.....
 - Waiting.....
 - Other..... X

Depth:
Start NA ft
End NA ft
Bit Size NA in

Formation
Samples
Collected No

Description of Operations:

B. Ziegler on site at 0700 hours.
At 0700 hours, Contractor begins demobilizing monitor well rig.
E. Pomar on site at 1600 hours.
At 1731 hours, Contractor moved rig off of pad and began fabricating the permanent wellhead.
E. Pomar off site at 2040 hours. B. Ziegler off site at 2015 hours.
There was no further work performed on the well through September 12, 1990, other than demobilization.

Recorded By: E. Pomar

WEEKLY SUMMARIES

MEMORANDUM**CH2M HILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: October 29, 1990

SUBJECT: Weekly Summary Report, Week of October 18, 1990, through
October 24, 1990, Palm Beach County Southern Region Wastewater
Treatment Plant Effluent Disposal System, Permit Numbers
UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

Demobilization of the drill rig and equipment continued on IW-1 and IW-2 through this report. The Contractor began mobilization of pump equipment at the L-30 canal for the injection test of IW-1. At the close of this report, the injection test was tentatively scheduled for Wednesday, October 31, 1990.

Purging of the dual-zone monitor well continued on a daily basis until October 23, 1990. The temporary wellhead constructed for injection testing of IW-1 will not allow for disposal of water from the monitor well. Purging of the monitor well will continue at the conclusion of the injection test of IW-1.

Water quality data was not collected this week from the eight surficial monitor wells that border the drilling pads. Final sampling of the wells shall be conducted next week.

Enclosures: Engineer's Shift Reports (IW-2)
Driller's Shift Reports (IW-2)

WEEKLY SUMMARY REPORT



TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: October 23, 1990

SUBJECT: Weekly Summary Report, Week of October 11, 1990, through October 17, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

Demobilization of the drill rig and equipment continued through this report period on IW-1.

The contractor began injecting fresh water down IW-2 on October 14, 1990, in preparation of the T.V. survey. Injection of fresh water and demobilization continued through the close of this report.

On October 15, 1990, the contractor began purging the Upper and Lower zones of the Dual-Zone Monitor Well on a daily basis (8 hours per day). Purged water will be disposed of down IW-1. Water quality data will be collected for 2 months on a weekly basis to establish an analytical base line for upper and lower zone.

The South Florida Water Management District approved the water withdrawal permit application for the injection tests on October 17, 1990. Injection testing on IW-1 and IW-2 is tentatively scheduled for the week of October 29, 1990.

Enclosures: Engineer's Shift Reports (IW-2)
Driller's Shift Reports (IW-2)
Water Quality Data (Surficial Monitor wells)
Lithology (IW-2 - 1,950 to 3,450 feet)

WEEKLY SUMMARY REPORT**CH2M HILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Doug VanNote/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: October 15, 1990

SUBJECT: Weekly Summary Report, Week of October 4, 1990, through October 10, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 and UC 50-165239

PROJECT: SEF24770.T0

Demobilization of the drill rig and equipment continued through this report on IW-1.

On October 9, 1990, a total depth of 3,450 feet below land surface was reached at IW-2. Contractor circulated the borehole to remove any fines that may have been left in the well during drilling. Circulation of the borehole continued with reverse-air drilling techniques through the end of the report. The TV survey was tentatively scheduled for the beginning of next week.

Demobilization of equipment on the monitor well continued through this report period.

Enclosures: Engineer's Shift Reports (IW-2)
Driller's Shift Reports (IW-2)
Water Quality Data (Surficial Monitor wells and IW-2)
Deviation Surveys (IW-2)
Lithology (MW - 1,050 to 1,980 feet)

dbt088/026.51

MEMORANDUM



TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: October 8, 1990

SUBJECT: Weekly Summary Report, Week of September 27, 1990, through October 3, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

Demobilization of the drill rig and equipment on IW-1 and the monitor well continued through October 3, 1990.

At IW-2, reaming of the 22-1/2-inch borehole has proceeded. While drilling at 3,122 feet on September 29, 1990, the transition drill collar separated leaving nine drill collars and the reamer assembly in the hole. The Contractor retrieved the reamer assembly and drill collars with an overshot fishing tool on October 1, 1990. Drilling of the 22-1/2-inch borehole resumed the same day. At the close of this reporting period, a total depth of 3,215 feet had been reached.

Enclosures: Engineer's Shift Reports (IW-2)
Driller's Shift Reports (IW-2)
Water Quality Data (Surficial Monitor wells and IW-2)
Deviation Surveys (IW-2)

M E M O R A N D U M

CH2M HILL

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: September 28, 1990

SUBJECT: Weekly Summary Report, Week of September 20, 1990 through
September 26 1990, Palm Beach County Southern Region Wastewater
Treatment Plant Effluent Disposal System, Permit Numbers UC 50-
165238 & UC 50-165239

PROJECT: SEF24770.T0

Demobilization of the drill rig and equipment on IW-1 began at the close of the last report period. Demobilization continued through the end of this report period.

The Contractor circulated the 24-inch casing on IW-2 to reduce the temperature differential created from the curing cement from September 18, 1990 until the evening shift on September 19, 1990. The casing pressure test was successfully conducted in the presence of FDER representatives on September 20, 1990. Reaming of the 22-1/2 inch borehole began the same day and continued through the end of this shift report.

Demobilization of drilling equipment on the monitor well continued through the end of this report period.

Enclosures: Engineer's Shift Reports (IW-2)
Driller's Shift Reports (IW-2)
Water Quality Data (Surficial Monitor wells and IW-2)
Deviation Surveys (IW-2)

WEEKLY SUMMARY REPORT

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Doug VanNote/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: September 20, 1990

SUBJECT: Weekly Summary Report, Week of September 13, 1990 through September 19, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

Flushing of IW-1 with fresh water was stopped on September 12, 1990, and was resumed on September 17, 1990. The TV survey was performed by Schlumberger Well Services on September 19, 1990. Demobilization of the drill rig and equipment was scheduled to begin at the close of this report period.

Grouting of the 24-inch casing on IW-2 was completed the morning of September 17, 1990. Contractor began circulating the casing with water on September 18, 1990, in preparation for the pressure test. Circulation of the casing continued through the end of this report period.

Demobilization of drilling equipment on the monitor well continued through this report period.

Enclosures: Engineer's Shift Reports (IW-1 and IW-2)
Driller's Shift Reports (IW-2)
Water Quality Data (Surficial Monitor wells)

WEEKLY SUMMARY REPORT

CH2MHILL

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Doug VanNote/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: September 18, 1990

SUBJECT: Weekly Summary Report, Week of September 6, 1990 through September 12, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 and UC 50-165239

PROJECT: SEF24770.T0

No further drilling activities were performed on IW-1 through this report period. The Contractor began flushing the well with fresh water on September 9, 1990. Flushing has been intermittent due to cementing and other construction activities on the site. The TV survey has tentatively been scheduled for the week of September 17, 1990.

Approval for the final casing setting depth on IW-2 was received from FDER on September 7, 1990. Drilling of the 32 1/2-inch borehole on IW-2 was completed on the same day to a total depth of 2,655-feet below land surface. The pilot hole remained open during reverse-air drilling to 2,673-feet. A neat cement bridge plug was placed over the interval from 2,651 to 2,673-feet the following day. A caliper log was then performed on the reamed hole to aid in grouting procedures. Installation of the 24-inch casing began on September 9, 1990 and was completed to a total depth on 2,645-feet bls on September 11, 1990. Pressure grouting of the casing was performed the same day. A temperature log was performed on September 12, 1990 to approximate the amount of cement fill. Grouting of the 24-inch casing continued on 12 hour intervals through the end of this report.

WEEKLY SUMMARY REPORT

Page 2

September 18, 1990

SEF24770.T0

Drilling of the 5-1/2-inch borehole on the dual-zone monitor well began on September 5, 1990. The borehole was completed to a total depth of 1,844-feet bls on September 7, 1990. A caliper log was performed over the lower monitor interval (1,900 feet to 1,984 feet) the same day. Demobilization of drilling equipment began on September 10, 1990 and continued through the end of this report.

dbt081/205.51

Enclosures:	Engineer's Shift Reports	(IW-1, IW-2 and MW)
	Driller's Shift Reports	(IW-2, and MW)
	Deviation Surveys	(IW-2 and MW)
	Water Quality Data	(Surficial Monitor wells)
	Geophysical logs	(IW-2 and MW)

WEEKLY SUMMARY REPORT**CH2MHILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: September 10, 1990

SUBJECT: Weekly Summary Report, Week of August 30, 1990 through
September 5, 1990, Palm Beach County Southern Region Wastewater
Treatment Plant Effluent Disposal System, Permit Numbers
UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

No work was performed on IW-1 through this report period. The next scheduled activity on IW-1 will be the injection test tentatively scheduled for the middle of September.

Drilling of the 32-1/2-inch borehole on IW-2 began on August 28, 1990. At the close of this report the Contractor had reached a total depth of 2,539 feet with the 32-1/2-inch reamed hole.

Cementing of the 6-inch casing on the dual-zone monitor well was completed on September 1, 1990. Cement was brought to 1,096 feet. The upper monitor zone will remain over the interval from 1,000 feet to 1,096 feet below land surface. A cement bond log of the 6-inch casing was performed the following day. The 6-inch casing was then circulated with water until September 3, 1990, in preparation for the pressure test. The pressure test was successfully performed on September 4, 1990, in the presence of FDER representatives. At the close of this report, the Contractor was rigging up to drill out the lower monitor interval from 1,900 feet to 1,980 feet.

Enclosures: Engineer's Shift Reports (IW-1, IW-2, and MW)
Driller's Shift Reports (IW-2, and MW)
Water Quality Data (Surficial Monitor Wells)
Deviation Survey (IW-2)
Geophysical Logs (MW)
Record on Instrument
Calibration (IW-1 and MW)

WEEKLY SUMMARY REPORT**CH2MHILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: September 5, 1990

SUBJECT: Weekly Summary Report, Week of August 23, 1990, through August 29, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 and UC 50-165239

PROJECT: SEF24770.T0

Development of IW-1 was completed on August 23, 1990. A temporary well head was constructed the following day for direct discharge of reverse-air drilling fluids from the dual-zone monitor well. No further work was performed on IW-1 through the end of the report.

During this week's drilling of the 12 1/4-inch pilot hole at IW-2, the final two cores were recovered over the intervals 2,506 to 2,516 feet and 2,620 to 2,633 feet. On August 26, 1990, the Contractor completed the pilot hole to a total depth of 2,810 feet bls. Geophysical logging of the pilot hole was completed on August 28, 1990. At the close of this report, the Contractor was tripping in the 32 1/2-inch reamer assembly.

WEEKLY SUMMARY REPORT

Page 2

September 5, 1990

SEF24770.T0

Drilling of the 14 3/4-inch borehole on the dual-zone monitor well was conducted from August 25 through 28, 1990, to a total depth of 1,902 feet. Installation of the 6-inch casing to 1,900 feet bls and pressure grouting were completed on August 29, 1990. At the close of this report, the Contractor was waiting on cement to set.

dbt081/170.51

Enclosures: Engineer's Shift Reports (IW-1, IW-2, and MW)
Driller's Shift Reports (IW-1, IW-2, and MW)
Water Quality Data (IW-2, MW, and Surficial Monitor Wells)
Deviation Survey (IW-2 and MW)
Lithology (IW-2)
Geophysical Logs (IW-2 - Caliper, Gama, LSN, Fluid Res.,
Temperature, DIL, DIP Meter, and Sonic; MW - Caliper, Gamma,
LSN, Fluid Res., and Temperature)

MEMORANDUM**CH2MHILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: August 28, 1990

SUBJECT: Weekly Summary Report, Week of August 16, 1990, through August 22, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 and UC 50-165239

PROJECT: SEF24770.T0

A total depth of 3,311 feet was reached at IW-1 on August 22, 1990. At the close of this summary, the Contractor was circulating the borehole to remove any solids and develop the well.

Drilling of the 12-1/4-inch pilot hole continued through the week on IW-2, four cores were recovered over the intervals from 2,092 to 2,102 feet, 2,190 to 2,200 feet, 2,290 to 2,300 feet, and 2,400 to 2,411 feet. Drilling and coring of the 12 1/4-inch pilot hole continued through the end of this summary.

On August 18, 1990, reaming of the 12-1/4-inch pilot hole at the dual-zone monitor well was completed to a depth of 1,010 feet bls. The 16-inch casing was installed to 1,000 feet on August 19, 1990, and was pressure grouted on the same day.

On August 20, 1990, FDER also requested additional information for their approval of the lower monitor interval of the dual-zone monitor well. This information was

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August 28, 1990

SEF24770.T0

provided to FDER and members of the TAC by facsimile transmission on August 22, 1990. At the close of this summary, the Contractor was awaiting instruction to proceed below the 1,000-foot depth.

Enclosures: Engineer's Shift Reports (IW-1, IW-2, and MW)
Driller's Shift Reports (IW-1, IW-2, and MW)
Water Quality Data (IW-2 and Surficial Monitor Wells)
Deviation Survey (IW-1, IW-2 and MW)
Lithology (MW 270-1,050 feet)
Geophysical Logs (MW - Temperature)

WEEKLY SUMMARY REPORT



TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER.WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER.TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Bart Ziegler/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Doug VanNote/CH2M HILL.DFB

DATE: August 20, 1990

SUBJECT: Weekly Summary Report, Week of August 9, 1990 through August 15, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 and UC 50-165239

PROJECT: SEF24770.T0

Cementing of the final string of casing (24-inch) at IW-1 was completed on August 11, 1990. No unusual difficulties were encountered during cementing.

In preparation for the casing pressure test at IW-1, the Contractor circulated the casing with water for 2 days to reduce the temperature differential created from the curing cement. On August 14, 1990, the casing pressure test was successfully conducted. Testing was witnessed by Bowo Okome of FDER. At the close of this summary the Contractor was reaming the borehole to 22 1/2-inches, from the base of the final casing to 3,300 feet.

Drilling of the 12-1/4-inch pilot hole on IW-2 to 2,900 feet commenced on August 10, 1990. At the close of this summary two cores had been recovered over the intervals from 2,061 feet to 2,071 feet and 2,092 feet to 2,105 feet.

Installation of the 24-inch casing to 260 feet on the dual-zone monitor well was completed on August 9, 1990. Drilling of the pilot hole to 1,000 feet was completed on August 14, 1990. Geophysical logging of the pilot hole was performed the follow-

M E M O R A N D U M

Page 2

August 20, 1990

SEF24770.T0

ing day. At the close of the summary the Contractor was rigging up to ream the pilot hole to a total depth of 1,000-feet.

dbt081/121.51

Enclosures:	Engineer's Shift Reports	(IW-1, IW-2, and MW)
	Driller's Shift Reports	(IW-1, IW-2, and MW)
	Water Quality Data	(IW-2 and Surficial Monitor Wells)
	Deviation Survey	(IW-1, IW-2 and MW)
	Pressure Test Data	(IW-1)
	Lithology	(MW - 0-270 feet)
	Geophysical logs	(MW - Caliper, Gamma, and LSN)

WEEKLY SUMMARY REPORT

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Bart Ziegler/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Doug VanNote/CH2M HILL/DFB

DATE: August 11, 1990

SUBJECT: Weekly Summary Report, Week of August 2, 1990 through August 8, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

The 24-inch final casing at IW-1 was installed to a total depth of 2,660 feet on August 3, 1990. At the close of this summary, the Contractor was waiting on the ninth stage of cement to set.

Cementing of the 34-inch casing (lower intermediate casing) on IW-2 was completed on August 7, 1990. A total of 14 stages of cement were required to completely fill the annulus. Drilling of the 12-inch pilot hole and coring was tentatively scheduled for August 9, 1990, after allowing the final stage of cement to cure.

Construction of the dual-zone monitor well began on August 7, 1990. At the close of the summary, the Contractor had drilled to a total depth of 270 feet and was preparing to install 24-inch casing to a total depth of 260 feet below land surface.

Enclosures: Engineer's Shift Reports (IW-1, IW-2, and MW)
Driller's Shift Reports (IW-1, IW-2, and MW)
Water Quality Data (Surficial Monitor Wells)
Deviation Survey (MW)
Geophysical logs - IW-1 (Caliper and temperature)
IW-2 (temperature)
MW (Gamma)

MEMORANDUM

CH2M HILL

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: August 3, 1990

SUBJECT: Weekly Summary Report, Week of July 26, 1990, through August 1, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Nos. UC 50-165237 and UC 50-165239

PROJECT: SEF24770.T0

Reaming of the 32-1/2-inch borehole on IW-1 was completed to a total depth of 2,670 feet on August 1, 1990. Approval by FDER for the final case setting depth of 2,660 feet to 2,670 feet for IW-1 was also received on August 1, 1990.

At the close of this summary, a drillable ridge plug had been placed from 2,667 to 2,670 feet and the Contractor was preparing to install the final casing (24-inch) of IW-1 to 2,660 feet below land surface.

Reaming of the 42-1/2-inch borehole on IW-2 was completed on July 27, 1990, to a total depth of 1,907 feet. A drillable bridge plug was placed from 1,898 to 1,907 feet on July 28, 1990. The Contractor began installation of the 44-inch lower intermediate casing on the same day. Installation of the 44-inch casing was completed on July 29 1990, and was pressure-grouted on the same day. At the close of this summary, the Contractor was waiting for the fifth stage of the cement to set.

WEEKLY SUMMARY REPORT**CH2M HILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Bart Ziegler/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Doug VanNote/CH2M HILL/DFB

DATE: July 30, 1990

SUBJECT: Weekly Summary Report, Week of July 19, 1990, through July 25, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System. Permit Numbers UC 50-165238 and UC 50-165239

PROJECT: SEF24770.T0

Reaming of the pilot hole at IW-1 to 32-1/2 inches continued through this weekly summary. The reamed hole had reached a total depth of 2,184 feet at the close of the summary.

Reaming of the pilot hole at IW-2 to 42-1/2 inches also continued through the week. A total depth of 1,883 feet had been reached at the close of the summary.

On July 25, 1990, the drilling rig for the monitor well arrived onsite. Mobilization has begun, and the commencement of drilling operations for the dual-zone monitor well is tentatively scheduled for July 30, 1990.

Selected casing setting depths for the final casing string of IW-1, and the lower intermediate casing of IW-2, were submitted to FDER on July 23, 1990. The Engineer is currently awaiting approval from FDER on both setting depths as of the close of this summary.

Enclosures: Engineer's Shift Reports (IW-1 and IW-2)
Driller's Shift Reports (IW-1 and IW-2)
Water Quality Data (Surficial Monitor Wells)
Deviation Survey (IW-1 and IW-2)
Lithology (IW-1 and IW-2)

MEMORANDUM

CH2MHILL

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: July 20, 1990

SUBJECT: Weekly Summary Report, Week of July 12, 1990, through July 18, 1990,
Palm Beach County Southern Region Wastewater Treatment Plant Effluent
Disposal System, Permit Nos. UC 50-165237 and UC 50-165239

PROJECT: SEF24770.T0

Drilling of the 12-1/4-inch pilot hole (IW-1) to 3,300 feet was completed on July 15, 1990. Geophysical logging began on the same day and was completed on July 16, 1990. Reaming of the pilot hole to 32-1/2 inches began on July 17, 1990.

Drilling of the 12-1/4-inch pilot hole (IW-2) to 1,953 feet was completed on July 12, 1990. Geophysical logging was performed the same day. Reaming of the pilot hole to 42-1/2 inches began on July 13, 1990.

At the close of this summary, the Contractor had drilled the reamed hole at IW-1 and IW-2 to 1,949 feet and 1,490 feet, respectively.

The geophysical logs and lithology are currently being reviewed for the final casing setting depth of IW-1 and the lower intermediate casing setting depth for IW-2. A

MEMORANDUM

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July 20, 1990

SEF24770.T0

separate letter with the Engineer's recommendation for the setting depth of each casing will following this summary.

Enclosures: Engineer's Shift Reports (IW-1 and IW-2)
 Driller's Shift Reports (IW-1 and IW-2)
 Water Quality Data (Surficial Monitor Wells IW-1 and IW-2)
 Deviation Surveys (IW-1 and IW-2)
 Geophysical Logs (IW-1 and IW-2)
 Lithology (IW-1)

WEEKLY SUMMARY REPORT**CH2M HILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Doug VanNote/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: July 16, 1990

SUBJECT: Weekly Summary Report, Week of July 5, 1990 through July 11, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

At the close of the last weekly summary, the Contractor was setting up to continue drilling the pilot holes on IW-1 and IW-2.

Drilling of the 12-1/4-inch pilot hole to 3,300-feet for IW-1 began during the evening shift of July 5, 1990. Drilling of the 12-1/4 inch pilot hole on IW-2 began on July 8, 1990.

At the close of this summary, the Contractor had drilled the pilot hole at IW-1 to a depth of 3,084-feet. Pilot hole drilling at IW-2 reached a depth of 1,924-feet. Geophysical logging is tentatively scheduled for Saturday and late Thursday afternoon for IW-1 and IW-2, respectively.

dbt081/004.51

Enclosures: Engineer's Shift Reports (IW-1 and IW-2)
Driller's Shift Reports (IW-1 and IW-2)
Water Quality Data (Surficial Monitor Wells, IW-1, and IW-2)
Deviation Survey (IW-1 and IW-2)

WEEKLY SUMMARY REPORT

CH2M HILL

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Bart Ziegler/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Doug VanNote/CH2M HILL/DFB

DATE: July 6, 1990

SUBJECT: Weekly Summary Report, Week of June 28, 1990 through July 4, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

Cementing of the 34-inch casing at IW-1 was completed on July 3, 1990, in nine stages. No difficulties were encountered during cementing of this casing. It is anticipated that drilling of the 12-1/4-inch pilot hole to 3,300 feet will begin on July 5, 1990.

On June 29, 1990, reaming of the 52-1/2-inch borehole at IW-2 was completed to a total depth of 1,010 feet. Installation of the 44-inch casing to 1,000 feet was subsequently completed on July 1, 1990. Cementing of the 44-inch casing was completed on July 3, 1990, in three stages. It is anticipated that the Contractor will begin drilling the 12-1/4-inch pilot hole to 2,200 feet July 5, 1990.

Enclosures: Engineer's Shift Reports (IW-1 and IW-2)
Driller's Shift Reports (IW-1 and IW-2)
Water Quality Data (Surficial Monitor Wells)
Deviation Surveys (IW-1 and IW-2)
Geophysical Logs (Temperature logs IW-1 and IW-2)

WEEKLY SUMMARY REPORT**CH2M HILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: June 29, 1990

SUBJECT: Weekly Summary Report, Week of June 21, 1990, through June 27, 1990, Palm Beach County Southern Region Wastewater Treatment Plan Effluent Disposal System, Permit Numbers UC 50-165238 and UC 50-165239

PROJECT: SEF24770.T0

Reaming of the 42-1/2 inch borehole on IW-1 was completed on June 24, 1990, to a total depth of 1,904-feet below land surface (bls). On June 25, 1990, a neat cement bridge plug was placed from 1,899 feet to 1,908 feet in three lifts. The Contractor began running the 34-inch diameter (0.500 inch wall) casing on June 26, 1990, and was completed to a total depth of 1,890 feet bls the morning of June 27, 1990. The 34-inch casing was then pressure-grouted with 79 sacks of 12 percent cement followed by 990 sacks of neat cement.

Reaming of the 58-1/2 inch borehole on IW-2 was completed on June 20, 1990. On June 21, 1990, the Contractor installed the 54-inch (0.500 inch wall) casing to a total depth of 260 feet bls. The casing was grouted in place with two stages, one pressure grout, and one tremie. Drilling of the 12-1/4 inch pilot hole commenced the night of June 22, 1990, and was completed to a total depth of 1,010 feet on June 24, 1990. Geophysical logs were performed the same day, and reaming of the pilot hole to 52-1/2 inches commenced the following day.

At the close of this summary, the Contractor was waiting for the first stage of cement to set on the 34-inch casing of IW-1 and continued reaming the 52-1/2 inch borehole on IW-2 (depth at close of summary was 717 feet).

Enclosures: Engineer's Shift Reports (IW-1 and IW-2)
Driller's Shift Reports (IW-1 and IW-2)
Water Quality Data (Surficial Monitor Wells)
Deviation Survey (IW-1 and IW-2)
Lithology (50-1,000 feet IW-2)
Geophysical Logs (Pilot Hole to 1,010 feet IW-2)

WEEKLY SUMMARY REPORT**CH2MHILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawi/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Bart Ziegler/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Doug VanNote/CH2M HILL/DFB

DATE: June 22, 1990

SUBJECT: Weekly Summary Report, Week of June 14, 1990, through June 20, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

The Contractor continued reaming throughout the week using the 42-1/2-inch stacked reamer on IW-1. The Engineer is still awaiting FDER's approval of the IW-1 34-inch intermediate casing setting depth to 1,890 feet bls.

On June 16, 1990, the Contractor began drilling of the pilot hole on IW-2 using a 12-1/4-inch bit assembly. The Contractor completed drilling of the pilot hole on IW-2 to a total depth of 270 feet bls on June 17, 1990. Geophysical logs (gamma ray, electric, and caliper) were performed on the pilot hole to its full depth. Reaming of the 12-inch pilot hole to 58-1/2-inches on IW-2 commenced on June 19, 1990.

The geophysical logs and drill cuttings were reviewed to determine the base of the surficial aquifer (top of Hawthorne formation) on IW-2. Data indicated that at this location the top of the Hawthorne formation occurs between 230 feet and 240 feet bls. A casing setting depth of 260-feet bls was selected for the 54-inch casing on IW-2.

At the close of this summary, the Contractor had completed reaming of the pilot hole on IW-1 to a depth of 1,767 feet and on IW-2 to a depth of 155 feet.

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Enc: Engineer's Shift Reports (IW-1 and IW-2)
Driller's Shift Reports (IW-1 and IW-2)
Water Quality Data (Surficial Monitor Wells)
Deviation Survey (IW-1 and IW-2)
Geophysical Logs (Pilot Hole to 260 feet IW-2)

WEEKLY SUMMARY REPORT**CH2M HILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Bart Ziegler/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Doug VanNote/CH2M HILL/DFB

DATE: June 14, 1990

SUBJECT: Weekly Summary Report, Week of June 7, 1990, through June 13, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

At the conclusion of last week's summary, the Contractor was preparing to perform straddle packer testing on IW-1. The straddle packer testing was conducted over the interval from 1,882-feet to 1,950-feet as outlined in Mr. McCormick's letter to Al Mueller dated June 12, 1990.

Based on a review of the collected data, the Engineer selected a setting depth for the 34-inch intermediate casing on IW-1 of 1,890 feet below land surface. This setting depth places the base of the casing in water with a TDS of 36,477 mg/l, well below the base of the USDW. We are now awaiting FDER's approval of the intermediate casing setting depth.

The Contractor began reaming the pilot hole of IW-1 to 42 1/2-inches on June 8, 1990. Drill cuttings from the reamed hole will now be rinsed and stored on site to later be used as road bed material as approved in Mr. Al Mueller's letter to Mr. Bart Ziegler dated June 8, 1990.

The Contractor has tentatively scheduled start of construction on IW-2 for June 14, 1990. At the close of this summary, the Contractor had completed reaming of the pilot hole on IW-1 to a depth of 1,447 feet.

dbt023\128.51

Enc: Engineer's Shift Reports
Driller's Shift Reports
Water Quality Data
Deviation Survey
Lithology (1,000 to 2,200 feet)

WEEKLY SUMMARY REPORT

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Doug VanNote/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: June 11, 1990

SUBJECT: Weekly Summary Report, Week of May 31, 1990, through June 6, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.TO

Pilot hole drilling of IW-1 was completed on June 6, 1990, to a total depth of 2,216-feet below land surface. Geophysical logging of the pilot hole was performed on the 1,000-foot to 2,216-foot interval. The geophysical logs performed were gamma ray, temperature, caliper, fluid resistivity, LS&N electric, and dual-induction.

A TV survey was also performed to assist in the selection of a packer setting interval. Straddle packer testing is to be performed to confirm that the intermediate casing is set below the base of the USDW and to investigate the yield of a potential monitor zone. A packer interval of 1,885-feet to 1,950-feet was selected. At the close of this summary period, the Contractor was setting up equipment for the straddle packer testing to be performed on IW-1.

dbt023/124.51

Enclosures: Engineer's Shift Reports
Driller's Shift Reports
Water Quality Data (Pilot Hole of IW-1)
Water Quality Data (Surficial Monitor Wells)
Deviation Survey
Geophysical Logs (1,000-feet to 2,216-feet)
Temperature
Caliper
Fluid Resistivity
Electric
Gamma Ray
Dual-Induction

WEEKLY SUMMARY REPORT

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Bart Ziegler/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Doug VanNote/CH2M HILL/DFB

DATE: June 1, 1990

SUBJECT: Weekly Summary Report, Week of May 24, 1990 through May 30, 1990,
Palm Beach County Southern Region Wastewater Treatment Plant
Effluent Disposal System, Permit Numbers UC 50-165238 and
UC 50-165239

PROJECT: SEF24770.TO

On May 24, 1990, the Contractor completed installation of the 44-inch casing on IW-1 to 1000 feet bls. Pressure grouting of the first stage was completed on May 24, 1990. On May 25, 1990, a temperature log was conducted from 1000-foot bls to the top of the first stage at 495 feet bls. The second and third cementing stages were subsequently completed on May 26, 1990.

The rig and associated equipment at IW-2 is set up and will need minor preparation before drilling begins. It is anticipated that drilling will commence within 1 to 1.5 weeks.

Pilot hole drilling by reverse air at IW-1 commenced on May 28, 1990, and at the close of this summary period, the Contractor had completed the pilot hole to a depth of 1,504 feet.

dbt023/110.51

Enclosures: Engineer's Shift Reports
Driller's Shift Reports
Water Quality Data (Surficial Monitor Wells)
Deviation Survey
Temperature Log (1,000-feet to 495-feet)

WEEKLY SUMMARY REPORT**CH2M HILL**

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: May 25, 1990

SUBJECT: Weekly Summary Report, Week of May 17, 1990 through May 23, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 and UC 50-165239

At the beginning of this summary period the Contractor had completed the 52-1/2 inch reamed borehole to 416-feet below land surface (bls). Drilling of the reamed hole has been very slow due to hard formations (limestone and chert) encountered. The reamer bit assembly had to be reconstructed during this period, resulting in approximately 1 day of down time for the Contractor.

On May 22, 1990, the Contractor raised the mast of the rig set up over IW-2. Drilling of IW-2 is anticipated to commence within the next couple of weeks.

Drilling of the 52-1/2 inch reamed hole was completed to 1,010-feet bls on May 23, 1990. At the close of this summary period the Contractor was preparing to install the 44-inch casing to 1,000-feet bls.

Enclosures: Engineer's Shift Reports
Driller's Shift Reports
Water Quality Data (Surficial Monitor Wells)
Deviation Survey

MEMORANDUM

CH2MHILL

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Doug VanNote/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: May 18, 1990

SUBJECT: Weekly Summary Report, Week of May 10, 1990, through May 16, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

On May 10, 1990, the Contractor completed installation of the 54-inch casing on IW-1 by placing cement from 96 feet to surface using the tremie method. Pilot hole drilling commenced on May 11 and was completed at 1,008 feet below land surface (bls) on May 14.

Geophysical logs (gamma ray, electric, and caliper) were performed on the pilot hole to its full depth. Reaming of the 12-inch pilot hole to a nominal 54-inch diameter began on May 14, 1990.

The geophysical logs and drill cuttings were reviewed to identify the base of the Tampa Limestone and the upper portion of the Suwannee Limestone. Data indicates that at this location the interface between these formations occurs between 950 feet and 1,000 feet. A casing setting depth of 1,000 feet bls was selected for the 44-inch casing.

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At the close of this summary period the Contractor had completed the reamed hole to a depth of 416 feet.

Enclosures: Engineer's Shift Reports
Driller's Shift Reports
Water Quality Data (Surficial Monitor Wells)
Deviation Survey
Lithology
Geophysical Logs (Pilot Hole to 1,008-feet)

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Jim Brantley/Youngquist Brothers
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
J.I. Garcia-Bengochea/CH2M HILL/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: May 11, 1990

SUBJECT: Weekly Summary Report, Week of May 4, 1990, through May 8, 1990, Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System, Permit Numbers UC 50-165238 & UC 50-165239

PROJECT: SEF24770.T0

On May 4, 1990, the Contractor completed drilling of the pilot hole on IW-1 to a depth of 260 feet below land surface (bls). Geophysical logs (gamma ray, electric, and caliper) were performed on the pilot hole to its full depth. Reaming of the 12-inch pilot hole to 58-1/2 inches also began on May 4, 1990.

The geophysical logs and drill cuttings were reviewed to determine the base of the surficial aquifer (top of Hawthorn formation). Data indicates that at this location the top of the Hawthorn formation occurs between 240 feet and 250 feet bls. A casing setting depth of 260 feet bls was selected for the 54-inch casing.

Reaming of the borehole was completed on May 9, 1990, using a 58-1/2-inch stacked reamer. The lead bit on the reamer matched the bit used for the pilot hole, 12-1/4 inches in diameter. The borehole was conditioned for several hours to insure proper installation of

M E M O R A N D U M

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the 54-inch casing. The first stage of cement was placed on the 54-inch casing at the close of this summary period.

The Engineer's Daily Report for May 2, 1990, had start and end depths for the night shift recorded incorrectly. Please substitute the enclosed daily report for May 2, 1990. This report has been revised to reflect to the correct depths.

Enclosures: Engineer's Shift Reports
 Driller's Shift Reports
 Water Quality Data (Surficial Monitor Wells)
 Geophysical Logs (Pilot Hole to 260-feet IW-1)

WEEKLY SUMMARY REPORT

TO: Al Mueller/FDER/WPB
Peggie Highsmith/FDER/WPB
Anthony LasCasas/PBCHD
Mike Merritt/USGS/Miami
Greg Rawl/SFWMD
Richard Deuerling/FDER/TLH
Steve Berton/EPA/ATL
Tom McCormick/CH2M Hill/DFB
Albert Muniz/CH2M Hill/DFB
Doug VanNote/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

FROM: Bart Ziegler/CH2M HILL/DFB

DATE: May 3, 1990

SUBJECT: Weekly Summary Report, Notice to Proceed March 24, 1990 through
May 3, 1990

PROJECT: SEF24770.TO

As the first weekly summary for the Palm Beach County Southern Region Wastewater Treatment Plant Effluent Disposal System this summary is inclusive of all work performed on the project to date. Summary periods for the remainder of the project will be Thursday through Wednesday on a weekly basis.

Youngquist Brothers, Inc., the selected drilling contractor, was issued Notice to Proceed on March 24, 1990. Drilling pads for IW-1, IW-2, and the Dual-Zone Monitor Well were completed on April 10, 1990.

On April 19, 1990, the 60-inch surface casings were vibrated into place at IW-1 and IW-2 at 50-foot bls and 25-foot bls, respectively. The eight surficial monitor wells were installed on April 21, 1990. All eight surficial monitor wells were sampled for background water quality data (temperature, conductivity, and chlorides) on April 25, 28, and May 1, 1990. Results of the water quality from the surficial monitor wells are attached. Elevation control points for drilling and logging operations were established on May 2, 1990, and are included in the daily report.

The Contractor began drilling the pilot hole of IW-1 at 0200 hours May 3, 1990. Geophysical logging of the pilot hole is tentatively scheduled for Friday, May 4, 1990.

TAC MEETING SUMMARIES

SUMMARY OF MEETING

MEETING LOCATION: Palm Beach County Water Utilities Department,
2065 Prairie Road, West Palm Beach

DATE: March 14, 1990

PREPARED BY: Doug VanNote (March 20, 1990)

ATTENDING: Paul Feldman/PBC Water Utilities Department
John Chesher/Hazen and Sawyer
Jim Brantley/Youngquist Brothers, Inc.
Kevin Greuel/Youngquist Brothers, Inc.
Randy Cape/Youngquist Brothers, Inc.
Tom McCormick/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
Bart Ziegler/CH2M HILL/DFB

COPIES: Bevin Beaudet/PBC Water Utilities Department
J.I. Garcia-Bengochea/CH2M HILL/GNV
Albert Muniz/CH2M HILL/DFB

PROJECT: SEF24770.T0

SUBJECT: Preconstruction Meeting, 10:30 a.m., March 14, 1990, for the construction of two deep injection wells and one dual-zone monitor well for effluent disposal at the Southern Region Waste Water Treatment Plant, Palm Beach County, Florida

INTRODUCTION

Mr. Bart Ziegler opened the preconstruction meeting at 10:30 a.m. with a brief description of the project and overview of the agenda.

PROJECT MANAGEMENT AND RESIDENT OBSERVATION

Mr. Ziegler introduced the CH2M HILL project team, and requested emergency phone numbers from all meeting attendees. The Drilling Contractor's (Youngquist Bros., Inc.) chain-of-command was also requested. Mr. Jim Brantley is vice president

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in charge of drilling operations, Mr. Kevin Greuel, site drilling superintendent, and Mr. Randy Cape, project administrator. Mr. Brantley added that these individuals would be a point of contact for the Engineer. All information would then be communicated to the appropriate individuals in the Youngquist Brothers Organization.

COORDINATION OF CONSTRUCTION ACTIVITIES ONSITE

Mr. Ziegler stated that weekly coordination meetings will be held on Monday mornings at 9:00 a.m. Mr. Ziegler asked that the Drilling Contractor attend the meetings when requested. Mr. McCormick added that attending the coordination meetings would be necessary if other contractors need to coordinate activities with the Drilling Contractor.

Mr. Brantley stated that the pole at the main entrance gate has been damaged and that large truck and trailer access into the gate is difficult. Mr. Paul Feldman said that the pole will remain there through the duration of construction. Mr. McCormick suggested that a record photograph be taken of the pole within the next 24 to 48 hours.

Mr. Ziegler asked that copies of all necessary permits be submitted to the Engineer before any phase of construction work begins. Mr. Cape agreed to submit copies of the permits once they are pulled.

Mr. Chesher said the piping contractor has completed water lines to the fire hydrant closest to the injection wells and water will be available within a few days.

Mr. Feldman stated that a meter and backflow preventer will be required on the fire hydrant, but that no charge would be made to the drilling contractor for the potable water used during construction. Mr. Ziegler asked that no drilling fluid mixing be conducted until the Engineer has collected primary and secondary samples. The Drilling Contractor shall advise the Engineer when his water line is in place.

Mr. Chesher said temporary power should not be a problem and can be connected through an onsite transformer.

The crew schedule will be a 24-hour swing shift with crew changes at 7:00 a.m. and 7:00 p.m. Mr. Chesher said that no security service is active at the site, but the entry

SUMMARY OF MEETING

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gates are locked at night and a night operator is on duty. The Drilling Contractor is to provide his own lock for the gate.

Mr. Ziegler said a letter from the Health Department is required for drilling mud and cuttings disposal. Mr. Brantley stated he has found a site for mud disposal and requested an approval letter from the Owner and the Health Department. Clean drill cuttings will be disposed of at Polo Trace. Polo Trace will be responsible for spreading of cuttings. Mr. Feldman is to provide a letter of agreement from the county and Polo Trace to be submitted to the PBC Health Department.

Mr. Ziegler advised Mr. Cheshier that the surface casings on the injection wells would be vibrated into place. Other contractors working at the site will want to be aware of this event so that they might undertake any safety precautions they considered appropriate. This can be a matter for discussion in the site coordination meeting.

Mr. Ziegler stated that the two sets of formation cuttings samples must be labeled clearly. Water samples should be delivered to the Engineer promptly and labeled clearly. Mr. Brantley said he will provide personnel to collect all cuttings and water samples.

Mr. Ziegler reminded the Drilling Contractor that certificates are required for all welders proposed for welding of casing. All casing setting depths and cementing operations need to be discussed and reviewed with the Engineer before installation. Mr. Brantley said he will provide a cementing form for review by the Engineer before commencing. Mr. McCormick mentioned that communication needs to be open and the team effort needs to be maintained.

The injection well permit requires that deviation surveys be conducted at 60-foot intervals. Packer tests will be conducted on Injection Well No. 1 at the 1,800 to 2,200-foot interval to establish the 10,000 TDS interface. Formation waters which cannot be stored onsite are to be transported by tanker truck to System 3 and disposed into the existing wet well. Mr. Ziegler requested that blow-off preventers be installed onsite before drilling begins. Mr. Brantley added that the Drilling Contractor has designed a rotating head similar to conventional blow-off preventers. Proper storage of fuels and/or oils shall be in conformance with county and state regulations. Mr. Ziegler reminded the Drilling Contractor that general cleanliness of

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the site is mandatory. Mr. McCormick added that if problems occur, the Engineer is to be notified immediately.

Mr. Chesher asked if the Drilling Contractor still planned to construct a road to the site from the entrance road passing by the existing construction trailers onsite.

Mr. Brantley stated that the Drilling Contractor does plan to build a road and that it would not be a problem if the septic tank drain field from the existing trailers does not interfere. Mr. Chesher said the Drilling Contractor would need to construct the road south of the flagged septic tank area.

Mr. Brantley mentioned that a septic tank and drain field will be constructed at the injection well site as required by Palm Beach County for the construction trailers.

REVIEW OF PROPOSED SCHEDULES

Mr. Ziegler discussed the construction schedule and issued the notice to proceed (NTP). This NTP was signed by Mr. Brantley and copies were distributed. Start of construction will be Saturday, March 24, 1990, and the scheduled completion date for the 210-day construction period is October 20, 1990. Mr. McCormick asked when the trailers will be installed. Mr. Brantley said that the trailer will be installed with water and power within approximately 30-40 days. Mr. McCormick asked Mr. Chesher if his trailer could be used for the FDER preconstruction meeting. Mr. Chesher said that would not be a problem.

Mr. McCormick discussed the Network Analysis chart. He said that one injection well, dual-zone monitor well, and surge control system must be in place and operable during initial plant startup. The Owner must have effluent disposal capabilities by June 1991. The second injection well can go as a second project and would not need to be operational until the plant exceeds 15 mgd capacity.

Mr. McCormick reviewed the construction activity network analysis. The contract for the construction of the deep injection well system consists of four related subprojects, two deep injection wells, a dual-zone monitor well, and a surge control system. The currently defined critical path for the plant requires that three of these, the surge control system, the dual-zone monitor well, and at least one injection well be completed by June 1, 1990.

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Activities on the deep injection well system can proceed independently of other plant construction, with four exceptions. Construction of the surge control system cannot commence until the pump station contractor clears the construction area, and inter-connection to the power supply and instrumentation for the surge control system and each of the injection wells and the dual-zone monitor well cannot be completed until the pump station contractor completes the instrumentation and power supply of the pump station. Mr. Chesher estimated that the surge control site would become available by June 1, 1990, and that instrumentation and power tie-ins could commence after December 1, 1990.

Mr. McCormick will incorporate these dates into the project schedule. The project schedule will be updated on a monthly basis by CH2M HILL and provided to the PBCWUD in electronic media and hard copy formats. CH2M HILL and the Drilling Contractor will meet on a weekly basis to discuss job progress and once a month the Drilling Contractor will submit a written progress report that will serve as the basis for the project schedule update.

Standard CH2M HILL submittal forms will be required by the Drilling Contractor along with the submittals. Mr. Ziegler mentioned that the forms must be properly filled out and complete or they will be returned.

Mr. Cape advised that the drilling pad for the wells was under design and asked if the Owner or Engineer had an objection to the inclusion of a block wall around the perimeter of the pads. Mr. McCormick stated that the design contained in the contract documents was a minimum standard and it was the intent that the Drilling Contractor tailor the pad design to meet the specific needs of his drilling equipment. The inclusion of a block wall would not be a problem, but it would be necessary to remove the wall at the end of the project and leave the pad with a curb, as shown on the drawings.

Submittals of O&M manuals must be complete so that the Engineer can prepare the Engineer O&M Manual in an efficient manner. Mr. Ziegler asked that the Drilling Contractor provide an equipment submittal schedule.

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PROGRESS PAYMENT APPLICATIONS

CH2M HILL will use the requested Palm Beach County payment and change order forms. Each payment will be monthly with cut-off date being the 1st of each month. The Engineer will hold payment for review for a maximum of 7 days, then deliver to the Owner for process time of 30 days. The total payment duration will be no more than 37 days. Mr. Ziegler added that a change order for the I&C and Electrical Interfacing will be prepared at a later date.

Mr. Brantley stated that the Drilling Contractor will invoice for casing stored onsite. A large portion of the casing for all three wells is scheduled for delivery at the same time due to freight charges. Mr. McCormick stated that should not be a problem, but it will be reviewed with the appropriate progress payment application.

DAILY REPORTS

The Engineer must prepare a daily and weekly report and submit to FDER along with the driller daily reports. Mr. Ziegler asked that the driller daily reports be concise and complete. Driller daily reports will be reviewed by the Engineer before submittal to FDER. The reporting work week will be Thursday to Wednesday. Correspondence will be mailed to FDER on Friday.

STORAGE AND STAGING AREA

Mr. Chesher mentioned that additional storage is possible and he will work with the Drilling Contractor to find a convenient storage area.

SAFETY

Mr. Ziegler included that the Drilling Contractor is solely responsible for safety at his construction site. He added that the Drilling Contractor must abide by all federal and state regulations. Mr. Brantley said that any problems with crew regarding unsafe acts should be addressed to him immediately.

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OTHER ITEMS

Injection wells will be relocated 20 feet east of the locations shown on the drawings.

FDER has requested that the permits be attached to the contract documents. Mr. McCormick added that the Engineer will attach the permits to the documents for informational purposes. FDER has requested additional logging of the injection wells. Mr. McCormick stated that the additional logging will be addressed as a change order when appropriate.

FDER has requested a preconstruction meeting one week prior to drilling. The meeting will be held onsite in the Hazen and Sawyer trailers.

Mr. Cape asked for the exact address of the site. Mr. Feldman stated the address as follows: 12751 Hagan Ranch Road, Boynton Beach 33437.

Mr. Brantley requested that the Palm Beach County Water Utilities Department consider a contract time extension. The time extension would reduce staffing problems and eliminate the need for two rigs drilling concurrently. The Drilling Contractor is to submit a written proposal to the Engineer for review with the Owner.

Mr. Feldman reminded the Drilling Contractor that the certificate of insurance must be kept current. He also requested that the Drilling Contractor must access Hagan Ranch Road from the south due to possible interference with the Hagan Road Elementary School and force main construction on Hagan Ranch Road.

The meeting adjourned at 11:30 p.m.

SUMMARY OF MEETING**MEETING**

LOCATION: Palm Beach County Southern Region Wastewater Treatment Plant,
Hazen and Sawyer Construction Trailer

DATE: April 11, 1990

PREPARED BY: Bart Ziegler (April 12, 1990)

ATTENDING: Al Mueller/FDER
Peggie Highsmith/FDER
Paul Feldman/PBCWUD
Jim Brantley/Youngquist Brothers
Kevin Greuel/Youngquist Brothers
Tom McCormick/CH2M Hill/DFB
Bart Ziegler/CH2M Hill/DFB

COPIES: Bevin Beaudet/PBCWUD
Albert Muniz/CH2M Hill/DFB
J.I. Garcia-Bengochea/CH2M Hill/GNV

PROJECT: SEF24770.T0

SUBJECT: Preconstruction Meeting with FDER, 10:00 a.m., April 11, 1990, for the construction of two deep injection wells and one dual-zone monitor well for effluent disposal at the Southern Region Waste Water Treatment Plant, Palm Beach County, Florida

INTRODUCTION

Mr. Tom McCormick opened the meeting with a brief discussion of the status of the project. The proposed construction schedule (as of March 14, 1990) was submitted to the members of FDER. Mr. McCormick stated that the schedule is tentative and may be extended. A preconstruction meeting was held with the County, the Engineer, and the Drilling Contractor on March 14, 1990. The notice to proceed was issued on March 24, 1990. A copy of the meeting minutes will be forwarded to FDER for the record. Mr. McCormick then turned the meeting over to Ms. Peggie Highsmith.

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REVIEW OF INJECTION WELL PERMITS

Ms. Highsmith reviewed the specific conditions of the permits to construct the test Class I Injection Wells at the Palm Beach County Southern Region Wastewater Treatment Plant (Permit Numbers: UC 50-165238 & 50-165239).

SITE REQUIREMENTS

Ms. Highsmith requested that the horizontal and vertical control points for each well and background water quality data for the surficial monitor wells be submitted with the Engineer's first weekly report. Mr. Ziegler stated that this information will be provided with the first weekly report.

CONSTRUCTION AND TESTING REQUIREMENTS

All items under construction and testing requirements were discussed. The following items were reviewed in detail.

Mr. Jim Brantley stated that a rotating blow-out preventor will be installed prior to drilling into artesian conditions as required by the permit. The blow-out preventor to be used has been tested under actual operating conditions up to pressures as high as 34 psi.

It was agreed upon by all members at the meeting that the lower monitor zone will be positioned in the first suitable transmissive interval below the USDW and that extension of the monitor well below the Hawthorn Formation would not proceed until the 2,000-foot casing string on IW-1 is cemented in place.

Ms. Highsmith stated that FDER requires 72 hours notice prior to any mechanical integrity testing. A memo indicating the proposed testing time can be sent by FAX to the local FDER office (407 964-1275) and will suffice as notification. Ms. Highsmith also requested that FDER be notified within 24 hours after commencement of drilling. Mr. Ziegler commented that FDER will be notified when drilling starts.

Ms. Highsmith stated that the site proposed for disposal of the cuttings by Youngquist Brothers has been approved. Polo Trace is to be used for disposal of cuttings from below 1,000-feet, and has not yet been approved. Paul Feldman is in the process of securing a letter from Polo Trace for submittal to the Health Department.

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Ms. Highsmith was unable to locate the package prepared and submitted by the Engineer containing RFI's and responses generated during the permit processing phase, but she does remember seeing it. Mr. Ziegler stated that the County, the Engineer, and the Contractor have incorporated the information into the documents, as requested.

QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

The Engineer of Record will certify documents related to the completion of the injection well system, as required by 17.28. Documents prepared for geologic/hydrogeologic evaluation would be certified by a Professional Geologist.

REPORTING REQUIREMENTS

Ms. Highsmith stated that all members of the TAC are to receive the daily and weekly Engineer's reports and daily Driller's reports.. A current list of TAC members is available through FDER.

The meeting was adjourned at 11:00 a.m.

dbt023/065.51

SUMMARY OF MEETING

DATE: July 21, 1989
SUBJECT: Technical Advisory Committee (TAC) Meeting,
10:00 a.m., July 11, 1989.

Review of the Conceptual Design, Draft Construction Documents, Construction procedures, and Proposed Construction Schedule for the Injection Well Effluent Disposal System at the Palm Beach County Southern Region WWTP

MEETING

LOCATION: Department of Environmental Regulation
1900 S. Congress Avenue, Suite A, West Palm Beach

ATTENDING: Paul Feldman/PBC Water Utilities Department
Lawton McCall/PBC Water Utilities Department
Robert Carr/PBC Water Utilities Department
Richard Deuerling/FDER/Tallahassee
Peggie Highsmith/FDER/West Palm Beach
Al Mueller/FDER/West Palm Beach
Anthony LasCasas/PBC Health Department
Jeff Giddings/SFWMD
Tom McCormick/CH2M HILL/DFB
Albert Muniz/CH2M HILL/DFB
Doug VanNote/CH2M HILL/DFB
Bart Ziegler/CH2M HILL/DFB

COPIES: Bevin Beaudet/PBC Water Utilities Department
J.I. Garcia-Bengochea/CH2M HILL/GNV

PROJECT: SEF24770.T0.

PREPARED BY: Doug VanNote

INTRODUCTION

Mr. Tom McCormick opened the meeting at 10:00 A.M. with an introduction of the project team, members of the TAC and an overview of the agenda.

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SEF24770.TO

PROJECT OVERVIEW

Following the introduction Mr. McCormick turned the meeting over to Mr. Bart Ziegler of CH2M-HILL. Mr. Ziegler briefly reviewed the Conceptual Design and discussed the project location, site layout, and well locations.

Mr. Ziegler noted that emergency discharge will not go to System 3 as previously stated in the Conceptual Design. In the event of an emergency discharge effluent will bypass the injection well pump station and flow by gravity to the onsite stormwater retention ponds. An Environmental Protection Agency NPDES permit application has been submitted and is in the review process. Mr. McCormick said that the emergency discharge plan had been revised at the request of FDER, to avoid the use of the System 3 WWTP percolation ponds.

Mr. Al Mueller asked if chlorination will be available before discharge to the retention ponds. Mr. Robert Carr responded and confirmed that the plant-design included facilities for chlorination before discharge to the stormwater retention ponds.

Mr. Ziegler briefly reviewed the facility requirements. He stated that this project addresses only the Phase I facilities. Peak hour flow (PHF) for Phase I is estimated to be 21.6 mgd with a combined injection well capacity of 30 mgd. Phase II PHF is estimated to be 43.2 mgd with injection well capacity remaining the same. During Phase II a third injection well or a 5.0 mg equalization storage tank will be constructed to accommodate PHF.

SPECIFICATIONS

Mr. Ziegler reviewed the draft construction documents submitted to FDER in May 1989. Mr. Ziegler noted that there was an editing error in the packer test portion of the draft specifications. Formation waters produced during packer testing will be transported to the System No. 3 or No. 9 wastewater treatment facilities for disposal by underground injection, pumped water will not be disposed via an onsite pond as indicated in the draft construction documents.

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Eight surficial observation wells will be installed for monitoring during construction. Background samples will be collected from all eight wells before any construction begins. During normal construction operations, the four outer wells will be sampled on a weekly basis. If fluctuations in water quality are noted in any well, sampling of the four inner wells will commence.

CONSTRUCTION AND TESTING

Mr. Ziegler reviewed the construction procedures with the TAC. Approximate casing setting depths were reviewed.

Mr. McCormick asked if a TAC meeting would be necessary to review the selection of the 54, 44, 34-inch casing setting depths. Ms. Peggy Highsmith and Mr. Richard Deuerling both agreed that a TAC meeting would not be necessary. Review of the geophysical logs and determination of casing depths could be handled over the phone unless unusual conditions developed that required a TAC. Ms. Highsmith stated that a TAC meeting will be required for determination of final casing setting depth and selection of the monitoring zones.

Ms. Highsmith asked if a packer test will be performed on both injection wells. Mr. Ziegler replied that packer testing will be executed on the first injection well to confirm that the selected casing setting depth for the 34-inch casing is below the 10,000 TDS interface.

Ms. Highsmith requested that a packer test be performed to assist in selection of the lower monitor zone. Mr. McCormick agreed to take this into consideration in the Engineer's response to the FDER Request for Information (RFI).

Eight cores will be collected below 2000 feet in the second injection well. Ms. Highsmith suggested that a high resolution dip meter log on the first well would be acceptable instead of coring. Mr. McCormick said he would take this into consideration and prepare a response to the RFI.

Mr. Ziegler discussed the geophysical logging schedule. Ms. Highsmith suggested using a high resolution dip meter along with sonic log for correlation on both injection wells.

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Ms. Highsmith added that Cement Bond Logs (CBLs) are not required for the injection wells but would be required for the monitor well. Mr. McCormick concluded that a CBL will be conducted on the final casing of the monitor well.

Ms. Highsmith requested that the Engineer consider the use of Dual Induction Logs in lieu of the electric logs proposed. Mr. McCormick agreed to review the relative performance of the tools and to include his decision in the response to the RFI.

Water from the L-30 canal will be used during the 12-hour injection tests of the wells. Permission for such use will be obtained from the appropriate agency before start of testing.

Ms. Highsmith asked that a directional survey (gyroscopic) be used instead of the proposed vertical deviation survey. Mr. McCormick noted that such tools were few in number and the service was very expensive. In addition, based on the extensive construction experience of CH2M HILL, such expense is unwarranted. The proposed construction technique, using stacked reamer assemblies with lead bits of the same diameter as the pilot bit coupled with vertical deviation surveys kept within very tight limits effectively insures that the reamer follows the pilot hole.

Ms. Highsmith stated that she was concerned not only about insuring that the reamer follow the pilot hole, but also about the potential for a well bore to spiral and come in contact with the well bore of either the other injection well or the monitor well. Mr. McCormick responded that it was the nature of the geologic formations to deviate drilling assemblies in a similar direction unless specific efforts were made to force the drill assembly in a particular direction. Under normal drilling conditions using similar equipment the well bores could be anticipated to deviate to the same extent and in the same direction. This fact and several aspects of the construction procedure reduce the potential for significant spiraling. The contractor is required to rework the well bore when it deviates from vertical by more than 45 minutes of a degree within a 90 foot interval, pilot hole and reamer holes are limited to approximately 1000 feet in length, and large diameter casing with 1/2-inch wall thickness is fairly rigid when hung vertically.

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Mr. Anthony LasCasas suggested using the vertical deviation surveys at a more frequent interval (60 feet instead of 90) and if confidence in the Vertical Deviation Survey was called into question during construction, then a gyroscopic direction survey could be required.

Mr. Deuerling requested that the Engineer submit a letter addressing a "worst-case" condition that could develop with the 45 minute deviation allowed in the construction specifications. Mr. McCormick stated that a worst-case condition would be reviewed in the Engineer's Response to the RFI.

Mr. Ziegler reviewed the Radio Active Tracer (RTS) and T.V. Surveys to be performed at the completion of each deep injection well. He also stated that potable water would be used for the RTS low rate injection tests.

Mr. Ziegler reviewed the water quality analysis to be performed on water from the injection zone. Ms. Highsmith added that water from the injection zone must be analyzed for primary and secondary drinking water standards. Analyses for priority pollutants will not be required for the injection zone. Mr. McCormick requested that the FDER supply a list of the analytical parameters required on water from the injection zone. Ms. Highsmith also added that as soon as possible five gallons of unacidized injection zone water is still required to be sent to Tallahassee (Attention: Professor Coward).

Mr. Mueller requested that the Engineer consider using barite as an alternative to salt as a weighing material. Mr. McCormick noted that barite was much more expensive but agreed to look into the option of using barite as a replacement for salt.

Mr. Ziegler discussed casing setting depths and reviewed the sampling schedule of the monitor well.

In response to a comment in DER's RFI, Mr. McCormick stated that the requirement for a coating on the casing could actually speed up the corrosion failure of the casing. Corrosion protection by application of a coating is dependent upon the integrity of the coating. If damage occurs to the coating, then the full

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corrosion potential of the structure concentrates at the breach in the coating. Pit corrosion is favored and corrosion penetration of the casing wall proceeds at rates as great as 100 times that of an uncoated casing. Within the drilling construction industry the favored technique for protecting casings is either the use of passivating fluids in the well bore or annulus, or the increase of wall thickness of the casing to accommodate the expected corrosion rate. The latter course has been chosen for this project. A wall thickness of 0.562-inches of mild steel will sustain an average annual corrosion rate of five mills per year for approximately 100 years, five times the design life of the facility.

Mr. Ziegler stated that full scale sampling of primary and secondary drinking water standards will be conducted at the beginning and end of the 2-month background sampling period and that every two weeks the monitor well will be sampled and analyzed for the standard parameters monitored during operational testing. Five casing volumes will be purged prior to each sampling event. Ms. Highsmith requested that ammonia be added to the primary and secondary drinking water parameters list and that the monitor well be sampled every week for the 2-month period for conductivity, chlorides, pH, temperature, and TDS. Mr. McCormick stated that the 2-month background monitoring program will be discussed in the letter responding to the RFI.

DISPOSAL OF DRILLING FLUIDS AND CUTTINGS

Mr. Ziegler reviewed the procedure for disposal of drill cuttings. He stated that all drilling muds will be the contractor's responsibility for disposal. Clean cuttings and fill material will be disposed of at Polo Trace golf course. All clear fluids will be injected into an existing injection well.

Mr. Jeff Giddings asked if the shallow monitor wells will be affected due to the dewatering proposed for the site. The Engineer will review the proposed dewatering schedule and adjust the depth of the monitor wells accordingly.

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SCHEDULE

Mr. Ziegler discussed the proposed 210 day versus 365 day drilling schedule. He added that if the 210-day schedule is selected, the wells will be drilled concurrently, but with the start of drilling staggered 30 days apart. Ms. Highsmith requested that the monitor well be drilled last. Operational start-up of the injection wells under either schedule will begin in June 1991.

MISCELLANEOUS ITEMS

Mr. Ziegler asked the TAC if there were any other items that needed to be discussed.

Mr. Mueller said more clarification on the recording and instrumentation data is needed before a permit can be issued. Some of the equipment required for permit review, specifically recording instrumentation is being provided under a separate contract. The engineer will forward copies of those contract documents to FDER for their review.

The meeting was adjourned at 12:00 noon.

dbt023/025.50

SUMMARY OF MEETING

CH2M HILL

DATE: December 13, 1988

SUBJECT: Review of the Conceptual Design of a Deep Injection Well Effluent Disposal System at the Palm Beach County Southern Region WWTP

ATTENDING: Peggie Highsmith/DER, West Palm Beach
Alex Padva/DER, West Palm Beach
Anthony LasCasas/PBC Health Department
David Butler/SFWMD
James Carey/EPA, Atlanta
Mike Merritt/USGS, Miami
Lawton McCall/PBC Water Utilities Department
Bob Carr/PBC Water Utilities Department
Tom McCormick/CH2M HILL, Deerfield Beach
Bart Ziegler/CH2M HILL, Deerfield Beach
Doug VanNote/CH2M HILL, Deerfield Beach

COPIES TO: Bevin Beaudet/PBC Water Utilities Department
J.I. Garcia-Bengochea/CH2M HILL, Gainesville
Albert Muniz/CH2M HILL, Deerfield Beach

PROJECT: SEF24770.T0.10

PREPARED BY: Doug VanNote, December 13, 1988

The meeting was opened at 10:00 a.m. with an introduction of the project team and the members of the TAC.

Mr. McCormick followed with a brief discussion of the project location, the proposed construction phases of the regional plant and the effluent disposal system proposed for each phase. Two 24-inch-diameter deep injection wells are currently under design to meet plant effluent disposal requirements during both Phase 1 (12 mgd) and Phase 2 (24 mgd). Phase III (36 mgd) construction will include additional injection wells.

Timely completion of the injection wells is crucial to plant startup and, therefore, the timely start of construction for the injection well project is of great importance. Mr. McCormick emphasized that it was CH2M HILL's intent to make every effort to insure that the permit application submittal was complete and that once the permitting clock was started there would be no delays in the permit application process.

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Ms. Highsmith commented that in her experience with DER, there had never been a permit application submittal that was judged complete upon first review, questions were always asked, and the permit clock was always stopped. She recommended that CH2M HILL allow at least 125 days for permit processing.

Mr. Padva suggested that CH2M HILL review DER files on recent permit applications to identify potential issues of concern to members of the TAC so that they might be addressed in the permit submittal. Mr. McCormick thanked Mr. Padva for the suggestion. CH2M HILL will review the files and address those concerns which are pertinent to the proposed project. CH2M HILL will accelerate the submittal of the permit application to start the permitting clock as early as possible.

Mr. McCormick then reviewed the proposed construction procedures for the deep injection wells. The wells are of staged casing design. A 54-inch-diameter surface casing will be set to approximately 200 feet in depth. A 44-inch-diameter intermediate casing will be set to approximately 1,000 feet in depth. In accordance with recent requests from TAC, the second intermediate casing (34-inch-diameter) will be set to below the 10,000 mg/l TDS interface. A final casing of 24-inch-diameter will be set to approximately 2,700 feet below land approximately surface. The total depth of the injection well will be approximately 3,300 feet. Each casing stage will be preceded by a pilot hole, and the casing setting depths will be based upon lithographic and geophysical data collected from the pilot hole. Casings will be cemented with ASTM Type II neat cement to a depth of 200 feet above the base of the casing, and fully cemented from that depth to the surface using ASTM Type II cements with bentonite gel. Specific additives proposed for use during cementing will be provided to the TAC with the permit application submittal.

DER has allowed 210 days for the construction of the wells. Packer testing will be performed on the pilot hole of the first injection well to establish that the second intermediate casing is set below the 10,000 mg/l TDS interface. Coring will be performed during the pilot hole drilling of the second injection well, with coring intervals selected using the geophysical data collected during the drilling of the first injection well's pilot hole. Eight 10-foot core sections

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will be collected and tested for compressibility, and horizontal and vertical permeability.

Meetings with the TAC during construction of the wells will be necessary for the confirmation of the setting depths of the second intermediate casing string (1,800 ft), and for the final casing string (2,700 ft) of the first injection well. It is anticipated that decisions regarding the setting depths of the remainder of the injection well casings can be presented to the members of the TAC by letter and confirmed by telephone. During construction of the monitor well, the TAC may request a meeting to review the data used as the basis for selection of the monitor zones.

During the construction project, CH2M HILL will provide weekly progress reports to members of the TAC along with copies of pertinent geophysical data. Resident observation will be provided during routine drilling operations, and as necessary when critical drilling operations are underway. The Resident Observer will be present during geophysical logging, coring, casing running, cementing, and testing activities.

Mr. Carey asked what was the basis for the selection of the monitor zones shown in the conceptual design. Mr. McCormick replied that the monitor zones shown were projected from an interpretation of the data from the System 3 and System 9 injection wells. The lower zone of the monitor well will be the first transmissive interval below the 10,000 mg/l TDS interface. The depth of this zone is uncertain, but generally a suitable transmissive interval can be anticipated between 1,900 and 2,100 feet. The upper monitor zone is a transmissive zone that has been reliably encountered throughout South Florida at approximately 1,000 feet in depth. This zone generally occurs just under the base the confining units of the upper Floridan Aquifer and serves to detect any effluent that might bypass either the intermediate casings or the lower monitor zone.

Mr. Mike Merritt questioned the specific methodology to be used to select the monitor zones. Tom McCormick pointed out that since the monitor well will be drilled last, there will be ample geophysical data available from the three pilot holes to allow a very clear selection of a suitable zone. Packer testing of the monitor zones is not proposed. The monitor well will be drilled using the air-reverse drilling

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technique with open discharge of developed fluids. The waters developed will be disposed of by injection into one of the injection wells.

To insure that correct background data is collected for the monitor zones, CH2M HILL is proposing a prolonged period of development of the monitor well. For a period of 2 months after construction, the monitor zones will be pumped at a low rate and periodically tested for chloride, conductivity, pH, and TDS. Once the TAC is satisfied that the water being produced from the zones is truly representative of background water quality, samples will be drawn for analysis for the parameters specified by DER. Tom McCormick asked that Peggie Highsmith provide a letter to CH2M HILL detailing the specific analytical parameters sought.

In a discussion of the proposed geophysical logging schedule, Tom McCormick confirmed that Radioactive Tracer Surveys (RTS) will be run on the base of both injection well effluent conduit casings as part of the Mechanical Integrity Testing (MIT) of the wells. The TAC advised that an RTS survey will not be required for the monitor well. Temperature logs will be run in the open pilot hole and on first stage casing cementing. A black and white TV survey is proposed for the final inspection of each well.

Mr. Anthony LasCasas asked if CH2M HILL intended to perform the geophysical logging with their own equipment. Tom McCormick replied that this was the case for the majority of the proposed geophysical services.

Mr. Mike Merritt asked if the temperature tool to be used was a differential temperature tool. This is the case; CH2M HILL has recently purchased a third geophysical logging unit, and this is the equipment proposed for use on this project. The unit is a new digital model and is equipped with a multi-probe tool.

Injection testing of the wells will be carried out using canal water from the adjacent Lake Worth Drainage District Canal L-30. A step injection test of between 10 to 12 hours is proposed. A first step of approximately 4,000 gpm will be performed while running injection logs, flowmeter, temperature, and fluid conductivity. This step will require between 4 and 6 hours. Following completion of the

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geophysical logging, the injection rate will be stepped up to 6,000 gpm for approximately 2 hours, and then to 8,000 gpm for 2 hours, and then to 10,000 gpm for 2 hours.

James Carey noted that the conceptual design referenced a 1982 USGS publication and questioned whether more recent information would not be appropriate. Tom McCormick replied that the SFWMD information was from their open file and contained the most recent information available. The USGS information was reviewed and not referenced to insure that older oil exploration wells might not be overlooked.

In response to a question by Mr. David Butler, Tom McCormick described the proposed effluent reuse system. The regional plant will produce approximately 4 million gallons per day of effluent for use as landscape irrigation and non-potable service water. The emergency discharge line that is to be run to the System 3 percolation ponds passes two potential users. Should the consumptive use permits of those potential users be restricted or should the potential users decide that effluent reuse is economically feasible, the emergency discharge line will be used to distribute treated effluent.

Mr. McCormick thanked the TAC for their attention and the meeting concluded at 11:30 a.m.

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