SWCC-IW1
SWCC-DZMW1

Program Management at Risk Services for Water, Wastewater & Irrigation Facilities

WW-4C.1
Southwest Plant
Class I Deep Injection Well System

Appendices

A through D and F through Q

January 2009

MWH

Cape Coral
FLORIDA

Appendix A

FDEP Construction Permit

Department of Environmental Protection

Jeb Bush
Governor

South District
P.O. Box 2549
Fort Myers, Florida 33902-2549

Colleen Castille
Secretary

BY ELECTRONIC MAIL:

In the Matter of an
Application for Permit by:

November 2, 2006

Charles G. Pavlos, Public Works Director
P.O. Box 1500207
1015 Cultural Park Blvd.
Cape Coral, FL 33915-0000
cpavlos@capecoral.net

Lee County – UIC/IW/DW
FDEP File No. 254598-001-UC
City of Cape Coral Southwest WTP &
WRF IW-1 Class I Injection Well

NOTICE OF PERMIT ISSUANCE

Enclosed is Permit Number 254598-001-UC to construct a Class I Injection Well (IW-1) system, issued pursuant to Section(s) 403.087, Florida Statutes.

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, 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000; 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.

Executed in Fort Myers, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Jon M. Iglehart
Director of District Management

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this PERMIT and all copies were mailed before the close of business on November 2, 2006 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to Section.120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Regina C. Dick

Clerk

11/2/2006

Date

CC:

Charles Davault charles.davault@dep.state.fl.us
Philip Waller philip.waller@mwhglobal.com
Nancy Marsh marsh.nancy@epa.gov
Steve Anderson sanderso@sfwmd.gov
Ron Reese rsreese@usgs.gov
Joe Haberfeld joe.haberfeld@dep.state.fl.us

Department of Environmental Protection

Jeb Bush
Governor

South District
P.O. Box 2549
Fort Myers, Florida 33902-2549

Colleen Castille
Secretary

BY ELECTRONIC MAIL:

NOTICE OF INTENT TO ISSUE PERMIT

PERMITTEE:

City of Cape Coral
P.O. Box 1500207
1015 Cultural Park Boulevard
Cape Coral, FL 33915-0000

Permit/Certification
Number: 254598-001-UC
Date of Issue: November 1, 2006
Expiration Date: October 31, 2006
County: Lee
Latitude: 26° 35' 10" N
Longitude: 82° 01' 23" W
Section/Town/Range: 04/45S/23E
Project: City of Cape Coral Southwest WRF & WTP IW-1 Class I Injection Well

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and Florida Administrative Code (F.A.C.) Rules 62-4, 62-520, 62-528, 62-550, 62-600, 62-601, 62-620, and 62-660. 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:

Construct one nominal 16-inch ID diameter tubing and packer Class I injection well (IW-1), with cemented 24" steel casing to approximately 2,400 feet below land surface (bls) and 16.5-inch FRP injection tubing cemented to approximately 2400 feet bls and a total depth of approximately 3,000 feet bls. Injection is into the Oldsmar Formation for the primary means of disposal of non-hazardous secondary treated domestic wastewater from the Southwest WRF and non-hazardous reverse osmosis concentrate from the Southwest WTP for a maximum disposal of 9.6 million gallons per day (MGD) at a maximum injection rate of 6,642 gpm. The dual zone monitoring well (DZMW-1) will be completed from approximately 1300 to 1350 feet bls and from approximately 1800 to 1850 feet bls.

The Application to Construct/Operate/Abandon Class I, III, or V Injection well System, DEP Form 62-528.900(1), was received September 9, 2005, with supporting documents and additional information last received February 13, 2006. The Certificate of Demonstration of Financial Responsibility was approved December 9, 2005. The project is located at the City of Cape Coral Southwest WRF at 3310 S.W. 20th Avenue, Lee County, Florida.

Subject to Specific Conditions 1-14.

SPECIFIC CONDITIONS:

1. GENERAL CRITERIA

a. Any permit noncompliance constitutes a violation of the Safe Drinking Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

b. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

c. The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

d. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures.

e. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation or reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

f. When requested by the Department, the permittee shall furnish, within the time specified, any information needed to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit.

g. Signatories and Certification Requirements

(1) All reports and other submittals required to comply with this permit shall be signed by a person authorized under Rules 62-528.340(1) or (2), F.A.C.

(2) In accordance with Rule 62-528.340(4), F.A.C., all reports shall contain the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

h. The permittee shall notify the Department and obtain approval prior to any physical alterations or additions to the injection or monitor well, including removal of the well head.

i. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or injection activity that may result in noncompliance with permit requirements.

j. The permittee shall report any noncompliance that may endanger health or the environment, including:

(1) Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; or

SPECIFIC CONDITIONS:

(2) 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.

(3) Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

k. No underground injection is allowed that causes or allows movement of fluid into an underground source of drinking water.

l. The permittee shall retain all records of all monitoring information concerning the nature and composition of injected fluid until five years after completion of any plugging and abandonment procedures specified under Rule 62-528.435, F.A.C. The permittee shall deliver the records to the Department office that issued the permit at the conclusion of the retention period unless the permittee elects to continue retention of the records.

m. If injection is to continue beyond the expiration date of this permit the permittee shall apply for, and obtain an operation permit. If necessary to complete the two-year operational testing period, the permittee shall apply for renewal of the construction permit at least 60 days prior to the expiration date of this permit.

2. Site Requirements

a. A drilling pad shall be provided to collect spillage of contaminants and to support the heaviest load that will be encountered during drilling.

b. The disposal of drilling fluids, cuttings, formation water or waste shall be in a sound environmental manner that avoids violation of surface and ground water quality standards. The disposal method shall be approved by the Department prior to start of construction.

c. Specific drilling pad dimensions and design details shall be provided to and approved by the Department prior to commencing construction (and shortly after selection of drilling contractor).

d. The water table monitoring wells surrounding the injection well and monitor well pads shall be sampled and analyzed prior to drilling this injection well and then weekly thereafter. Sampling shall include specific conductance, pH, chloride, temperature and water level.

e. Pursuant to Rule 62-528.455(1)(c)6., F.A.C., a survey indicating the exact location in metes and bounds of all wells authorized by this permit shall be provided prior to issuance of an operating permit.

3. Construction and Testing Requirements

a. The permittee shall contact the Technical Advisory Committee (TAC) chairman so that he may schedule progress review meetings at appropriate times with the TAC and permittee for the purpose of reviewing the results of tests, geophysical logging, surveys, drilling records and construction problems.

b. All drilling shall be inside a blow out preventer upon penetration of the Floridan Aquifer.

SPECIFIC CONDITIONS:

c. Mechanical integrity testing is a two-part demonstration which includes a pressure test to demonstrate that no leaks are present in the casing, tubing or packer and a temperature or noise log and radioactive tracer survey to demonstrate the absence of leaks behind the casing. Verification of pressure gauge calibration must be provided at the scheduled tests. An interim mechanical integrity test consisting of a pressure test on the cemented tubing will be conducted midway between the standard 5-year mechanical integrity tests.

d. Department approval and Technical Advisory Committee (TAC) review pursuant to F.A.C. Rule 62-528 is required for the following stages of construction:

(1) Intermediate casing seat selection for injection and monitor wells.

(2) Final casing seat selection for injection and monitor wells.

(3) Prior to conducting the 24-hour injection test with reclaimed water.

(4) Prior to operational (long term) testing with effluent.

(5) The permittee shall submit all necessary supporting documentation/data, with interpretation, to the TAC for review.

e. The cementing program, as required in Section 62-528.410(5), Florida Administrative Code, shall be submitted to the Department and the Technical Advisory Committee for review. Cementing shall not commence prior to approval being granted.

f. All temperature surveys (except for mechanical integrity demonstration) shall be run within 48 hours after cementing.

g. TAC meetings are scheduled on the 1st Tuesday of each month subject to a 5 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 delay.

h. The Permittee shall insure that safe internal pressures are maintained during the cementing of all casings.

i. The injection zone and monitoring zones shall be sampled for background water quality prior to commencement of any injection testing. Parameters to be measured are the primary and secondary drinking water standards (except asbestos, dioxin, epichlorhydrin, and acrylamide) and the minimum criteria for municipal effluent.

j. The injection and monitor well(s) at the site shall be abandoned when no longer usable for their intended purpose, or when posing potential threat to the quality of the waters of the State. Within 180 days of well abandonment, the permittee shall submit to the Department and the TAC the proposed plugging method, pursuant to Rule 62-528.435, F.A.C.

k. All salt used in well drilling shall be stored in an environmentally sound manner. Accurate records shall be kept on the amount of salt used.

l. All dual induction, sonic and caliper geophysical logs run on the pilot holes of the injection well and monitor wells shall be submitted with scales of one inch equals one hundred feet (1”=100’), two inches equals one hundred feet (2"=100'), and five inches equals one hundred feet (5"=100')

m. An engineering drawing showing the drill pad construction (including material used) and locations of the injection well, dual zone monitor well, and the water table monitor wells shall be provided for Department approval prior to pad construction and well construction.

SPECIFIC CONDITIONS:

4. Quality Assurance/Quality Control Requirements

a. This permit approval is based upon evaluation of the data contained in the application dated August 2005 and the plans and/or specifications submitted in support of the application. Any proposed modifications to this permit shall be submitted in writing to the Underground Injection Control program manager, the TAC for review and clearance prior to implementation. Changes of negligible impact to the environment and staff time will be reviewed by the program manager, cleared when appropriate and incorporated into this permit. Changes or modifications other than those described above will require submission of a completed application and appropriate processing fee as per Rule 62-4.050, F.A.C.

b. A professional engineer registered pursuant to Chapter 471, Florida Statutes shall be retained throughout the construction period to be responsible for the construction operation and to certify the application, specifications, completion report and other related documents. The Department shall be notified immediately of any change of engineer.

c. Where required by Chapter 471 (P.E.) or Chapter 492 (P.G.) F.S., applicable portions of permit applications and supporting documents that are submitted to the Department for public record shall be signed and sealed by the professional(s) who approved or prepared them.

d. The Department shall be notified immediately of any problems that may seriously hinder compliance with this permit, construction progress, or good construction practice. The Department may require a detailed written report describing the problem, remedial measures taken to assure compliance and measures taken to prevent recurrence of the problem.

e. Issuance of a Class I Test/Injection well construction and testing permit does not obligate the Department to authorize operation of the injection well system, unless the wells qualify for an operation permit applied for by the permittee and issued by the Department.

5. Reporting Requirements

a. All reports and surveys required by this permit must be submitted concurrently to all the members of the TAC. The TAC consists of representatives from these agencies:

Florida Department of Environmental Protection
South District
P.O. Box 2549
Fort Myers, FL 33902-2549

Florida Department of Environmental Protection
Bureau of Water Facilities Regulation
UIC Program, MS 3530
2600 Blair Stone Rd.
Tallahassee, FL 32399-2400

South Florida Water Management District
P.O. Box 24860
West Palm Beach, FL 33416-4860

United States Geological Survey
9100 NW 36th Street, Suite 107
Miami, FL 33178

SPECIFIC CONDITIONS:

b. Members of the TAC shall receive a weekly summary of the daily log kept by the contractor. The reporting period shall run for seven (7) days and reports shall be mailed or emailed within 48 hours of the last day of the reporting period. The report shall include but is not limited to the following:

(1) Description of daily footage drilled by diameter of bit or size of hole opener or reamer being used;

(2) Description of formation and depth encountered; and specific conductance of water samples collected during drilling. Description of work during installation and cementing of casings; include amounts of casing and actual cement used versus calculated volume required.

(3) Lithological description of drill cuttings collected every ten (10) feet or at every change in formation. Description of work and type of testing accomplished, geophysical logging, pumping tests, deviation survey results, and coring results.

(4) Description of any construction problems that develop and their status to include a description of what is being done or has been done to correct the problem.

(5) Description of the amount of salt used.

(6) Results of any water quality analyses performed as required by this permit, including pad monitor wells

(7) Copies of the driller's log are to be submitted with the weekly summary.

c. The Department must be notified seventy-two (72) hours prior to all testing for mechanical integrity on the injection well. Testing should begin during daylight hours Monday through Friday.

d. Annotated copies of geophysical logs, lithologic descriptions and logs and water quality data (from drilling and packer tests) must be submitted to TAC, with interpretation, for intermediate and final casing seat selection approvals by the Department.

e. An interpretation of all test results must be submitted with all test data and geophysical logs.

f. After completion of construction and testing, a final report, certified by a P.E. and P.G., shall be submitted to the Department and the TAC. The report shall include, but not be limited to, all information and data collected under Rule 62-528.450(2) and Rule 62-528.450(3), F.A.C., with appropriate interpretations. Mill certificates for the casing(s) shall be included in this report. To the extent possible, the transmissivity of the injection zone and maximum injection rate within safe pressure limits shall be estimated.

6. The construction permit includes a period of temporary injection operation for the purposes of long term testing. Prior to commencement of operational testing:

a. Construction of the injection well shall be complete and the permittee shall submit a notice of completion of construction certified by a P.E. to the Department.

b. Each well shall first be tested for integrity of construction, and shall be followed by a short-term injection test of such duration to allow for the prediction of the operating pressure.

c. The permittee shall submit the following information to each member of the Technical Advisory Committee:

(1) A copy of the borehole television survey(s)

SPECIFIC CONDITIONS:

(2) Geophysical logs

(3) Mechanical integrity test data

(4) Data obtained during the short term injection testing conducted pursuant to Rules 62-528.405(3)(a) and 62-528.410(7)(e), and 62-528.450(3)(a)2., F.A.C.

(5) Confining zone data

(6) Background water quality data for the injection and monitor zones

(7) Wastestream analysis

(8) As-built well construction specifications

(9) Draft operation and maintenance manual with emergency procedures

(10) Other data obtained during well construction needed by the Department to evaluate whether the well will operate in compliance with Department rules.

d. The emergency discharge method shall be fully operational and no emergency discharge shall occur until the permittee has obtained all necessary permits.

e. Any corrective action required under Rule 62-528.300(5)(c)2., F.A.C., has been completed.

f. Written authorization shall be obtained from the Department. Authorization shall be for up to two years or the expiration date of the construction permit, whichever is less, and is nonrenewable. The authorization shall specify the conditions under which operational testing is approved. The authorization shall include:

(1) Injection pressure limitation

(2) Injection flow rate limitation

(3) Monthly specific injectivity testing

(4) Reporting requirements, and

(5) An expiration date for the operational testing period not to exceed two years.

g. Before authorizing operational testing the Department shall conduct an inspection of the facility to determine if the conditions of the permit have been met.

7. Operational Testing Requirements

a. Operational Testing Conditions - Injection Well System

(1) The injection system shall be monitored in accordance with rule 62-528.425(1)(g) and 62-528.430(2), F.A.C.

(2) The following injection well performance data shall be recorded and reported at the frequency indicated from the injection well instrumentation in the Monthly Operating Report as indicated below. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

SPECIFIC CONDITIONS:

The permittee shall use continuous indicating and recording devices to monitor injection flow rate and injection pressure and annular pressure. In the case of operational failure of any of these instruments for a period of more than 48 hours, the permittee shall report to the Department in writing the remedial action to be taken and the date when the failure will be corrected.

INJECTION WELL IW-I . The proposed specifications for the injection wells are as follows:

Casing Diameter (OD)	Depth (bls) Cased	Open Hole (bls)
48"Steel	500'	
40"Steel	1400'	
24" Steel	2400'	
18" FRP Tbg	2400'	2400-3000'

Parameters	Reporting Frequency
Injection Pressure (p.s.i)	Daily/Monthly
Maximum Injection Pressure	Daily/Monthly
Minimum Injection Pressure	Daily/Monthly
Average Injection Pressure	Daily/Monthly
Flow Rate (g.p.m.)	Daily/Monthly
Maximum Flow Rate	Daily/Monthly
Average Flow Rate	Daily/Monthly
Minimum Flow Rate	Daily/Monthly
Total Volume WRF Effluent Injected (gallons)	Daily
Total Volume WRF Effluent Injected (gallons)	Monthly
Total Volume WTP Concentrate Injected (gallons)	Daily
Total Volume WTP Concentrate Injected (gallons)	Monthly

Injectate Water Quality

WRF Effluent Water Quality

Ammonia (mg/L)	Monthly
TKN (mg/L)	Monthly
Nitrate and Nitrite as N (mg/l)	Monthly

WTP Concentrate Water Quality

TKN (mg/L)	Monthly
pH (std. units)	Monthly
Specific Conductance (µmhos/cm)	Monthly
Chloride (mg/L)	Monthly
Sulfate (mg/L)	Monthly
Field Temperature (deg. C)	Monthly
Total Dissolved Solids (mg/L)	Monthly
Sodium (mg/L)	Monthly

SPECIFIC CONDITIONS:

Calcium (mg/L)	Monthly
Potassium (mg/L)	Monthly
Magnesium (mg/L)	Monthly
Iron (mg/L)	Monthly
Bicarbonate (mg/L)	Monthly
Gross Alpha	Monthly
Radium 226	Monthly
Radium 228	Monthly

b. Operational Testing Conditions - Monitor Well System.

(1) The monitor well system will consist of one Dual Zone Monitor Well as described below:

Well Number	Casing Dia. (OD)	Depth (bls) Cased	Open Hole(bls)
DZMW-1	24" Steel	500'	
	16" Steel	1300'	1300-1350'
	6.625" FRP	1800'	1800-1850'

(2) All monitor wells shall be monitored in accordance with rule 62-528.425 and 62-528.430, F.A.C. The following monitor well performance data shall be recorded and reported at the frequency indicated from the monitor well instrumentation in the Monthly Operating Report as indicated below. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The permittee shall use continuous indicating and recording devices to monitor the monitor zone pressures or water levels. In the case of operational failure of any of these instruments for a period of more than 48 hours, the permittee shall report to the Department in writing the remedial action to be taken and the date when the failure will be corrected.

DZMW-1 Parameters	Reporting Frequency
Maximum Water Level or Pressure (Ft. NGVD or psi)	Daily/Monthly
Minimum Water Level or Pressure	Daily/Monthly
Average Water Level or Pressure	Monthly
Water Quality	
TKN (mg/L)	Weekly
Specific Conductance (µmhos/cm)	Weekly
Total Dissolved Solids (mg/L)	Weekly
pH (std. units)	Weekly
Chloride (mg/L)	Weekly
Sulfate (mg/L)	Weekly
Field Temperature (°C)	Weekly
Ammonia (mg/L)	Weekly
Sodium (mg/L)	Monthly
Calcium (mg/L)	Monthly
Potassium (mg/L)	Monthly
Magnesium (mg/L)	Monthly
Iron (mg/L)	Monthly
Bicarbonate (mg/L)	Monthly

SPECIFIC CONDITIONS:

Gross Alpha	Monthly (deep monitor zone only)
Radium 226	Monthly (deep monitor zone only)
Radium 228	Monthly (deep monitor zone only)

(3) Water quality data may be reduced to monthly analyses after a minimum six months of data if the conditions of Rule 62-528.450(3)(d), F.A.C., have been met and with Department approval.

c. The permittee shall calibrate all pressure gauge(s), flow meter(s), chart recorder(s), and other related equipment associated with the injection well system on a semi-annual basis. The permittee shall maintain all monitoring equipment and shall ensure that the monitoring equipment is calibrated and in proper operating condition at all times. Laboratory equipment, methods, and quality control will follow EPA guidelines as expressed in Standard Methods for the Examination of Water and Wastewater. The pressure gauge(s), flow meter(s), and chart recorder(s) shall be calibrated using standard engineering methods.

d. The permittee shall submit monthly to the Department the results of all injection well and monitor well data required by this permit no later than the last day of the month immediately following the month of record. The results shall be sent to the Department of Environmental Protection, P.O. Box 2549, Fort Myers, Florida 33902-2549. A copy of this report shall also be sent to the Department of Environmental Protection, Underground Injection Control Program, MS 3530, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.

e. The Engineer of Record or designated qualified representative must be present for the start-up operations and the Department must be notified in writing of the date operational testing commenced for the well.

8. Abnormal Events

a. In the event the permittee is temporarily unable to comply with any conditions of this permit due to breakdown of equipment, power outages, destruction by hazard of fire, wind, or by other cause, the permittee shall notify the Department. Notification shall be made in person, by telephone or by electronic mail within 24 hours of breakdown or malfunction to the UIC Program staff, South District office.

b. A written report of any noncompliance referenced in 1) above shall be submitted to the South District office within five days after its occurrence. The report shall describe the nature and cause of the breakdown or malfunction, the steps being taken or planned to be taken to correct the problem and prevent its reoccurrence, emergency procedures in use pending correction of the problem, and the time when the facility will again be operating in accordance with permit conditions.

9. Emergency Disposal

a. All applicable federal, state and local permits must be in place to allow for any alternate discharges due to emergency or planned outage conditions.

b. Any changes in emergency disposal methods must be submitted for Technical Advisory Committee (TAC) and USEPA review and Department approval.

c. The permittee shall notify the Department within 24 hours whenever an emergency discharge has occurred (Rule 62-528.415(4)(c)1., F.A.C.). Written notification shall be provided to the Department within 5 days after each occurrence. The Permittee shall indicate the location and duration of the discharge and the volume of fluid discharged.

SPECIFIC CONDITIONS:

10. Financial Responsibility

a. The permittee shall maintain the resources necessary to close, plug and abandon the injection and associated monitor wells, at all times (Rule 62-528.435(9), F.A.C.).

b. The permittee shall review annually the plugging and abandonment cost estimates. The permittee shall resubmit documentation necessary to demonstrate financial responsibility using the revised cost estimates on or before March 31 of each year.

c. In the event that the mechanism used to demonstrate financial responsibility should become invalid for any reason, the permittee shall notify the Department of Environmental Protection in writing within 14 days of such invalidation. The permittee shall, within 30 days of said notification, submit to the Department for approval, new financial documentation in order to comply with Rule 62-528.435(9), F.A.C., and the conditions of this permit.

11. Mechanical Integrity

a. Injection is prohibited until the permittee affirmatively demonstrates that the well has mechanical integrity. Prior to operational testing the permittee shall establish, and thereafter maintain, mechanical integrity of the well at all times.

b. If the Department determines that the injection well lacks mechanical integrity, written notice shall be given to the permittee.

c. Unless the Department requires the immediate cessation of injection, within 48 hours of receiving written notice from the department that the well lacks mechanical integrity the permittee shall cease injection into the well unless the Department allows continued injection pursuant to (d) below.

d. The Department may allow the permittee to continue operation of a well that lacks mechanical integrity if the permittee demonstrates that fluid movement into or between underground sources of drinking water is not occurring.

12. The permittee is reminded of the necessity to comply with the pertinent regulations of any other regulatory agency, as well as any county, municipal, and federal regulations applicable to the project. These regulations may include, but not limited to, those of the Federal Emergency Management Agency in implementing flood control measures. This permit should not be construed to imply compliance with the rules and regulations of other regulatory agencies.

13. The permittee shall be aware of and operate under the general conditions in Rule 62-528.307(1)(a) through (x) and Rule 62-528.307(2)(a) through (f), F.A.C. These general conditions are binding upon the permittee and enforceable pursuant to Chaper 403 of the Florida Statutes.

PERMITTEE:
Charles P Pavlos, Director of Public Works
City of Cape Coral

Permit/Cert. No.: 254598-001-UC
Date of Issue: November 1, 2006
Expiration Date: October 31, 2011

SPECIFIC CONDITIONS:

Note: In the event of an emergency the permittee shall contact the Department by calling (850) 488-1320. During normal business hours, the permittee shall call (239) 332-6975.

Issued this 1st day of November.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Jon M. Iglehart
Director of District Management

JMI/AMM/rcd

Appendix B

Deviation Surveys

Injection Well IW-1

Deviation Surveys

IW-1 DEVIATION SURVEYS

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

PILOT HOLE SURVEYS		
DATE	**DEPTH (ft bls)**	**DEVIATION (degrees)**
10/14/2007	90	0.5
10/14/2007	180	0.5
10/15/2007	270	0.5
10/15/2007	360	0.5
10/15/2007	450	0.5
10/26/2007	540	0.5
10/26/2007	630	0.5
10/26/2007	720	0.25
10/26/2007	800	0.25
10/26/2007	890	0.5
10/26/2007	980	0.5
10/27/2007	1,070	0.5
10/27/2007	1,160	0.5
10/27/2007	1,250	0.75
10/27/2007	1,340	0.25
10/28/2007	1,430	0.25
10/27/2007	1,520	0.3
10/27/2007	1,610	0.1
10/28/2007	1,700	0.1
12/1/2007	1,790	0.5
2/8/2007	1,880	0.5

REAMED HOLE SURVEYS		
DATE	**DEPTH (ft bls)**	**DEVIATION (degrees)**
10/16/2007	90	0.5
10/17/2007	180	0.5
10/18/2007	270	0.25
10/19/2007	360	0.5
10/20/2007	450	0.25
11/4/2007	540	0.2
11/4/2007	630	0.2
11/8/2007	720	0.5
11/9/2007	810	0.5
11/10/2007	900	0.33
11/10/2007	990	0.25
11/12/2007	1,080	0.3
11/12/2007	1,170	0.2
11/13/2007	1,260	0.15
11/13/2007	1,350	0.2
11/13/2007	1,440	0.25
11/14/2007	1,530	0.25
11/14/2007	1,620	0.25
2/2/2008	1,727	0.25
2/3/2008	1,818	0.25
2/3/2008	1,904	0.125

IW-1 DEVIATION SURVEYS

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

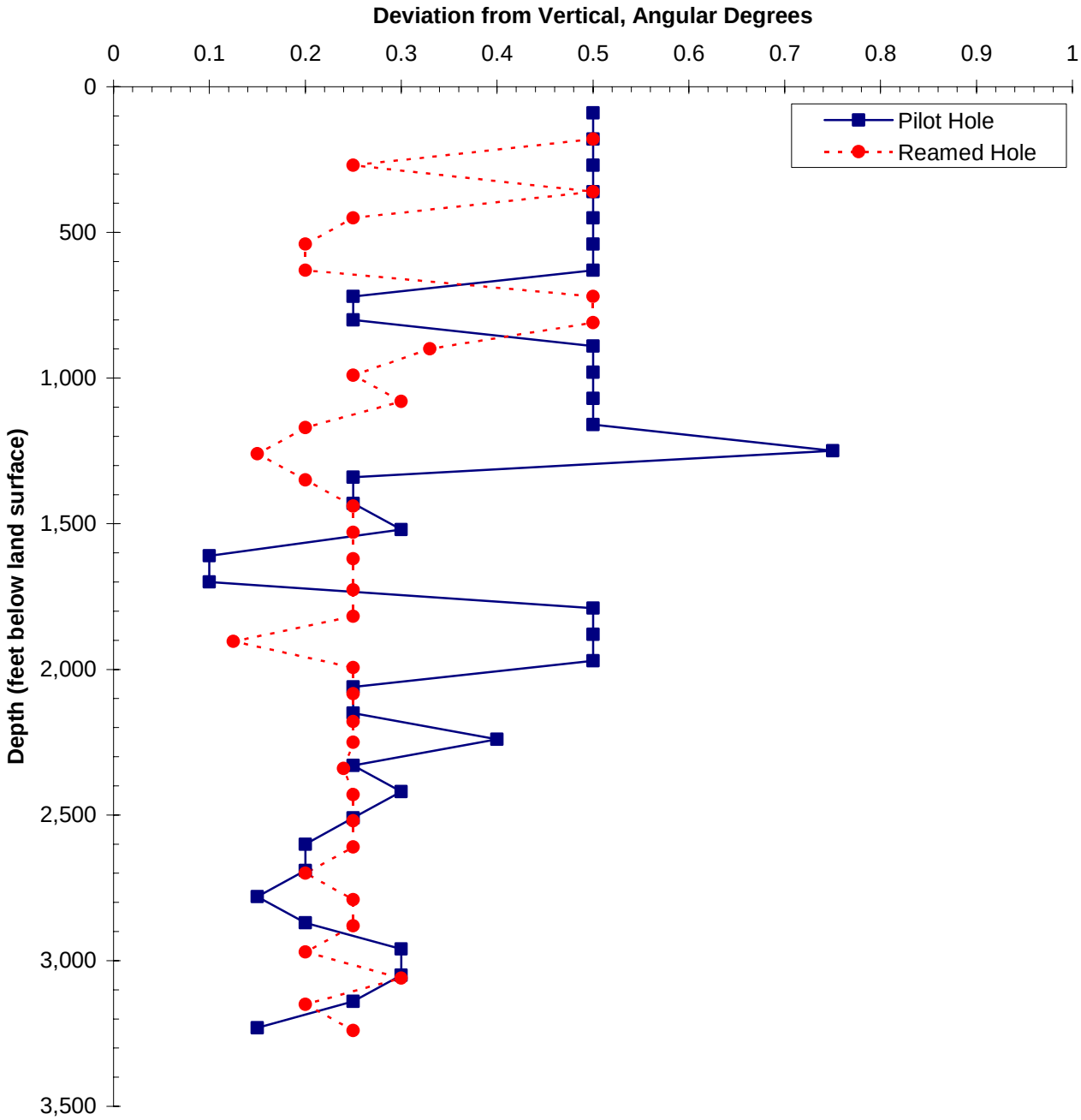
JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

PILOT HOLE SURVEYS		
DATE	**DEPTH (ft bls)**	**DEVIATION (degrees)**
12/14/2007	2,780	0.15
12/14/2007	2,870	0.2
12/17/2007	2,960	0.3
12/18/2007	3,050	0.3
12/18/2007	3,140	0.25
12/19/2007	3,230	0.15

REAMED HOLE SURVEYS		
DATE	**DEPTH (ft bls)**	**DEVIATION (degrees)**
2/22/2008	2,790	0.25
2/24/2008	2,880	0.25
3/1/2008	2,970	0.2
3/9/2008	3,060	0.3
3/24/2008	3,150	0.2
3/23/2008	3,240	0.25

NOTE: ft bls - feet below land surface

CITY OF CAPE CORAL
Southwest WRF & ROWTP IW-1
Pilot Hole & Reamed Hole
Deviation Surveys



Monitor Well DZMW-1

Deviation Surveys

DZMW-1 DEVIATION SURVEYS

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

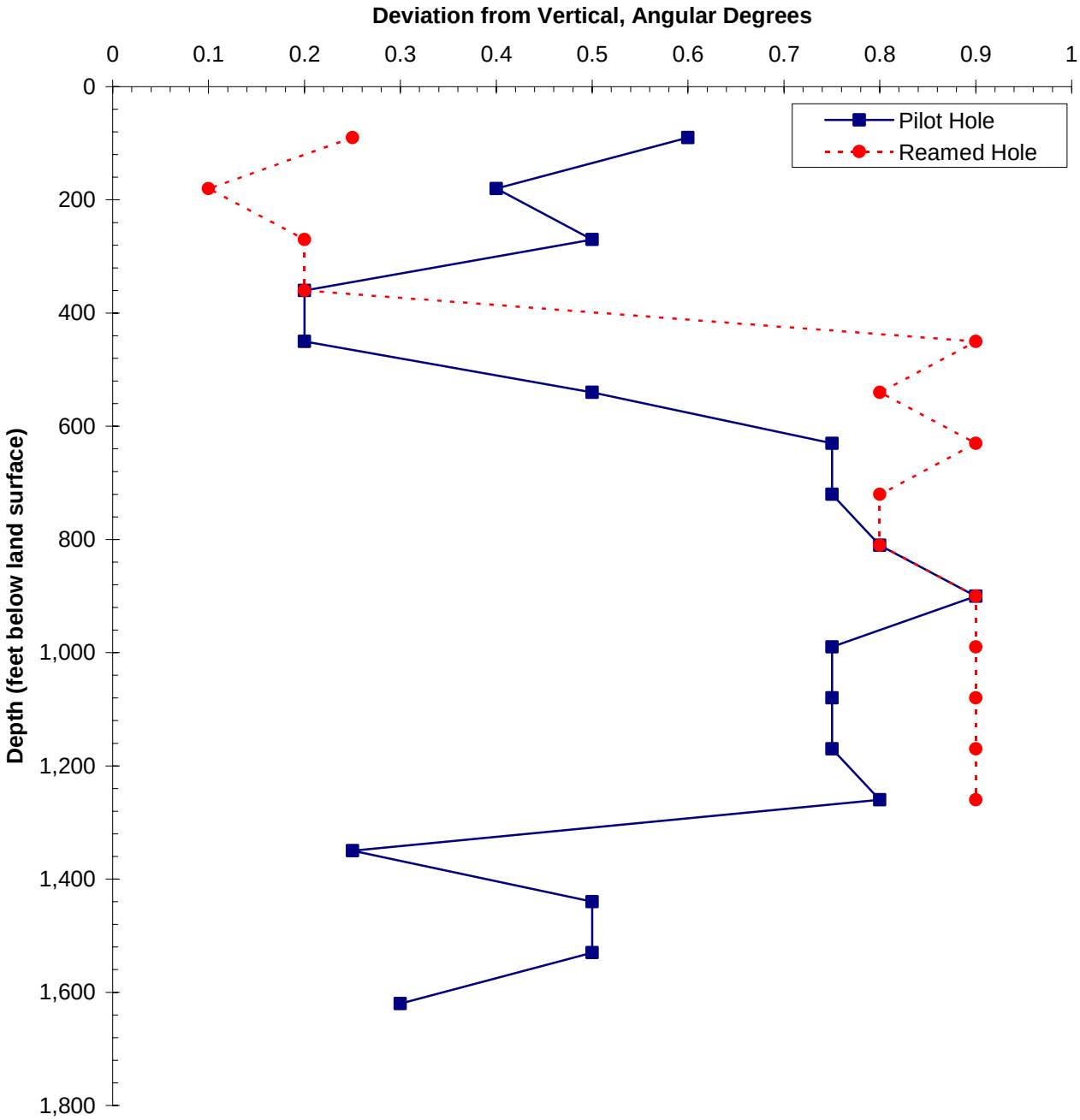
JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

PILOT HOLE SURVEYS		
DATE	**DEPTH (ft bls)**	**DEVIATION (degrees)**
5/9/2008	90	0.6
5/9/2008	180	0.4
5/9/2008	270	0.5
5/10/2008	360	0.2
5/10/2008	450	0.2
5/16/2008	540	0.5
5/17/2008	630	0.75
5/17/2008	720	0.75
5/17/2008	810	0.8
5/18/2008	900	0.9
5/18/2008	990	0.75
5/18/2008	1,080	0.75
5/18/2008	1,170	0.75
5/18/2008	1,260	0.8
5/18/2008	1,350	0.25
5/18/2008	1,440	0.5
5/20/2008	1,530	0.5
5/21/2008	1,620	0.3

REAMED HOLE SURVEYS		
DATE	**DEPTH (ft bls)**	**DEVIATION (degrees)**
5/11/2008	90	0.25
5/12/2008	180	0.1
5/12/2008	270	0.2
5/12/2008	360	0.2
5/13/2008	450	0.9
6/11/2008	540	0.8
6/12/2008	630	0.9
6/12/2008	720	0.8
6/12/2008	810	0.8
6/13/2008	900	0.9
6/14/2008	990	0.9
6/15/2008	1,080	0.9
6/16/2008	1,170	0.9
6/16/2008	1,260	0.9

NOTE: ft bls - feet below land surface

CITY OF CAPE CORAL
Southwest WRF & ROWTP DZMW-1
Pilot Hole & Reamed Hole
Deviation Surveys



Appendix C

Lithologic Logs

Injection Well IW-1

Lithologic Log

LITHOLOGIC DESCRIPTION OF SAMPLES FROM

INJECTION WELL 1

SOUTHWEST WRF AND ROWTP
CAPE CORAL, FLORIDA

DEPTH	DESCRIPTION
	UNDIFFERENTIATED MARINE TERRACE DEPOSITS
0 – 18	Sand, very pale orange (10 YR 8/2) to black (N1), intergranular porosity, possibly high permeability, fine to medium grained, subrounded, unconsolidated, organics (25%), shell (15%), heavy minerals (trace), mollusks
18 - 30	Shell Bed, light olive gray (5Y 5/2), intergranular porosity, possibly high permeability, unconsolidated, sand (20%), clay (trace), phosphate (5%), mollusks
	HAWTHORN GROUP PEACE RIVER FORMATION
30 – 40	Clayey silt, light olive gray (5Y 5/2), intergranular porosity, low permeability, very fine grained dolomite silt, poor induration with dolosilt, clay, and micrite cements, sand (30%), phosphate (5%), mollusks
40 - 90	Dolosilt/clay, olive gray (5Y 3/2), intergranular porosity, low permeability, very fine grained subhedral crystals, poor induration with dolosilt and clay cements, clay (5%), sand (15%), phosphate (5%)
90 – 100	Clayey sand, olive gray (5Y 3/2), intergranular porosity, low to medium permeability, very fine to coarse grained, subrounded to rounded, poor induration with dolomite and clay cements, phosphate (20%) some coarse size, clay (2%), dolosilt (5%), fossil fragments
100 – 110	Clayey sand, grayish olive (10Y 4/2), intergranular porosity, medium permeability, fine to medium grained, subrounded, poor induration with dolomite and clay cements, dolomite (2%), clay (trace), phosphate (20%), mollusks
110 -130	Clayey sand, olive gray (5Y 3/2), intergranular porosity, medium permeability, fine to coarse grained, subrounded to rounded, poor induration with clay cement, clay (trace), phosphate (30%), limestone (trace)

130 – 150	Limestone (wackestone), yellowish gray (5Y 7/2), intergranular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, 35 % allochems, grain size is microcrystalline to fine, poor induration with micrite cement, sand 35 %, phosphate 15 %, mollusks, benthonic foraminifera
150 -180	Clayey sand, light olive gray (5Y 5/2), intergranular porosity, medium permeability, fine to coarse grained, subrounded, medium spericity, poor induration with clay and dolomite cements, phosphate 15 %, fossil fragments
180 – 190	Clay, grayish olive (10Y 4/2), intergranular porosity, low permeability, poor induration with clay cement, sand 5 %, phosphate 2 %
190 – 200	Shell bed, yellowish gray (5Y 7/2), intergranular porosity, medium permeability, poor induration, sand 25 %, phosphate 10 %, mollusks
200 – 210	Phosphatic sand, pale greenish yellow (10Y 8/2), intergranular porosity, medium permeability, fine grained, rounded, high spericity, unconsolidated, quartz sand 15 %, limestone 10 %, mollusks
210 – 220	Limestone and phosphate rubble zone, yellowish gray, intergranular porosity, medium permeability, poor induration with micrite cement, phosphate 25 %, limestone fragments 25 %, mollusks
220 – 230	Sandy Clay, pale olive (10Y 6/2), intergranular porosity, low permeability, poor induration with clay and dolomite cements, sand 25%, phosphate 15%
230 – 240	As above, less sand (10%) and phosphate (5%)
240 – 260	Clayey sand, yellowish gray (5Y 8/1), intergranular porosity, low to medium permeability, very fine to medium grained, poor induration with clay and micrite cements, limestone 30%, clay (trace), phosphate 5%
260 – 270	Clayey sand, medium light gray (N6), intergranular porosity, low to medium permeability, very fine to coarse grained, subrounded to angular, soft, sticky, poor induration with clay and micrite cements, limestone (25%), clay (20%), sand (10%), phosphate (5%).
270 – 280	Clayey sand, medium light gray (N6), intergranular porosity, low to medium permeability, very fine to medium grained, subrounded to subangular, poor induration with clay and micrite cements, limestone (20%), sand (20%), clay (10%), phosphate (5%).

280 – 290	Dolosilt/Clay, light olive gray (5Y 6/1), intergranular porosity, low to medium permeability, very fine to fine grained, subrounded to rounded, very soft, sticky, poor induration with clay and trace micritic cements, limestone (10%), sand (5%), phosphate (5%).
290 – 300	Dolosilt/Clay, medium light gray (N6), intergranular porosity, low to medium permeability, very fine to coarse grained, subrounded to angular, soft, sticky, poor induration with clay and micrite cements, limestone (25%), clay (20%), sand (10%), phosphate (5%).
300 – 320	Dolosilt/Clay, medium light gray (N6), intergranular porosity, low to medium permeability, very fine to medium grained, sub-rounded to sub-angular, soft, sticky, poor induration with clay and micrite cements, limestone (15%), clay (20%), sand (10%), phosphate (5%).
320 – 330	Dolosilt/Clay, light olive gray (5Y 6/1), intergranular porosity, low to medium permeability, very fine to fine grained, subrounded to rounded, soft, sticky, poor induration with clay and trace micritic cements, limestone (15%), sand (15%), phosphate (5%).
330 – 360	Dolosilt/Clay, light gray (N7), intergranular porosity, low to medium permeability, very fine to medium grained, subrounded to rounded, very soft, sticky, poor induration with clay and trace micritic cements, limestone (15%), sand (20%), clay (15%), phosphate (5%).
360 – 380	Dolosilt/Clay Marl, light gray (N7) to yellowish gray (5Y 8/1), intergranular porosity, low to medium permeability, very fine to medium grained, subrounded to rounded, very soft, sticky, poor induration with clay and trace micritic cements, limestone (25%), sand (10%), clay (10%), phosphate (5%).

ARCADIA FORMATION

380 – 390	Sandy Limestone (wackestone), yellowish gray (5Y 8/1), intergranular porosity, medium porosity, grains are micritic, moderately hard with poor to moderate induration, micrite calcite cement, sand (20%), clay (10%), phosphate (5%), mollusks
390 – 410	Sandy limestone (wackestone), yellowish gray (5Y 8/1), intergranular and vugular porosity, low to medium permeability, grain types are biogenic, micrite, intraclast, fine grained, 25% allochems, microcrystalline to medium grained, poor induration with micrite cement, sand (25%), clay (trace), phosphate (5%), mollusks, bryozoans, benthonic foraminifera

410 – 420	Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, micrite, and crystal, fine grained, 35% allochems, microcrystalline to medium grained, moderate induration with micrite and sparry calcite cements, sand (10%), phosphate (trace), mollusks
420 – 430	Sandy Limestone (wackestone), yellowish gray (5Y 7/2), intergranular and moldic porosity, low to medium permeability, grain types are biogenic, micrite, and crystal, fine grained, 25% allochems, microcrystalline to medium grained, poor induration with micrite, spar and clay cements, clay (trace), sand (30 %), phosphate (3%), mollusks
430 – 440	Limestone (mudstone), yellowish gray (5Y 7/2), intergranular porosity, low permeability, grain types are biogenic and micrite, very fine grained, 10% allochems, microcrystalline to fine grained, poor induration with micrite cement, sand (15%), phosphate (2%)
440 – 450	Limestone (wackestone), yellowish gray (5Y 7/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, fine grained, 35% allochems, microcrystalline to medium grained, moderate induration with micrite cement, sand (5%), phosphate (5%), mollusks
450 – 470	Limestone (mudstone), yellowish gray (5Y 7/2), intergranular porosity, low permeability, grain types are biogenic and micrite, very fine grained, 10% allochems, microcrystalline to very fine grained, poor induration with micrite and clay cements, sand (5%), phosphate (5%)
470 – 482	Limestone (mudstone), yellowish gray (5Y 7/2), intergranular porosity, low permeability, grain types are biogenic and micrite, very fine grained, 5% allochems, microcrystalline to very fine grained, poor induration with micrite and clay cements, sand (10%), phosphate (2%)
482 – 490	Dolostone, yellowish gray (5Y 7/2), intercrystalline and pin point vugular porosity, low permeability, microcrystalline to very fine grained crystals, subhedral, 50 to 90% alteration, good induration with dolomite and sparry calcite cements, sand (trace), phosphate (trace)
490 – 510	Limestone (wackestone), very pale orange (10 YR 8/2), intergranular and moldic porosity, medium to high permeability, grain types are skeletal, biogenic, and micrite, fine to medium grained, 45% allochems, moderate induration with micrite cement, sand (15%), phosphate (5%), mollusks, benthonic foraminifera, bryozoans

510 – 520	no sample
520 – 540	Limestone (wackestone), yellowish gray (5Y 8/1), intergranular porosity, low to medium permeability, moderately hard, grains are biogenic and micrite, 15% allochems, microcrystalline to fine grained, good induration with micrite cement, clay (trace), phosphate (trace), benthic foraminifera.
540 – 550	Limestone (wackestone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal, and micrite, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (trace), mollusks, corals
550 – 560	Limestone (wackestone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal, and micrite, moderately to well indurated with micrite and spar cements, quartz sand (5%), phosphate (3%), crystalline limestone (20%), mollusks, corals
560 – 570	Limestone (wackestone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal, and micrite, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (10%), mollusks, corals
570 – 590	Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium to low permeability, grain types are biogenic, skeletal, and micrite, very fine grained, about 20 % allochems, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (5%), mollusks
590 – 600	Limestone (packstone), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium to high permeability, grain types are biogenic, skeletal, and micrite, fine grained, about 65 % allochems, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (5%), mollusks, benthonic foraminifera
600 – 610	Limestone (mudstone), yellowish gray (5Y 8/1), intergranular and moldic porosity, low permeability, grain types are biogenic, skeletal, and micrite, very fine grained, about 10 % allochems, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (5%), mollusks, benthonic foraminifera
600 – 610	Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and moldic porosity, low permeability, grain types are biogenic, skeletal, and micrite, very fine grained, about 35 % allochems, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (5%), mollusks, benthonic foraminifera

610 – 620 Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal, and micrite, very fine grained, about 45 % allochems, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (5%), mollusks, benthonic foraminifera

620 – 640 Dolostone, light olive gray (5Y 5/2), intercrystalline and vugular porosity, possibly low permeability, microcrystalline to very fine grained subhedral crystals, medium alteration, good induration with dolomite and spar cements, carbonate clay in sample

640 – 660 Dolostone (50%), light olive gray (5Y 5/2), intercrystalline and vugular porosity, possibly low permeability, microcrystalline to very fine grained subhedral crystals, medium alteration, good induration with dolomite and spar cements, carbonate clay in sample

Dolomitic Limestone (packstone) (50%), very pale orange (10YR 8/2), intergranular porosity, possibly low permeability, fine to medium grained allochems, moderately altered, moderately indurated with micrite and dolomite cements, trace clay

660 – 700 Limestone (packstone), yellowish gray (5Y 8/1), intergranular and moldic porosity, low to medium permeability, grains are biogenic and skeletal with trace micrite, > 80% allochems, fine to medium grains, moderately indurated with micrite and dolomite cements, moderate alteration, trace dolomite and carbonate clay.

SUWANNEE LIMESTONE

700 – 710 Limestone (grainstone/calcarenite), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium to high permeability, grains are biogenic and skeletal and crystal, > 90% allochems, medium grained, moderately to well indurated with micrite and dolomite cements, moderate alteration, trace dolomite, benthonic foraminifera, milliolids (Suwannee Limestone)

710 – 720 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 70% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks

720 – 740 Limestone (wackestone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, low to medium permeability, grains types are biogenic, skeletal and micrite, 15% allochems, microcrystalline to fine grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks

740 – 750 Limestone (mudstone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, low permeability, grains types are biogenic, skeletal and micrite, 10% allochems, microcrystalline to very fine grained, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids

750 – 770 Limestone (grainstone/calcarenite), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium to high permeability, grains are biogenic and skeletal and crystal, 90% allochems, medium grained, moderately to well indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, echinoids, mollusks

770 – 780 Limestone (wackestone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, low to medium permeability, grains types are biogenic, skeletal and micrite, 35% allochems, microcrystalline to fine grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera (*Rotallia mexicana)*, milliolids, mollusks

780 – 800 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 70% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, clay (1%), benthonic foraminifera, milliolids, mollusks

800 – 820 Limestone (grainstone/calcarenite), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium to high permeability, grains are biogenic and skeletal and crystal, 90% allochems, medium grained, poorly indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, echinoids, mollusks

820 – 860 Limestone (wackestone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, low to medium permeability, grains types are biogenic, skeletal and micrite, 45% allochems, microcrystalline to fine grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks, echinoids

860 – 870	Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera
870 – 890	Limestone (mudstone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, low permeability, grains types are biogenic, skeletal and micrite, 10% allochems, microcrystalline to very fine grained, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids
890 – 910	Carbonate Clay/Marl, yellowish gray (5Y 8/1), intergranular porosity, low permeability, soft, plastic, grains are very fine and micritic, poor induration, trace limestone from above and trace medium bluish gray (5B 5/1) moderately indurated mudstone.
910 – 940	Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 70% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks
940 – 960	Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera
960 – 980	Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 70% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, echinoid spines, benthonic foraminifera, milliolids, mollusks
980 – 1000	Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium to high permeability, grain types are biogenic, intraclast, and micrite, 80% allochems, medium grained, poor to moderate induration with micrite and spar cements, benthonic forams, echinoids
1000 – 1020	Limestone (grainstone/calcarenite), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium to high permeability, grains are biogenic and skeletal and crystal, 90% allochems, medium grained, poorly indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, echinoids, mollusks

1020 – 1040 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 70% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks

1040 – 1060 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 60% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks, echinoids

1060 – 1070 Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera

1070 – 1090 Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 35% allochems, moderate induration with micrite and sparry calcite cements, quartz sand (1%) benthonic foraminifera

1090 – 1120 Limestone (wackestone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 35% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera

1120 – 1130 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 60% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, dolomite fragments (2%), benthonic foraminifera, milliolids, mollusks, echinoids

1130 – 1150 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, low to medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, pyrite (trace), benthonic foraminifera, echinoids, pellets

1150 – 1180 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, low to medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 35% allochems, moderate induration with micrite and sparry calcite cements, quartz sand (trace), benthonic foraminifera, echinoids, pellets

1180 – 1200 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, quartz sand (trace), benthonic foraminifera, pellets

1200 – 1210 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, pyrite (trace), quartz sand (trace), benthonic foraminifera, pellets

1210 – 1220 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, clay (trace), benthonic foraminifera, pellets

OCALA LIMESTONE

1220 – 1250 Limestone (wackestone - packstone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 60% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera (*Heterestegina sp. Lepidocyclina ocalana,Operculinoides sp.*) , pellets

1250 – 1270 Limestone (wackestone - packstone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 60% allochems, moderate induration with micrite and sparry calcite cements, slight alteration, quartz sand (trace), benthonic foraminifera, pellets

1270 – 1290 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1290 – 1300 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to very fine grained, 30% allochems, moderate induration with micrite and sparry calcite cements, soft carbonate clay (10%), quartz sand (trace), benthonic foraminifera, pellets

1300 – 1310 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 30% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1310 -1320 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 30% allochems, moderate induration with micrite and sparry calcite cements, soft carbonate clay (10%), quartz sand (trace), benthonic foraminifera, pellets

1320 -1340 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 30% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1340 – 1380 Limestone (wackestone to packstone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 60% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets, mollusks

1380 – 1400 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1400 -1420 Limestone (wackestone to packstone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 60% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets, mollusks

1420 – 1430 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1430 – 1460 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 30% allochems, moderate induration with micrite and sparry calcite cements, soft carbonate clay (5%), benthonic foraminifera, pellets

1460 – 1470 Calcareous Clay, yellowish gray (5Y 7/2), intergranular porosity, low permeability, poor induration with clay, micrite, and dolomite cements, quartz sand (trace), formation contact

AVON PARK FORMATION

1470 – 1490 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 30% allochems, moderate induration with micrite and sparry calcite cements, soft carbonate clay (5%), benthonic foraminifera (*Operculinoides sp.*)

1490 – 1510 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 65% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*, *O*perculinoides *sp.*, *Gypsina sp.*), milliolids, mollusks, echinoids

1510 – 1520 As above, benthonic foraminifera (cones)

1520 – 1540 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 75% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*, *O*perculinoides *sp.*,), milliolids, mollusks, echinoids

1540 – 1560 Limestone (packstone to grainstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 85% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*, *O*perculinoides *sp.*,), milliolids, mollusks, echinoids, coquinoid (milliolids)

1560 – 1580 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 55% allochems, microcrystalline to medium grains, moderately to well indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*), milliolids, mollusks, echinoids

1580 – 1610 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera

1610 – 1630 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 65% allochems, microcrystalline to medium grains, moderately to well indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*), milliolids, mollusks, echinoids

1630 – 1650 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 7/2), intergranular, vugular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 75% allochems, microcrystalline to medium grains, well indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*), milliolids, mollusks, echinoids

1650 – 1670 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 50% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, cones

1670 – 1680 Crystalline limestone, very pale orange (10YR 8/2), intercrystalline and pin point vugular porosity, low permeability, grain types are biogenic, crystal, and micrite, microcrystalline to very fine grained, good induration with sparry calcite and micrite cements, benthonic foraminifera

1680 – 1700 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 7/2), intergranular, vugular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 65% allochems, microcrystalline to medium grains, moderate induration with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*), milliolids, mollusks, echinoids

1700 – 1710 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 7/2), intergranular, vugular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 60% allochems, microcrystalline to medium grains, moderate induration with micrite and sparry calcite cements, trace carbonate clay, benthonic foraminifera, milliolids, mollusks, echinoids

1710 – 1730 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 7/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 70% allochems, microcrystalline to medium grains, slight alteration, trace dolomite rhombs, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks, echinoids

1730 – 1740 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 7/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 60% allochems, microcrystalline to medium grains, trace dolomite rhombs, moderate induration with micrite and sparry calcite cements, trace carbonate clay, benthonic foraminifera, milliolids

1740 – 1750 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 7/2), intergranular, vugular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 60% allochems, microcrystalline to medium grains, moderate induration with micrite and sparry calcite cements, trace carbonate clay, benthonic foraminifera, milliolids, mollusks, echinoids

1750 – 1760 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular, vugular and moldic porosity, possibly low permeability, grain types are crystalline and micrite, 20% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement, undistinguishable forams.

1760 – 1770 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 40% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement, pellets.

1770 – 1780 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 10% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement.

1780 – 1790 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 20% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement, pellets.

1790 – 1800 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 10% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement.

1800 – 1810 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 10% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement, pellets.

1810 – 1820 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 40% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement, pellets.

1820 – 1830 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 10% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement.

1830 – 1840 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 20% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement, pellets.

1840 – 1850 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 10% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement.

1850 – 1860 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 50% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement.

1860 – 1870 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain type is crystalline, 10% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement.

1870 – 1880 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain type is crystalline, 40% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement.

1880 – 1890 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain types are crystalline and micrite, 10% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement.

1890 – 1900 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain type is crystalline, 30% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement.

1900 - 1910 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain type is crystalline and biogenic, 30% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement.

1910 - 1920 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain type is crystalline and biogenic, 10% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement.

1920 - 1930 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular and vugular porosity, possibly low permeability, grain type is crystalline, 20% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement.

1930 - 1940 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular, intercrystalline, and vugular porosity, possibly low permeability, grain type is crystalline and biogenic, 15% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement. Calcareous clay in sample.

1940 – 1950 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular, intercrystalline, and vugular porosity, possibly low permeability, grain type is crystalline and biogenic, 10% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement.

1950 – 1970 No sample.

1970 – 1980 Dolomitic limestone, pale yellowish brown (10YR 6/2), intergranular and intercrystalline porosity, possibly low permeability, grain type is crystalline and biogenic, poor induration, high alteration in dolostone, 20% micrite allochems, microcrystalline to medium grain, micrite and sparry calcite cements and dolomite rhombs, forams present.

1980 -1990 Lime mud, yellowish gray (5Y 8/1), intergranular porosity, possibly low permeability, grain type is biogenic and micritic, 90% allochems, very fine grains, unconsolidated, 10% indurated wackestone limestone.

1990 – 2000 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular and intercrystalline porosity, possibly low permeability, grain type is crystalline and biogenic, 20% allochems, microcrystalline to very fine grain, poor induration with sparry calcite cement, dolomite rhombs present.

2000 – 2030 Dolomitic Limestone, yellowish gray (5 Y 8/1) to dark yellowish brown (10YR 4/2), intergranular and intercrystalline porosity, possibly low permeability, grain type is crystalline, biogenic and micrite, 20% allochems, microcrystalline to fine grain, good induration with sparry calcite cement and dolomite, high alteration, forams present.

2030 -2040 Dolomitic Limestone, yellowish gray (5 Y 8/1), intergranular and intercrystalline porosity, possibly low permeability, grain type is crystalline, biogenic and micritic, 50% allochems, microcrystalline to very fine grain, poor induration with sparry calcite cement, dolomite rhombs present.

OLDSMAR FORMATION

2040 – 2050 Dolostone, mottled moderate yellowish brown (10YR 5/4) to dusky yellowish brown, intercrystalline porosity and pin-point vugular porosity, medium permeability, grain type is microcrystalline, high alteration, very good induration, 20% micritic limestone present.

2050 – 2060 Dolostone, mottled moderate yellowish brown (10YR 5/4) to dusky yellowish brown, intercrystalline porosity and pin-point vugular porosity, medium permeability, grain type is microcrystalline, high alteration, very good induration, trace micritic limestone present.

2060 – 2080 Dolostone, dark yellowish brown (10YR 4/2), intercrystalline and pin point vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, good induration with dolomite cement, limestone cavings

2080 – 2120 Dolostone, dusky yellowish brown (10YR 2/2), intercrystalline, intracrystalline, and vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, good induration with dolomite and micrite cements, micrite (trace), sucrosic crystals (trace).

2120 – 2150 Dolostone, dusky yellowish brown (10YR 2/2), intercrystalline, intracrystalline, and vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, good induration with dolomite cement, sucrosic dolomite rhombs.

2150 – 2190 Dolostone, dusky yellowish brown (10YR 2/2), intercrystalline, intracrystalline, and vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, good induration with dolomite cement, sucrosic dolomite rhombs.

2190 – 2230 Dolostone, dusky yellowish brown (10YR 2/2), intercrystalline, intracrystalline, and vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, good induration with dolomite cement, sucrosic dolomite rhombs.

2230 – 2300 Dolostone, dusky yellowish brown (10YR 2/2), intercrystalline, intracrystalline, and vugular porosity, medium permeability, microcrystalline to fine grained euhedral crystals, high alteration, good induration with dolomite cement, sucrosic dolomite rhombs, trace calcite spars.

2300 – 2340 Dolostone, dusky yellowish brown (10YR 2/2), intercrystalline, intracrystalline, and vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, good induration with dolomite cement, sucrosic dolomite rhombs. Gypsum (trace). Limestone (20%).

2340 – 2350 Dolomitic Limestone, yellowish gray (5 Y 8/1), intercrystalline, intracrystalline, and vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, good induration with dolomite cement, sucrosic dolomite rhombs. Gypsum (trace).

2350 – 2410 Limestone, very pale orange (10 YR 8/2 to yellowish gray (5 Y 8/1), intergranular, vugular and moldic porosity, possibly medium permeability, grain types are crystalline and micrite, 40% allochems, microcrystalline to very fine grain, good induration with micrite and sparry calcite cement, undistinguishable forams.

2410 – 2450 Dolostone, dusky yellowish brown (10YR 2/2), intercrystalline, and vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, moderate induration with dolomite cement, sucrosic dolomite rhombs. Limestone cavings in sample.

2450 – 2480 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, and vugular porosity, possibly medium permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, sparry calcite and dolomite cement, lignite in sample (5%), undistinguishable forams (40%).

2480 – 2500 Dolomitic Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, and vugular porosity, possibly medium permeability, microcrystalline to fine grained, 50% allochems, unconsolidated to poor induration with micrite, sparry calcite and dolomite cement, lignite in sample (5%), undistinguishable forams (40%).

2500 - 2530 Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, and vugular porosity, possibly high permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, lignite in sample (5%), undistinguishable forams (30%).

2530 - 2565 Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, and vugular porosity, possibly high permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, lignite in sample (5%), undistinguishable forams (30%). Decrease in dolomite quantity with depth.

2565 - 2570 Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, and vugular porosity, possibly high permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, lignite in sample (5%), undistinguishable forams (30%).

2570 - 2590 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, porosity, possibly high permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement.

2590 - 2610 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline porosity, possibly high permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, lignite in sample (20%), Decrease in lignite quantity with depth. Trace crystalline carbonate.

2610 - 2620 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, porosity, possibly high permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, undistinguishable forams (5%).

2620 - 2630 Limestone, very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, and vugular porosity, possibly high permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, lignite in sample (5%).

2630 - 2640 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, porosity, possibly high permeability, microcrystalline to fine grained, 60% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement.

2640 – 2650 Dolomitic Limestone, yellowish gray (5 Y 8/1), intercrystalline, intracrystalline, and vugular porosity, possibly low permeability, microcrystalline to fine grained euhedral crystals, high alteration, 60% allochems, unconsolidated to poor induration with micrite, and dolomite cement with, sucrosic dolomite rhombs.

2650 - 2670 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline, intergranular porosity, possibly high permeability, microcrystalline to medium grained, 30% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, undistinguishable forams (10%).

2670 - 2700 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to medium grained, 50% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, undistinguishable forams (5%).

2700 - 2730 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to fine grained, 40% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, undistinguishable forams (5%).

2730 - 2760 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to medium grained, 50% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, undistinguishable forams (5%).

2760 - 2800 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to medium grained, 40% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, undistinguishable forams (10%).

2800 - 2840 Limestone, (packstone) very pale orange (10 YR 8/2) to yellowish gray (5 Y 8/1), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to medium grained, 50% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, undistinguishable forams (10%).

2840 - 2860 Limestone, (packstone) yellowish gray (5 Y 7/2), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to medium grained, 40% allochems, unconsolidated to poor induration with micrite, and sparry calcite cement, undistinguishable forams (5%).

2860 - 2890 Limestone, (packstone) yellowish gray (5 Y 7/2), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to medium grained, 30% allochems, unconsolidated to poor induration with micrite, sparry calcite, and dolomite cement, undistinguishable forams (10%), slightly dolomitic (5%).

2890 - 2900 Limestone (packstone), yellowish gray (5 Y 7/2) and Dolostone, medium dark gray (N 4), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to very fine grained, 20% allochems, poor to good induration with micrite, sparry calcite, and dolomite cement.

2900 – 2950 Limestone, (packstone) yellowish gray (5 Y 7/2), intercrystalline and intergranular porosity, possibly high permeability, microcrystalline to fine grained, 20% allochems, unconsolidated to poor induration with micrite, sparry calcite, and dolomite cement, undistinguishable forams (5%), slightly dolomitic (5%).

2950 – 2970 Dolostone, pale yellowish brown (10YR 6/2), intercrystalline and vugular porosity, possibly high permeability, microcrystalline to medium grained euhedral crystals, high alteration, moderate induration with dolomite cement, sucrosic, dolomite rhombs. Limestone cavings in sample.

2970 – 2980 Dolostone, pale yellowish brown (10YR 6/2), intercrystalline porosity, possibly medium to high permeability, microcrystalline, high alteration, moderate induration with dolomite cement, limestone cavings in sample.

2980 – 3000 Dolostone, dusky yellowish brown (10 YR 2/2), intercrystalline porosity, possibly medium permeability, microcrystalline, high alteration, good induration with dolomite cement, massive, no visible secondary permeability.

3000 – 3020 Dolostone, dusky yellowish brown (10 YR 2/2), intercrystalline porosity, possibly medium permeability, cryptocrystalline to microcrystalline, high alteration, good induration with dolomite cement, massive, no visible secondary permeability.

3020 – 3050 Dolostone, dusky yellowish brown (10 YR 2/2), intercrystalline, intracrystalline, and pin point vugular porosity, possibly low permeability, microcrystalline, high alteration, good induration with dolomite cement, massive, no visible secondary permeability.

3050 – 3080 Dolostone, dusky yellowish brown (10 YR 2/2), intercrystalline, intracrystalline, and pin point vugular porosity, possibly low permeability, microcrystalline, high alteration, good induration with dolomite cement, massive, no visible secondary permeability.

3080 – 3100 Dolostone, dusky yellowish brown (10 YR 2/2), intercrystalline, intracrystalline, and pin point vugular porosity, possibly low permeability, microcrystalline, high alteration, good induration with dolomite cement, massive, no visible secondary permeability.

3100 – 3110 Dolostone, pale yellowish brown (10 YR 6/2), intercrystalline, intracrystalline, and pin point vugular porosity, possibly low to medium permeability, microcrystalline to , medium alteration, good induration with dolomite cement, no visible secondary permeability.

3110 – 3220 Dolostone, pale yellowish brown (10 YR 6/2), dusky yellowish brown (10 YR 2/2) and dark gray (N3), intercrystalline and intracrystalline, possibly low to medium permeability, cryptocrystalline to microcrystalline, high alteration, good induration with dolomite cement, massive, no visible secondary permeability.

3220 - 3230 Dolomitic limestone (packstone), light olive gray (5Y 6/1), intergranular porosity, possibly low permeability, fine to medium grained, 25% allochems, poor to good induration with micrite, sparry calcite, and dolomite cement.

3230 – 3240 No sample

3240 – 3270 Dolomitic limestone (packstone), light olive gray (5Y 6/1), intergranular porosity, possibly low permeability, fine to medium grained, 25% allochems, poor to good induration with micrite, sparry calcite, and dolomite cement.

CEDAR KEYS FORMATION

3270 -3280 Anhydrite (gypsum), white (N9) to very light gray (N8), intragranular porosity, low permeability, massive, opaque, soft with good induration, trace dolomitic limestone from above.

Monitor Well DZMW-1

Lithologic Log

LITHOLOGIC DESCRIPTION OF SAMPLES FROM

DUAL ZONE MONITOR WELL

SOUTHWEST WRF AND ROWTP
CAPE CORAL, FLORIDA

DEPTH	DESCRIPTION
	UNDIFFERENTIATED MARINE TERRACE DEPOSITS
0 – 20	Sand, very pale orange (10 YR 8/2) to black (N1), intergranular porosity, possibly high permeability, fine to medium grained, subrounded, unconsolidated, organics (25%), shell (15%), heavy minerals (trace), mollusks
20 - 30	Shell Bed, light olive gray (5Y 5/2), intergranular porosity, low permeability, poor induration with clay, micrite, and dolosilt cements, sand (20%), clay (10), phosphate (5%), mollusks, benthonic foraminifera (Ammonia beccarii)
	HAWTHORN GROUP PEACE RIVER FORMATION
30 – 40	Clayey silt, light olive gray (5Y 5/2), intergranular porosity, low permeability, very fine grained dolomite silt, poor induration with dolosilt, clay, and micrite cements, sand (20%), phosphate (5%), mollusks, benthonic foraminifera
40 - 90	Dolosilt/clay, olive gray (5Y 3/2), intergranular porosity, low permeability, very fine grained subhedral crystals, poor induration with dolosilt and clay cements, clay (5%), sand (10%), phosphate (5%)
90 – 100	Clayey sand, light olive gray (5Y 5/2), intergranular porosity, low to medium permeability, very fine to coarse grained, subrounded to rounded, poor induration with dolomite and clay cements, phosphate (10%) some coarse size, clay (2%), dolosilt (5%), fossil fragments
100 – 120	Clayey sand, yellowish gray (5Y 7/2), intergranular porosity, medium permeability, fine to medium grained, subrounded, poor induration with dolomite, micrite, and clay cements, dolomite (2%), clay (trace), phosphate (5%), mollusks, benthonic foraminifera

120 - 130	Clayey sand, yellowish gray (5Y 7/2), intergranular porosity, medium permeability, fine to coarse grained, subrounded to rounded, poor induration with clay cement, clay (trace), phosphate 20%, limestone (10%)
130 – 150	Limestone (wackestone), yellowish gray (5Y 7/2), intergranular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, 35 % allochems, grain size is microcrystalline to fine, poor induration with micrite cement, sand 25 %, phosphate 5 %, mollusks, benthonic foraminifera
150 -170	Clayey sand, light olive gray (5Y 5/2), intergranular porosity, medium permeability, fine to coarse grained, subrounded, medium spericity, poor induration with clay and dolomite cements, phosphate 15 %, fossil fragments
170 – 180	Limestone (wackestone), yellowish gray (5Y 7/2), intergranular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, 45 % allochems, grain size is microcrystalline to fine, moderate induration with micrite cement, sand 25 %, phosphate 5 %, mollusks, benthonic foraminifera
180 – 190	Clay, grayish olive (10Y 4/2), intergranular porosity, low permeability, poor induration with clay cement, sand 5 %, phosphate 2 %
190 – 200	Phosphatic sand, pale greenish yellow (10Y 8/2), intergranular porosity, medium permeability, fine grained, rounded, high spericity, unconsolidated, quartz sand 15 %, limestone 10 %, mollusks
200 – 210	Limestone (mudstone), grayish yellow (5 Y 8/4), intergranular porosity, low permeability, grain types are biogenic and micrite, 10 % allochem, grain size is microcrystalline to fine, poor induration with micrite cement, phosphate 25 %
210 – 220	Calcareous Clay, pale olive (10Y 6/2), intergranular porosity, low permeability, poor induration with clay and dolomite cements, sand 5%, phosphate 5%
220 – 240	Clayey sand, yellowish gray (5Y 8/1), intergranular porosity, low to medium permeability, very fine to medium grained, poor induration with clay and micrite cements, limestone 30%, clay (trace), phosphate 5%
240 – 250	Limestone (wackestone), yellowish gray (5Y 7/2), intergranular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, 45 % allochems, grain size is microcrystalline to fine, moderate induration with micrite cement, sand 25 %, phosphate 5 %, mollusks, benthonic foraminifera

260 – 280	Sandy clay, medium light gray (N6), intergranular porosity, low permeability, poor induration with clay, dolosilt, and micrite cements, limestone (20%), sand (20%), phosphate (5%).
280 – 300	Dolosilt/Clay, yellowish gray (5 Y 7/2), intergranular porosity, low to medium permeability, very fine to fine grained, very soft, sticky, poor induration with clay and trace micritic cements, limestone (10%), sand (5%), phosphate (5%).
300 - 320	Dolosilt/Clay, pale olive (10 Y 6/2), intergranular porosity, low permeability, poor induration with dolomite, clay, and micrite cements, clay (10%), sand (10%), phosphate (5%).
320 – 340	Dolosilt/Clay, yellowish gray (5 Y 7/2), intergranular porosity, low to medium permeability, poor induration with dolomite, clay, and micrite cements, limestone (5%), clay (10%), sand (10%), phosphate (15%).
340 – 350	Sandy Limestone (wackestone), yellowish gray (5Y 8/1), intergranular porosity, medium porosity, grains are micritic, poor to moderate induration, micrite calcite cement, sand (20%), clay (10%), phosphate (5%), mollusks
350 – 360	Dolosilt/Clay, light olive gray (5Y 6/1), intergranular porosity, low to medium permeability, very fine to fine grained, subrounded to rounded, soft, sticky, poor induration with clay and trace micritic cements, limestone (15%), sand (15%), phosphate (5%).

ARCADIA FORMATION

360 – 380	Sandy Limestone (wackestone), grayish orange (10 YR 7/4), intergranular porosity, medium porosity, grains are micritic, moderately hard with poor to moderate induration, micrite calcite cement, sand (20%), clay (10%), phosphate (5%), mollusks
380 – 390	Dolosilt/Clay, light olive gray (5Y 6/1), intergranular porosity, low to medium permeability, very fine to fine grained, subrounded to rounded, soft, sticky, poor induration with clay and trace micritic cements, limestone (15%), sand (15%), phosphate (5%).
390 – 400	Sandy limestone (wackestone), yellowish gray (5Y 8/1), intergranular and vugular porosity, low to medium permeability, grain types are biogenic, micrite, intraclast, fine grained, 25% allochems, microcrystalline to medium grained, poor induration with micrite cement, sand (25%), clay (trace), phosphate (5%), mollusks, bryozoans, benthonic foraminifera

400 – 410	Limestone (wackestone),yellowish gray (5 Y 7/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, micrite, and crystal, fine grained, 35% allochems, microcrystalline to medium grained, poor induration with micrite and sparry calcite cements, sand (10%), phosphate (trace), mollusks
410 – 420	Sandy Limestone (wackestone), yellowish gray (5Y 7/2), intergranular and moldic porosity, medium permeability, grain types are biogenic, micrite, and crystal, fine grained, 25% allochems, microcrystalline to medium grained, moderate induration with micrite, spar and clay cements, clay (trace), sand (10 %), phosphate (3%), mollusks
420 – 430	Limestone (mudstone), yellowish gray (5Y 7/2), intergranular porosity, low permeability, grain types are biogenic and micrite, very fine grained, 10% allochems, microcrystalline to fine grained, poor induration with micrite cement, sand (15%), phosphate (2%)
430 – 450	Limestone (wackestone), yellowish gray (5Y 7/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, fine grained, 35% allochems, microcrystalline to medium grained, moderate induration with micrite cement, sand (5%), phosphate (5%), mollusks
450 – 470	Limestone (mudstone), yellowish gray (5Y 7/2), intergranular porosity, low permeability, grain types are biogenic and micrite, very fine grained, 10% allochems, microcrystalline to very fine grained, poor induration with micrite and clay cements, sand (5%), phosphate (5%)
470 – 490	Limestone (wackestone), very pale orange (10 YR 8/2), intergranular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, fine grained, 35% allochems, microcrystalline to very fine grained, moderate induration with micrite and sparry calcite cements, sand (5%), phosphate (2%)
490 - 500	Limestone (packstone), very pale orange (10 YR 8/2), intergranular and moldic porosity, medium to high permeability, grain types are skeletal, biogenic, and micrite, fine to medium grained, 65% allochems, moderate induration with micrite cement, sand (15%), phosphate (5%), mollusks, benthonic foraminifera, bryozoans
500 - 510	Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and intercrystalline porosity, low to medium permeability, grain types are biogenic, skeletal, and crystal, fine grained, microcrystalline to fine grained, 25% allochems, good induration with micrite, sparry calcite, and dolomite cements, benthic foraminifera, mollusks.

510 – 530 Dolostone, grayish orange (10 YR 7/4), intercrystalline and vugular porosity, possibly low permeability, medium to high alteration, microcrystalline to very fine grained subhedral crystals, good induration with dolomite and spar cements.

530 – 550 Limestone (wackestone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal, and micrite, 35% allochems, fine grained, microcrystalline to medium grained, moderately to well indurated with micrite and spar cements, quartz sand (1%), phosphate (1%), crystalline limestone (20%), mollusks, corals, benthonic foraminifera.

550 – 570 Limestone (wackestone), very pale orange (10YR 8/2) to light gray (N7), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal, and micrite, 45% allochems, microcrystalline to coarse grained, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (1%), mollusks, corals, benthonic foraminifera.

570 – 590 Limestone (packstone), very pale orange (10 YR 8/2), intergranular and moldic porosity, medium to low permeability, grain types are biogenic, skeletal, and micrite, very fine grained, about 20 % allochems, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (5%), mollusks, benthonic foraminifera.

590 – 610 Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal, and micrite, fine grained, about 65 % allochems, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (5%), mollusks, benthonic foraminifera.

610 – 620 Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and moldic porosity, moderate permeability, grain types are biogenic and skeletal, fine grained, about 30 % allochems, moderately indurated with micrite and spar cements, quartz sand (5%), phosphate (5%), mollusks, benthonic foraminifera, *Sorites sp.*

620 – 630 Dolostone, medium light gray (N 6), vugular and intercrystalline porosity, low permeability, medium alteration, very fine grained subhedral crystals, microcrystalline to fine grained, good induration with dolomite, micrite and spar cements, quartz sand (5%), phosphate (5%)

630 – 640 Limestone (mudstone), white (N 9), intergranular porosity, low permeability, grain types are biogenic, skeletal, and micrite, very fine grained, about 10 % allochems, poorly indurated with micrite and spar cements, quartz sand (5%), phosphate (2%), mollusks, benthonic foraminifera, looks like formation contact (reworked)

SUWANNEE LIMESTONE

640 – 650 Limestone (packstone), yellowish gray (5Y 8/1), intergranular and moldic porosity, medium to high permeability, grains are biogenic and skeletal and crystal, 65% allochems, medium grained, moderately to well indurated with micrite and dolomite cements, moderate alteration, trace dolomite, trace quartz sand, benthonic foraminifera, milliolids (Suwannee Limestone)

650 – 670 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium to high permeability, grains types are biogenic, skeletal and micrite, 70% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks

670 – 690 Limestone (grainstone/calcarenite), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, possibly high permeability, grains types are biogenic, skeletal and micrite, 85% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks, corals, bryozoans

690 – 700 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grains types are biogenic, skeletal and micrite, 55% allochems, microcrystalline to fine grained, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids

700 – 720 Limestone (packstone), very pale orange (10 YR 8/2), intergranular and moldic porosity, medium to high permeability, grains are biogenic and skeletal and crystal, 65% allochems, medium grained, moderately to well indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, echinoids, mollusks

720 – 730 Limestone (grainstone/calcarenite), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, possibly high permeability, grains types are biogenic, skeletal and micrite, 90% allochems, microcrystalline to medium grained, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera (*Rotallia sp.)*, milliolids, mollusks

730 – 740 Limestone (wackestone), pale yellowish orange (10YR 8/6), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 45% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, benthonic foraminifera (cones), milliolids, mollusks

740 – 750 Limestone (wackestone), very pale orange (10 Y 8/2), intergranular and vugular porosity, medium permeability, grains are biogenic and skeletal and micrite, 35 % allochems, medium grained, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, echinoids, mollusks

750 – 760 Limestone (grainstone/calcarenite), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, possibly high permeability, grains types are biogenic, skeletal and intraclast, 90% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks

760 – 770 Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera

770 – 780 Limestone (wackestone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grains types are biogenic, skeletal and micrite, 30% allochems, microcrystalline to very fine grained, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids

780 – 790 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 65% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks

790 – 800 Limestone (wackestone), yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera (Discorinopsis sp.)

800 – 810 Limestone (packstone), very pale orange (10YR 8/2) to grayish orange (10 YR 7/4), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 70% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, echinoid spines, benthonic foraminifera, milliolids, mollusks

810 – 820 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, low permeability, grain types are biogenic, crystal, and micrite, 25% allochems, medium grained, poor to moderate induration with micrite and spar cements, calcareous clay (5%), benthonic forams, echinoids.

820 – 830 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, low permeability, grain types are biogenic, crystal, and micrite, 25% allochems, medium grained, moderate induration with micrite and spar cements, benthonic forams, echinoids.

830 – 840 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, low permeability, grain types are biogenic, crystal, and micrite, 25% allochems, medium grained, poor to moderate induration with micrite and spar cements, calcareous clay (5%), benthonic forams, echinoids.

840 – 860 Limestone (packstone), pale yellowish brown (10 YR 6/2), intergranular, moldic and vugular porosity, moderate permeability, grain types are biogenic, crystal, and micrite, 45% allochems, medium grained, moderate induration with micrite and spar cements, abundant benthonic forams, echinoids, mollusks.

860 – 880 Limestone (packstone), pale yellowish brown (10 YR 6/2), intergranular, moldic and vugular porosity, grain types are biogenic, skeletal, and micrite, 40% allochems, fine to medium grained, moderate induration with micrite and spar cements, benthonic forams, echinoids.

880 – 890 Limestone (wackestone), very light gray (N 8), intergranular, moldic and vugular porosity, grain types are biogenic, skeletal, and micrite, 20% allochems, fine to medium grained, moderate induration with micrite and spar cements, calcareous silt and clay (15%), benthonic forams, echinoids.

890 – 900 Limestone (mudstone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, low permeability, grain types are biogenic and micrite, 5% allochems, fine to medium grained, moderate induration with micrite and spar cements, benthonic forams.

900 – 910 Limestone (wackestone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, low permeability, grain types are biogenic, skeletal, and micrite, 20% allochems, fine to medium grained, moderate induration with micrite and spar cements, calcareous silt and clay 20%, benthonic forams.

910 – 920 Limestone (wackestone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, low permeability, grain types are biogenic, skeletal, and micrite, 25% allochems, fine to medium grained, moderate induration with micrite and spar cements, benthonic forams.

920 - 950 Limestone (wackestone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, low permeability, grain types are biogenic, skeletal, and micrite, 20% allochems, fine to medium grained, moderate induration with micrite and spar cements, calcareous silt and clay 20%, benthonic forams.

950 – 960 Limestone (wackestone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, low permeability, grain types are biogenic, skeletal, and micrite, 20% allochems, fine to medium grained, moderate induration with micrite and spar cements, calcareous silt and clay 15%, benthonic forams.

960 – 970 Limestone (grainstone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, grain types are biogenic, skeletal, and micrite, 80% allochems, fine to medium grained, moderate induration with micrite and spar cements, benthonic forams, spicules.

970 – 990 Limestone (packstone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, grain types are biogenic, skeletal, and micrite, 60% allochems, fine to medium grained, moderate induration with micrite and spar cements, benthonic forams*,(Discorinopsis gunteri, sp.)*

990 – 1000 Limestone (wackestone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, low permeability, grain types are biogenic, skeletal, and micrite, 20% allochems, fine to medium grained, moderate induration with micrite and spar cements, benthonic forams.

1000 – 1030 Limestone (grainstone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, grain types are biogenic, skeletal, and micrite, 90% allochems, fine to medium grained, moderate induration with micrite and spar cements, benthonic forams, spicules.

1030 – 1040 Limestone (grainstone), yellowish gray (5 Y 8/1), intergranular, moldic and vugular porosity, grain types are biogenic, skeletal, and micrite, 90% allochems, fine to medium grained, moderate induration with micrite and spar cements, benthonic forams, spicules, (*Dictyoconus cookei, sp.)*

1040 – 1050 Limestone (packstone), grayish orange (10 YR 7/4), intergranular and vugular porosity, medium permeability, grain types are biogenic, crystal, and micrite, 65% allochems, medium grained, moderate induration with micrite and spar cements, benthonic forams, echinoids.

1050 – 1070 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal and micrite, 45% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks

1070 – 1080 Limestone (mudstone), white (N 9) to very pale orange (10YR 8/2), intergranular porosity, low permeability, grain types are biogenic, skeletal and micrite, 10% allochems, microcrystalline to medium grains, poorly indurated with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks, echinoids

1080 – 1090 Limestone (packstone), yellowish gray (5Y 8/1), intergranular and vugular porosity, possibly high permeability, grain types are biogenic, skeletal, and intraclast, microcrystalline to medium grained, 75% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera (cones)

1090 – 1100 Limestone (mudstone/calcareous clay), white (N 9) to very pale orange (10 YR 8/2), intergranular and vugular porosity, low permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 10% allochems, poor induration with micrite and sparry calcite cements, phosphatic sand (1%), benthonic foraminifera (possible reworked zone near Formation contact)

1100 – 1110 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 8/1), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and intraclast, microcrystalline to medium grained, 65% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, milliolids, mollusks

1110 – 1130 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 60% allochems, microcrystalline to medium grains, poorly

indurated with micrite and sparry calcite cements, dolomite fragments (2%), benthonic foraminifera, milliolids, mollusks, echinoids

1130 – 1140 Limestone (packstone), yellowish gray (5 Y 8/1) to very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 55% allochems, moderate induration with micrite and sparry calcite cements, quartz sand (trace), benthonic foraminifera, echinoids, pellets, mollusks

1140 – 1160 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, low to medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 35% allochems, moderate induration with micrite and sparry calcite cements, quartz sand (trace), benthonic foraminifera, echinoids, pellets

1160 – 1170 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 45% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1170 – 1180 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 35% allochems, moderate induration with micrite and sparry calcite cements, quartz sand (trace), benthonic foraminifera, pellets

1180 – 1200 Limestone (wackestone), grayish orange (10 YR 7/4) to very pale orange (10 YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1200 – 1210 Limestone (wackestone), grayish orange (10 YR 7/4) to very pale orange (10 YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 50% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

OCALA LIMESTONE

1210 – 1220 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 65% allochems, microcrystalline to medium grains,

moderately indurated with micrite and sparry calcite cements, benthonic foraminifera

1220 – 1230 Limestone (packstone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 65% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera (*Heterestegina sp. Lepidocyclina ocalana, Operculinoides sp.*) , pellets, echinoids, bryozoans

1230 – 1250 Limestone (wackestone - packstone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 60% allochems, moderate induration with micrite and sparry calcite cements, slight alteration, quartz sand (trace), benthonic foraminifera (*Heterestegina sp., Lepidocyclina ocalana, Operculinoides sp., Gypsina globula*), pellets, echinoides

1250 – 1260 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera (*Amphistegina sp.*), pellets

1290 – 1300 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to very fine grained, 30% allochems, moderate induration with micrite and sparry calcite cements, soft carbonate clay (10%), quartz sand (trace), benthonic foraminifera, pellets

1300 – 1310 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 30% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1310 -1320 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 30% allochems, moderate induration with micrite and sparry calcite cements, soft carbonate clay (10%), quartz sand (trace), benthonic foraminifera, pellets

1320 -1340 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 30% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1340 – 1380 Limestone (wackestone to packstone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 60% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets, mollusks

1380 – 1400 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1400 -1420 Limestone (wackestone to packstone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to medium grained, 60% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets, mollusks

1420 – 1430 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, pellets

1430 – 1460 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 30% allochems, moderate induration with micrite and sparry calcite cements, soft carbonate clay (5%), benthonic foraminifera, pellets

1460 – 1470 Calcareous Clay, yellowish gray (5Y 7/2), intergranular porosity, low permeability, poor induration with clay, micrite, and dolomite cements, quartz sand (trace), formation contact

AVON PARK FORMATION

1470 – 1490 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 30% allochems, moderate induration with micrite and sparry calcite cements, soft carbonate clay (5%), benthonic foraminifera (*Operculinoides sp.*)

1490 – 1510 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 65% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*, *O*perculinoides *sp.*, *Gypsina sp.*), milliolids, mollusks, echinoids

1510 – 1520 As above, benthonic foraminifera cones

1520 – 1540 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 75% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*, *Operculinoides sp.*,), milliolids, mollusks, echinoids

1540 – 1560 Limestone (packstone to grainstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal and micrite, 85% allochems, microcrystalline to medium grains, moderately indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*, *O*perculinoides *sp.*,), milliolids, mollusks, echinoids, coquinoid (milliolids)

1560 – 1580 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grain types are biogenic, skeletal and micrite, 55% allochems, microcrystalline to medium grains, moderately to well indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*), milliolids, mollusks, echinoids

1580 – 1610 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 40% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera

1610 – 1630 Limestone (packstone), very pale orange (10YR 8/2), intergranular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 65% allochems, microcrystalline to medium grains, moderately to well indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*), milliolids, mollusks, echinoids

1630 – 1650 Limestone (packstone), very pale orange (10YR 8/2) to yellowish gray (5Y 7/2), intergranular, vugular and moldic porosity, medium permeability, grains types are biogenic, skeletal and micrite, 75% allochems, microcrystalline to medium grains, well indurated with micrite and sparry calcite cements, benthonic foraminifera (*Dictyoconus cookei*), milliolids, mollusks, echinoids

1650 – 1660 Limestone (wackestone), very pale orange (10YR 8/2), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, microcrystalline to fine grained, 50% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, cones

Appendix D

Cores

Injection Well IW-1

Core No. 1
1,760 – 1,771

MWH

IW-1 CORING WORKSHEET

DATE(S): 11/30/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Jean Jean
TYPE OF BIT USED: Diamond
CORE NUMBER: 1
DIAMETER: 4-inch

START/ FINISH TIME CORING: #### **TO:** 19:04
CORED INTERVAL: 1760 **TO:** 1771
LENGTH OF CORED INTERVAL: 11 feet
LENGTH OF CORE SAMPLE RECOVERED: 6.4

PERCENT OF SAMPLED LENGTH RECOVERED: 58%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
1760	Dolomitic Limestone with Dolostone Seams	21	0	3	30
1761	Dolomitic Limestone with Dolostone Seams	26	15	4	30
1762	Dolomitic Limestone with Dolostone Seams	24	20	4	35
1763	Dolomitic Limestone with Dolostone Seams	24	20	4	50
1764	Dolomitic Limestone with Dolostone Seams	26	21	4	50
1765	Dolomitic Limestone with Dolostone Seams	24	20	4	50
1766	Dolomitic Limestone with Dolostone Seams	24	16	4	50
1767	Dolomitic Limestone with Dolostone Seams	24	18	5	50
1768	Dolomitic Limestone with Dolostone Seams	23	25	4-5	50
1769	Dolomitic Limestone with Dolostone Seams	24	16	4-5	50
1770	Dolomitic Limestone with Dolostone Seams	24	10	4	50
1771	Dolomitic Limestone with Dolostone Seams	24	20	7-9	50

Observer's Initials: ABF

MWH

IW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL IW-1

CORE #1

1,760 feet bls – 1,771 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 11/30/2007
Cored Interval (feet): 11.0	Recovered Core (feet): 6.4	Recovery: 58%

DEPTH (feet bls)	DESCRIPTION
1760 to 1761.8	DOLOMITIC LIMESTONE WITH DOLOSTONE SEAMS – very pale orange (10 YR 8/2) to yellowish gray (5Y 7/2), intergranular, intercrystalline, and moldic porosity, possibly low permeability, grain type is crystal, micrite and biogenic, 30% allochems, microcrystalline to very fine grain, good induration with micrite, sparry calcite and dolomite cement, benthic forams and other undistinguishable fossil molds and casts, dolomite rhombs in section, dolostone seams throughout.
1761.8 to 1763	DOLOMITIC LIMESTONE WITH DOLOSTONE SEAMS – very pale orange (10 YR 8/2) to pale yellowish brown (10YR 6/2), intergranular, intercrystalline, and moldic porosity, possibly low permeability, grain type is crystal, micrite and biogenic, 20% allochems, microcrystalline to very fine grain, good induration with micrite, sparry calcite and dolomite cement, undistinguishable ffossils, increase in dolostone seams. Fossil molds filled with sparry calcite and micrite.
1,763 to 1,766.4	DOLOMITIC LIMESTONE WITH DOLOSTONE SEAMS – very pale orange (10 YR 8/2) to yellowish gray (5Y 7/2), intergranular, intercrystalline, and moldic porosity, possibly low permeability, grain type is crystal, micrite and biogenic, 30% allochems, microcrystalline to very fine grain, good induration with micrite, sparry calcite and dolomite cement, benthic forams and other undistinguishable fossil molds and casts, dolomite rhombs in section, dolostone seams throughout.

Injection Well IW-1

Core No. 2
1,824 – 1,835

MWH

IW-1 CORING WORKSHEET

DATE(S): 12/1/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Jay Swartzentruber
TYPE OF BIT USED: Diamond
CORE NUMBER: 2
DIAMETER: 4-inch

START/ FINISH TIME CORING: 0101 **TO:** 0216
CORED INTERVAL: 1824 **TO:** 1835
LENGTH OF CORED INTERVAL: 11 feet
LENGTH OF CORE SAMPLE RECOVERED: 1 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 9%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
1824	Dolomitic Limestone		5		
1825	Dolomitic Limestone	22	8	2	15
1826	Dolomitic Limestone	23	5	2	15
1827	Dolomitic Limestone	24	6	4	15
1828	Dolomitic Limestone	23	5	3	15
1829	Dolomitic Limestone	24	7	3	15
1830	Dolomitic Limestone	24	5	3	15
1831	Dolomitic Limestone	23	8	4	15
1832	Dolomitic Limestone	22	6	4	20
1833	Dolomitic Limestone	23	8	4	20
1834	Dolomitic Limestone	24	6	5	20
1835	Dolomitic Limestone	23	11	5	25

Observer's Initials: ABF

MWH

IW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL IW-1

CORE #2

1,824 feet bls – 1,835 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 12/1/2007
Cored Interval (feet): 11.0	Recovered Core (feet): 1	Recovery: 9%

DEPTH (feet bls)	DESCRIPTION
1,824 ft to 1,835 ft	DOLOMITIC LIMESTONE – very pale orange (10 YR 8/2) to pale yellowish brown (10 YR 6/2), intergranular, intercrystalline, and moldic porosity, possibly low permeability, grain type is crystal, micrite and biogenic, 20% allochems, microcrystalline to very fine grain, good induration with primarily sparry calcite cement, micrite and dolomite cement also present, crystalline, dolomite rhombs in section.

Injection Well IW-1

Core No. 3
1,845 – 1,858

MWH

IW-1 CORING WORKSHEET

DATE(S): 12/3/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Jean Jean
TYPE OF BIT USED: Diamond
CORE NUMBER: 3
DIAMETER: 4-inch

START/ FINISH TIME CORING: 1048 **TO:** 1210
CORED INTERVAL: 1845 **TO:** 1858
LENGTH OF CORED INTERVAL: 13 feet
LENGTH OF CORE SAMPLE RECOVERED: 8 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 62%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
1845	Limestone with Calcareous Sand	20	8	2-4	45
1846	Limestone with Calcareous Sand	16	5	1	40
1847	Limestone with Calcareous Sand	18	5	3	35
1848	Limestone with Calcareous Sand	19	6	3	45
1849	Limestone with Calcareous Sand	18	4	3	45
1850	Limestone with Calcareous Sand	18	5	3	45
1851	Limestone with Calcareous Sand	18	6	2-3	50
1852	Limestone with Calcareous Sand	20	5	2-4	60
1853	Limestone with Calcareous Sand	20	7	2-4	65
1854	Limestone with Calcareous Sand	16	5	2-4	55
1855	Limestone with Calcareous Sand	18	4	1-4	50
1856	Limestone with Calcareous Sand	18	5	2-4	60
1857	Limestone with Calcareous Sand	18	16	4-5	60
1858	Limestone with Calcareous Sand	18		5-9	55

Observer's Initials: CLM

MWH

IW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL IW-1

CORE #3

1,845 feet bls – 1,858 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 12/3/2007
Cored Interval (feet): 13.0	Recovered Core (feet): 8	Recovery: 61%

DEPTH (feet bls)	DESCRIPTION
1845 to 1858	LIMESTONE WITH CALCAREOUS SAND – yellowish gray (5 Y 7/2), intergranular, intercrystalline, and moldic porosity, possibly moderate permeability, grain type is crystal and biogenic, 60% allochems, microcrystalline to very fine grain, unconsolidated to good induration with sparry calcite cement, pellets in sample, limestone nodules in sample are microcrystalline.

Injection Well IW-1

Core No. 4
1,880 – 1,891

MWH

IW-1 CORING WORKSHEET

DATE(S): 12/4/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Doug Drayer
TYPE OF BIT USED: Diamond
CORE NUMBER: 4
DIAMETER: 4-inch

START/ FINISH TIME CORING: 1301 **TO:** 1509
CORED INTERVAL: 1880 **TO:** 1891
LENGTH OF CORED INTERVAL: 11 feet
LENGTH OF CORE SAMPLE RECOVERED: 7 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 64%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
1880	Dolostone with Limestone Intraclasts	20	11	3	20
1881	Dolostone with Limestone Intraclasts	24	10	4	25
1882	Dolostone with Limestone Intraclasts	24	7	4	30
1883	Crystalline Limestone	24	5	4	30
1884	Crystalline Limestone	23	11	4	35
1885	Crystalline Limestone	24	13	4	35
1886	Crystalline Limestone	24	15	4	35
1887	Crystalline Limestone	24	7	4	35
1888	Crystalline Limestone	24	11	4	35
1889	Crystalline Limestone	24	31	4-5	38
1890	Crystalline Limestone	24	7	4-8	50
1891	Crystalline Limestone	24		8	65

Observer's Initials: CLM

MWH

IW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL IW-1

CORE #4

1,880 feet bls – 1,891 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 12/4/2007
Cored Interval (feet): 11.0	Recovered Core (feet): 7	Recovery: 64%

DEPTH (feet bls)	DESCRIPTION
1880 to 1881.8	DOLOSTONE WITH LIMESTONE INTRACLASTS, yellowish gray (5 Y 7/2) to pale yellowish brown (10 YR 6/2), intergranular, intercrystalline,and vugular porosity, possibly low permeability, microcrystalline subhedral crystals, medium alteration, good induration with dolomite and sparry calcite cement, dense.
1881.8 to 1886.6	CRYSTALLINE LIMESTONE, yellowish gray (5 Y 8/1) to light olive gray (5 Y 6/1), intergranular, intercrystalline,vugular, and moldic porosity, possibly low permeability, grain type is crystal, micrite and biogenic, 10% allochems, microcrystalline to very fine grain, good induration with sparry calcite cement,

Injection Well IW-1

Core No. 5
1,945 – 1,956

MWH

IW-1 CORING WORKSHEET

DATE(S): 12/6/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Eric Baker
TYPE OF BIT USED: Diamond
CORE NUMBER: 5
DIAMETER: 4-inch

START/ FINISH TIME CORING: 427 **TO:** 635
CORED INTERVAL: 1945 **TO:** 1956
LENGTH OF CORED INTERVAL: 11 feet
LENGTH OF CORE SAMPLE RECOVERED: 8.5 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 77%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
1945	Limestone (mudstone)	20		1 - 2	40
1946	Dolomitic Limestone	20	7	1	40
1947	Dolomitic Limestone	20	13	1 -2	45
1948	Dolomitic Limestone	20	13	2	35
1949	Limestone (wackestone)	20	12	1 - 2	40
1950	Limestone (wackestone)	20	12	1 - 2	40
1951	Limestone (wackestone to packstone)	20	11	1 - 2	40
1952	Limestone (wackestone to packstone)	20	7	1 - 2	35
1953	Limestone (wackestone to packstone)	20	7	1 - 2	40
1954.5	Limes Limestone (as above w/ lignite)	20	7	1 - 2	50

Observer's Initials: RAW

MWH

IW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL IW-1

CORE #5

1,945 feet bls – 1,956 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 12/6/2007
Cored Interval (feet): 11.0	Recovered Core (feet): 8.5	Recovery: 77%

DEPTH (feet bls)	DESCRIPTION
1945 to 1946	LIMESTONE (mudstone), yellowish gray (5 Y 8/1) to light brown (5YR 6/4), intergranular and vugular porosity, possibly low permeability, grain type is crystal, micrite and biogenic, 10% allochems, microcrystalline to very fine grain, moderate induration with sparry calcite and micrite cements, benthonic foraminifera
1946 to 1948	DOLOMITIC LIMESTONE, pale yellowish brown (10 YR 6/2), intergranular, intercrystalline, and vugular porosity, possibly low permeability, microcrystalline to very fine grained subhedral crystals, medium alteration, good induration with dolomite and sparry calcite cement
1948 to 1950	LIMESTONE (wackestone), pale yellowish brfown (10YR 6/2, intergranular, intercrystalline,vugular, and moldic porosity, medium permeability, grain type is crystal, micrite and biogenic, 25% allochems, microcrystalline to medium grained, good induration with sparry calcite cement and micrite cements, benthonic foraminifera,
1950 to 1951	DOLOSTONE, grayish orange (10 YR 7/4), intergranular, intercrystalline,and vugular porosity, possibly low permeability, microcrystalline subhedral crystals, medium alteration, good induration with dolomite and sparry calcite cement, dense.
1951 to 1954	LIMESTONE (wackestone to packstone), very pale orange (10YR 8/2), intergranular, vugular, and moldic porosity, medium permeability, grain type is crystal, micrite and biogenic, 50% allochems, microcrystalline to medium grained, good induration with sparry calcite cement and micrite cements, benthonic foraminifera
1954 to 1954.5	LIMESTONE (AS ABOVE) with lignite beds

Injection Well IW-1

Core No. 6
1,985 – 1,996

MWH

IW-1 CORING WORKSHEET

DATE(S): 12/7/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220246.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Eric Baker
TYPE OF BIT USED: Diamond
CORE NUMBER: 6
DIAMETER: 4-inch

START/ FINISH TIME CORING: 804 **TO:**
CORED INTERVAL: 1985 **TO:** 1986
LENGTH OF CORED INTERVAL: 11 feet
LENGTH OF CORE SAMPLE RECOVERED: 2 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 18%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
1985	Limestone	20		1 - 2	25 - 30
1986	Limestone	20	17	5 - 6	30
1987	Limestone	24	19	4 - 5	40 - 50
1988		20	20	5 - 6	65
1989		20	15	5	100
1990		20	10	4	100
1991		20	10	5 - 6	90
1992		20	5	5 - 6	100
1993		20	5	5	120
1994		20	5	5	120
1995		20	4	5	120
1996		20	6	2 - 4	150

Observer's Initials: RAW

MWH

IW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL IW-1

CORE #6

1,985 feet bls – 1,996 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 12/7/2007
Cored Interval (feet): 11.0	Recovered Core (feet): 2	Recovery: 18%

DEPTH (feet bls)	DESCRIPTION
1985 to 1985.3	DOLOSTONE, dark yellowish brown (10YR 4/2, vugular and intercrystalline porosity, possibly low permeability, microcrystalline to very fine grained euhedral crystals, high alteration, good induration with dolomite cement
1985.3 to 1986.7	DOLOSTONE, pale yellowish brown (10 YR 6/2), intercrystalline, moldic, and vugular porosity, possibly low permeability, microcrystalline to very fine grained subhedral crystals, medium alteration, good induration with dolomite and sparry calcite cement, intraclasts of limestone nodules (15%0, bioturbated
1986.7 to 1987	LIMESTONE (wackestone), pale yellowish brfown (10YR 6/2, intergranular, intercrystalline,vugular, and moldic porosity, medium permeability, grain type is crystal, micrite and biogenic, 45% allochems, microcrystalline to medium grained, moderate induration with sparry calcite and micrite cements, glauconite flecks, organics, benthonic foraminifera

Injection Well IW-1

Core No. 7
2,062 – 2,073

MWH

IW-1 CORING WORKSHEET

DATE(S): 12/8/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220246.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Doug Drayer/Jean Jean
TYPE OF BIT USED: Diamond
CORE NUMBER: 7
DIAMETER: 4-inch

START/ FINISH TIME CORING: 1318 **TO:** 2030
CORED INTERVAL: 2062 **TO:** 2073
LENGTH OF CORED INTERVAL: 11 feet
LENGTH OF CORE SAMPLE RECOVERED: 6.2 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 56%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
2062	Dolostone	20		7	60
2063	Dolostone	20	45	7	70
2064	Dolostone	20	40	7	70
2065	Dolostone	20	44	7	75
2066	Dolostone	12	48	8	85
2067	Dolostone	12	40	9	60
2068	Dolostone	12	29	9	65
2069	Dolostone	12	44	9	60
2070		12	42	9	60
2071		12	40	11	60 -65
2072		12	35	11	65
2073		12	25	11 - 13	80 - 90

Observer's Initials: MK/RAW

MWH

IW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL IW-1

CORE #7

2,062 feet bls – 2,073 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 12/8/2007
Cored Interval (feet): 11.0	Recovered Core (feet): 6.2	Recovery: 56%

DEPTH (feet bls)	DESCRIPTION
2,062 to 2,063.6	DOLOSTONE, olive gray (5Y 4/1) to light olive gray (5Y 6/1), intercrystalline and vugular porosity, moderate to possibly low permeability, microcrystalline subhedral crystals, very well indurated with sucrosic crystallization and dolomite cement completely or partially filling vugs.
2,063 to 2,068.2	DOLOSTONE, pale yellowish brown (10YR 6/2), intercrystalline and trace vugular porosity, possibly low permeability, microcrystalline subhedral crystals, very well indurated, trace vugs.

Injection Well IW-1

Core No. 8
2,091 – 2,097

MWH

IW-1 CORING WORKSHEET

DATE(S): 12/9/2007
12/10/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220246.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Eric Baker - Jean Jean
TYPE OF BIT USED: Diamond
CORE NUMBER: 8
DIAMETER: 4-inch

START/ FINISH TIME CORING: 1530 **TO:** 600
CORED INTERVAL: 2091 **TO:** 2097
LENGTH OF CORED INTERVAL: 6 feet
LENGTH OF CORE SAMPLE RECOVERED: 5 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 83%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
2091	Dolostone	20		5 - 6	32
2092	Dolostone	16	150	10	50
2093	Dolostone	28	140	11	60
2094	Dolostone	28	118	12	55
2095	Dolostone	28	92	13	60
2096	Dolostone	28	170	11	60
2097	Dolostone, stop coring	28	220	15	65

Observer's Initials: MK/RAW

MWH

IW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL IW-1

CORE #8

2,091 feet bls – 2,097 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 12/9/2007
Cored Interval (feet): 6.0	Recovered Core (feet): 4.7	Recovery: 83%

DEPTH (feet bls)	DESCRIPTION
2,091 to 2,091.2	DOLOSTONE, dark yellowish brown (10YR 4/2), intracrystalline and pin point vugular porosity, low permeability, microcrystalline to fine euhedral crystals, high alteration, good indurated with dolomite cement, sparry calcite lining vugs.
2,091.2 to 2,095.7	DOLOSTONE, dark yellowish brown (10YR 4/2), intracrystalline, vugular, and moldic porosity, possibly low permeability, microcrystalline to very fine euhedral crystals, high alteration, well indurated with dolomite cement, vertical soluction vug from 2091.3 ft to 2091.9 ft, spar filling vugs, fossil molds below 2092 ft

Monitor Well DZMW-1

Core No. 9
1,535 – 1,545

MWH

DZMW-1 CORING WORKSHEET

DATE(S): 5/19/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Don Huey
TYPE OF BIT USED: Diamond
CORE NUMBER: 9
DIAMETER: 4-inch

START/ FINISH TIME CORING: 2002 **TO:** 2251
CORED INTERVAL: 1535 **TO:** 1545
LENGTH OF CORED INTERVAL: 10 feet
LENGTH OF CORE SAMPLE RECOVERED: 3 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 30%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
1536	Limestone	4	18	1	4
1536	Limestone	4	23	1	12
1537	Limestone	4	20	1	18
1538	Limestone	4 - 6	15	2	40
1539	Limestone	6	12	2	80
1540	Limestone	6	10	2	25
1541	Limestone	6	10	2	25
1542	Limestone	6	6	2	150

Observer's Initials: MK/RAW

MWH

DZMW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL DZMW-1

CORE #9

1,535 feet bls – 1,545 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 05/9/2007
Cored Interval (feet): 10.0	Recovered Core (feet): 3	Recovery: 30%

DEPTH (feet bls)	DESCRIPTION
1535 – 1535.7	Dolostone, grayish orange (10 YR 7/4), intergranular and vugular porosity, low to medium permeability, 50% to 90% alteration, very fine grained subhedral crystals, microcrystalline to fine grained, moderate induration with dolomite and micrite cements, micrite (35%), peat flecks (1%), unfossilliferous
1535.7 – 1536.2	Dolomitic limestone, grayish orange (10 YR 7/4), intergranular and vugular porosity, low to medium permeability, grain types are biogenic, crystal, and micrite, 25% allochems, microcrystalline to fine grained, moderate induration with micrite and dolomite cements, dolomite (40%), peat flecks (trace), benthonic foraminifera
1536.2 – 1536.6	Dolostone, moderate yellowish brown (10 YR 5/4), intercrystalline and vugular porosity, low to medium permeability, 50% to 90% alteration, very fine grained euhedral crystals, good induration with dolomite and sparry calcite cements, benthonic foraminifera

Monitor Well DZMW-1

Core No. 10
1,410 – 1,420

MWH

DZMW-1 CORING WORKSHEET

DATE(S): 5/21/2007

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MANAGER: Neil Johnson

OWNER: City of Cape Coral

DRILLER: Don Huey
TYPE OF BIT USED: Diamond
CORE NUMBER: 10
DIAMETER: 4-inch

START/ FINISH TIME CORING: 0030 **TO:** 400
CORED INTERVAL: 1560 **TO:** 1571
LENGTH OF CORED INTERVAL: 11 feet
LENGTH OF CORE SAMPLE RECOVERED: 8 feet

PERCENT OF SAMPLED LENGTH RECOVERED: 73%

DEPTH	CORE DESCRIPTION	RPM of Drill String	PENETRATION TIME (minutes)	WEIGHT ON BIT x1000 (lbs)	PUMP PRESSURE (psi)
1560		6	15	2	7
1561		6	30	3	15
1562		6	15	3	5
1563		6	15	3	5
1564		6	15	3	5
1565		6	15	3	6
1566		6	15	3	4
1567		6	30	3	5

Observer's Initials: MK

MWH

DZMW-1 CORE DESCRIPTION

CITY OF CAPE CORAL

SOUTHWEST CAPE WTP MONITOR WELL DZMW-1

CORE #10

1,560 feet bls – 1,570 feet bls

Core Diameter (inches): 4	Bit Type: Diamond	Date: 05/20/2007
Cored Interval (feet): 10.0	Recovered Core (feet): 8	Recovery: 80%

DEPTH (feet bls)	DESCRIPTION
1560 – 1562.0	Limestone (wackestone), grayish orange (10 YR 7/4), intergranular and vugular porosity, low to medium permeability, grain types are biogenic, micrite, and skeletal, 35% allochems, microcrystalline to fine grained, moderate alteration with micrite, sparry calcite, and dolomite cements, dolomite (25%), peat seams (2%), benthonic foraminifera, core in pieces
1562.0 – 1562.4	Limestone (wackestone), very pale orange (10 YR 8/2) to grayish orange (10 YR 7/4), intergranular and vugular porosity, medium permeability, grain types are biogenic, skeletal, and micrite, 45% allochems, microcrystalline to fine grained, moderate induration with micrite and sparry calcite cements, benthonic foraminifera
1562.4 – 1562.8	Limestone (packstone), very pale orange (10 YR 8/2) to grayish orange (10 YR 7/4), intergranular, vugular, and moldic porosity, medium to high permeability, grain types are biogenic, micrite, and skeletal, 65% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, core broken into 2 pieces
1562.8 – 1563.4	Limestone (wackestone), grayish orange (10 YR 7/4), intergranular, moldic, and vugular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, 45% allochems, microcrystalline to medium grained, moderate induration micrite and sparry calcite cements, benthonic foraminifera
1563.4 – 1563.6	Limestone (wackestone), grayish orange (10 YR 7/4), intergranular and pin point vugular porosity, low to medium permeability, grain types are biogenic, micrite, and crystal, 35% allochems, microcrystalline to fine grained, moderate induration with micrite, sparry calcite, and dolomite cements, dolomite (10%), benthonic foraminifera

1563.6 – 1564.2	Limestone (wackestone), very pale orange (10 YR 8/2) to grayish orange (10 YR 7/4), intergranular, moldic, and vugular porosity, medium permeability, grain types are biogenic, micrite, and skeletal, 40% allochems, microcrystalline to fine grained, moderate induration with micrite and sparry calcite cements, benthonic foraminifera
1564.2 – 1565.0	Limestone (wackestone), very pale orange (10 YR 8/2) to grayish orange (10 YR 7/4), intergranular, moldic, and vugular porosity, low to medium permeability, grain types are biogenic, micrite, and skeletal, 30% allochems, microcrystalline to fine grained, moderate induration with micrite and sparry calcite cements, benthonic foraminifera
1565.0 – 1565.8	Limestone (packstone), very pale orange (10 YR 8/2) to grayish orange (10 YR 7/4), intergranular, vugular, and moldic porosity, medium to high permeability, grain types are biogenic, micrite, and skeletal, 65% allochems, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, semi vertical fracture on upper piece, core in 2 pieces
1565.8 – 1566.4	Limestone (wackestone), grayish orange (10 YR 7/4), intergranular and pin point vugular porosity, low permeability, grain types are biogenic, micrite, and skeletal, 30% allochems, microcrystalline to fine grained, moderate induration with micrite and sparry calcite cements, benthonic foraminifera
1566.4 – 1567.2	Limestone (packstone), very pale orange (10 YR 8/2) to grayish orange (10 YR 7/4), intergranular, vugular, and moldic porosity, medium to high permeability, grain types are biogenic, micrite, and skeletal, 75% allochems, microcrystalline to medium grained, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, fracture on upper piece, core in 2 pieces
1567.2 – 1568.2	Limestone (wackestone), grayish orange (10 YR 7/4), intergranular and pin point vugular porosity, low to medium permeability, grain types are biogenic, micrite, and skeletal, 45% allochems, microcrystalline to fine grained, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, small (1 inch) vertical vugs, lower .2 ft is a packstone
1568.2 – 1568.4	Limestone (wackestone), grayish orange (10 YR 7/4), intergranular and pin point vugular porosity, low permeability, grain types are biogenic, micrite, and skeletal, 30% allochems, microcrystalline to fine grained, moderate induration with micrite and sparry calcite cements, benthonic foraminifera, peat seams in lower 2 inches

Injection Well IW-1

Core Analysis Laboratory Reports

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

July 14, 2008
File Number 08-028

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

RECEIVED
JUL 17 2008

Attention: Wu Fei

Subject: Rock Core Testing, City of Cape Coral, Florida

Ms. Fei:

As requested, vertical and horizontal permeability and specific gravity tests have been completed on limestone rock cores provided for testing by your firm. The samples were received on 02/05/08. The designations of the 16 samples are listed below.

Core	Depth (feet)
1	1762.0-1763.0
3	1833.0-1833.5
4	1887.7-1888.2
5	1988.5-1989.5
6	1950.0-1950.7
7	1953.0-1953.8
8	2093.0-2093.8
9	2064.0-2064.6
10	2065.0-2065.5
11	2093.8-2094.3
12	2095.0-2095.5
13	2096.0-2097.0
14	1763.7-1764.2
15	1764.2-1765.0
17	1445.5-1446.9
18	1948.5-1949.3

The permeability tests were performed in general accordance with ASTM Standard D 5084 "Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter" using either the constant head test method (Method A) or the falling-head rising-tailwater method (Method C). The permeability test results are presented on the attached hydraulic conductivity test reports.

The measured mineral specific gravities are presented on the attached test reports. The specific gravity tests were performed in general accordance with ASTM Standard D 854 "Specific Gravity of Soil Solids by Water Pycnometer" using 40 to 75 grams specimens ground to pass the U.S. Standard No. 40 sieve.

The specimens were reported to be from the samples designated herein. The test results are indicative of only the specimens that were actually tested. The test results presented are based upon accepted industry practice as well as test method(s) listed. Ardaman & Associates, Inc. neither accepts responsibility for, nor makes claims to the final use and purpose of the material.

The results of unconfined compression tests completed on eight specimens will be submitted by July 18, 2008.

Please contact us if you have any questions about the test results or require additional information.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.

Thomas S. Ingra, P.E.
Laboratory Director
Florida License No. 31987

TSI/ed

C:\Documents and Settings\jan.wildman\Documents\Projects\08\08-028\report01.wpd

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/02/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 1, 1762.0-1763.0'**

LABORATORY IDENTIFICATION NO.: 08028/1kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 80 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 4, 8, 11

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 17 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.36	9.75	773.31	14.9	115.0	0.320	86	30	160	22	0.9	2	1424.7	15.8	91	7.3×10^{-7}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/13/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 1, 1762.0-1763.0'**

LABORATORY IDENTIFICATION NO.: 08028/1kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 87 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 3; 5, 8, 12

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 17 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.53	5.01	128.77	14.9	116.0	0.314	88	30	160	63	0.5	2	239.27	15.8	93	1.5×10^{-6}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TW Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 03/28/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 3, 1833.0-1833.5'**

LABORATORY IDENTIFICATION NO.: 08028/3kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 99 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 6, 9, 12

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 4.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.71

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
8.02	9.64	585.31	14.1	121.0	0.285	96	30	160	15	3.5	2	1134.5	14.1	96	5.7×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: DM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/11/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 3, 1833.0-1833.5'**

LABORATORY IDENTIFICATION NO.: 08028/3kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 91 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 7, 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 4.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.08	5.02	140.08	14.2	121.5	0.281	98	30	160	44	1.5	2	272.79	14.2	98	3.7×10^{-5}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 03/28/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 4, 1887.7-1888.2'**

LABORATORY IDENTIFICATION NO.: 08028/4kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 95 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 6, 9, 12

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 5.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.73

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
8.61	9.51	611.62	16.1	117.3	0.311	97	30	160	26	3.7	2	1150.1	16.1	97	3.0×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 07/14/08

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/12/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 4, 1887.7-1888.2'**

LABORATORY IDENTIFICATION NO.: 08028/4kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 90 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 4, 7, 12, 16

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 5.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.73 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.18	5.01	141.48	16.2	118.2	0.306	99	30	160	51	7.0	2	268.10	16.2	99	3.4×10^{-5}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/02/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 5, 1988.5-1989.5'**

LABORATORY IDENTIFICATION NO.: 08028/5kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 75 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 4, 9, 13

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 21.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.80 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.27	9.23	687.23	16.7	111.1	0.364	82	30	160	17	0.8	2	1223.4	17.9	88	1.1×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/13/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 5, 1988.5-1989.5'**

LABORATORY IDENTIFICATION NO.: 08028/5kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 81 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 5, 7, 8, 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 21.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.80 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.41	5.01	126.46	16.7	111.4	0.362	82	30	160	60	1.1	2	225.79	17.9	88	1.7×10^{-5}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 03/27/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 6, 1950.0-1950.7'**

LABORATORY IDENTIFICATION NO.: 08028/6kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 92 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 4, 7, 9, 13

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 7.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.76 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
9.84	9.71	728.80	11.2	130.4	0.243	97	30	160	26	4.5	2	1522.6	11.2	97	6.9×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JW Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/11/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 6, 1950.0-1950.7'**

LABORATORY IDENTIFICATION NO.: 08028/6kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 88 % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 55

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 7.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.76 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.24	5.02	143.14	11.3	129.1	0.250	93	30	160	27	1.6	2	296.12	11.3	93	5.8×10^{-5}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/03/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 7, 1953.0-1953.8'**

LABORATORY IDENTIFICATION NO.: 08028/7kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 94 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 6, 9

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 8.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.75 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
8.52	9.76	637.13	16.6	117.0	0.318	98	30	160	23	7.0	2	1194.2	16.6	98	5.5×10^{-4}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/15/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 7, 1953.0-1953.8'**

LABORATORY IDENTIFICATION NO.: 08028/7kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 100 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 33

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 8.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.75

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.02	5.02	138.89	16.4	117.1	0.318	97	30	160	41	29.2	2	260.54	16.4	97	5.8×10^{-4}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TW Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/07/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 8, 2093.0-2093.8'**

LABORATORY IDENTIFICATION NO.: 08028/8kV

SAMPLE DESCRIPTION: Brown dolomitic limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 96 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 33

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 18.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.84

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.19	10.10	815.95	0.75	172.1	0.029	70	35	155	210	0.7	36	2250.4	0.76	71	3.0×10^{-10}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 06/20/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: Core 8, 2093.0-2093.8'

LABORATORY IDENTIFICATION NO.: 08028/8kH

SAMPLE DESCRIPTION: Brown dolomitic limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 67 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 7, 25, 31

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 18.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.84 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.06	5.02	139.90	0.60	172.2	0.028	58	30	160	207	0.2	6	386.09	0.75	72	3.4×10^{-10}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JW Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/05/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 9, 2064.0-2064.6'**

LABORATORY IDENTIFICATION NO.: 08028/9kV

SAMPLE DESCRIPTION: Brown dolomitic limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 100 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 7, 10, 13

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 9 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.83

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.19	10.08	814.01	0.82	169.9	0.038	59	30	160	116	1.7	11	2215.9	1.1	79	7.6×10^{-10}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 05/06/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 9, 2064.0-2064.6'**

LABORATORY IDENTIFICATION NO.: 08028/9kH

SAMPLE DESCRIPTION: Brown dolomitic limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 65 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 39, 63

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 9 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.83 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.63	5.03	151.37	1.2	170.2	0.036	93	30	70	189	0.7	10	412.76	1.2	93	4.1×10^{-10}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/07/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 10, 2065.0-2065.5'**

LABORATORY IDENTIFICATION NO.: 08028/10kV

SAMPLE DESCRIPTION: Brown dolomitic limestone (heterogenous - about half of sample appears porous, while other half is not - contact between different rock types at about 45 degree angle). Porous section through length of specimen in vertical direction.

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 65 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 5, 8

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 9 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.88 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
8.36	10.11	671.18	1.4	167.5	0.068	56	30	160	40	2.2	2	1801.6	1.6	64	2.2×10^{-7}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 05/07/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 10, 2065.0-2065.5'**

LABORATORY IDENTIFICATION NO.: 08028/10kH

SAMPLE DESCRIPTION: Brown dolomitic limestone (heterogenous - about half of sample appears porous, while other half is not - contact between different rock types at about 45 degree angle). Porous section not through length of specimen in horizontal direction.

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 90 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 24, 32, 39

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 9 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.88 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.47	5.02	147.81	1.7	170.0	0.054	84	45	145	296	0.2	41	402.78	1.7	84	7.8×10^{-11}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 07/14/08

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/09/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 11, 2093.8-2094.3'**

LABORATORY IDENTIFICATION NO.: 08028/11kV

SAMPLE DESCRIPTION: Brown dolomitic limestone with solution cracks

Solution cracks extend through length of specimen in vertical direction.

ASTM D 5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 76 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 5, 8, 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 8 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.83 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.14	10.07	807.62	0.37	166.1	0.059	16	30	70	2	16.9	3	2150.2	0.68	30	9.2×10^{-4}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 05/06/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 11, 2093.8-2094.3'**

LABORATORY IDENTIFICATION NO.: 08028/11kH

SAMPLE DESCRIPTION: Brown dolomitic limestone with solution cracks. Solution cracks do not extend through length of specimen in horizontal direction.

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 92 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 20, 26, 34

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 8 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.83 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.14	5.02	141.52	0.33	168.0	0.048	18	35	155	200	0.2	21	381.07	0.68	37	1.7×10^{-10}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/05/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 12, 2095.0-2095.5'**

LABORATORY IDENTIFICATION NO.: 08028/12kV

SAMPLE DESCRIPTION: Brown dolomitic limestone with vugs and solution cracks. Solution cracks extend through length of specimen in vertical direction.

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 84 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 5, 8, 11

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 6 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.86 - ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.73	10.08	855.76	1.6	167.4	0.062	70	30	160	48	3.1	3	2295.4	1.6	70	5.4×10^{-6}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JW Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 05/07/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 12, 2095.0-2095.5'**

LABORATORY IDENTIFICATION NO.: 08028/12kH

SAMPLE DESCRIPTION: Brown dolomitic limestone with vugs and solution cracks. Solution cracks do not extend through length of specimen in horizontal direction.

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 74 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 15, 21, 32

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 6 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.86 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.63	5.03	131.53	1.2	163.9	0.082	37	30	70	217	0.6	16	345.45	1.5	48	2.1×10^{-10}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JW Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/07/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 13, 2096.0-2097.0'**

LABORATORY IDENTIFICATION NO.: 08028/13kV

SAMPLE DESCRIPTION: Brown dolomitic limestone with vugs

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 85 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 5, 8, 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 12 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.85 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.04	9.98	786.25	2.2	163.0	0.084	69	30	160	17	2.0	2	2053.2	2.3	73	1.7×10^{-6}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 05/07/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 13, 2096.0-2097.0'**

LABORATORY IDENTIFICATION NO.: 08028/13kH

SAMPLE DESCRIPTION: Brown dolomitic limestone with vugs

ASTM D 5084 TEST METHOD:

- ☐ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☒ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 59 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 4, 8, 11, 14

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 12 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.85 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.93	5.03	137.49	2.5	160.3	0.099	66	30	70	3	5.9	3	353.22	2.5	66	1.6×10^{-4}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/05/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 14, 1763.7-1764.2'**

LABORATORY IDENTIFICATION NO.: 08028/14kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 93 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 4, 7, 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 5.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.65 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.05	9.67	737.89	15.2	117.4	0.290	98	30	160	47	0.9	3	1387.8	15.2	98	5.6×10^{-7}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/25/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: Core 14, 1763.7-1764.2'

LABORATORY IDENTIFICATION NO.: 08028/14kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 96 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 6, 9, 12

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 5.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.65

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.87	5.02	136.07	15.1	117.9	0.287	100	30	160	39	0.7	2	257.11	15.1	100	2.7×10^{-6}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

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ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 03/27/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 15, 1764.2-1765.0'**

LABORATORY IDENTIFICATION NO.: 08028/15kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 89 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 7, 9,13

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 7 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.66 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.34	9.73	768.17	16.6	114.7	0.309	99	30	160	23	0.8	2	1412.4	16.6	99	5.4×10^{-7}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/12/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 15, 1764.2-1765.0'**

LABORATORY IDENTIFICATION NO.: 08028/15kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 75 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 7, 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 7 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.66 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.88	5.02	136.16	16.5	114.9	0.308	98	30	160	49	0.4	4	250.67	16.5	98	6.9×10^{-7}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/05/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 17, 1445.5-1446.9'**

LABORATORY IDENTIFICATION NO.: 08028/17kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 94 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 4, 7, 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 4 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.72 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
9.31	9.75	695.63	12.2	123.4	0.273	89	30	160	24	2.1	3	1375.4	12.2	89	1.2×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TW Date: 07/14/08

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 05/01/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 17, 1445.5-1446.9'**

LABORATORY IDENTIFICATION NO.: 08028/17kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 70 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 4, 7, 10

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 4 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.72 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.36	5.02	125.87	11.9	127.5	0.249	98	30	70	68	0.6	2	257.28	12.0	99	1.1×10^{-5}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

The test data and all associated project information presented hereon shall be held in confidence and disclosed to other parties only with the authorization of the Client or Ardaman & Associates, Inc. Physical and electronic records of each project are kept for a minimum of 7 years. Test samples are kept in storage for at least 10 working days after mailing of the test report, prior to being discarded, unless a longer storage period is requested in writing and accepted by Ardaman & Associates, Inc.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/03/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 18, 1948.5-1949.3'**

LABORATORY IDENTIFICATION NO.: 08028/18kV

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 100 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 3, 6, 9

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 7.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.77

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
10.00	9.65	731.51	15.6	118.6	0.314	94	30	160	22	2.0	2	1390.0	15.6	94	3.4×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: City of Cape Coral

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08 SET UP: 04/15/08

DATE REPORTED: 07/14/08

INCOMING LABORATORY SAMPLE NO.: **Core 18, 1948.5-1949.3'**

LABORATORY IDENTIFICATION NO.: 08028/18kH

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 94 % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 15

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 7.5 Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.77 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.94	5.02	137.40	15.4	118.2	0.316	92	30	160	48	1.3	2	260.23	15.4	92	4.3×10^{-5}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 07/14/08

Monitor Well DZMW-1

Core Analysis Laboratory Reports

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

RECEIVED
JUL 18 2008

July 16, 2008
File Number 08-028

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Attention: Wu Fei
Subject: Rock Core Testing, City of Cape Coral, Florida

Ms. Fei:

As requested, unconfined compression tests have been completed on limestone rock cores provided for testing by your firm. The samples were received on 02/05/08. The designations of the eight samples are listed below.

Core	Depth (feet)
1	1762.0-1763.0
2	1763.0-1763.5
5	1988.5-1989.5
7	1953.0-1953.8
8	2093.0-2093.8
13	2096.0-2097.0
16	1885.0-1885.6
19	1949.3-1950.0

The unconfined compression tests were performed in general accordance with ASTM Standard D 7012 "Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures" using the unconfined test method (Method C). The unconfined compression test results are presented on the attached test reports.

The specimens were reported to be from the samples designated herein. The test results are indicative of only the specimens that were actually tested. The test results presented are based upon accepted industry practice as well as test method(s) listed. Ardaman & Associates, Inc. neither accepts responsibility for, nor makes claims to the final use and purpose of the material.

Please contact us if you have any questions about the test results or require additional information.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.

Thomas S. Ingra, P.E.
Laboratory Director
Florida License No. 31987

C:\Documents and Settings\jan.wildman\Documents\Projects\08\08-028\report02.wpd

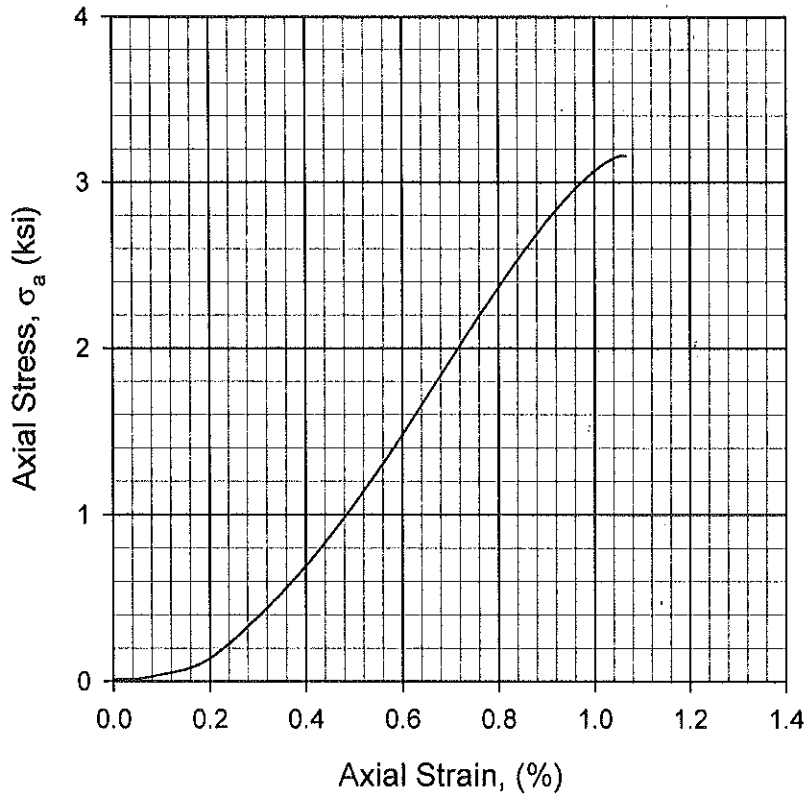
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: **City of Cape Coral**
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08
DATE TEST SET-UP: 07/09/08
DATE REPORTED: 07/16/08

INCOMING SAMPLE NO.: **Core 1, 1762.0-1763.0'**
BORING - SAMPLE Core 1
DEPTH 1762.0-1763.0 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C1
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.33	5.04	2.0	5.4	115.7	32	0.013	0.12	8.6	3160	4.3×10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 22.0

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on 20,000 lb Instron compression machine

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.71 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: FM Date: 07/16/08

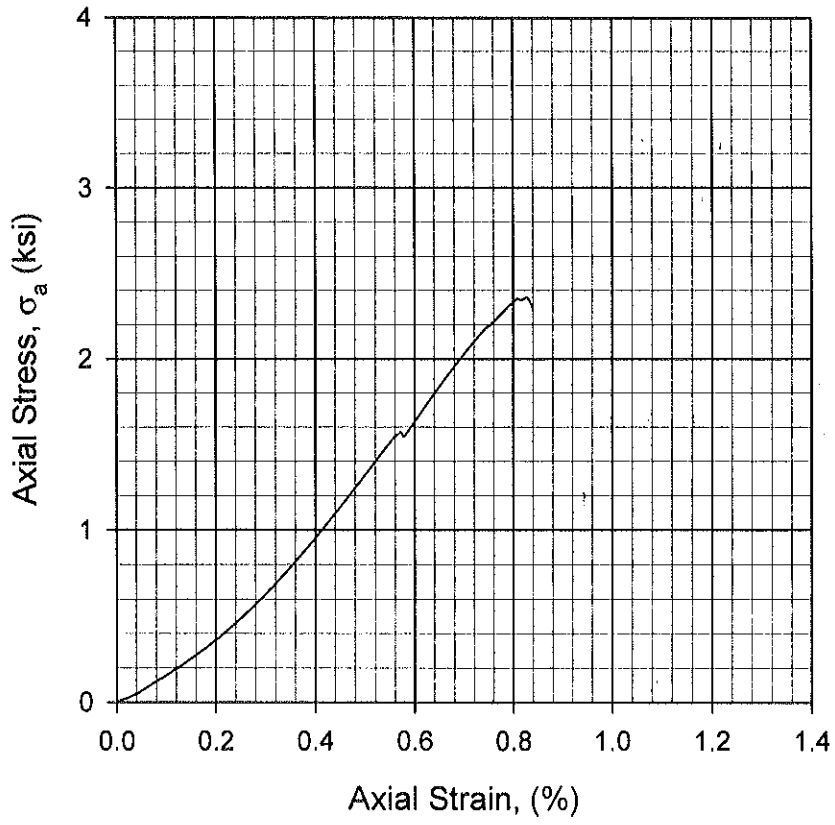
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: **City of Cape Coral**
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08
DATE TEST SET-UP: 07/09/08
DATE REPORTED: 07/16/08

INCOMING SAMPLE NO.: **Core 2, 1763.0-1763.5'**
BORING - SAMPLE Core 2
DEPTH 1763.0-1763.5 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C2
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_o (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.28	5.05	2.0	4.3	114.7	25	0.013	0.12	6.6	2358	3.6×10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 22.0

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on 20,000 lb Instron compression machine

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.68 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: PM Date: 07/16/08

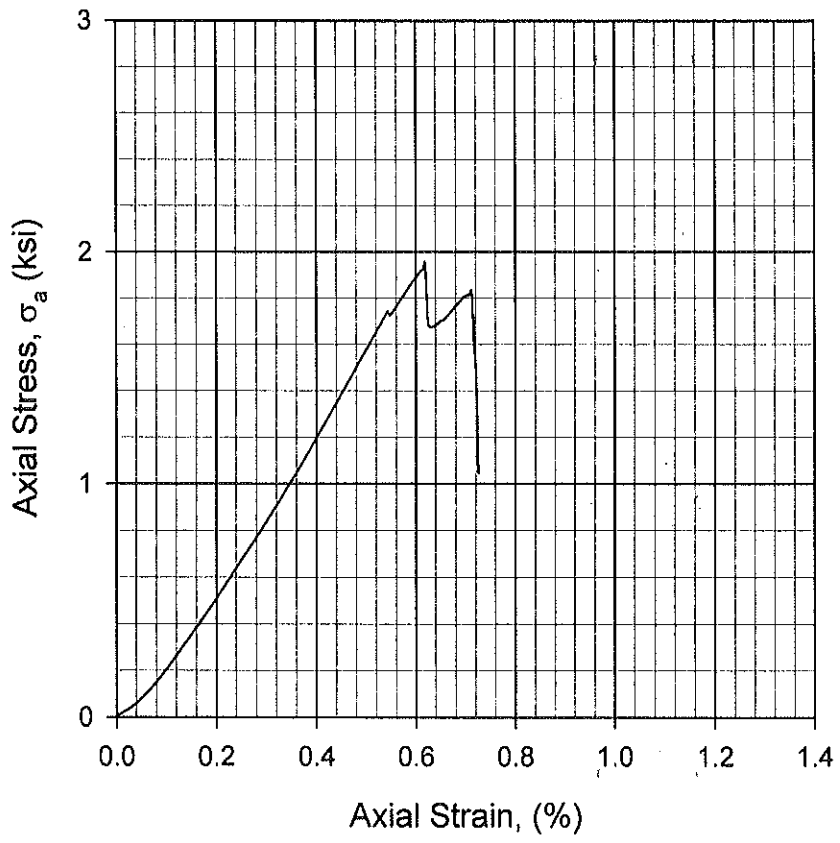
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: **City of Cape Coral**
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08
DATE TEST SET-UP: 07/09/08
DATE REPORTED: 07/16/08

INCOMING SAMPLE NO.: **Core 5, 1988.5-1989.5'**
BORING - SAMPLE Core 5
DEPTH 1988.5-1989.5 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C5
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_o (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.42	5.03	2.1	9.0	115.3	49	0.013	0.12	5.1	1819	3.6×10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 22.0

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on 20,000 lb Instron compression machine

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.80 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: TM Date: 07/16/08

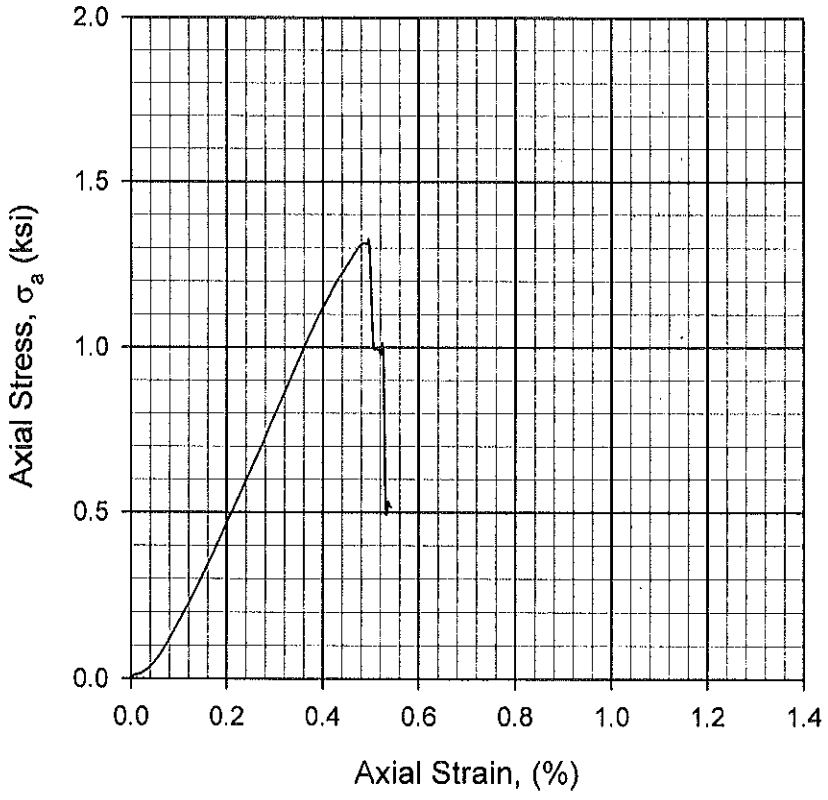
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: **City of Cape Coral**
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08
DATE TEST SET-UP: 07/09/08
DATE REPORTED: 07/16/08

INCOMING SAMPLE NO.: **Core 7, 1953.0-1953.8'**
BORING - SAMPLE: Core 7
DEPTH 1953.0-1953.8 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C7
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
9.97	5.04	2.0	4.7	117.9	28	0.013	0.13	3.8	1316	3.3×10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 22.0

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on 20,000 lb Instron compression machine

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.75 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: TM Date: 07/16/08

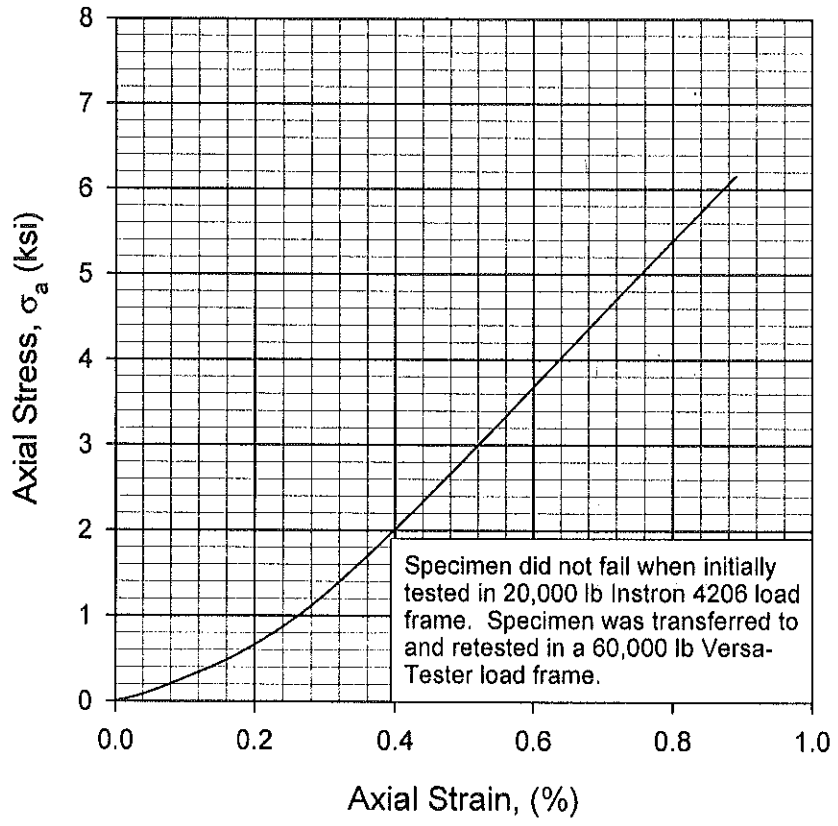
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: **City of Cape Coral**
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08
DATE TEST SET-UP: 07/09/08
DATE REPORTED: 07/16/08

INCOMING SAMPLE NO.: **Core 8, 2093.0-2093.8'**
BORING - SAMPLE Core 8
DEPTH 2093.0-2093.8 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C8
SAMPLE DESCRIPTION: Dark gray dolomitic limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.22	5.04	2.0	0.29	173.1	34	0.013	0.12	3.3	14,400	8.7×10^5 at 35% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 22.0

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Maximum load in Versa-Tester load frame was 44,600 lb. Rate of loading for Instron 4206 portion of test. Time to failure for Versa-Tester portion of test.

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.84 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: JM Date: 07/16/08

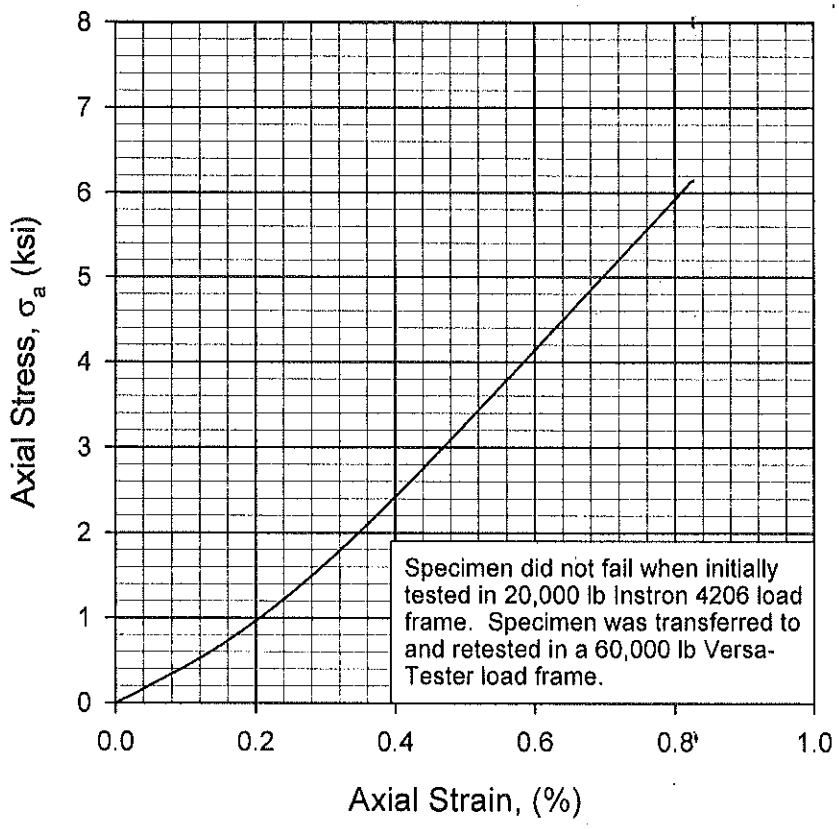
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: **City of Cape Coral**
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08
DATE TEST SET-UP: 07/09/08
DATE REPORTED: 07/16/08

INCOMING SAMPLE NO.: **Core 13, 2096.0-2097.0'**
BORING - SAMPLE Core 13
DEPTH 2096.0-2097.0 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C13
SAMPLE DESCRIPTION: Gray dolomitic limestone with vugs

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.23	5.04	2.0	0.88	167.1	39	0.013	0.12	2.7	14,500	8.9×10^5 at 35% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 22.0

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Maximum load in Versa-Tester load frame was 44,800 lb. Rate of loading for Instron 4206 portion of test. Time to failure for Versa-Tester portion of test.

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.85 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: TM Date: 07/16/08

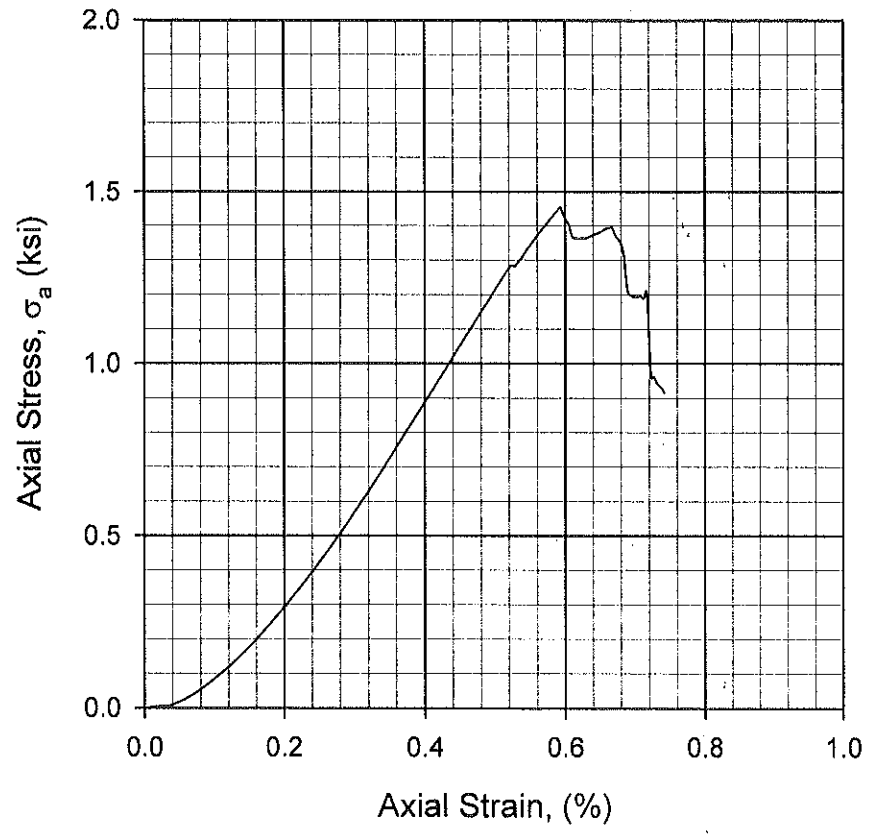
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: **City of Cape Coral**
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08
DATE TEST SET-UP: 07/09/08
DATE REPORTED: 07/16/08

INCOMING SAMPLE NO.: **Core 16, 1885.0-1885.6'**
BORING - SAMPLE Core 16
DEPTH 1885.0-1885.6 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C16
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.27	5.03	2.0	6.6	115.3	38	0.013	0.12	4.8	1453	3.2×10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 22.0

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on 20,000 lb Instron compression machine

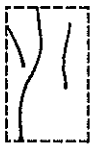
SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.72 ☐ Assumed ☒ Measured

FAILURE SKETCH



Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: TM Date: 07/16/08

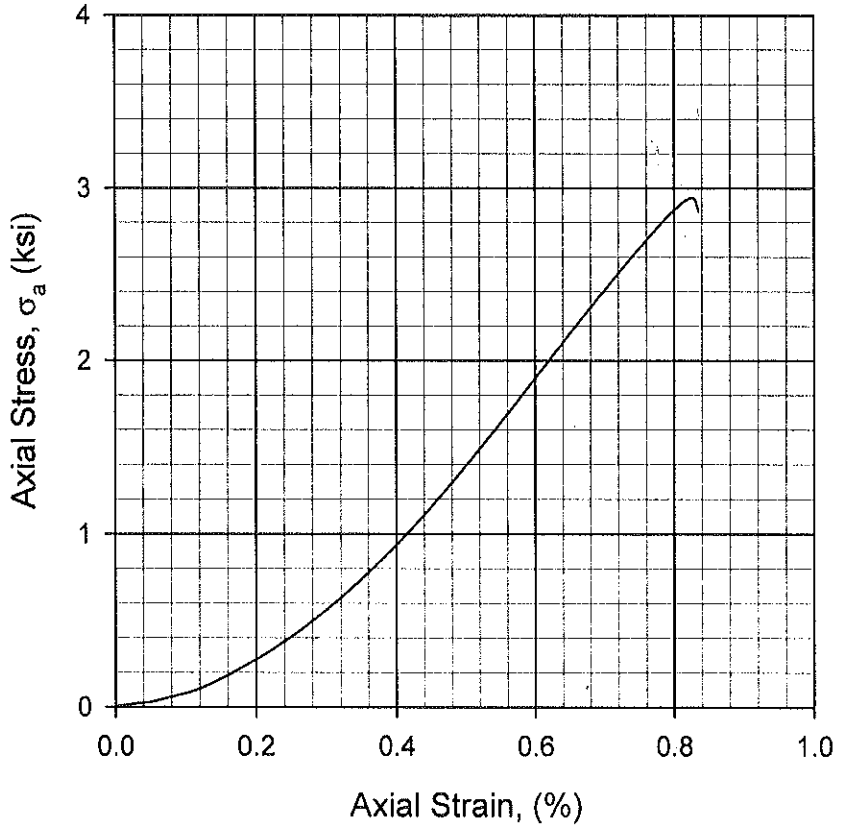
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: **City of Cape Coral**
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 02/05/08
DATE TEST SET-UP: 07/09/08
DATE REPORTED: 07/16/08

INCOMING SAMPLE NO.: **Core 19, 1949.3-1950.0'**
BORING - SAMPLE Core 19
DEPTH 1949.3-1950.0 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C19
SAMPLE DESCRIPTION: Light brown limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.14	5.04	2.0	4.4	126.3	35	0.013	0.12	6.6	2943	5.1×10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 22.0

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on 20,000 lb Instron compression machine

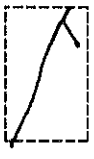
SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.73 ☐ Assumed ☒ Measured

FAILURE SKETCH



Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: PM Date: 07/16/08

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

August 21, 2008
File Number 08-028

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Attention: Wu Fei

Subject: Rock Core Testing, Cape Coral SW Dual Zone Monitor Well No. 1

Ms. Fei:

As requested, vertical and horizontal permeability, unconfined compression and specific gravity tests have been completed on limestone rock cores provided for testing by your firm. The samples were received on 07/21/08. The designations of the five samples are listed below.

Core	Depth (feet)
9	1535.0-1535.7
9	1536.2-1536.6
10	1563.4-1564.0
10	1564.7-1565.1
10	1565.8-1566.5

The permeability tests were performed in general accordance with ASTM Standard D 5084 "Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter" using the constant head test method (Method A). The permeability test results are presented on the attached hydraulic conductivity test reports.

The unconfined compression tests were performed in general accordance with ASTM Standard D 7012 "Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures" using the unconfined test method (Method C). The unconfined compression test results are presented on the attached test reports.

The measured mineral specific gravities are presented on the attached test reports. The specific gravity tests were performed in general accordance with ASTM Standard D 854 "Specific Gravity of Soil Solids by Water Pycnometer" using 50 to 75 gram specimens ground to pass the U.S. Standard No. 40 sieve.

The specimens were reported to be from the samples designated herein. The test results are indicative of only the specimens that were actually tested. The test results presented are based upon accepted industry practice as well as test method(s) listed. Ardaman & Associates, Inc. neither accepts responsibility for, nor makes claims to the final use and purpose of the material.

Please contact us if you have any questions about the test results or require additional information.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.

Thomas S. Ingra, P.E.
Laboratory Director
Florida License No. 31987

C:\Documents and Settings\jan.wildman\Documents\Projects\08\08-028\report03.wpd

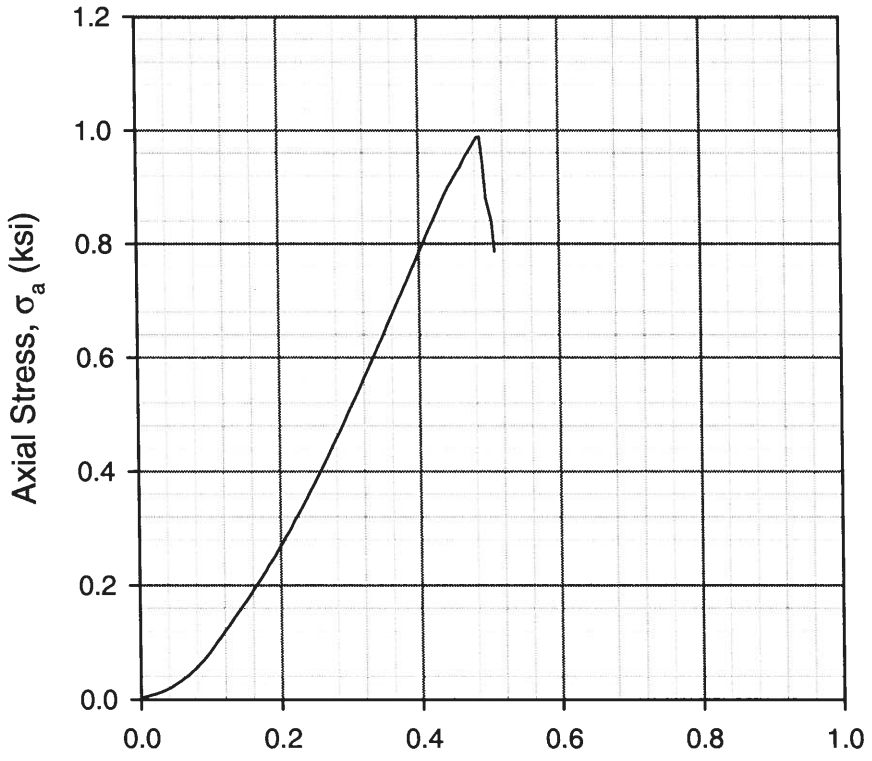
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: Cape Coral SW DZMW No. 1
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08
DATE TEST SET-UP: 07/28/08
DATE REPORTED: 08/21/08

INCOMING SAMPLE NO.: **Core 9**
BORING - SAMPLE -
DEPTH 1535.0-1535.7 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C9
SAMPLE DESCRIPTION: Light Brown Limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.43	5.03	2.07	9.5	114.5	54	0.013	0.12	4.0	989	2.6x10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 21

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on Instron 4206 with 10,000 lb load cell

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.72 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: TM Date: 08/21/08

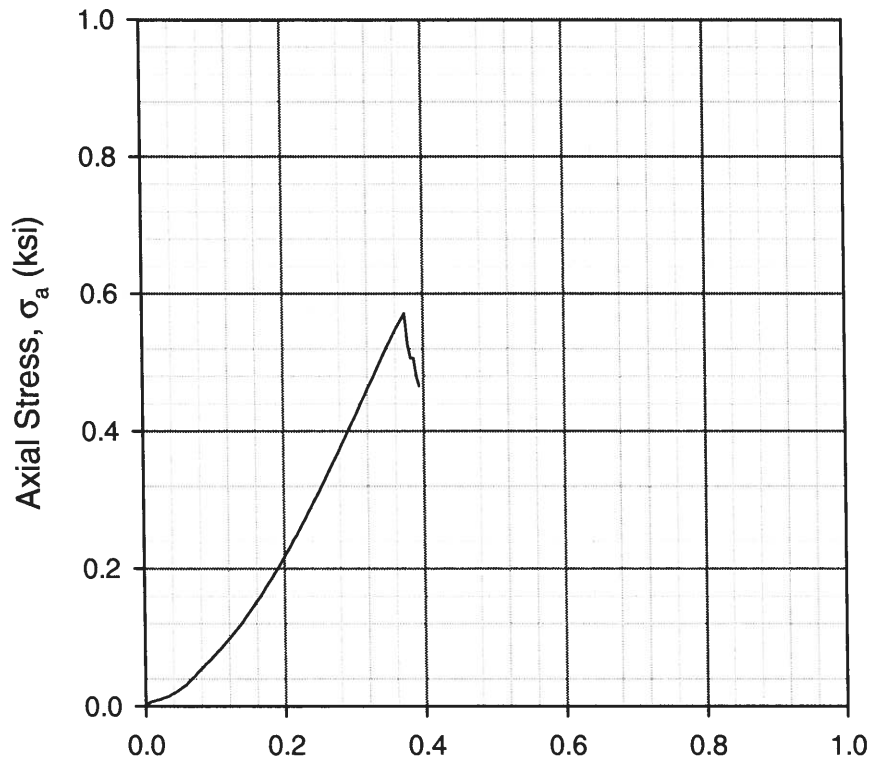
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: Cape Coral SW DZMW No. 1
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08
DATE TEST SET-UP: 07/28/08
DATE REPORTED: 08/21/08

INCOMING SAMPLE NO.: **Core 10**
BORING - SAMPLE -
DEPTH 1563.4-1564.0 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C10A
SAMPLE DESCRIPTION: Light Brown Limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
10.32	5.03	2.05	9.7	109.3	48	0.013	0.12	3.0	571	2.1x10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 21

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on Instron 4206 with 10,000 lb load cell

SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.70 ☐ Assumed ☒ Measured

FAILURE SKETCH

Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: JM Date: 08/21/08

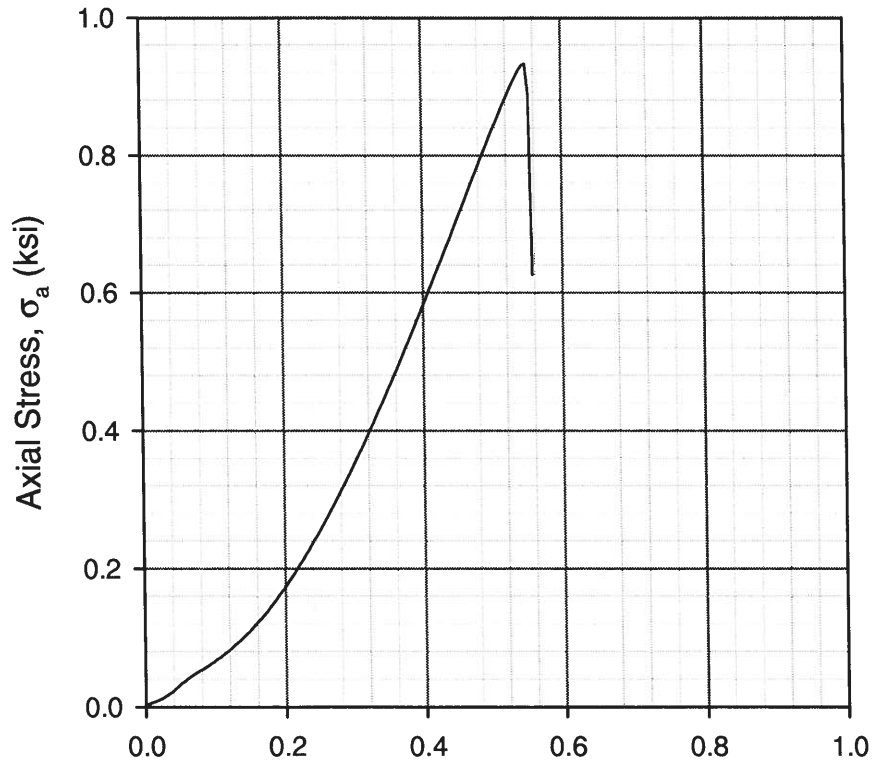
ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
INTACT ROCK CORE UNCONFINED COMPRESSION TEST REPORT

CLIENT: Youngquist Brothers, Inc.
PROJECT: Cape Coral SW DZMW No. 1
FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08
DATE TEST SET-UP: 07/28/08
DATE REPORTED: 08/21/08

INCOMING SAMPLE NO.: **Core 10**
BORING - SAMPLE -
DEPTH 1565.8-1566.5 ☒ ft; ☐ m
LABORATORY IDENTIFICATION NO.: 08028/C10B
SAMPLE DESCRIPTION: Light Brown Limestone

Specimen Dimensions			Initial Conditions			Rate of Loading		Time to Failure (minutes)	Unconfined Compressive Strength, σ_a(ult) (lb/in^2)	Young's Modulus, E (lb/in^2)
H (cm)	D (cm)	H/D	w_c (%)	γ_d (lb/ft^3)	S (%)	$\dot{\varepsilon}$ (cm/minute)	$\dot{\varepsilon}$ (%/minute)			
9.96	5.03	1.98	13.4	110.5	68	0.013	0.13	4.3	933	2.4×10^5 at 50% σ_a(ult)



TEST PROCEDURES

☒ ASTM Standard D 7012, Method C

Air Temperature (°C): 21

Capping Material: ☐ None ☒ Lab-Stone ☐ Sulfur

Comments: Tested on Instron 4206 with 10,000 lb load cell

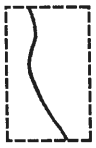
SPECIMEN PREPARATION

Original Core Diameter (inch): 4

Specimen Sub-Cored for Testing: ☒ Yes ☐ No

G_s: 2.71 ☐ Assumed ☒ Measured

FAILURE SKETCH



Where: H = Specimen height; D = Specimen diameter; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\dot{\varepsilon}$ = Vertical displacement rate; and G_s = Specific gravity.

Checked By: JM Date: 08/21/08

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Cape Coral SW DZMW No. 1

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08 SET UP: 07/29/08

DATE REPORTED: 08/21/08

INCOMING LABORATORY SAMPLE NO.: **Core 9, 1536.2-1536.6'**

LABORATORY IDENTIFICATION NO.: 08028/9kV1536

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 95 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 14, 25

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 4.0/2.8* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.74 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
6.87	9.89	528.16	13.5	121.4	0.290	91	30	160	26	1.3	1	1027.3	13.5	91	1.7×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.
* First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/21/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Cape Coral SW DZMW No. 1

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08 SET UP: 07/31/08

DATE REPORTED: 08/21/08

INCOMING LABORATORY SAMPLE NO.: **Core 9, 1536.2-1536.6'**

LABORATORY IDENTIFICATION NO.: 08028/9kH1536

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 76 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 18, 23, 30

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 4.0/2.8* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.74 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.91	5.03	156.89	13.3	124.4	0.273	97	30	70	40	8.1	5	312.67	13.5	99	2.0×10^{-5}

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
* First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 08/21/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Cape Coral SW DZMW No. 1

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08 SET UP: 07/29/08

DATE REPORTED: 08/21/08

INCOMING LABORATORY SAMPLE NO.: **Core 10, 1564.7-1565.1'**

LABORATORY IDENTIFICATION NO.: 08028/10kV1564

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 95 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 14, 24

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 5.0/3.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.73 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.41	9.88	567.71	15.6	119.3	0.300	99	30	160	36	0.9	1	1084.5	15.7	100	1.1×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) WDS calculated from initial air-dry weight of specimen.
* First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 08/21/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Cape Coral SW DZMW No. 1

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08 SET UP: 07/31/08

DATE REPORTED: 08/21/08

INCOMING LABORATORY SAMPLE NO.: **Core 10, 1564.7-1565.1'**

LABORATORY IDENTIFICATION NO.: 08028/10kH1564

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: - %

- ☐ Beginning of Test;
- ☐ End of Test

$\Delta\sigma_c$ (psi): -

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 5.0/3.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.73

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.96	5.03	158.01	15.9	117.9	0.308	98	30	70	57	8.3	1	298.58	15.9	98	**8.8×10^{-6}**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
* First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: JM Date: 08/21/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Cape Coral SW DZMW No. 1

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08 SET UP: 07/29/08

DATE REPORTED: 08/21/08

INCOMING LABORATORY SAMPLE NO.: **Core 10, 1565.8-1566.5'**

LABORATORY IDENTIFICATION NO.: 08028/10kV1565

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 99 %

- ☐ Beginning of Test;
- ☒ End of Test

$\Delta\sigma_c$ (psi): 14

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☐ Yes ☒ No

As-Received Length (inch): 8.0/6.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☒ Vertical ☐ Horizontal

SPECIFIC GRAVITY, G_s: 2.71

- ☐ Assumed
- ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.26	10.00	569.95	21.3	106.0	0.373	97	30	160	39	5.7	1	967.97	21.3	97	5.8×10^{-5}

COMMENTS: (1) Core sample selected for permeability testing was cut to length, air-dried, deaired under vacuum for a minimum of 24 hours, and then saturated with deaired tap water from the bottom up while still under vacuum. (2) Final w_c from horizontal permeability test specimen. WDS calculated from measured wet weight and final w_c.
* First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/21/08

Form SR-2B: Rev. 0

ARDAMAN & ASSOCIATES, INC. GEOTECHNICAL TESTING LABORATORY
ROCK CORE HYDRAULIC CONDUCTIVITY TEST REPORT

CLIENT: Youngquist Brothers, Inc.

PROJECT: Cape Coral SW DZMW No. 1

FILE NO.: 08-028

DATE SAMPLE RECEIVED: 07/21/08 SET UP: 07/31/08

DATE REPORTED: 08/21/08

INCOMING LABORATORY SAMPLE NO.: **Core 10, 1565.8-1566.5'**

LABORATORY IDENTIFICATION NO.: 08028/10kH1565

SAMPLE DESCRIPTION: Light brown limestone

ASTM D 5084 TEST METHOD:

- ☒ A - Constant Head
- ☐ B - Falling Head; Constant Tailwater
- ☐ C - Falling Head; Rising Tailwater
- ☐ F - Constant Volume; Falling Head - Rising Tailwater

B-FACTOR: 83 (stable) % ☐ Beginning of Test; ☒ End of Test

$\Delta\sigma_c$ (psi): 18, 23, 30

SPECIMEN DATA:

As-Received Diameter (inch): 4 Diameter Trimmed: ☒ Yes ☐ No

As-Received Length (inch): 8.0/6.0* Length Trimmed: ☒ Yes ☐ No

TEST SPECIMEN ORIENTATION: ☐ Vertical ☒ Horizontal

SPECIFIC GRAVITY, G_s: 2.71 ☐ Assumed ☒ Measured (ASTM D 854)

PERMANENT: ☒ Deaired Tap Water ☐ Other

Initial Conditions							Test Conditions					Final Conditions			Hydraulic Conductivity
H (cm)	D (cm)	V (cm^3)	w_c (%)	γ_d (pcf)	n	S (%)	$\bar{\sigma}_c$ (psi)	u_b (psi)	i_{avg}	Q (cm^3)	t (days)	WDS (g)	w_c (%)	S (%)	k_{20} (cm/sec)
7.95	5.02	157.22	21.1	107.3	0.365	99	30	70	40	7.8	5	270.45	21.3	100	**5.8×10^{-5}**

COMMENTS: (1) Horizontal permeability test specimen was cross-cored from the corresponding vertical test specimen.
* First length is total sample length. Second length is useable length at full core diameter.

Where: H = Specimen height; D = Specimen diameter; V = Volume; WDS = Dry mass; w_c = Moisture content (ASTM D 2216); γ_d = Dry density; S = Saturation; $\bar{\sigma}_c$ = Isotropic effective confining stress; u_b = Back-pressure; i_{avg} = Average hydraulic gradient; Q = Flow volume; t = Test duration; k_{20} = Saturated hydraulicconductivity at 20°C; n = Total porosity; and G_s = Specific gravity.

Checked By: TM Date: 08/21/08

Form SR-2B: Rev. 0

Appendix E

Geophysical Logs

Appendix F

Pilot Hole Water Quality

Injection Well IW-1

Pilot Hole Water Quality

IW-1 PILOT HOLE WATER QUALITY

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

DATE	TIME	DEPTH (ft bls)	TEMP. (°C)	pH	SPECIFIC COND. (µmhos/cm)	TDS field calculated (mg/L)	CHLORIDE (mg/L)	COMMENTS	OBSERVER'S INITIALS
10/25/2007	22:20	562	--	--	2,130	1,427	220	after specific capacity test	MK
10/26/2007	4:45	642	25.4	11.30	1,388	930	180	after specific capacity test	MK
10/26/2007	10:00	714	25.7	8.83	1,291	865	288	after specific capacity test	RAW
10/26/2007	14:40	804	27.9	8.64	1,442	966	385	after specific capacity test	RAW
10/26/2007	16:28	880	29.0	8.72	1,726	1,156	425	after specific capacity test	RAW
10/26/2007	21:10	960	27.0	8.88	2,077	1,392	510	after specific capacity test	MK
10/26/2007	0:00	1,040	27.0	8.70	2,541	1,702	725	after specific capacity test	MK
10/27/2007	4:00	1,120	26.7	8.75	2,574	1,725	780	after specific capacity test	MK
10/27/2007	6:20	1,200	27.8	8.67	2,540	1,702	760	after specific capacity test	MK
10/27/2007	9:32	1,280	27.4	8.29	2,585	1,732	900	after specific capacity test	RAW
10/27/2007	13:50	1,360	28.5	8.34	2,920	1,956	800	after specific capacity test	RAW
10/27/2007	17:30	1,440	28.3	8.37	3,314	2,220	950	after specific capacity test	RAW
10/27/2007	21:40	1,520	28.2	8.67	3,340	2,238	850	after specific capacity test	MK
10/28/2007	1:10	1,600	27.8	8.51	5,320	3,564	1,900	after specific capacity test	MK
10/28/2007	5:30	1,680	27.7	8.18	7,040	4,717	3,400	after specific capacity test	MK
10/28/2007	8:10	1,718			8,040	5,387		during drilling/ 12" from pit open	RAW
10/28/2007	8:40	1,725			8,730	5,849		during drilling/ 12" from pit open	RAW

IW-1 PILOT HOLE WATER QUALITY

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

DATE	TIME	DEPTH (ft bls)	TEMP. (°C)	pH	SPECIFIC COND. (µmhos/cm)	TDS field calculated (mg/L)	CHLORIDE (mg/L)	COMMENTS	OBSERVER'S INITIALS
10/28/2007	9:10	1,735			8,870	5,943		during drilling/ 12" from pit open	RAW
10/28/2007	10:25	1,749	29.4		38,400	25,728	13,500	12" from pit closed for 10 min	RAW
11/29/2007	0:15	1,760	30.7		14,700	9,849		during drilling/ 12" from pit open	ABF
12/1/2007	9:04	1,790	28.6	11.53	12,400	8,308	4,000	after specific capacity test	CLM
12/2/2007	13:15	1,840	30.2	10.99	11,010	7,377	3,500	after specific capacity test	CLM
12/5/2007	02:14	1,920	30.1	6.63	9,356	6,269	3,400	after specific capacity test	ABF
12/7/2007	22:36	2,000	27.2	7.17	14,550	9,749	6,500	after specific capacity test	RAW
12/9/2007	5:53	2,080	27.3	6.57	41,750	27,973	14,000	after specific capacity test	RAW
12/11/2007	5:53	2,160	27.2	6.82	42,550	28,509	14,000	after specific capacity test	ABF
12/11/2007	20:35	2,240	29.8	6.50	53,800	36,046	19,000	after specific capacity test	RAW
12/12/2007	09:47	2,320	28.5	6.44	50,420	33,781	18,000	after specific capacity test	ABF
12/12/2007	22:28	2,400	27.8	6.44	50,230	33,654	18,000	after specific capacity test	JL
12/13/2007	9:26	2,480	27.9	7.47	50,290	33,694	18,500	after specific capacity test	ABF
12/13/2007	16:19	2,560	27.8	7.32	50,400	33,768	19,000	after specific capacity test	ABF
12/13/2007	0:00	2,640	27	7.44	49,330	33,051	18,500	after specific capacity test	JL
12/14/2007	7:17	2,720	27.9	7.52	48,560	32,535	18,500	after specific capacity test	ABF
12/14/2007	16:40	2,800	27.8	6.2	48,340	32,388	18,500	after specific capacity test	ABF

IW-1 PILOT HOLE WATER QUALITY

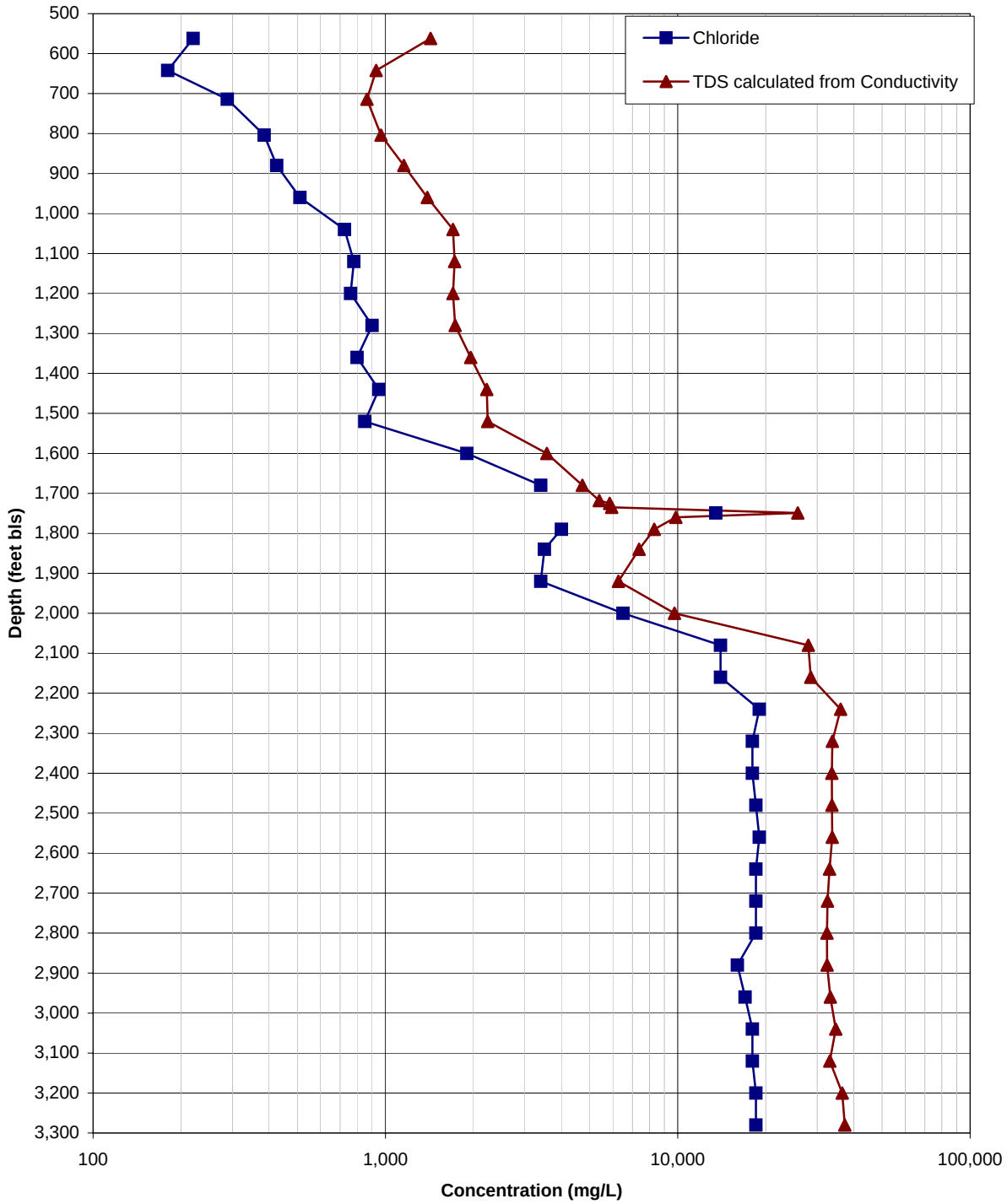
CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

DATE	TIME	DEPTH (ft bls)	TEMP. (°C)	pH	SPECIFIC COND. (µmhos/cm)	TDS field calculated (mg/L)	CHLORIDE (mg/L)	COMMENTS	OBSERVER'S INITIALS
12/17/2007	2:33	2,880	24.9	7.09	48,390	32,421	16,000	after specific capacity test	CLM
12/17/2007	13:24	2,960	26.8	7.36	49,660	33,272	17,000	after specific capacity test	ABF
12/18/2007	3:45	3,040	26.2	7.06	51,800	34,706	18,000	after specific capacity test	CLM
12/18/2007	20:09	3,120	28.6	7.01	49,400	33,098	18,000	after specific capacity test	CLM
12/19/2007	12:22	3,200	6.56	6.56	54,500	36,515	18,500	after specific capacity test	RAW
12/20/2007	8:45	3,280	29.9	6.99	55,600	37,252	18,500	after specific capacity test	RAW

NOTES:
ft bls - feet below land surface
°C - degrees Celcius
µmhos/cm - micro ohms per centimeter
mg/L - milligrams per liter

CITY OF CAPE CORAL
SOUTHWEST WRF DEEP INJECTION WELL SYSTEM
IW-1 Pilot Hole Water Quality



Monitor Well DZMW-1

Pilot Hole Water Quality

DZMW-1 PILOT HOLE WATER QUALITY

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

DATE	TIME	DEPTH (ft bls)	TEMP. (ºC)	pH	SPECIFIC COND. (µmhos/cm)	TDS field calculated (mg/L)	CHLORIDE (mg/L)	COMMENTS	OBSERVERS INITIALS
5/16/2008	--	540	27.0	8.99	1,359	911	525	drill stem	MK
5/16/2008	6:10	580	27.5	8.65	1,322	886	823	drill stem	MK
5/17/2008	4:50	620	27.2	8.63	2,096	1,404	628	after specific capacity test	ABF
5/17/2008	6:15	660	27.0	8.38	2,066	1,384	723	drill stem	MK
5/17/2008	7:50	700	27.2	8.00	2,466	1,652	805	after specific capacity test	MK
5/17/2008	8:34	740	27.0	7.69	2,936	1,967	930	drill stem	MK
5/17/2008	15:30	780	27.2	7.57	3,402	2,279	895	after specific capacity test	MK
5/17/2008	17:00	820	27.5	7.60	3,067	2,055	903	drill stem	MK
5/17/2008	19:20	860	27.6	7.57	3,379	2,264		after specific capacity test	ABF
5/17/2008	23:05	900	27.3	7.63	3,501	2,346	1,010	drill stem	ABF
5/18/2008	00:05	940	27.6	7.62	3,378	2,263	1,070	after specific capacity test	ABF
5/18/2008	1:02	980	27.7	7.53	3,399	2,277	1,100	drill stem	ABF
5/18/2008	2:23	1,020	27.6	7.62	3,469	2,324	1,130	after specific capacity test	ABF
5/18/2008	4:35	1,060	27.5	7.59	3,469	2,324	1,110	drill stem	ABF
5/18/2008	9:35	1,100	28.4	7.64	3,737	2,504	1,130	after specific capacity test	MK
5/18/2008	11:20	1,140	28.7	7.77	3,514	2,354	1,170	drill stem	MK
5/18/2008	13:40	1,180	28.4	7.45	3,915	2,623	1,180	after specific capacity test	MK

DZMW-1 PILOT HOLE WATER QUALITY

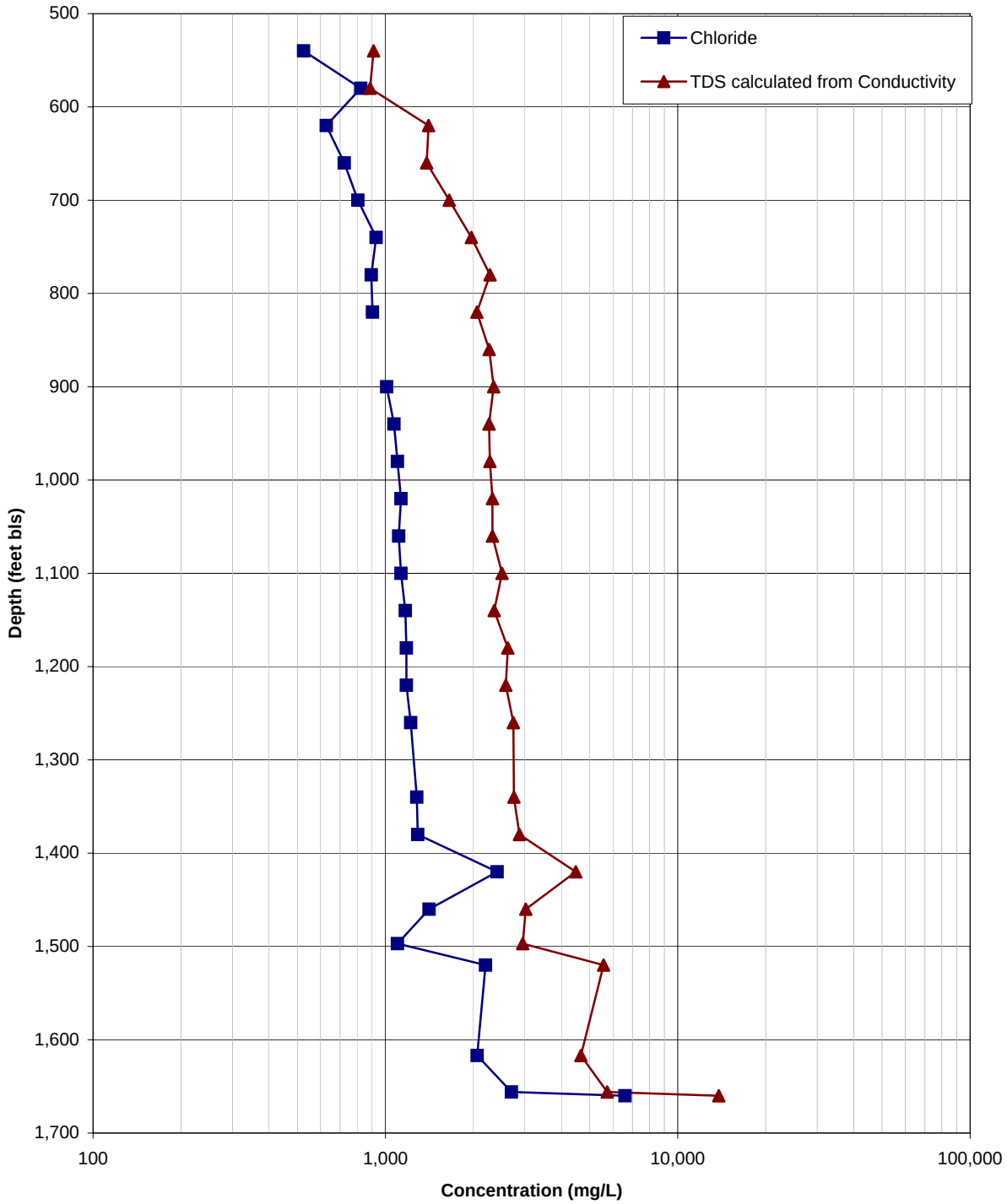
CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

DATE	TIME	DEPTH (ft bls)	TEMP. (ºC)	pH	SPECIFIC COND. (µmhos/cm)	TDS field calculated (mg/L)	CHLORIDE (mg/L)	COMMENTS	OBSERVERS INITIALS
5/18/2008	15:30	1,220	28.7	7.37	3,853	2,582	1,180	drill stem	MK
5/18/2008	17:30	1,260	28.9	7.57	4,087	2,738	1,220	after specific capacity test	MK
5/18/2008	20:53	1,340	27.7	8.06	4,105	2,750	1,280	after specific capacity test	ABF
5/18/2008	23:05	1,380	27.7	8.05	4,287	2,872	1,290	drill stem	ABF
5/19/2008	01:15	1,420	27.5	7.69	6,680	4,476	2,410	after specific capacity test	ABF
5/19/2008	02:50	1,460	27.6	8.47	4,508	3,020	1,410	drill stem	ABF
5/19/2008	4:29	1,497	--	--	4,400	2,948	1,100	after specific capacity test	ABF
5/21/2008	20:45	1,520	--	--	8,320	5,574	2,200	drill stem	JC
5/21/2008	22:10	1,617	--	--	6,960	4,663	2,060	after specific capacity test	JC
5/22/2008	0:30	1,656	--	--	8,560	5,735	2,700	drill stem	JC
5/22/2008	2:02	1,660	--	--	20,620	13,815	6,600	after specific capacity test	JC

Notes:
ft bls - feet below land surface
ºC - degrees Celcius
µmhos/cm - micro ohms per centimeter
mg/L - milligrams per liter

CITY OF CAPE CORAL
SOUTHWEST WRF DEEP INJECTION WELL SYSTEM
DZMW-1 Pilot Hole Water Quality



Appendix G

Video Surveys

Injection Well IW-1

Open Hole Video Survey

Video Survey of Open Hole
Injection Well IW-1
1,700 feet bpl to 3,283 feet below land surface
Southwest RO WRF
Cape Coral, Florida

Starting Depth feet	Ending Depth feet	Description of Video Survey
1700.0	1744.0	Gauge hole (smooth)
1744.0	1753.0	Gauge hole, highly fractured
1753.0	1754.0	Cavity
1754.0	1756.0	Gauge hole, fractured
1756.0	1765.0	Gauge hole (smooth), possible confinement
1765.0	1772.0	Smooth gauge hole with small cavities and vugs
1772.0	1773.0	Small horizonal cavity
1773.0	1796.0	Smooth gauge hole with small cavities, fractures and vugs
1796.0	1850.0	Gauge hole (alternating rough to smooth), with small cavities, and some vertical fracture
1850.0	1860.0	Gauge hole (smooth), few vugs
1860.0	1863.0	Irregular hole, highly fractured
1863.0	1864.0	Gauge hole (smooth)
1864.0	1867.0	Gauge hole (rough), small solution cavity
1867.0	1874.0	Gauge hole (smooth), possible confinement
1874.0	1898.0	Gauge hole (alternating rough to smooth), with vugs and some vertical fracture
1898.0	1899.0	Gauge hole, small cavities
1899.0	1911.0	Gauge hole smooth
1911.0	1913.0	Horizontal solution cavity
1913.0	1926.0	Gauge hole (smooth), possible confinement
1926.0	1927.0	Gauge hole (smooth), vugs
1927.0	1939.0	Gauge hole (smooth), possible confinement
1939.0	1940.0	Horizontal solution cavity
1940.0	1943.0	Gauge hole (smooth), possible confinement
1943.0	1945.0	Horizontal solution cavity
1945.0	1958.0	Gauge hole (smooth), possible confinement
1958.0	1970.0	Gauge hole (rough), small solution cavities and vugs
1970.0	1984.0	Gauge hole (smooth), vugs, small discontinuous verticle fractures
1984.0	1990.0	Gauge hole (rougher), larger solution cavitities, verticle fractures
1990.0	2018.0	Gauge hole (smooth), small solution cavities, small verticle fractures
2018.0	2022.0	Horizontal solution cavity
2022.0	2038.0	Gauge hole (smooth), possible confinement
2038.0	2043.0	Gauge hole (rough), solution cavities
2043.0	2046.0	Horizontal solution cavity
2046.0	2069.0	Gauge hole larger solution cavity and vugs
2069.0	2088.0	Larger cavity, verticle fracture
2088.0	2093.0	Irregular hole, highly fractured
2093.0	2101.0	Gauge hole (rough), small solution cavities
2101.0	2112.0	Large cavity, highly fractured
2112.0	2121.0	Irregular hole, highly continuous fractured, with large cavities
2121.0	2126.0	Gauge hole (relatively smooth, but slightly rough), vugs
2126.0	2127.0	Horizontal solution cavity

Starting Depth feet	Ending Depth feet	Description of Video Survey
2127.0	2134.0	Gauge hole (smooth), continous fractures verticle and horizontal
2134.0	2136.0	Horizontal fracture cavity
2136.0	2142.0	Gauge hole (rough) large vugs, solution cavities, and fractures
2142.0	2152.0	Gauge hole (rough), small vugs and continuous verticle fractures
2152.0	2168.0	Horizontal fracture cavity
2169.0	2186.0	Gauge hole (rough), small vugs and continuous verticle fractures
2186.0	2189.0	Large cavity
2189.0	2192.0	Gauge hole (rough), large vugs, solution cavities, and verticle fractures
2192.0	2195.0	Large cavity, highly fractured
2195.0	2224.0	Gauge hole (rough), large vugs, solution cavities, and verticle fractures
2224.0	2270.0	Gauge hole (rough), horizontal solution cavities, vugs
2270.0	2290.0	Irregulat to gauge hole, large solution cavities, verticle and horizontal
2290.0	2296.0	Gauge hole, vusgs with large solution features
2296.0	2331.0	Gauge hole (relatively smooth, but slightly rough), vugs
2331.0	2358.0	Gauge hole (smooth), possible confinement
2358.0	2358.5	Horizontal solution cavity
2358.5	2360.5	Gauge hole (smooth), possible confinement
2360.5	2361.0	Horizontal solution cavity
2361.0	2368.0	Gauge hole (smooth), possible confinement
2368.0	2370.0	Gauge hole (smooth),vugs, horizontal solution features, white
2370.0	2392.0	Gauge hole (smooth), possible confinement, occasional horizontal solution features or vugs
2392.0	2404.0	Gauge hole (rough), large vugs, solution cavities, and verticle features
2404.0	2416.0	Gauge hole (smooth), possible confinement, occasional horizontal solution features or vugs
2416.0	2438.0	Gauge hole (relatively smooth),vugs, horizontal solution features, some verticle fracturing
2438.0	2439.0	Horizontal fracture cavity
2439.0	2443.0	Gauge hole, (smooth), horizontal fractures
2443.0	2447.0	Gauge hole (smooth)
2447.0	2448.0	Horizontal cavity
2448.0	2559.0	Gauge hole (smooth), possible confinement
2559.0	2561.0	Gauge hole (smooth), small solution cavities
2561.0	2579.0	Gauge hole (smooth), occassional dissolution features, possible confinement
2579.0	2586.0	Gauge hole as above with larger more frequent dissolution features
2586.0	2665.0	Gauge hole (smooth), occassional dissolution features, possible confinement
2665.0	2700.0	Gauge hole (smooth), small to large solution cavities, vugs
2700.0	2703.0	Gauge hole (smooth)
2703.0	2716.0	Gauge hole (smooth), small to large solution cavities, vugs
2716.0	2750.0	Gauge hole (smooth)
2750.0	2866.0	Gauge hole (smooth), occasional horizontal solution cavities,possible confinment
2866.0	2872.0	Irregular hole, solution cavities
2872.0	2876.0	Gauge hole (smooth), occasional horizontal solution cavities,possible confinment

Starting Depth feet	Ending Depth feet	Description of Video Survey
2876.0	2880.0	Large solution cavity
2880.0	2899.0	Gauge hole (smooth), increasing solution cavities, verticle fracture
2899.0	2909.0	Gauge hole (smooth), vugs
2909.0	2940.0	Gauge hole (smooth), vugs, verticle fracture
2940.0	2956.0	Roughly gauge, abundant solution features, large verticle fracturing
2956.0	2970.0	Irregular hole, highly fractured
2970.0	3001.0	Gauge hole, highly fractured
3001.0	3020.0	Large cavity, highly fractured boulders, obstruction at 3015
3020.0	3026.0	Irregular hole, highly fractured
3026.0	3051.0	Gauge hole, large horizontal solution cavities, vugs
3051.0	3055.0	Irregular hole, horizontal and verticle fractures
3055.0	3074.0	Gauge hole, horizontal and verticle fractures, vugs
3074.0	3077.0	Horizontal fracture cavity
3077.0	3091.0	Gauge hole, horizontal and verticle fractures, vugs
3091.0	3092.0	Horizontal fracture cavity
3092.0	3102.0	Gauge hole, horizontal and verticle fractures, vugs
3102.0	3103.0	Horizontal fracture cavity
3103.0	3111.0	Gauge hole, horizontal and verticle fractures, vugs
3111.0	3112.0	Horizontal fracture cavity
3112.0	3139.0	Gauge hole, horizontal and verticle fractures, vugs
3139.0	3140.0	Horizontal fracture cavity
3140.0	3144.0	Irregular hole highly fractured
3144.0	3158.0	Large cavity, highly fractured with boulders
3158.0	3162.0	Irregular hole, highly fractured
3162.0	3164.0	Large cavity, highly fractured with boulders
3164.0	3175.0	Irregular hole, highly fractured
3175.0	3200.0	Gauge hole, horizontal and verticle fractures, vugs
3200.0	3268.0	visibility poor, appears to be as above
3268.0	3283.0	Mottled white and grey dense formation change, Cedar Key Formation anhydrite/gypsum

Injection Well IW-1

FRP Video Survey

Video Survey of IW-1 18-inch FRP Injection Tubing
Injection Well IW-1
Southwest RO WRF
Cape Coral, Florida

Starting Depth	Ending Depth	Description of Video Survey
feet	feet	
0	12	Stainless Steel Riser
12	12	Stainless steel to FRP coupling
41	41	Threaded FRP joint
44	44	Threaded FRP joint
74	74	Threaded FRP joint
103	103	Threaded FRP joint
133	133	Threaded FRP joint
161	161	Threaded FRP joint
191	191	Threaded FRP joint
220	220	Threaded FRP joint
249	249	Threaded FRP joint
278	278	Threaded FRP joint
307	307	Threaded FRP joint
336	336	Threaded FRP joint
365	365	Threaded FRP joint
393	393	Threaded FRP joint
423	423	Threaded FRP joint
452	452	Threaded FRP joint
481	481	Threaded FRP joint
510	510	Threaded FRP joint
539	539	Threaded FRP joint
568	568	Threaded FRP joint
597	597	Threaded FRP joint
625	625	Threaded FRP joint
654	654	Threaded FRP joint
683	683	Threaded FRP joint
712	712	Threaded FRP joint
741	741	Threaded FRP joint
770	770	Threaded FRP joint
799	799	Threaded FRP joint
827	827	Threaded FRP joint
857	857	Threaded FRP joint
886	886	Threaded FRP joint
915	915	Threaded FRP joint
944	944	Threaded FRP joint
973	973	Threaded FRP joint
1002	1002	Threaded FRP joint
1030	1030	Threaded FRP joint
1059	1059	Threaded FRP joint
1088	1088	Threaded FRP joint
1116	1116	Threaded FRP joint
1145	1145	Threaded FRP joint
1174	1174	Threaded FRP joint
1202	1202	Threaded FRP joint
1232	1232	Threaded FRP joint
1261	1261	Threaded FRP joint
1290	1290	Threaded FRP joint
1319	1319	Threaded FRP joint
1348	1348	Threaded FRP joint
1377	1377	Threaded FRP joint

Starting Depth	Ending Depth	Description of Video Survey
feet	feet	
1406	1406	Threaded FRP joint
1435	1435	Threaded FRP joint
1464	1464	Threaded FRP joint
1493	1493	Threaded FRP joint
1521	1521	Threaded FRP joint
1550	1550	Threaded FRP joint
1579	1579	Threaded FRP joint
1608	1608	Threaded FRP joint
1637	1637	Threaded FRP joint
1665	1665	Threaded FRP joint
1694	1694	Threaded FRP joint
1723	1723	Threaded FRP joint
1752	1752	Threaded FRP joint
1781	1781	Threaded FRP joint
1810	1810	Threaded FRP joint
1840	1840	Threaded FRP joint
1869	1869	Threaded FRP joint
1897	1897	Threaded FRP joint
1926	1926	Threaded FRP joint
1955	1955	Threaded FRP joint
1983	1983	Threaded FRP joint
2012	2012	Threaded FRP joint
2042	2042	Threaded FRP joint
2071	2071	Threaded FRP joint
2100	2100	Threaded FRP joint
2129	2129	Threaded FRP joint
2158	2158	Threaded FRP joint
2186	2186	Threaded FRP joint
2215	2215	Threaded FRP joint
2244	2244	Threaded FRP joint
2273	2273	Threaded FRP joint
2302	2302	Threaded FRP joint
2331	2331	Threaded FRP joint
2360	2360	Threaded FRP joint
2389	2389	Threaded FRP joint
2419	2419	Threaded FRP joint
2448	2448	Threaded FRP joint
2477	2477	Threaded FRP joint
2505	2505	Threaded FRP joint
2534	2534	Threaded FRP joint
2564	2564	Threaded FRP joint
2593	2593	Threaded FRP joint
2621	2621	Threaded FRP joint
2650	2650	Threaded FRP joint
2680	2680	Threaded FRP joint
2709	2709	Threaded FRP joint
2738	2738	Threaded FRP joint
2767	2767	Threaded FRP joint
2795	2795	Threaded FRP joint
2825	2825	Threaded FRP joint
2853	2853	Threaded FRP joint
2882	2882	Threaded FRP joint
2911	2911	Threaded FRP joint
2925	2940	cement lining tubing
2940	2943	cementing packer
2943	2953	24-inch casing lines with cement
2953	2970	Gauge hole (smooth), small solution cavities

Starting Depth	Ending Depth	Description of Video Survey
feet	feet	
2970	3001	Gauge hole, horizontal and verticle fractures, vugs
3001	3026	Large cavity, highly fractured, boulders
3026	3065	Gauge hole, large horizontal solution cavities, vugs
3065	3074	Irregular hole, horizontal and verticle fractures
3074	3078	Large cavity, highly fractured, boulders
3078	3085	Gauge hole, horizontal and verticle fractures, vugs
3085	3090	Irregular hole, horizontal and verticle fractures
3090	3136	Gauge hole, large horizontal solution cavities, vugs
3136	3145	Gauge hole, horizontal and verticle fractures, vugs
3145	3162	Large cavity, highly fractured, boulders
3162	3174	Gauge hole, horizontal and verticle fractures, vugs
3174	3207	Gauge hole, solution cavities, vugs
3207	3261	Gauge hole (smooth), small solution cavities
3261	3272	Gauge hole (smooth)

Monitor Well DZMW-1

FRP Video Survey

Video Survey of DZMW-1 6.625-inch FRP Casing
Monitor Well DZMW-1
Southwest RO WRF
Cape Coral, Florida

Starting Depth	Ending Depth	Description of Video Survey
feet	feet	
0	21	Stainless Steel Riser
12	21	Stainless steel to FRP coupling
51	51	Threaded FRP joint
81	81	Threaded FRP joint
111	111	Threaded FRP joint
140	140	Threaded FRP joint
170	170	Threaded FRP joint
199	199	Threaded FRP joint
229	229	Threaded FRP joint
258	258	Threaded FRP joint
288	288	Threaded FRP joint
317	317	Threaded FRP joint
347	347	Threaded FRP joint
376	376	Threaded FRP joint
406	406	Threaded FRP joint
435	435	Threaded FRP joint
464	464	Threaded FRP joint
494	494	Threaded FRP joint
523	523	Threaded FRP joint
552	552	Threaded FRP joint
582	582	Threaded FRP joint
611	611	Threaded FRP joint
641	641	Threaded FRP joint
670	670	Threaded FRP joint
699	699	Threaded FRP joint
729	729	Threaded FRP joint
758	758	Threaded FRP joint
788	788	Threaded FRP joint
817	817	Threaded FRP joint
847	847	Threaded FRP joint
876	876	Threaded FRP joint
905	905	Threaded FRP joint
935	935	Threaded FRP joint
965	965	Threaded FRP joint
994	994	Threaded FRP joint
1023	1023	Threaded FRP joint
1052	1052	Threaded FRP joint
1082	1082	Threaded FRP joint
1111	1111	Threaded FRP joint
1141	1141	Threaded FRP joint
1170	1170	Threaded FRP joint
1200	1200	Threaded FRP joint
1229	1229	Threaded FRP joint
1258	1258	Threaded FRP joint
1288	1288	Threaded FRP joint
1317	1317	Threaded FRP joint
1346	1346	Threaded FRP joint
1376	1376	Threaded FRP joint
1405	1405	Threaded FRP joint
1377	1377	Threaded FRP joint

Starting Depth	Ending Depth	Description of Video Survey
feet	feet	
1406	1406	Threaded FRP joint
1435	1435	Threaded FRP joint
1464	1464	Threaded FRP joint
1493	1493	Threaded FRP joint
1523	1523	Threaded FRP joint
1553	1553	Threaded FRP joint
1582	1582	Threaded FRP joint
1608	1619	Bottom of FRP casing
1619	1648	Gauge hole (smooth), small solution cavities

Appendix H

Specific Capacity Testing

Injection Well IW-1

Pilot Hole Specific Capacity

IW-1 SPECIFIC CAPACITY TESTING
DURING PILOT HOLE DRILLING

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Volume of Tank: 2,500 Gallons

DATE	TIME TO FILL TANK (min)	WELL DEPTH (ft)	WATER LEVEL STATIC (ft als)	WATER LEVEL PUMPING (ft als)	Δ WATER LEVEL (ft)	FLOW (gpm)	SPECIFIC CAPACITY (gpm/ft)	COMMENTS	OBSERVER'S INITIALS
10/25/2007	6.50	562	8.0	-1.7	9.7	385	40		MK
10/26/2007	6.50	642	-38.6	-40.4	1.8	385	214		MK
10/26/2007	5.22	714	-31.5	-36.6	5.1	479	94		RAW
10/26/2007	6.05	804	-25.1	-29.7	4.6	413	91		RAW
10/26/2007	4.33	880	-22.3	-31.6	9.4	577	62		RAW
10/26/2007	5.00	960	-21.1	-34.2	13.1	500	38		MK
10/26/2007	5.00	1,040	-22.4	-35.8	13.4	500	37		MK
10/26/2007	5.00	1,040	-22.4	-35.8	13.4	500	37		MK
10/27/2007	5.00	1,120	-19.0	-36.8	17.8	500	28		MK
10/27/2007	4.50	1,200	-21.7	-37.9	16.2	556	34		MK
10/27/2007	5.17	1,280	-15.9	-33.6	17.7	484	27		RAW
10/27/2007	4.85	1,360	-13.9	-32.8	18.9	515	27		RAW
10/27/2007	4.92	1,440	-18.2	-35.2	17.0	508	30		RAW
10/27/2007	4.90	1,520	-13.2	-16.4	3.2	510	159	Electric tape malfunctioned, may not be a true SC	MK
10/28/2007	5.10	1,600				490		Test error	MK
10/28/2007	5.25	1,680	-7.1	-8.7	1.6	476	298		MK
11/30/2007		1,760	9.0					Too much mud in hole to perform SC test. Well is alive.	ABF
12/1/2007	3.92	1,790	0.0	0.0		638		Drawdown not observed due to kill or fresh water pumped for core?	CLM
12/2/2007	3.95	1,840	-20.0	-0.2	-19.80	633		Drawdown not observed due to kill or fresh water pumped for core?	CLM
12/5/2007	4.35	1,920	10.5	-0.7	11.15	575	52		ABF
12/7/2007	4.58	2,000	-18.10	-78.20	60.10	545	9		RAW
12/9/2007	2.05	2,080	2.83	0.40	2.43	1,220	501		RAW
12/11/2007	3.75	2,160	4.40	-1.58	5.98	667	111		ABF
12/11/2007	3.62	2,240	0.60	-21.10	21.70	691	32		RAW
12/12/2007	7.01	2,320	-0.08	-0.25	0.17	357	2,100		ABF
12/12/2007	4.24	2,400	-2.90	-3.35	0.45	590	1,311		JL
12/13/2007	4.66	2,480	-1.6	-2.1	0.50	536	1,072		ABF

IW-1 SPECIFIC CAPACITY TESTING
DURING PILOT HOLE DRILLING

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

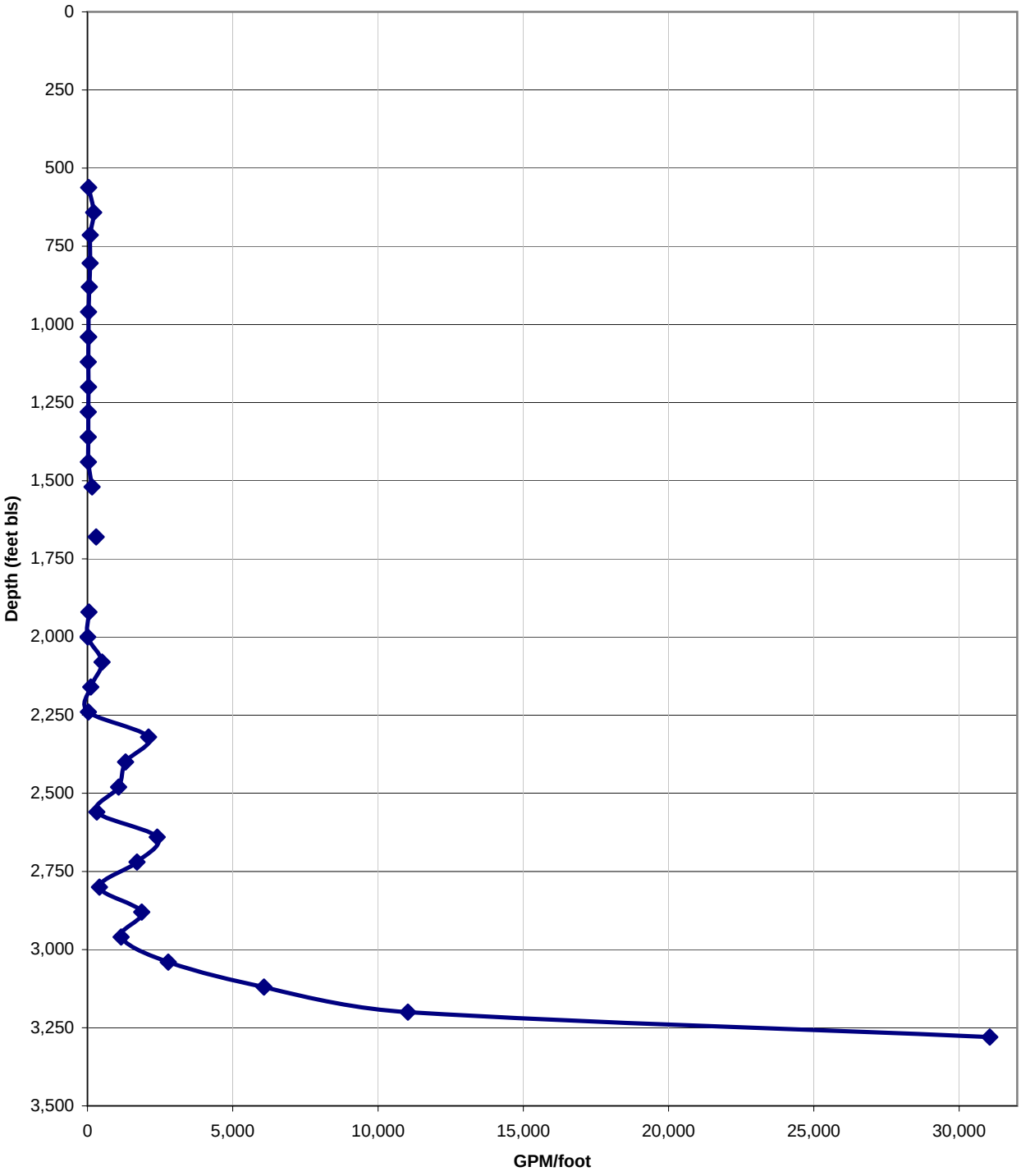
JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Volume of Tank: 2,500 Gallons

DATE	TIME TO FILL TANK (min)	WELL DEPTH (ft)	WATER LEVEL STATIC (ft als)	WATER LEVEL PUMPING (ft als)	Δ WATER LEVEL (ft)	FLOW (gpm)	SPECIFIC CAPACITY (gpm/ft)	COMMENTS	OBSERVER'S INITIALS
12/13/2007	4.58	2,560	-1.70	-3.40	1.7	546	321		ABF
12/13/2007	3.47	2,640	-6.70	-7.00	0.3	720	2,400		JL
12/14/2007	3.67	2,720	-7.20	-7.60	0.40	682	1,705		MK
12/14/2007	3.03	2,800	-5.90	-7.90	2.00	824	412		ABF
12/17/2007	4.47	2,880	-5.70	-6.00	0.30	560	1,866		CLM
12/17/2007	3.08	2,960	-9.40	-10.10	0.70	811	1,158		ABF
12/18/2007	4.50	3,040	-0.30	-0.50	0.20	556	2,778		CLM
12/18/2007	4.12	3,120	-3.40	-3.50	0.10	607	6,073		CLM
12/19/2007	4.53	3,200	-1.60	-1.65	0.05	551	11,029		RAW
12/20/2007	8.05	3,280	-5.30	-5.31	0.01	311	31,056		RAW

NOTES:
ft - feet
ft als - feet above land surface
gpm - gallons per minute
min - minutes
Δ - change

City of Cape Coral Southwest RO WTP
Injection Well (IW-1)
Pilot Hole Specific Capacity



Monitor Well DZMW-1

Pilot Hole Specific Capacity

DZMW-1 SPECIFIC CAPACITY TESTING
DURING PILOT HOLE DRILLING

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

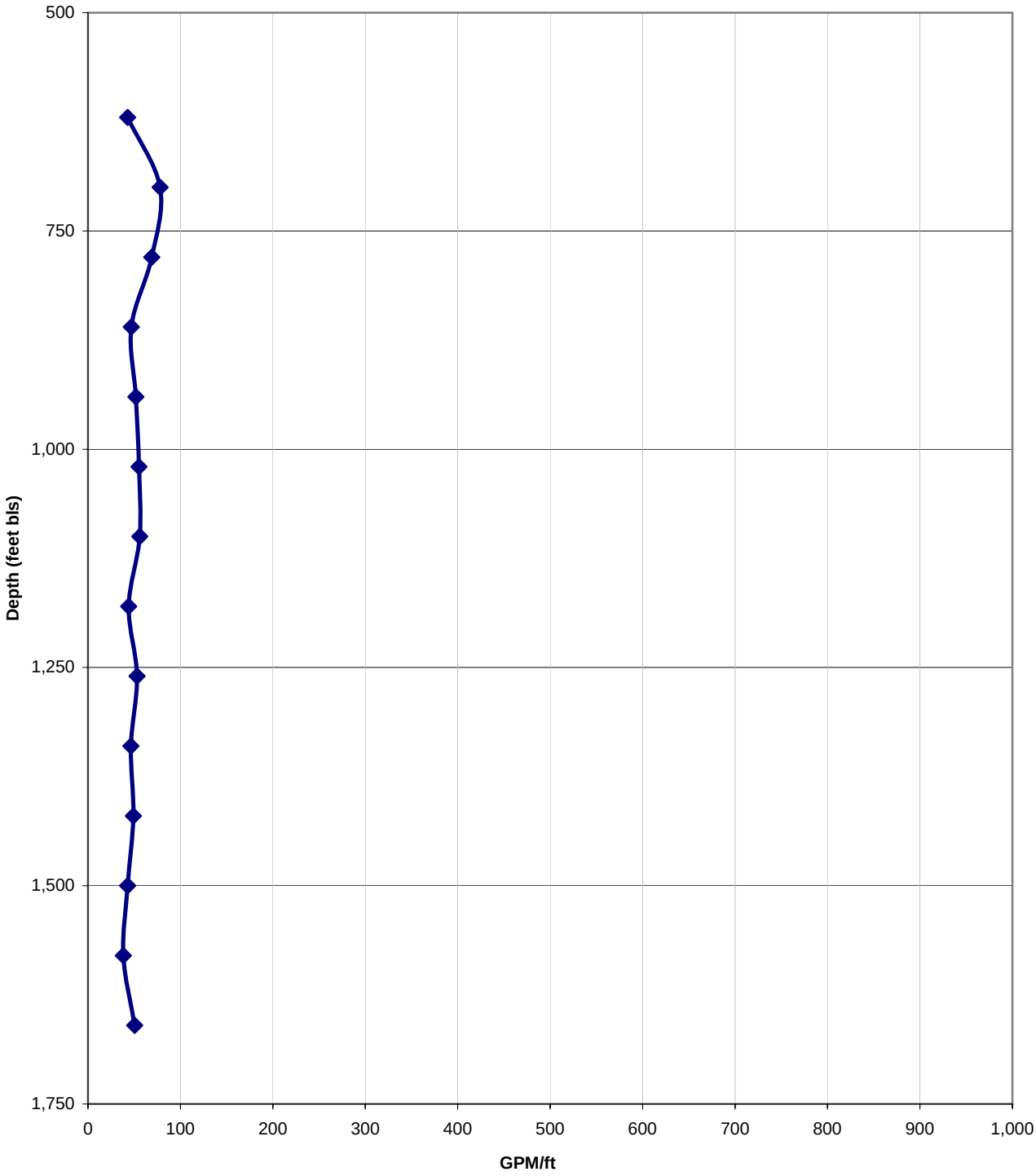
JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Volume of Tank: 3,000 Gallons

DATE	TIME TO FILL TANK (min)	WELL DEPTH (ft)	WATER LEVEL STATIC (ft als)	WATER LEVEL PUMPING (ft als)	Δ WATER LEVEL (ft)	FLOW (gpm)	SPECIFIC CAPACITY (gpm/ft)	COMMENTS	OBSERVER'S INITIALS
5/17/2008	14.00	620	-42.4	-47.4	5.0	214	43	manual reading	ABF
5/17/2008	12.00	700	-37.6	-40.8	3.2	250	78	manual reading	MK
5/17/2008	8.00	780	-30.6	-36.0	5.4	375	69	manual reading	MK
5/17/2008	11.00	860	-31.3	-37.1	5.8	273	47	manual reading	ABF
5/17/2008	8.00	940	-31.6	-38.9	7.3	375	52	manual reading	ABF
5/18/2008	7.00	1,020	-30.5	-38.2	7.8	429	55	manual reading	ABF
5/18/2008	7.00	1,100	-28.2	-35.8	7.6	429	56	electric tape	MK
5/18/2008	8.00	1,180	-31.3	-39.8	8.5	375	44	electric tape	MK
5/18/2008	7.00	1,260	-32.9	-41.0	8.1	429	53	electric tape	MK
5/18/2008	7.00	1,340	-29.6	-38.8	9.2	429	46	electric tape	ABF
5/18/2008	6.00	1,420	-28.7	-38.9	10.2	500	49	electric tape	ABF
5/19/2008	7.00	1,500	-28.5	-38.5	10.0	429	43	electric tape	ABF
5/21/2009	8.00	1,580	-28.8	-38.6	9.8	375	38	electric tape	JL
5/22/2008	6.00	1,660	-31.6	-41.5	9.9	500	51	electric tape	JL

NOTES:
ft - feet
ft als - feet above land surface
gpm - gallons per minute
min - minutes
Δ - change

City of Cape Coral Southwest RO WTP
Monitor Well (DMZW-1)
Pilot Hole Specific Capacity

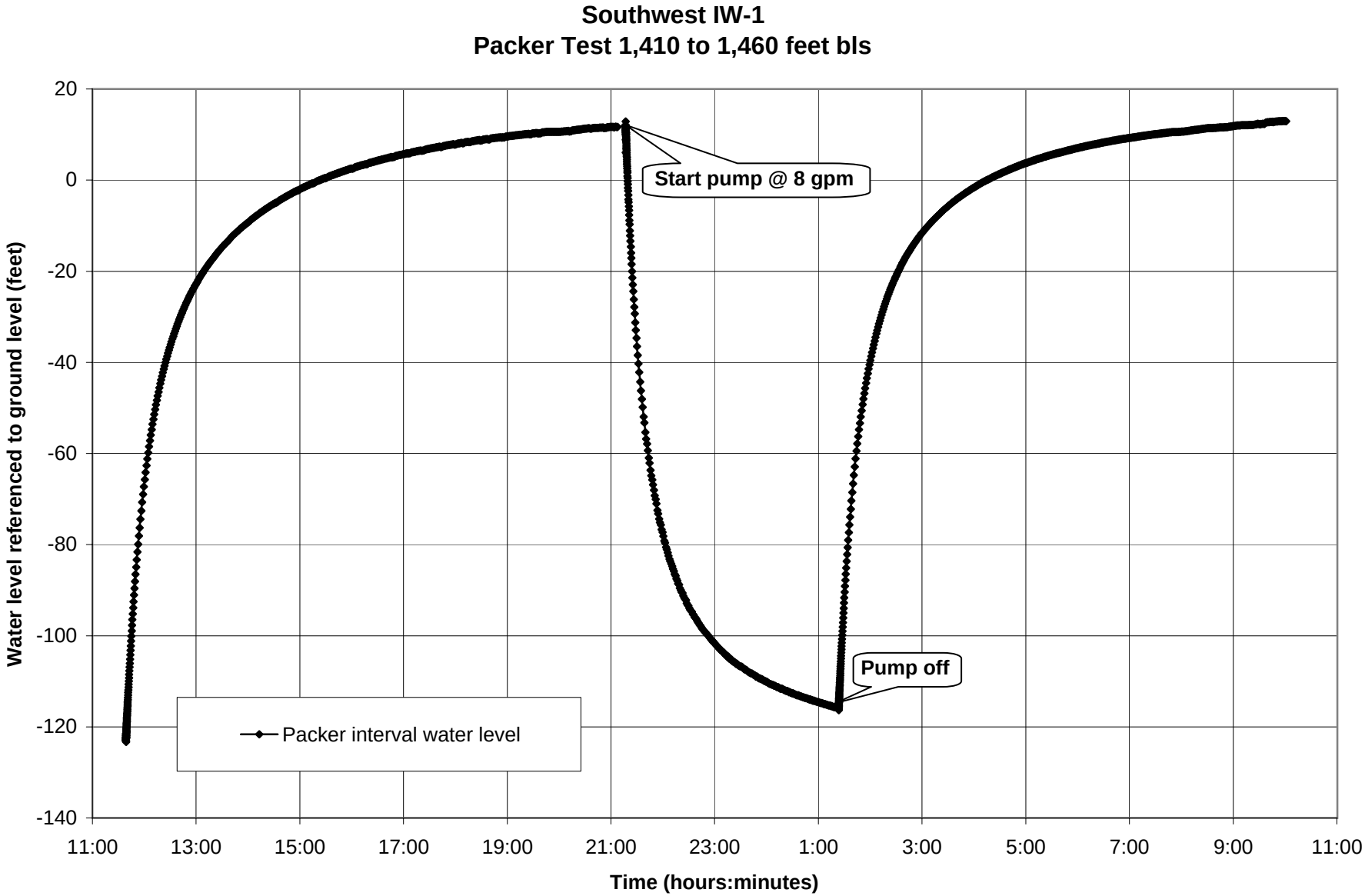


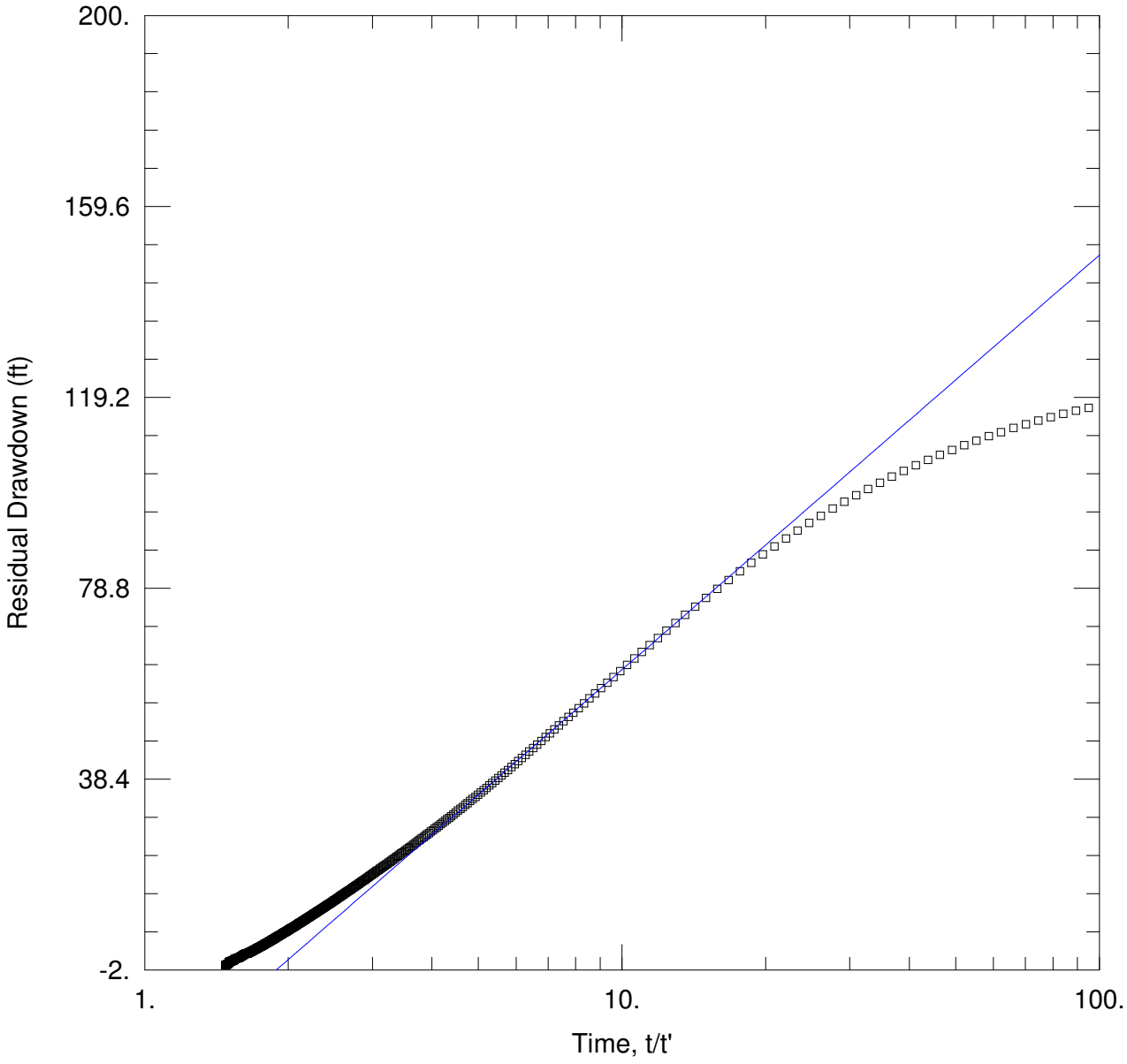
Appendix I

Packer Testing Data and Graphs

Injection Well IW-1

Packer Test - 1,410 to 1,460 feet bls


Southwest IW-1
Packer Test 1,410 to 1,460 feet bls
Water level referenced to ground level (feet)
20
0
-20
-40
-60
-80
-100
-120
-140
11:00
13:00
15:00
17:00
19:00
21:00
23:00
1:00
3:00
5:00
7:00
9:00
11:00
Time (hours:minutes)
Start pump @ 8 gpm
Pump off
Packer interval water level



SOUTHWEST IW-1 PACKER TEST 1,410 TO 1,460 FEET BLS

AQUIFER DATA

Saturated Thickness: 50. ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

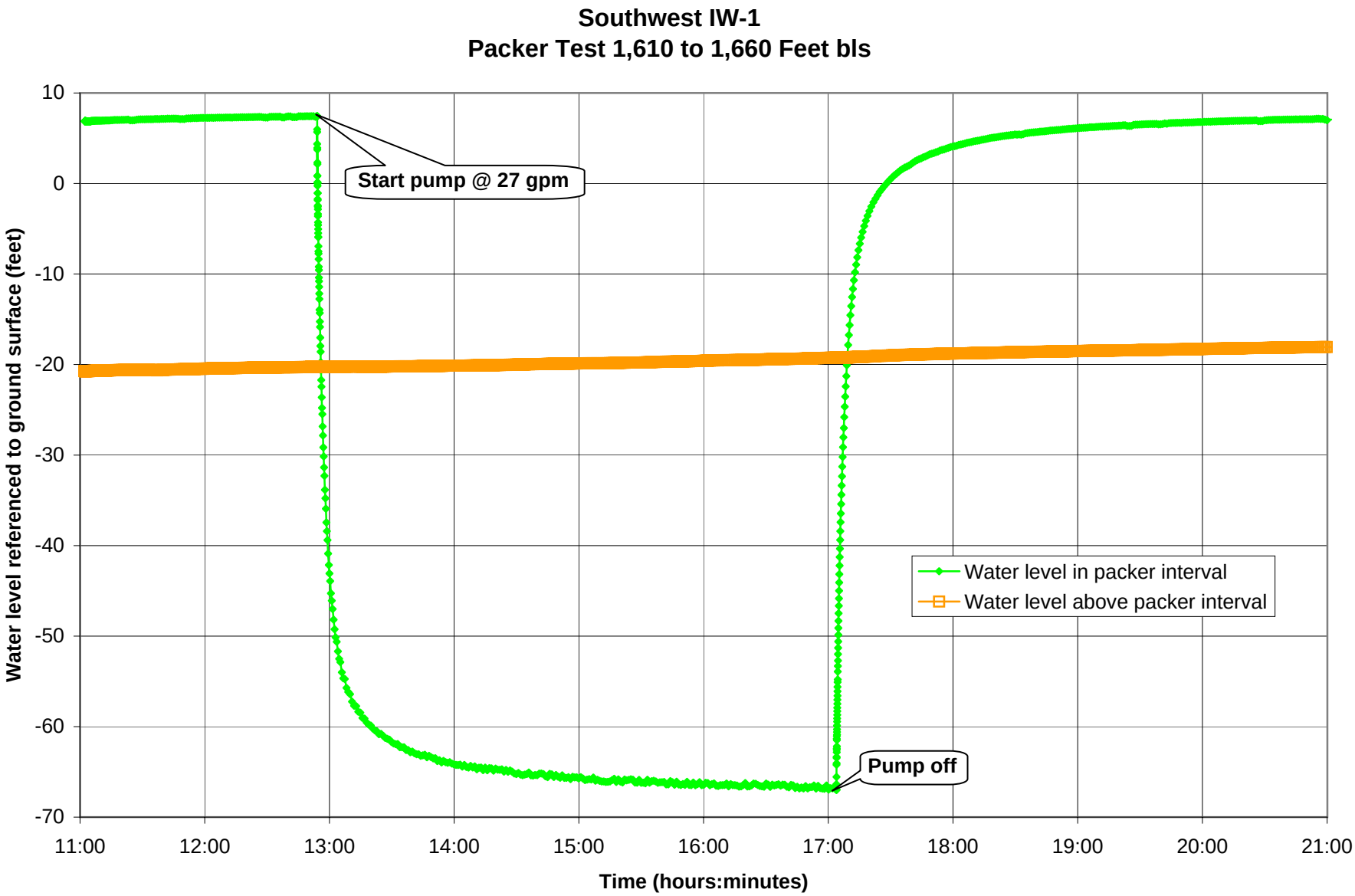
Solution Method: Theis (Recovery)

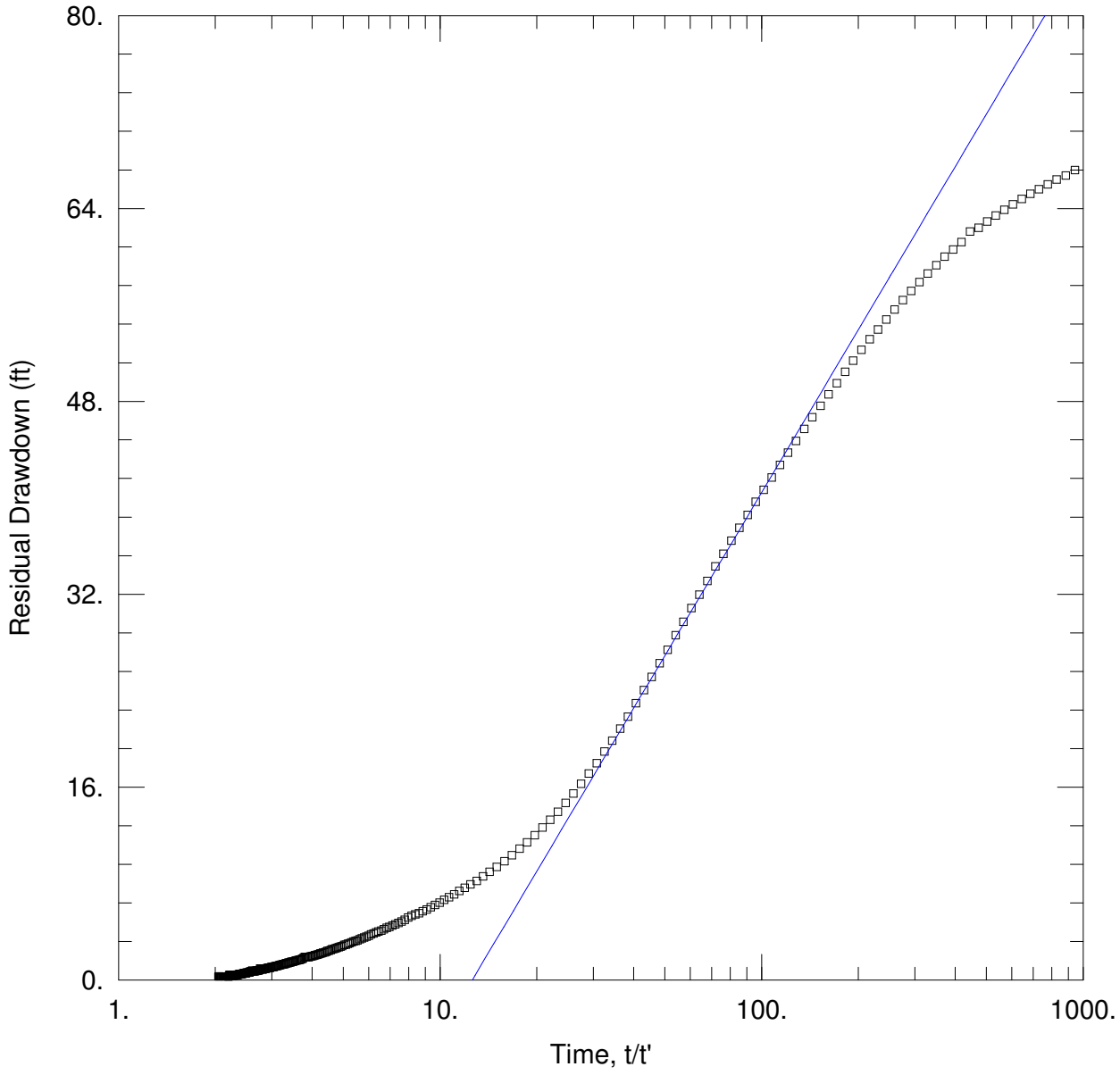
T = 3.217 ft^2/day

S/S' = 1.989

Injection Well IW-1

Packer Test - 1,610 to 1,650 feet bls


Southwest IW-1
Packer Test 1,610 to 1,660 Feet bls
Water level referenced to ground surface (feet)
10
0
-10
-20
-30
-40
-50
-60
-70
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
Time (hours:minutes)
Start pump @ 27 gpm
Pump off
Water level in packer interval
Water level above packer interval



SOUTHWEST IW-1 PACKER TEST 1,610 TO 1,660 FEET BLS

AQUIFER DATA

Saturated Thickness: 50. ft

Anisotropy Ratio (Kz/Kr): 0.5

SOLUTION

Aquifer Model: Confined

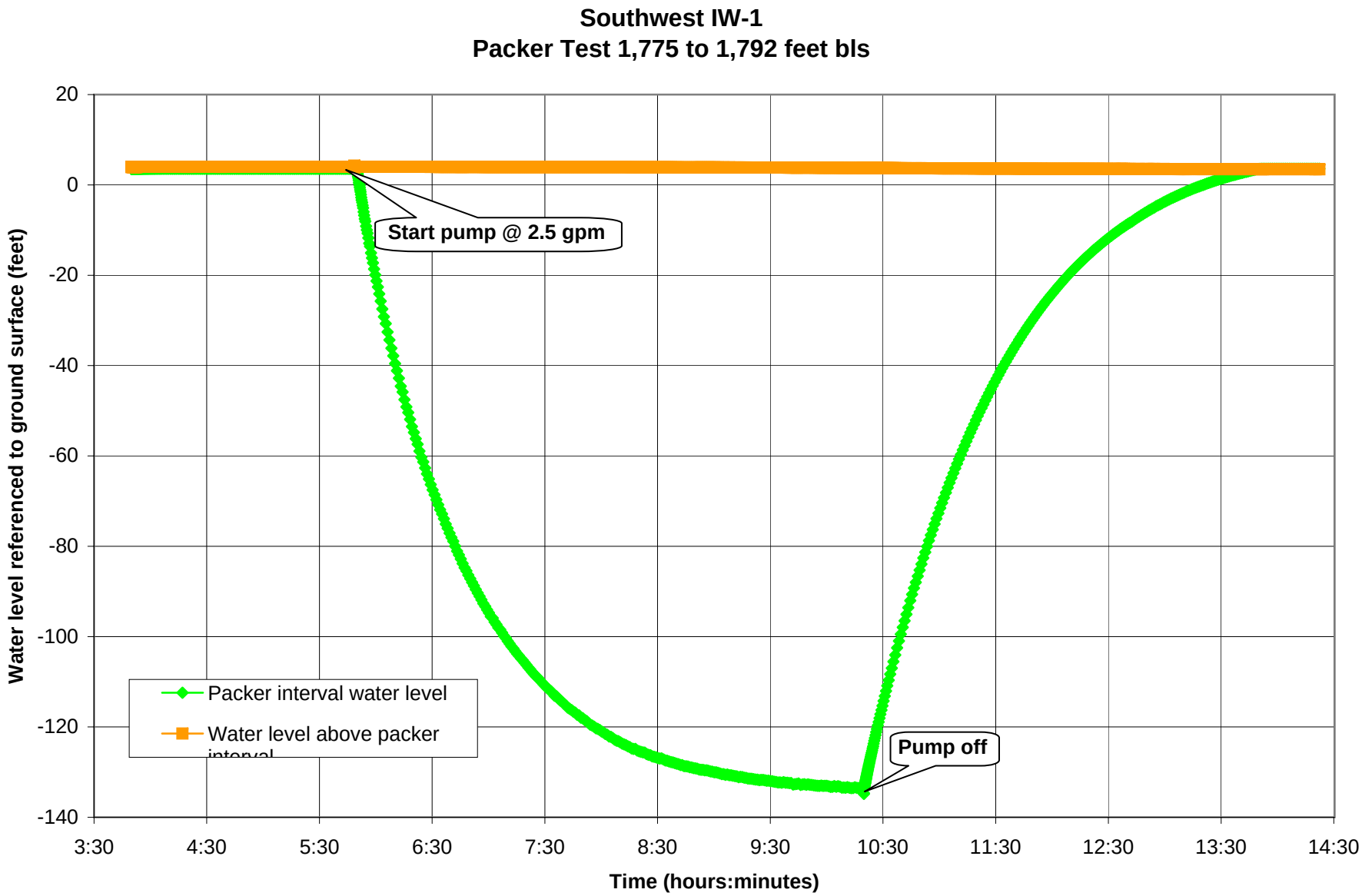
Solution Method: Theis (Recovery)

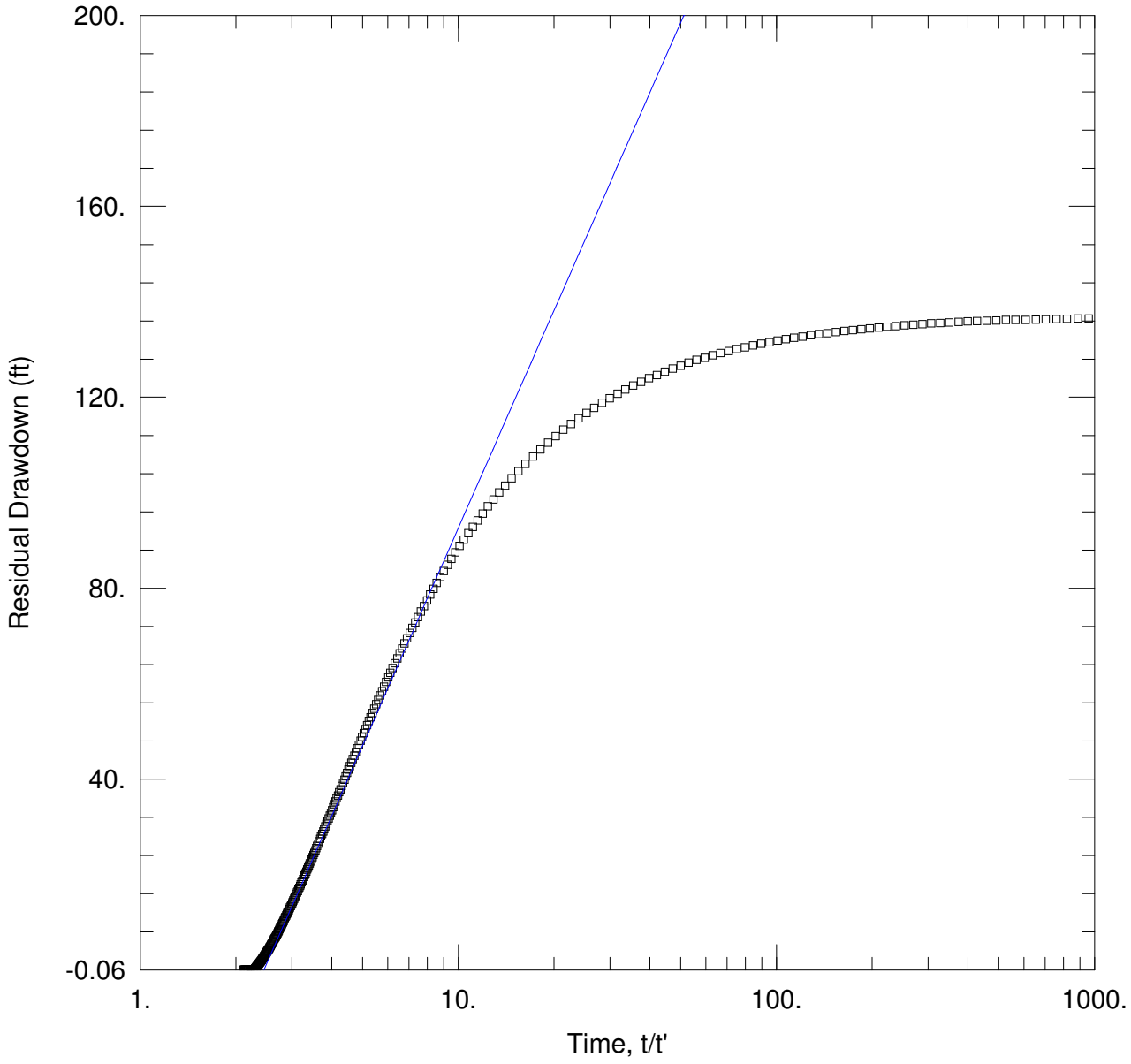
T = 21.2 ft^2/day

S/S' = 12.6

Injection Well IW-1

Packer Test – 1,775 to 1,792 feet bls


Southwest IW-1
Packer Test 1,775 to 1,792 feet bls
Water level referenced to ground surface (feet)
20
0
-20
-40
-60
-80
-100
-120
-140
3:30
4:30
5:30
6:30
7:30
8:30
9:30
10:30
11:30
12:30
13:30
14:30
Time (hours:minutes)
Start pump @ 2.5 gpm
Pump off
Packer interval water level
Water level above packer interval



SOUTHWEST IW-1 PACKER TEST 1,775 TO 1,792 FEET BLS

AQUIFER DATA

Saturated Thickness: 17. ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

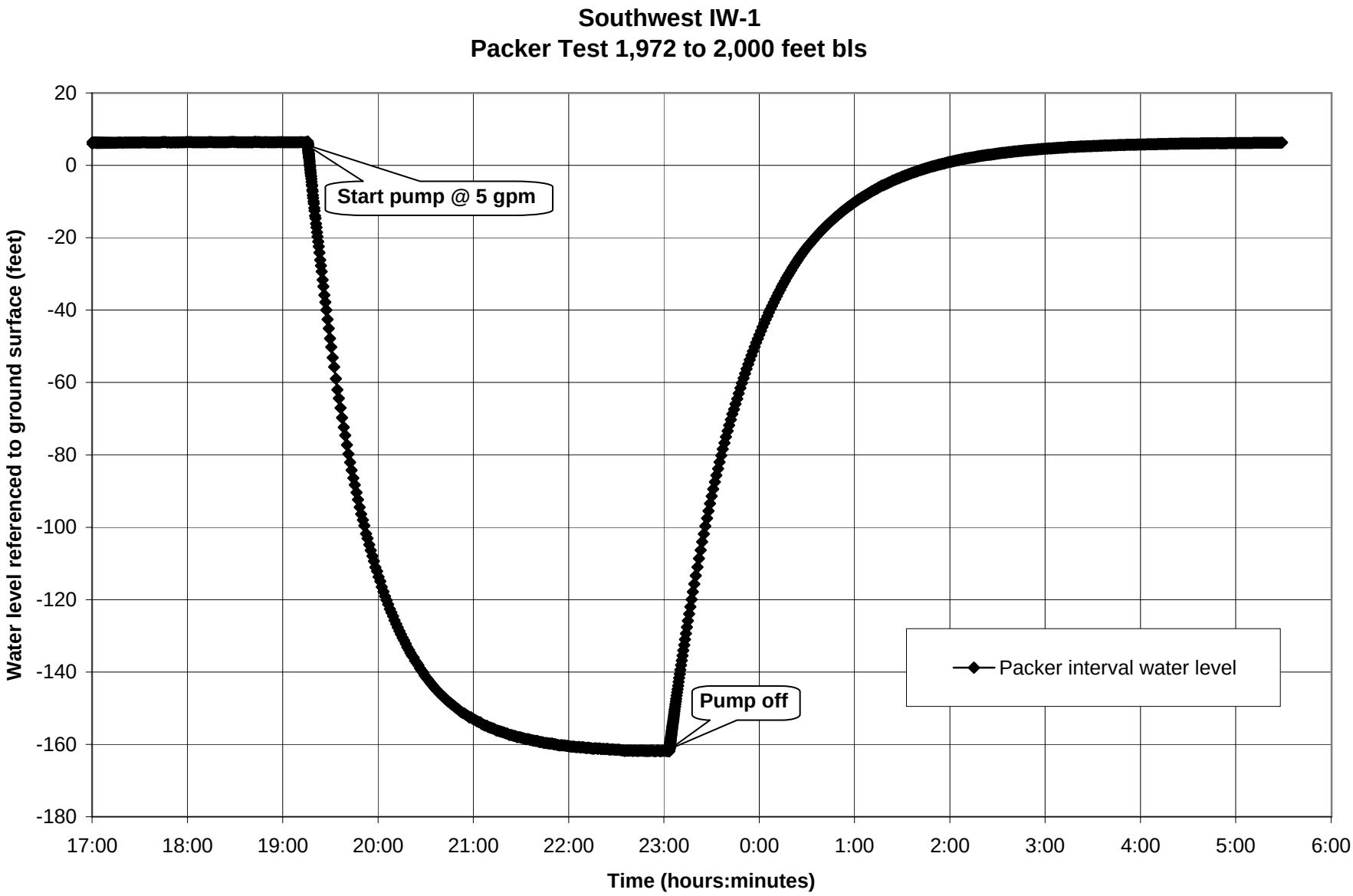
Solution Method: Theis (Recovery)

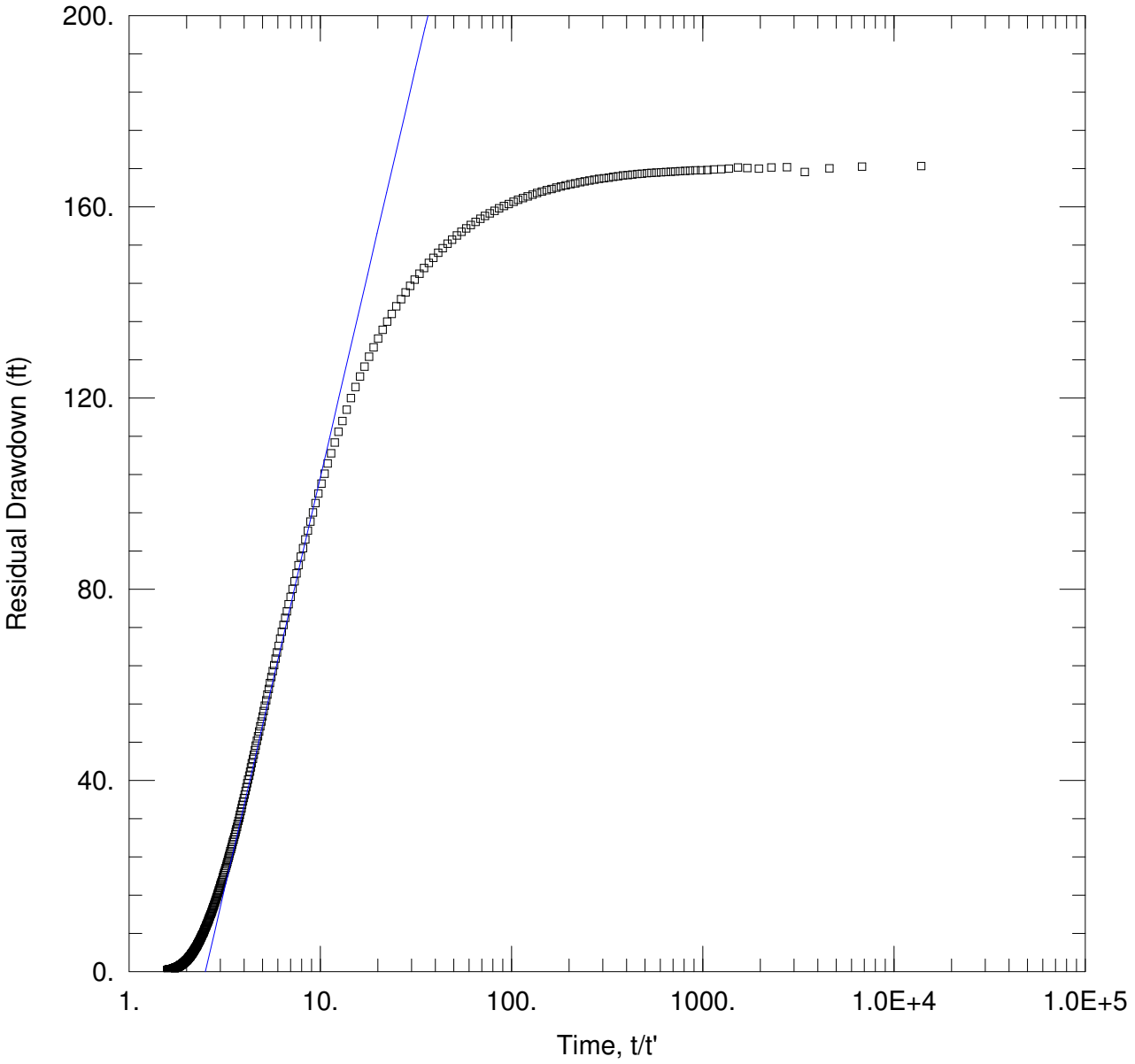
T = 0.5819 ft^2/day

S/S' = 2.451

Injection Well IW-1

Packer Test – 1,972 to 2,000 feet bls


Southwest IW-1
Packer Test 1,972 to 2,000 feet bls
Water level referenced to ground surface (feet)
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
Start pump @ 5 gpm
Pump off
Packer interval water level
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
1:00
2:00
3:00
4:00
5:00
6:00
Time (hours:minutes)



SOUTHWEST IW-1 PACKER TEST 1,972 TO 2,000 FEET BLS

AQUIFER DATA

Saturated Thickness: 28. ft

Anisotropy Ratio (Kz/Kr): 1.

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Recovery)

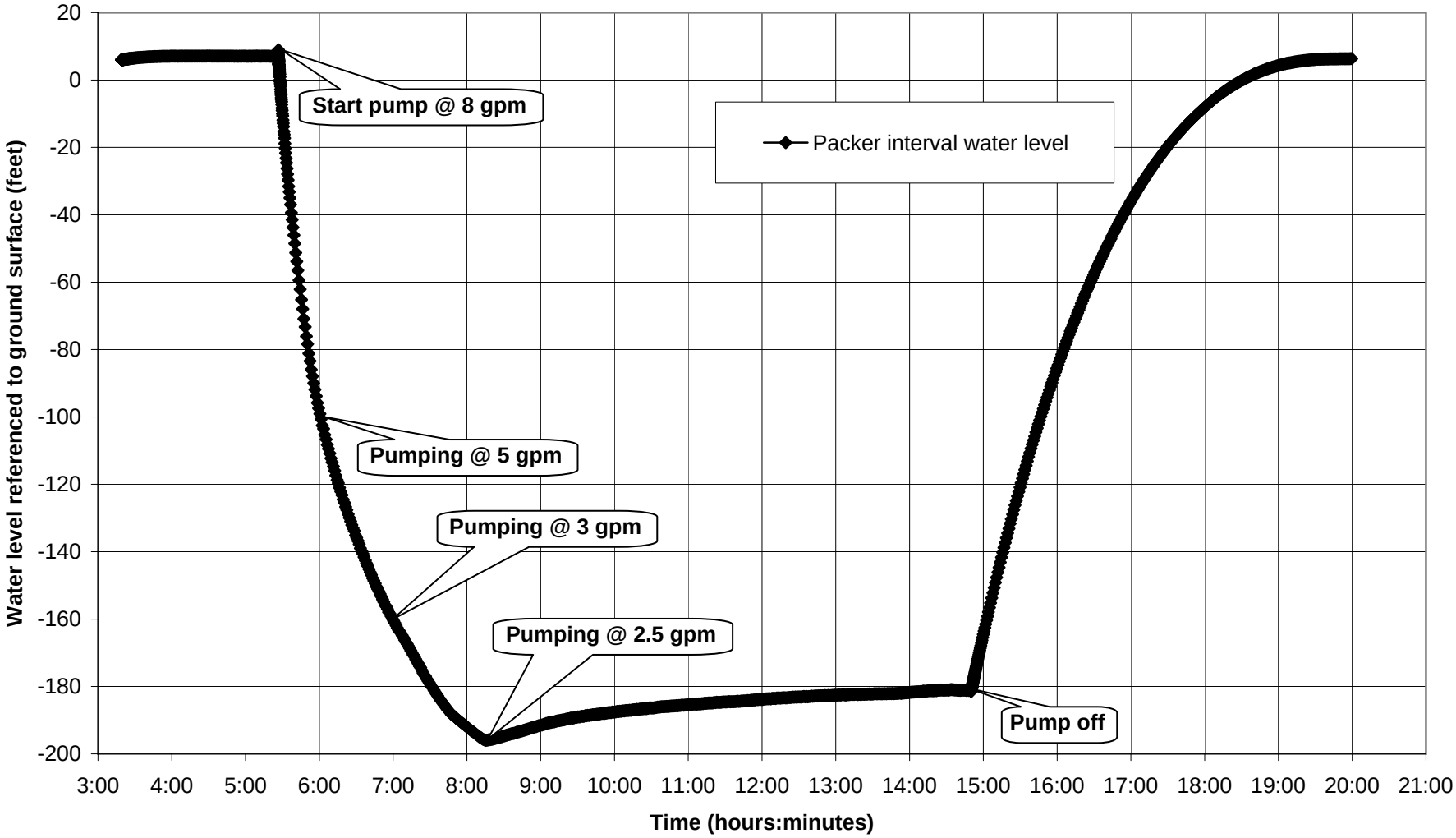
T = 1.026 ft^2/day

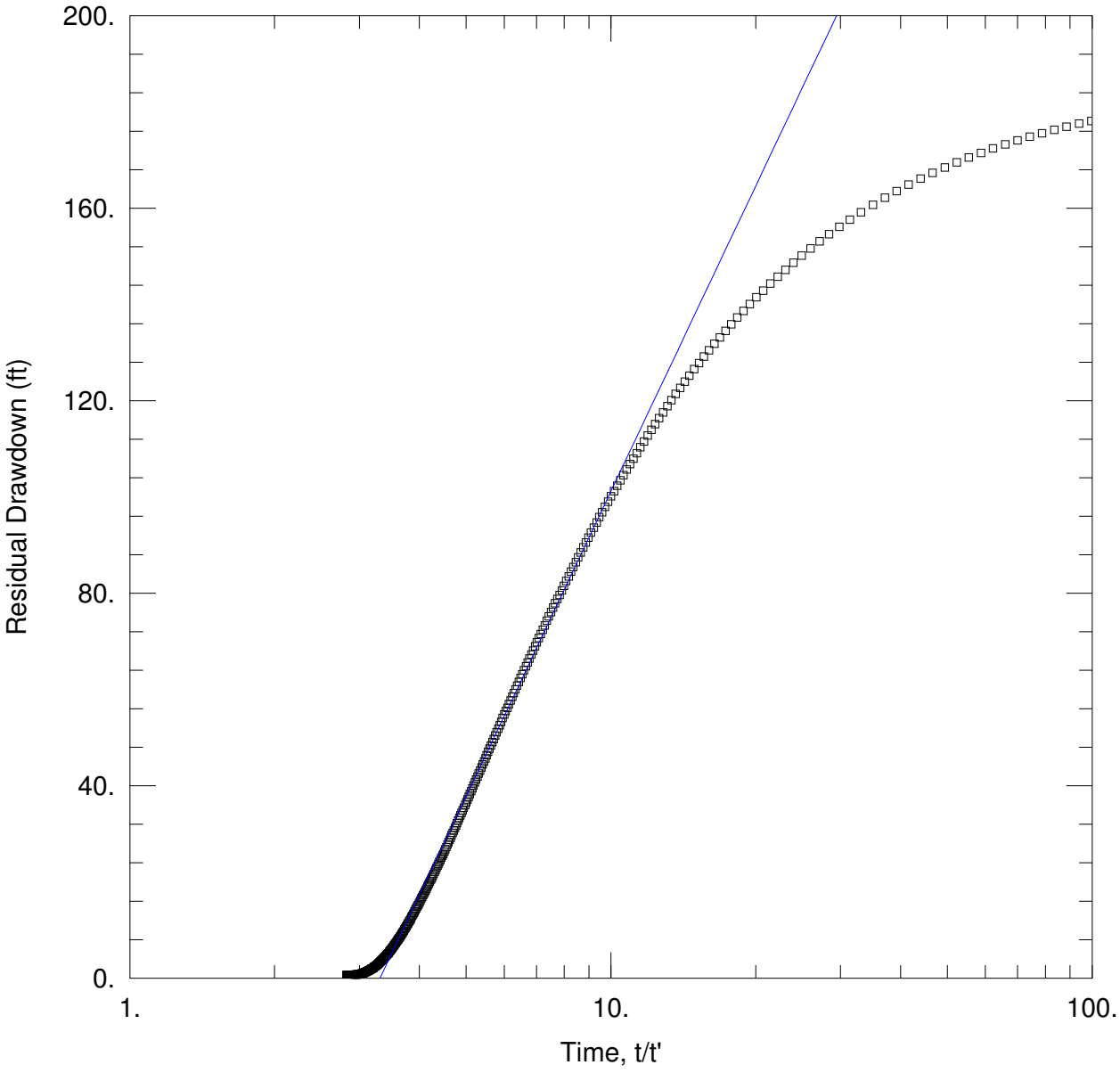
S/S' = 2.508

Injection Well IW-1

Packer Test – 2,001 to 2,029 feet bls

Southwest IW-1
Packer Test 2,001 to 2,029 feet bls





SOUTHWEST IW-1 PACKER TEST 2,001 TO 2,029 FEET BLS

AQUIFER DATA

Saturated Thickness: 28. ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

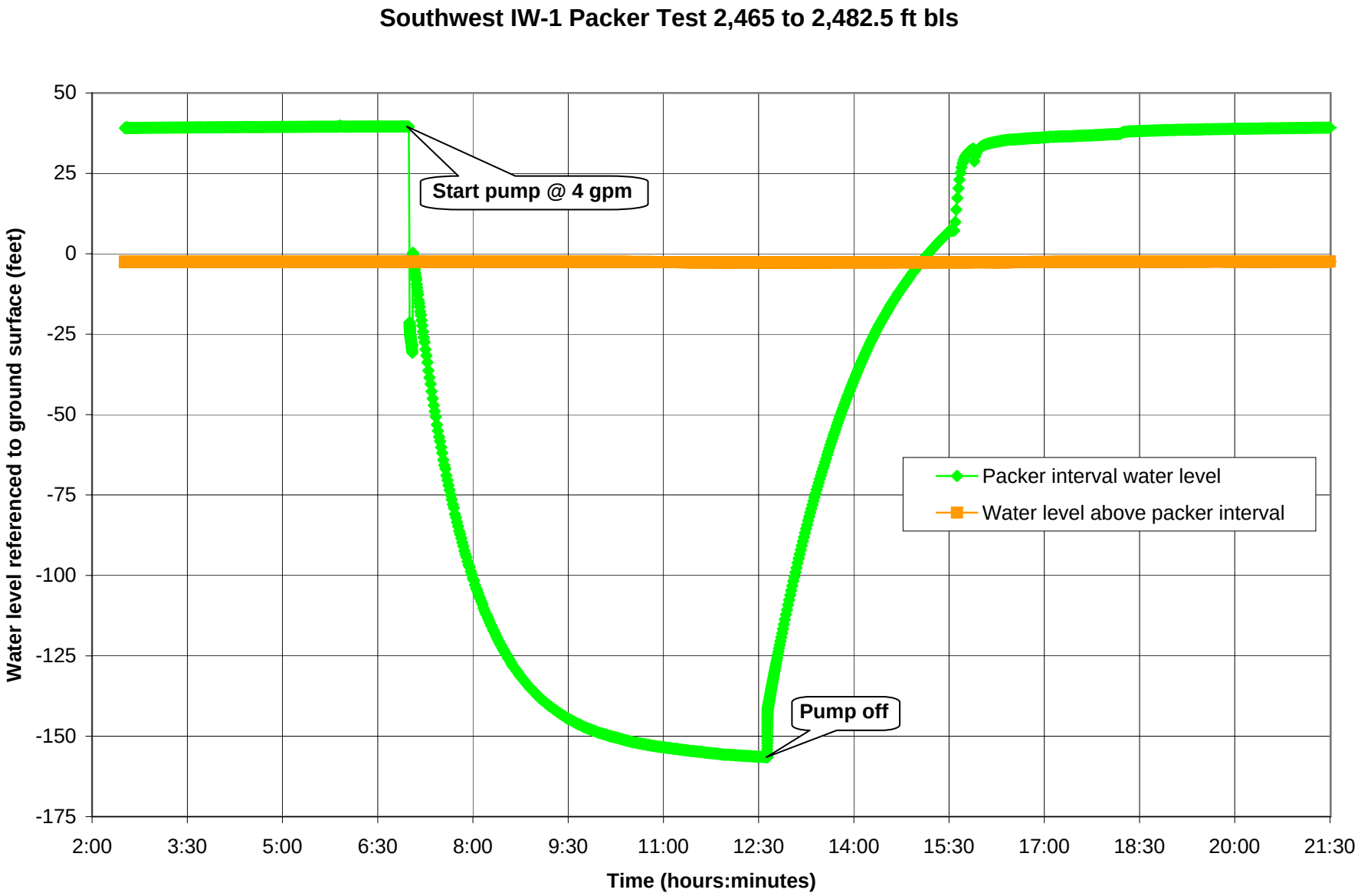
Solution Method: Theis (Recovery)

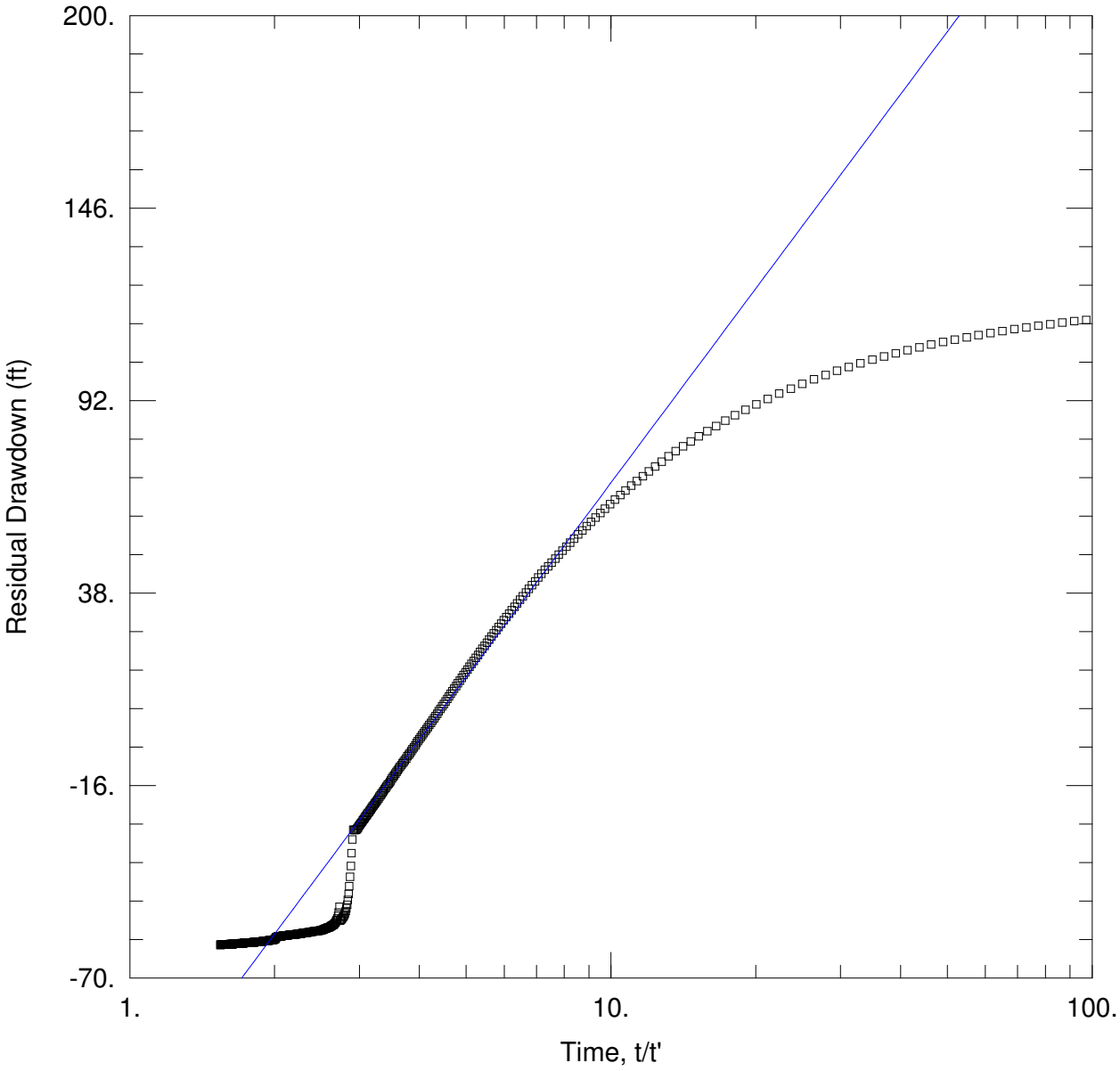
T = 0.837 ft^2/day

S/S' = 3.311

Injection Well IW-1

Packer Test - 2,465 to 2,485 feet bls


Southwest IW-1 Packer Test 2,465 to 2,482.5 ft bls
Water level referenced to ground surface (feet)
50
25
0
-25
-50
-75
-100
-125
-150
-175
2:00
3:30
5:00
6:30
8:00
9:30
11:00
12:30
14:00
15:30
17:00
18:30
20:00
21:30
Time (hours:minutes)
Start pump @ 4 gpm
Pump off
Packer interval water level
Water level above packer interval



SOUTHWEST IW-1 PACKER TEST 2,465 TO 2,482.5 FEET BLS

AQUIFER DATA

Saturated Thickness: 17.5 ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

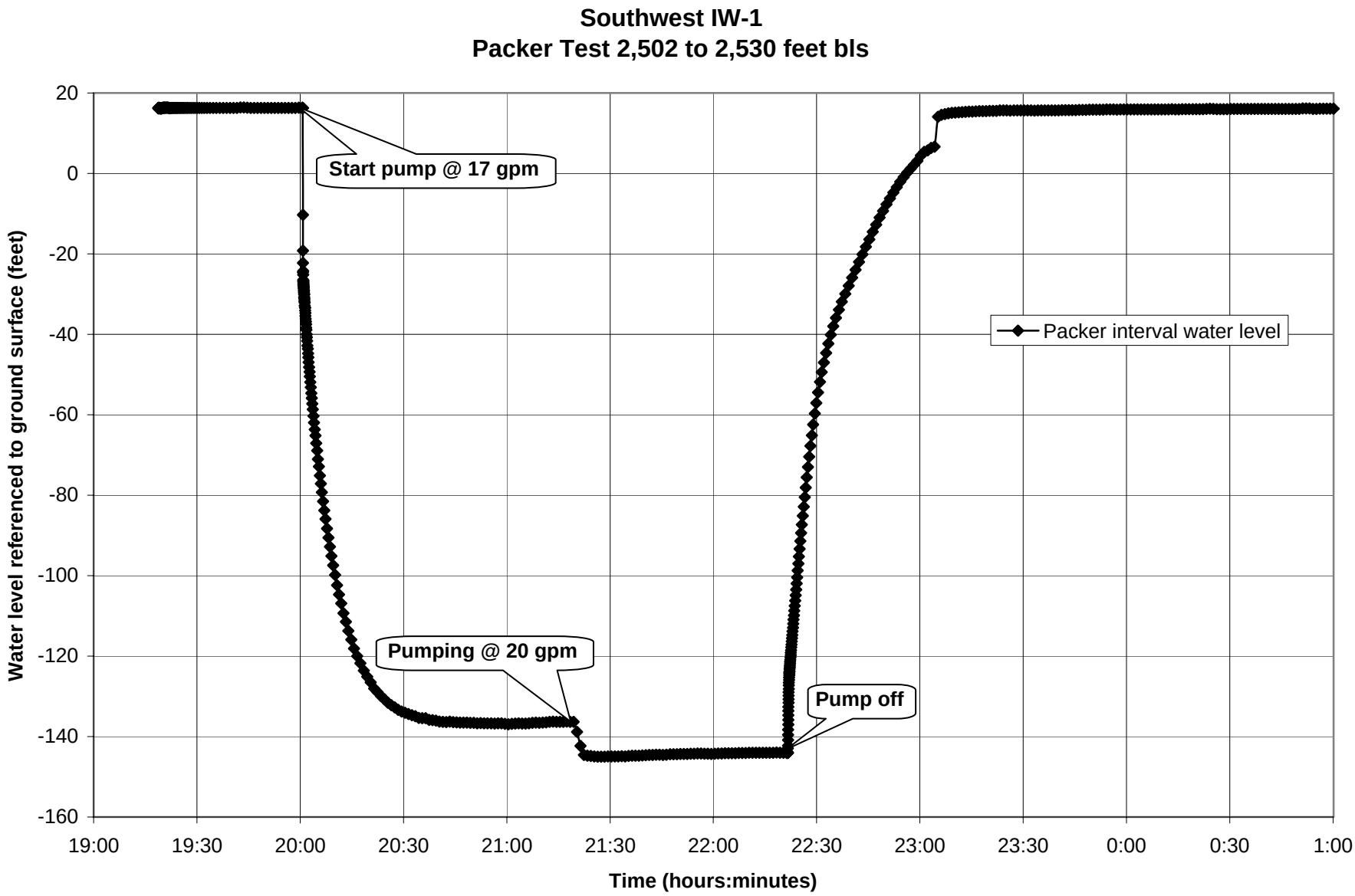
Solution Method: Theis (Recovery)

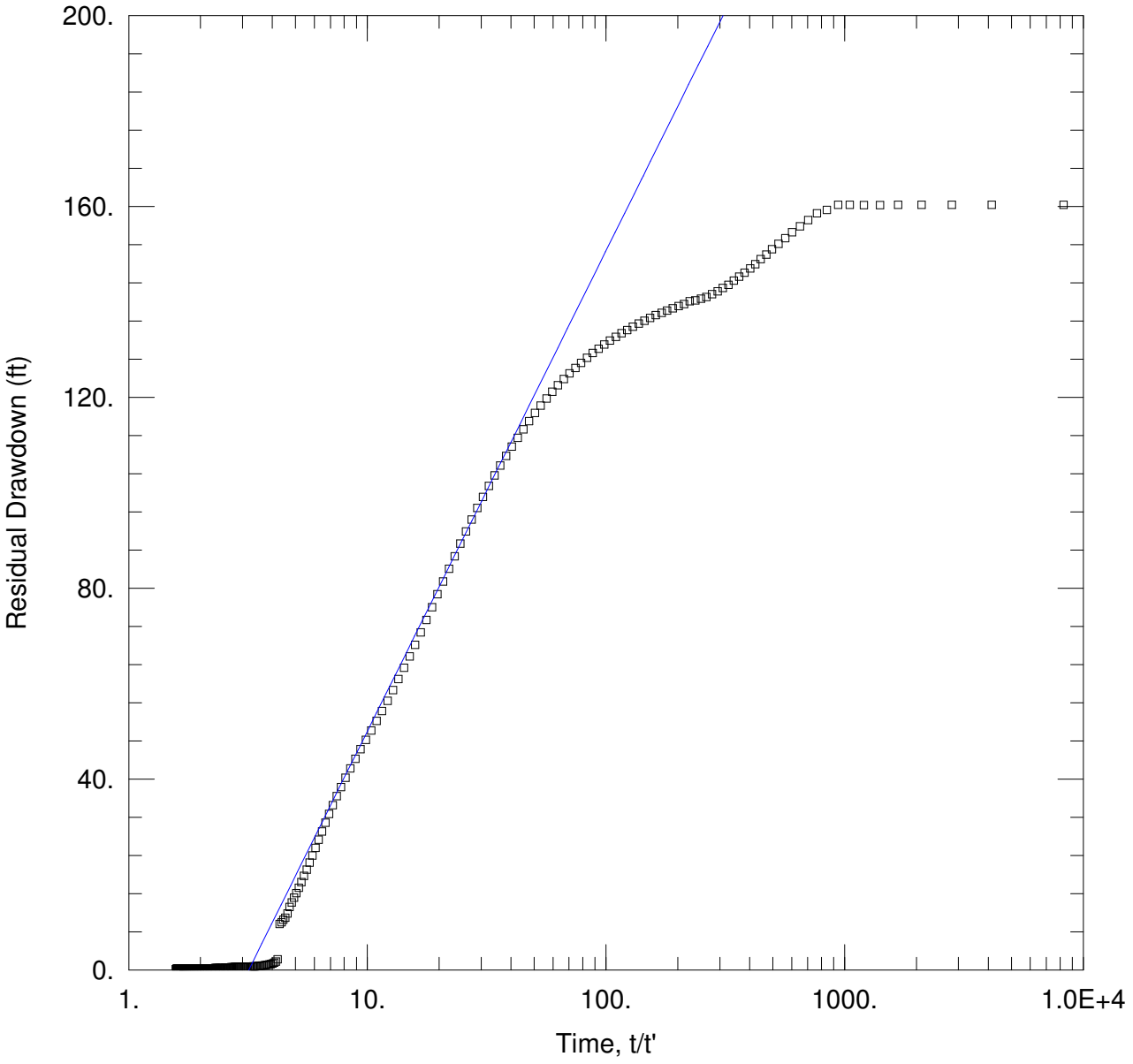
T = 0.7793 ft^2/day

S/S' = 4.163

Injection Well IW-1

Packer Test - 2,500 to 2,530 feet bls


Southwest IW-1
Packer Test 2,502 to 2,530 feet bls
Water level referenced to ground surface (feet)
20
0
-20
-40
-60
-80
-100
-120
-140
-160
19:00
19:30
20:00
20:30
21:00
21:30
22:00
22:30
23:00
23:30
0:00
0:30
1:00
Time (hours:minutes)
Start pump @ 17 gpm
Pumping @ 20 gpm
Pump off
Packer interval water level



SOUTHWEST IW-1 PACKER TEST 2,502 TO 2,530 FEET BLS

AQUIFER DATA

Saturated Thickness: 28. ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

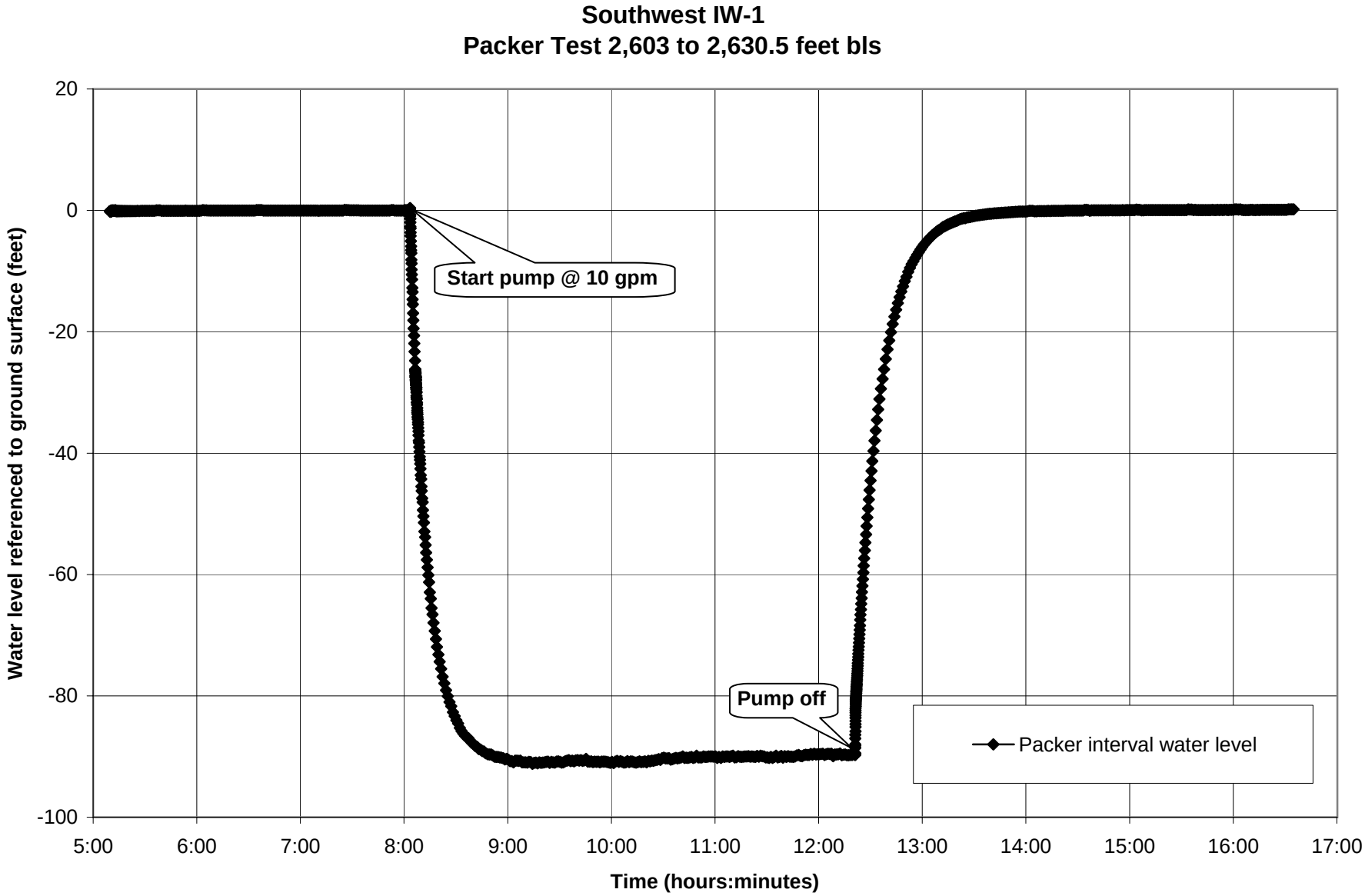
Solution Method: Theis (Recovery)

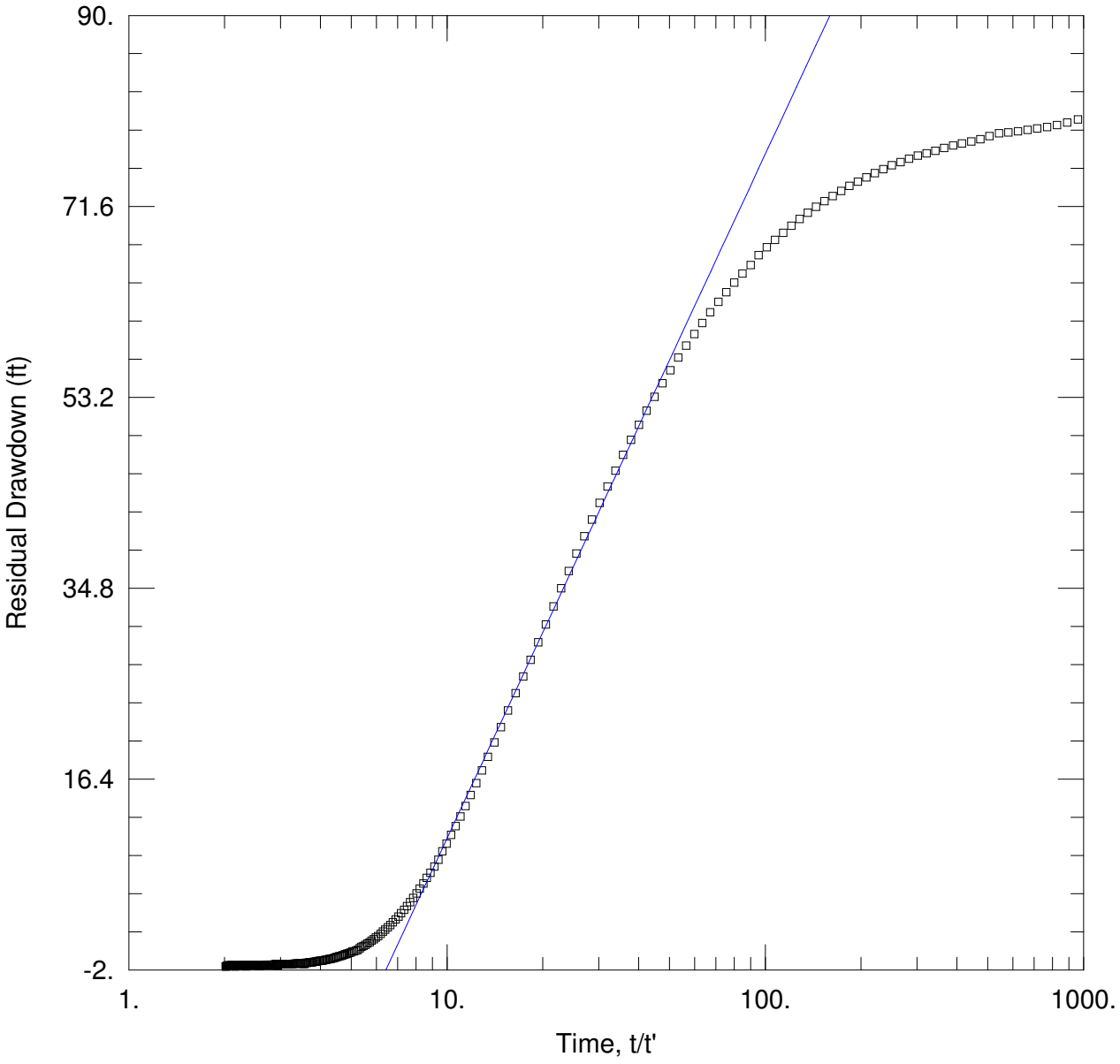
T = 7.01 ft^2/day

S/S' = 3.184

Injection Well IW-1

Packer Test - 2,600 to 2,630 feet bls


Southwest IW-1
Packer Test 2,603 to 2,630.5 feet bls
Water level referenced to ground surface (feet)
20
0
-20
-40
-60
-80
-100
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
Time (hours:minutes)
Start pump @ 10 gpm
Pump off
Packer interval water level



SOUTHWEST IW-1 PACKER TEST 2,603 TO 2,630.5 FEET BLS

AQUIFER DATA

Saturated Thickness: 27.5 ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Recovery)

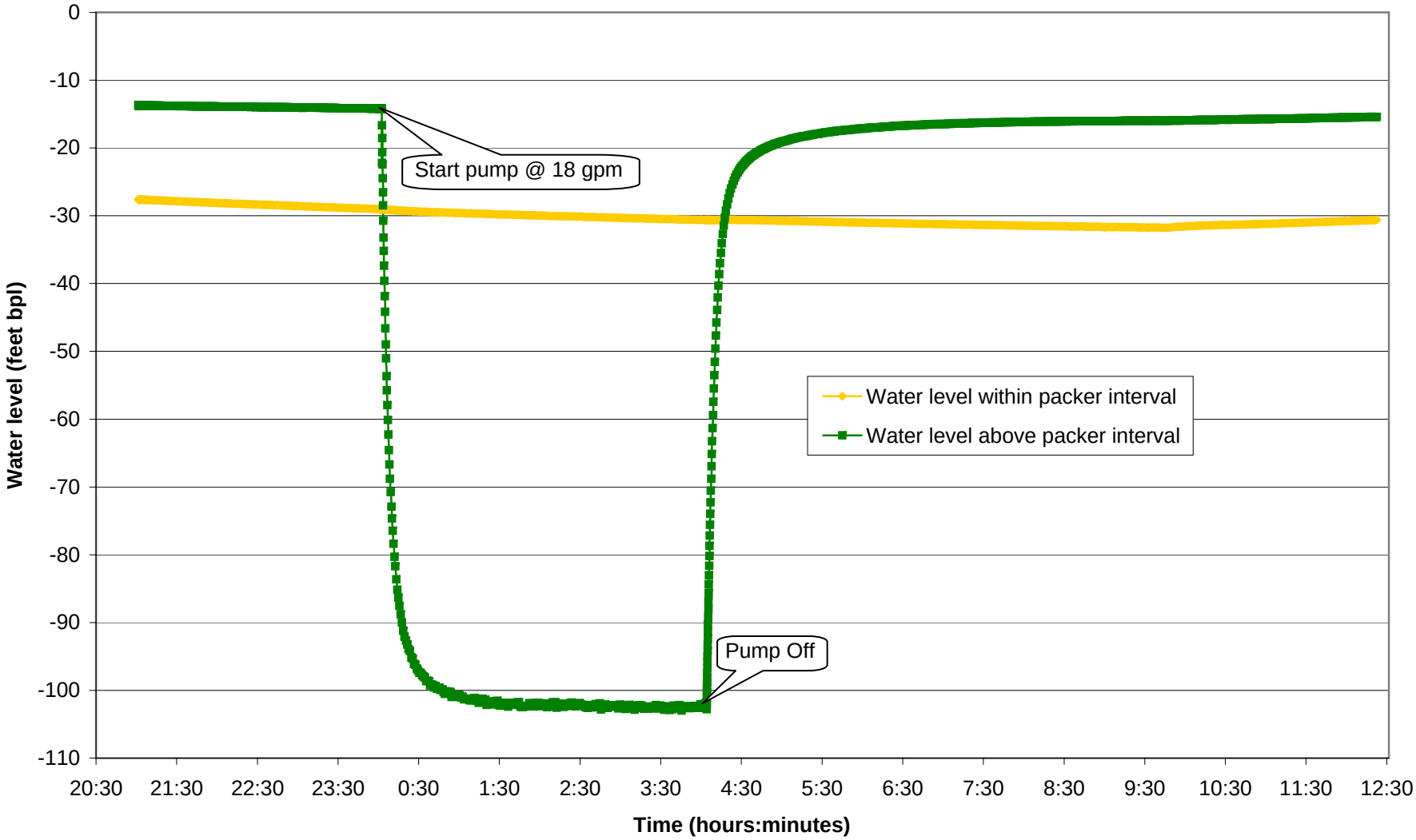
T = 5.349 ft^2/day

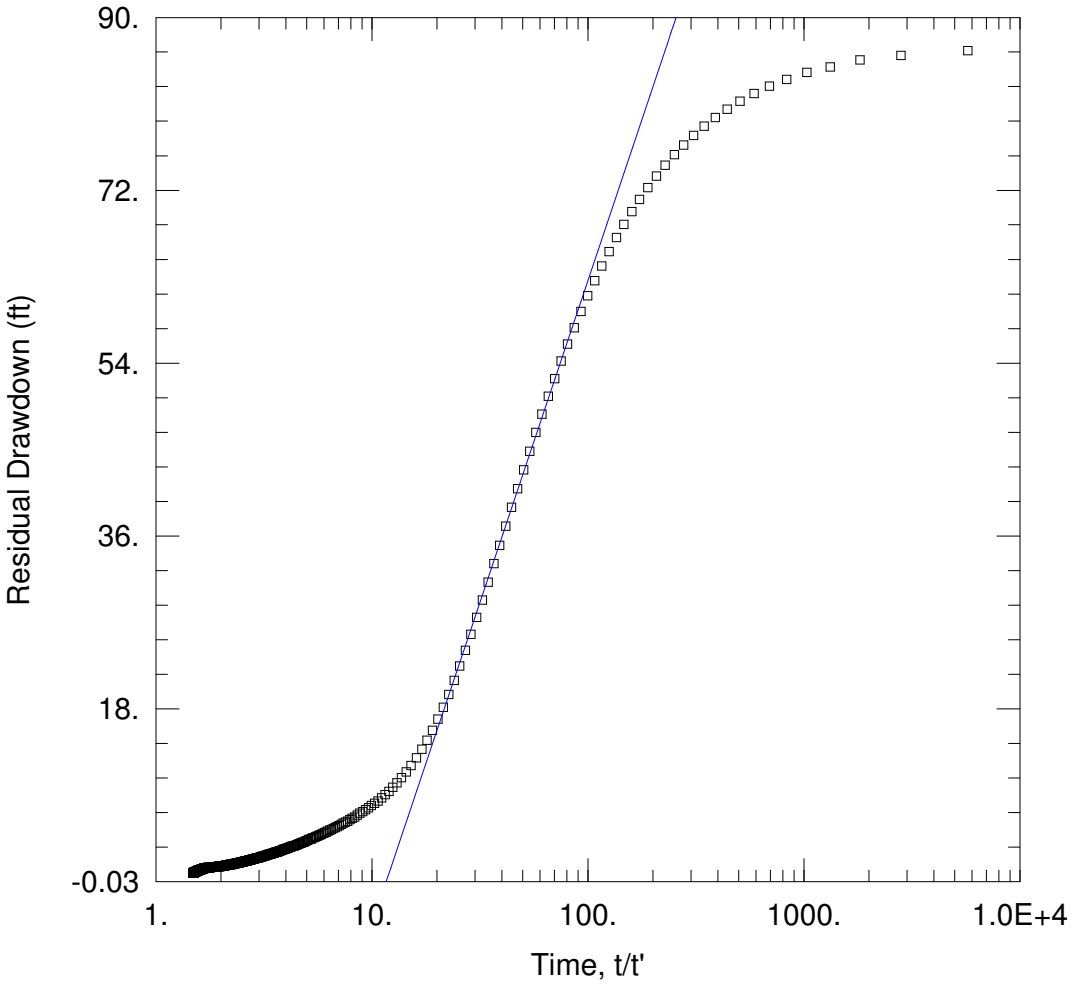
S/S' = 6.889

Monitor Well DZMW-1

Packer Test – 1,320 to 1,360 feet bls

Southwest DZMW-1
Packer Test 1,320 to 1,360 feet bpl (2nd run)





SOUTHWEST DZMW-1 PACKER TEST 1,320 TO 1,360 FEET BLS (2ND RUN)

AQUIFER DATA

Saturated Thickness: 40. ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

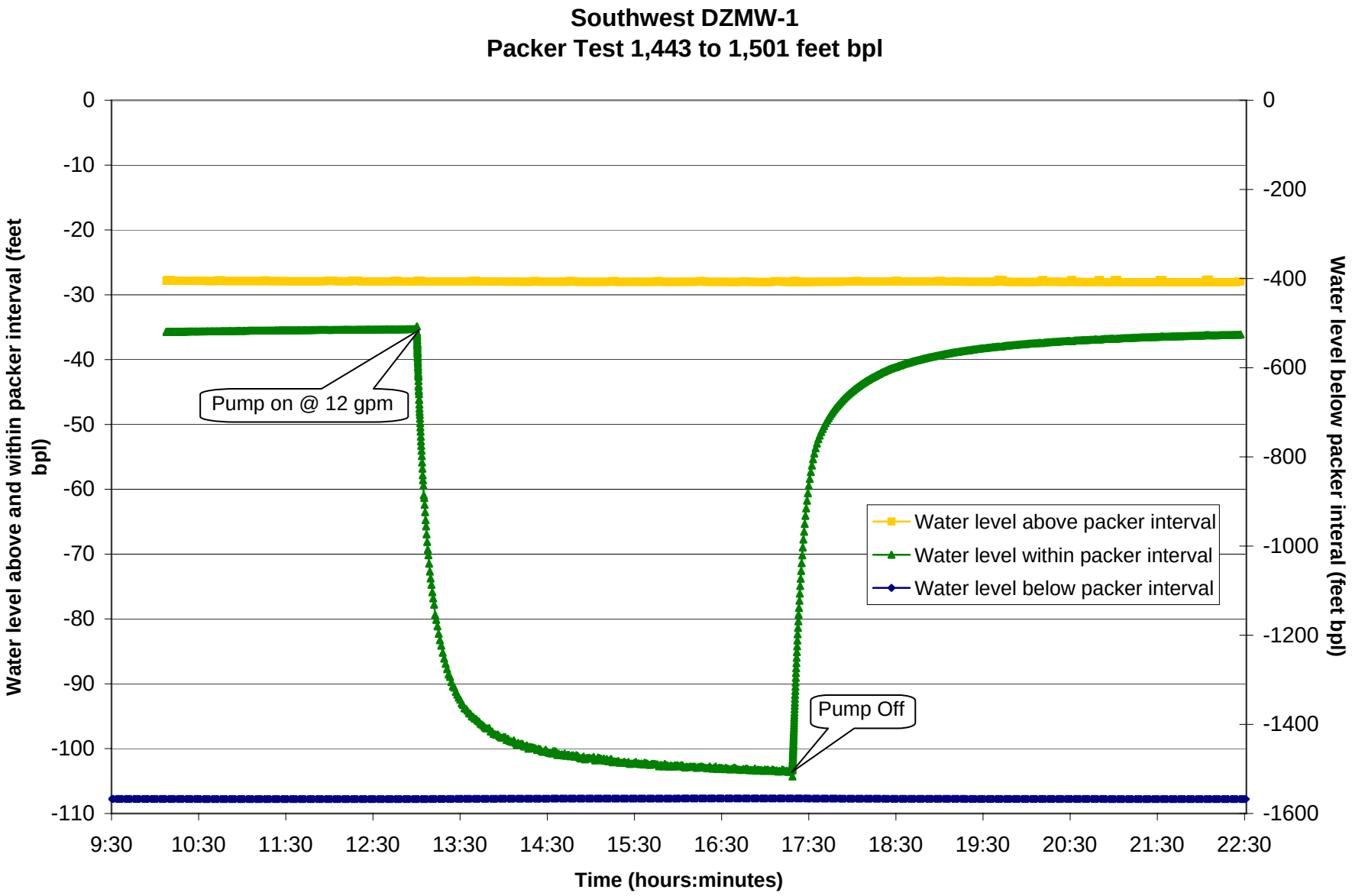
Solution Method: Theis (Recovery)

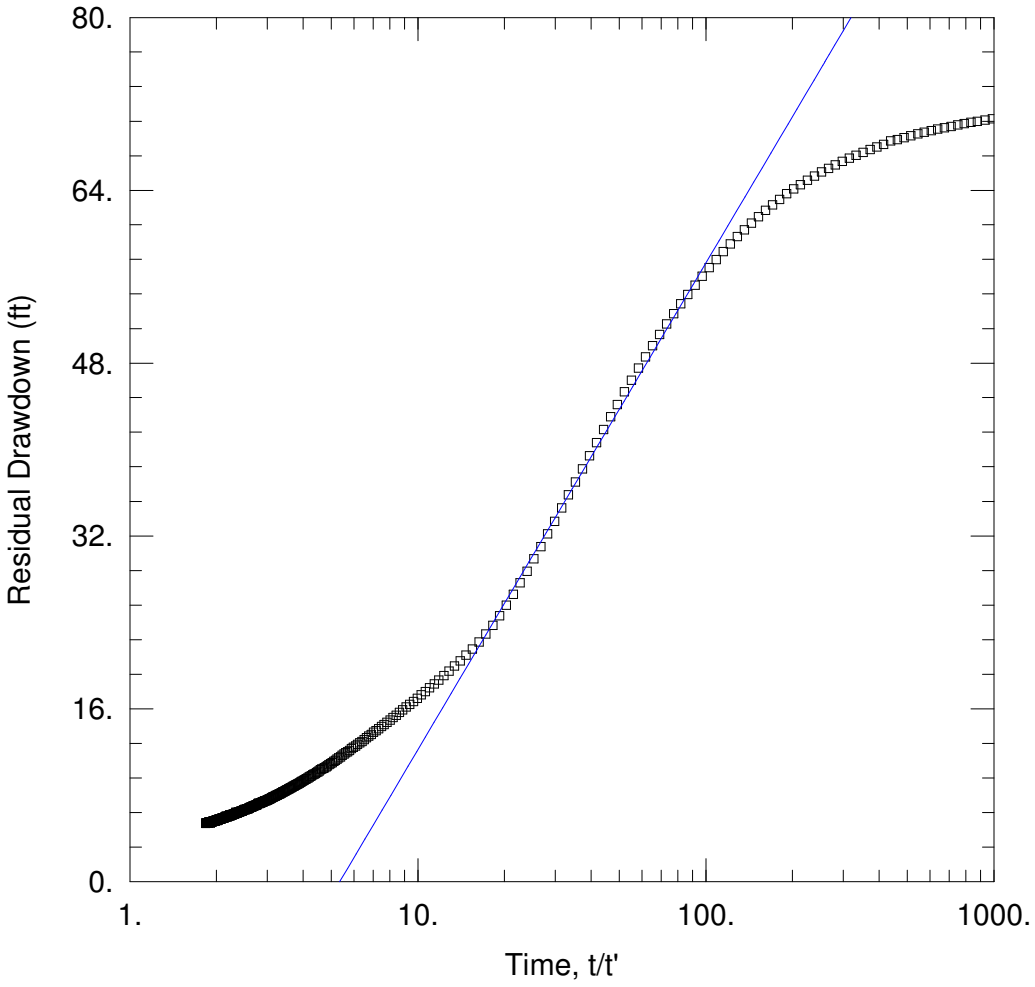
T = 9.468 ft^2/day

S/S' = 11.66

Monitor Well DZMW-1

Packer Test – 1,443 to 1,501 feet bls


Southwest DZMW-1
Packer Test 1,443 to 1,501 feet bpl
Water level above and within packer interval (feet bpl)
Water level below packer interval (feet bpl)
Time (hours:minutes)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-200
-400
-600
-800
-1000
-1200
-1400
-1600
9:30
10:30
11:30
12:30
13:30
14:30
15:30
16:30
17:30
18:30
19:30
20:30
21:30
22:30
Pump on @ 12 gpm
Pump Off
Water level above packer interval
Water level within packer interval
Water level below packer interval



SOUTHWEST DZMW-1 PACKER TEST 1,443 TO 1,501 FEET BLS

AQUIFER DATA

Saturated Thickness: 58. ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

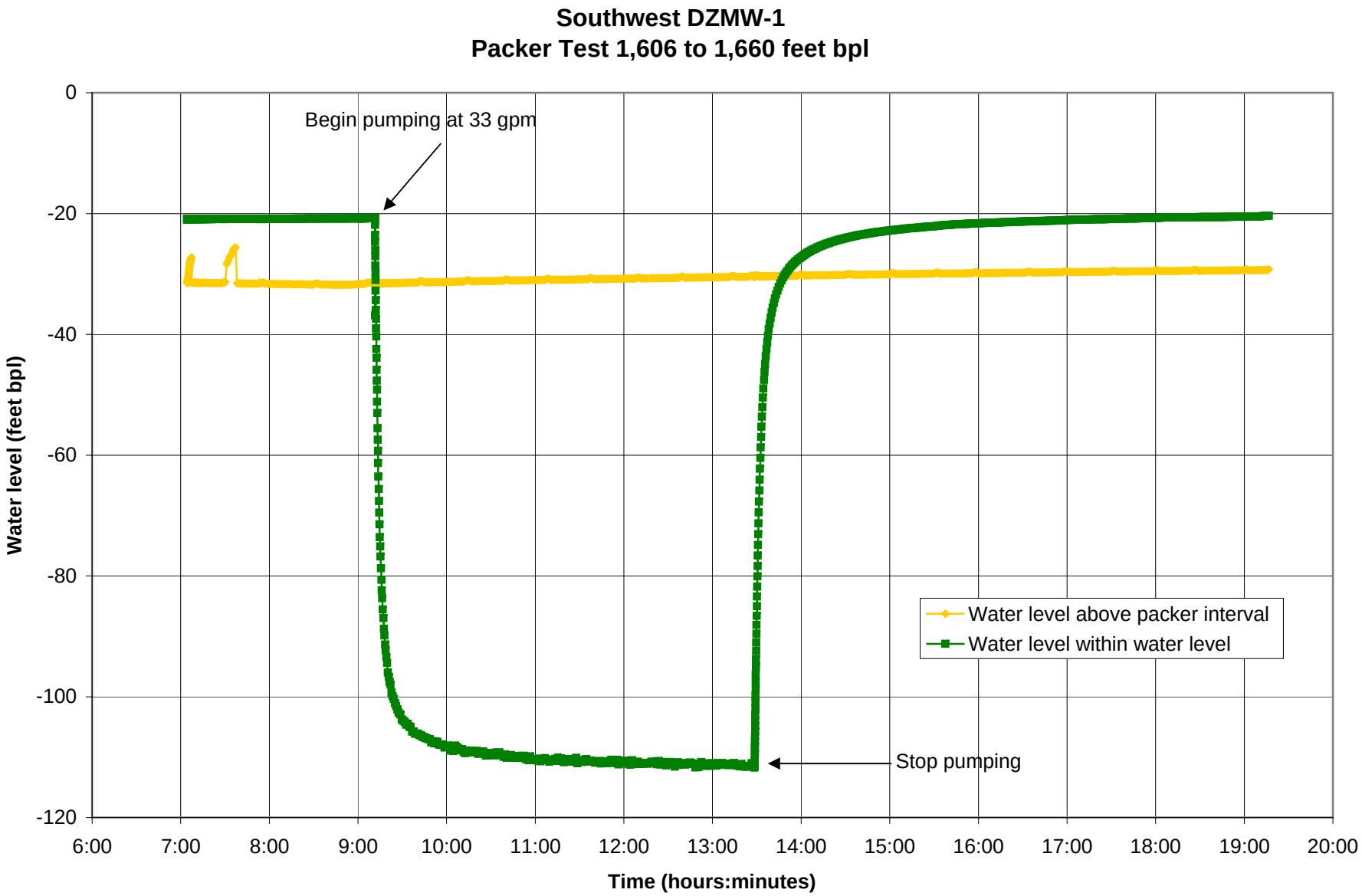
Solution Method: Theis (Recovery)

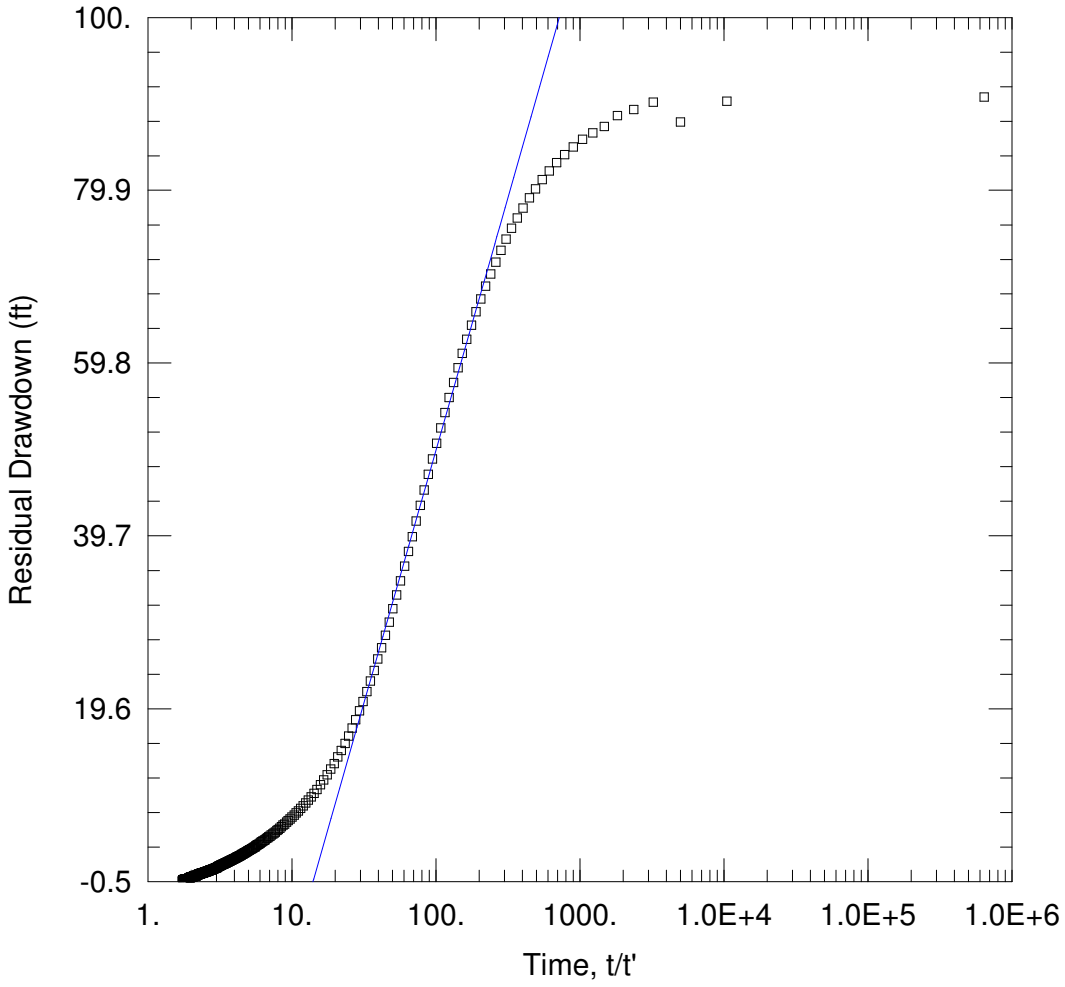
T = 9.394 ft^2/day

S/S' = 5.356

Monitor Well DZMW-1

Packer Test – 1,606 to 1,660 feet bls


Southwest DZMW-1
Packer Test 1,606 to 1,660 feet bpl
Begin pumping at 33 gpm
Stop pumping
Water level above packer interval
Water level within water level
Water level (feet bpl)
0
-20
-40
-60
-80
-100
-120
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
Time (hours:minutes)



SOUTHWEST DZMW-1 PACKER TEST 1,606 TO 1,660 FEET BLS

AQUIFER DATA

Saturated Thickness: 54. ft

Anisotropy Ratio (Kz/Kr): 0.005

SOLUTION

Aquifer Model: Confined

Solution Method: Theis (Recovery)

T = 19.22 ft^2/day

S/S' = 14.29

Appendix J

Packer Testing Water Quality Laboratory Results

Injection Well IW-1

Packer Test 1,410 – 1,460

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: F0711034
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:
Client Project Name: SW CapeCoral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: F0711034 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
J3: The reported value failed to meet the established quality control criteria.
J4: The sample matrix interfered with the ability to make an accurate determination.
J5: The data is questionable because of improper lab or field protocols.
K: Off scale low, actual value is less than the value given.
L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Sanders Laboratories follows DEP standard operating procedures for field sampling.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Client Project: SW CapeCoral
Lab Project: F0711034
Report Date: 11/05/07

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
F0711034-01	STRADDLE #2 1410-1460 GRAB	Ground Water	11/2/07 8:00	11/1/07 1:17

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	SM4500-NH3-D	0.52		0.05	mg/L as N	11/2/07 12:15	AG	E84380
Chloride	SM4500Cl-B	1180		1	mg/L	11/5/07 9:00	BB	E84380
Nitrogen, Total Kjeldahl	351.2	0.58	J3	0.10	mg/L as N	11/5/07 8:11	BY	E84380
pH	SM4500H-B	8.06	Q	0.01	std units	11/5/07 11:40	AK	E84380
Specific Conductivity	SM2510B	3950		0.1	µmhos/cm	11/2/07 13:30	BB	E84380
Sulfate	ASTM-D516-90	351		2	mg/L	11/2/07 15:10	BB	E84380
Total Dissolved Solids	SM2540C	2770		20	mg/L	11/2/07 14:15	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # F0711034

Page 1 of 1

Client YBI
Address On FILE
Phone 239-489-4444 Fax 239 489 4545

Report To: MARY BETH, JAY, NEIL
Bill To: YBI
P.O. #
Project Name 278011
Project Location: SW CAPE CORAL

Sample Supply:
Customer Type:
Field Report #:
Kit #
REQUESTED DUE DATE: 11/12/07

Sampled By (PRINT) JAY SWARTZENTRUBER
Sampler Signature

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	ANALYSES REQUEST TDS	Cl-	Sulfate	Ammonia	TKN	pH	TEMP*	Sample ID #
1	STRADDLE #2 1410-1460	11/1/07	0117	GW	X					✓	✓		✓				01A
1	STRADDLE #2 1410-1460	11/1/07	0117	GW	X							✓					01B

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Aimee Fratucangeli	11/2/07	05:30	Daniel L. Buscator	11-2-07	0530
	Daniel L. Buscator	11-2-07	0630	Angel A. Caraballo	11-2-07	0630
	Angel A. Caraballo	11/2/07	800		11.2	800
		11/2/07	11:20		11/02	11:20
		11/02	1130		11/2/07	1235

COMMENTS:
EMAIL:
SWARTZJAY@AOL.COM
72 HR TAT

OKAY TO RUN AS IS...
CLIENT INITIAL:
SAMPLES ON ICE
*(Yes) No

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 16880 Gator Road, Fort Myers, FL 33912 • (239) 590-0337 • FAX (239) 590-0536

Injection Well IW-1

Packer Test 1,610 – 1,660

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: F0711033
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:
Client Project Name: SW CapeCoral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: F0711033 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
J3: The reported value failed to meet the established quality control criteria.
J4: The sample matrix interfered with the ability to make an accurate determination.
J5: The data is questionable because of improper lab or field protocols.
K: Off scale low, actual value is less than the value given.
L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Sanders Laboratories follows DEP standard operating procedures for field sampling.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Client Project: SW CapeCoral
Lab Project: F0711033
Report Date: 11/05/07

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
F0711033-01	STRADDLE #1 1610-1650 GRAV	Ground Water	11/2/07 8:05	10/30/07 16:55

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	SM4500-NH3-D	0.52		0.05	mg/L as N	11/2/07 12:15	AG	E84380
Chloride	SM4500Cl-B	17200		1	mg/L	11/5/07 9:00	BB	E84380
Nitrogen, Total Kjeldahl	351.2	0.83	J3	0.10	mg/L as N	11/5/07 8:11	BY	E84380
pH	SM4500H-B	7.20	Q	0.01	std units	11/5/07 11:40	AK	E84380
Specific Conductivity	SM2510B	39000		0.1	µmhos/cm	11/2/07 13:30	BB	E84380
Sulfate	ASTM-D516-90	1840		2	mg/L	11/2/07 15:10	BB	E84380
Total Dissolved Solids	SM2540C	28600		20	mg/L	11/2/07 14:15	AS	E84380

Approved by:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Comments: Total Dissolved Solids result is preliminary, final result will be available Tuesday the 6th.

Test Results meet all the requirements of the NELAC standards.

Injection Well IW-1

Packer Test 1,775 – 1,792

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # FOT1033

Page _____ of _____

Client YBI
Address on File
Phone 239-489-4444 Fax 239-489-4545

Report To: Mary Beth, JAY, Neil
Bill To: YBI
P.O. #
Project Name 278011
Project Location: SW Cape Coral

Sample Supply:
Customer Type:
Field Report #:
Kit #
REQUESTED DUE DATE: 11/12/07

Sampled By (PRINT) JAY Swartzentruber
Sampler Signature

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	#	ANALYSES REQUEST: TDS, Chloride, Sulfate (Cond), Ammonia, TKN, pH, Temp*	Sample ID #
1	SEMIDDLE #1 1610-1650	10/30/07	4:55	GW	X						✓ ✓ ✓	01A
1	" " " 1610-1650	10/30/07	4:55	GW	X						✓	01B

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	[illegible]	11/2/07	0530	Daniel L. Buschhol	11-2-07	0530
	Daniel L. Buschhol	11/2/07	0630	Angel A. Caraballo	11-2-07	0630
	[illegible]	11/2/07	0805	[illegible]	11.2	800
	R. [illegible]	11/2/07	10:30	[illegible]	11/2	10:30
	[illegible]	11/2	12:37	[illegible]	11/2/07	1235

COMMENTS: Email Swartzjay@Aol.com
72 HR TAT

OKAY TO RUN AS IS...
CLIENT INITIAL:
SAMPLES ON ICE * (Yes) No

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 16880 Gator Road, Fort Myers, FL 33912 • (239) 590-0337 • FAX (239) 590-0536

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: N0801059
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:

Client Project Name: South Cape Coral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: N0801059 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
J3: The reported value failed to meet the established quality control criteria.
J4: The sample matrix interfered with the ability to make an accurate determination.
J5: The data is questionable because of improper lab or field protocols.
K: Off scale low, actual value is less than the value given.
L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Laboratory report shall not be reproduced except in full, without the written approval of Sanders Laboratories.

Sanders Laboratories follows DEP standard operating procedures for field sampling.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Client Project: South Cape Coral
Lab Project: N0801059
Report Date: 01/06/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0801059-01	Packer Test grab	Ground Water	1/4/08 17:15	1/4/08 14:55

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	SM4500-NH3-D	0.26		0.05	mg/L as N	1/6/08 9:00	AG	E84380
Chloride	SM4500Cl-B	12800		1	mg/L	1/4/08 17:30	BB	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.31	I,J3	0.10	mg/L as N	1/5/08 9:36	BB	E84380
pH	SM4500H-B	7.24	Q	0.01	std units	1/4/08 18:05	AS	E84380
Specific Conductivity	SM2510B	42000		0.1	µmhos/cm	1/5/08 8:15	BB	E84380
Sulfate	ASTM-D516-90	1960		2	mg/L	1/4/08 17:42	AG	E84380
Total Dissolved Solids	SM2540C	21800		20	mg/L	1/4/08 17:30	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N0801059

Page 1 of 1

Client Youngquist Bros

Address

Phone Fax

Report To: Marybeth

Bill To:

P.O. #

Project Name

Project Location: CAPE Coral - southwest

Sample Supply: GW

Customer Type:

Field Report #:

Kit #

REQUESTED DUE DATE:

Sampled By (PRINT): Client

Sampler Signature

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	ANALYSES REQUEST pH, Cond, Cl, SO_4, TDS	NH_3, TKN	Sample ID #
	Packard Test	1.4.08	1455	G		1				1		-01A
	"	"	"	"			1				1	01B

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Client	1.4.08	1610	Hilary Crook	1.4.08	1610
	Hilary Crook	1/4/08	1715		1/4/8	1715

COMMENTS:

OKAY TO RUN AS IS...

CLIENT INITIAL:

SAMPLES ON ICE (Yes) No

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 16880 Gator Road, Fort Myers, FL 33912 • (239) 590-0337 • FAX (239) 590-0536

Injection Well IW-1

Packer Test 1,973 – 2,000

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: N0712451
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:
Client Project Name: South Cape Coral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: N0712451 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
J3: The reported value failed to meet the established quality control criteria.
J4: The sample matrix interfered with the ability to make an accurate determination.
J5: The data is questionable because of improper lab or field protocols.
K: Off scale low, actual value is less than the value given.
L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Sanders Laboratories follows DEP standard operating procedures for field sampling.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Client Project: South Cape Coral
Lab Project: N0712451
Report Date: 01/02/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0712451-01	Packer Test #4 grab	Ground Water	12/31/07 10:45	12/29/07 23:00

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	SM4500-NH3-D	0.20		0.05	mg/L as N	12/31/07 12:00	AG	E84380
Chloride	SM4500Cl-B	18000		1	mg/L	12/31/07 12:20	BB	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.37	I	0.10	mg/L as N	12/31/07 15:55	BB	E84380
pH	SM4500H-B	6.74	Q	0.01	std units	12/31/07 12:00	BB	E84380
Specific Conductivity	SM2510B	49500		0.1	µmhos/cm	12/31/07 12:15	BB	E84380
Sulfate	ASTM-D516-90	2940		2	mg/L	12/31/07 12:51	AG	E84380
Total Dissolved Solids	SM2540C	29400		20	mg/L	12/31/07 14:40	AG	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # 278011
N0712451
Page 1 of 1

Client YoungQuist Brothers Inc.
Address 15465 Pine Ridge Rd.
Ft. Myers FL.
Phone 239-910-6327 Fax 239-489-4545

Report To: YoungQuist Bros.
Bill To: MaryBeth@YoungQuistBrothers.com
P.O. # 278011
Project Name SWCC
Project Location: Cape coral

Sample Supply:
Customer Type:
Field Report #:
Kit #
REQUESTED DUE DATE: ASAP 1/1/08

Sampled By (PRINT)
Sampler Signature

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	ANALYSES REQUEST: Chloride	Specific Conduct	Sulfate	Ammonia	T.K.N	Total dissolve Solids	P.E	Temp	Sample ID #
	packer test #4	122907	2300	C		1												-01
	↓	↓	↓	↓			1											↓

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
C5126021L	Shawn Young	12/30/07	13:15	Hilary Crook	123007	1315
T-124-001 Field	Hilary Crook	123107	1045	Manager	12/31/07	1045
PH 6						
2						

COMMENTS:
A - PH, Cond, Cl-, TDS, SO4
B - NH3, TKN

OKAY TO RUN AS IS...
CLIENT INITIAL:
SAMPLES ON ICE (Yes) No

Injection Well IW-1

Packer Test 2,001 – 2,029

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: N0712414
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:
Client Project Name: South Cape Coral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: N0712414 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
J3: The reported value failed to meet the established quality control criteria.
J4: The sample matrix interfered with the ability to make an accurate determination.
J5: The data is questionable because of improper lab or field protocols.
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L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Sanders Laboratories follows DEP standard operating procedures for field sampling.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Client Project: South Cape Coral
Lab Project: N0712414
Report Date: 12/28/07

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0712414-01	Packer Test #3 grab	Ground Water	12/27/07 16:05	12/27/07 13:50

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	SM4500-NH3-D	0.15	I	0.05	mg/L as N	12/28/07 9:30	AG	E84380
Chloride	SM4500Cl-B	17600		1	mg/L	12/28/07 13:45	BB	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.35	I	0.10	mg/L as N	12/28/07 10:36	BB	E84380
pH	SM4500H-B	6.55	Q	0.01	std units	12/27/07 17:00	AG	E84380
Specific Conductivity	SM2510B	51200		0.1	µmhos/cm	12/28/07 11:15	BB	E84380
Sulfate	ASTM-D516-90	2360		2	mg/L	12/27/07 17:03	AG	E84380
Total Dissolved Solids	SM2540C	29100		20	mg/L	12/27/07 16:00	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N071 2414

Page ____ of ____

Client: YoungQuist Brothers Inc.
Address: ____
Phone: ____ Fax: 239-489-4545

Report To: YoungQuist
Bill To: MaryBeth@youngQuistBrothers.com
P.O. #: ____
Project Name: ____
Project Location: ____

Sample Supply: GW
Customer Type: ____
Field Report #: ____
Kit #: ____
REQUESTED DUE DATE: ____

Sampled By (PRINT): Shawn

Sampler Signature: ____

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	TOTAL	Ph, Cl, SO4, Tds, Cond	NH3, TKN										Sample ID #
	packer Test #3	122707	1350	G		1				6	1	1										01A
	↓	↓	↓	↓			1			2			1									001B

Bottle Lot #: C512602K

COMMENTS: 25°

OKAY TO RUN AS IS...
CLIENT INITIAL:

SAMPLES ON ICE: Yes / No (circled: No)

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Shawn Gregory	1450		Hilary Crook	122707	1450
Hilary Crook	122707	1605	[illegible signature] Taylor	1227	1605

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Injection Well IW-1

Packer Test 2,465 – 2,483

Client Project: South Cape Coral
Lab Project: N0801096
Report Date: 01/10/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0801096-01	Packer Test #8 grab	Ground Water	1/9/08 7:20	1/8/08 13:36

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	SM4500-NH3-D	0.53		0.05	mg/L as N	1/9/08 9:30	AG	E84380
Chloride	SM4500Cl-B	6800		1	mg/L	1/9/08 10:30	BB	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.50	J3	0.10	mg/L as N	1/9/08 14:25	BB	E84380
pH	SM4500H-B	7.00	Q	0.01	std units	1/9/08 8:45	BB	E84380
Specific Conductivity	SM2510B	22500		0.1	µmhos/cm	1/9/08 8:50	BB	E84380
Sulfate	ASTM-D516-90	1150		2	mg/L	1/9/08 9:14	AG	E84380
Total Dissolved Solids	SM2540C	11400		20	mg/L	1/9/08 16:20	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUST(

PROJECT # N0801096

Page 1 of 1

Client YOUNGQUIST BROS.
Address
Phone Fax

Report To:
Bill To:
P.O. #
Project Name
Project Location: CAPE CORAL SW IW-1

Sample Supply: GW
Customer Type:
Field Report #:
Kit #
REQUESTED DUE DATE: 1/10/8

Sampled By (PRINT) ERIC BAKER
Sampler Signature

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	ANALYSES REQUEST pH COND	Cl, SO4, TDS	NH_3, TKN	Sample ID #
	PACKER TEST #8	1/8/08	13:36	GW	X		X					1	1A
						X	X			1			1B

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
		1.8.08	1630	HilaryCrook	1808	1630
	Hilary Crook	1808	1800		1/8/8	1800
		1/9/8	720		1/9/8	720

COMMENTS:
pH: 7.46
Temp 28.4
cond 22,920

OKAY TO RUN AS IS...
CLIENT INITIAL:
SAMPLES ON ICE (Yes) No

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Injection Well IW-1

Packer Test 2,503 – 2,530

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: N0801008
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:
Client Project Name: South Cape Coral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: N0801008 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
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L: Off scale high, actual value is known to be greater than the value given.
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V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

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Laboratory PQL's are available upon request.

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Client Project: South Cape Coral
Lab Project: N0801008
Report Date: 01/03/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0801008-01	Packer Test #5 grab	Ground Water	1/2/08 7:20	12/31/07 13:18

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	SM4500-NH3-D	0.39		0.05	mg/L as N	1/3/08 13:15	AG	E84380
Chloride	SM4500Cl-B	13600		1	mg/L	1/3/08 10:45	BB	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.47		0.10	mg/L as N	1/3/08 12:03	BB	E84380
pH	SM4500H-B	7.14	Q	0.01	std units	1/2/08 9:15	AG	E84380
Specific Conductivity	SM2510B	37400		0.1	µmhos/cm	1/2/08 16:15	BB	E84380
Sulfate	ASTM-D516-90	2120		2	mg/L	1/2/08 16:49	AG	E84380
Total Dissolved Solids	SM2540C	22100		20	mg/L	1/2/08 17:00	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N080 1008

Page 1 of 1

Client Youngquist Brothers INC.
Address
Phone Fax

Report To: Youngquist Brothers
Bill To: MARYBETH@youngquistbrothers.com
P.O. # 278011
Project Name SWCC
Project Location: CAPE CORAL

Sample Supply: GW
Customer Type:
Field Report #:
Kit #
REQUESTED DUE DATE: 1/3/08

Sampled By (PRINT) CASEY MAJEWSKI
Sampler Signature Casey Majewski

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	ANALYSES REQUEST Cl, cond, pH, SO4, TDS, TKN	NH3, TKN	Sample ID #
1	PACKER TEST #5	12/31/07	1318	G		X				X		-01A
1	PACKER TEST #5	12/31/07	1318	G			X				X	↓ B

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
C5126021C	Casey Majewski	1.1.08	1000	Hilary Crook	1/1/08	1000
T-124-001	Hilary Crook	1.2.08	0720	Mike Cage	1/2/08	0720

COMMENTS:
cond: 38.84 ms
Temp 29.3
pH: 7.13

11.1°C

OKAY TO RUN AS IS...
CLIENT INITIAL:

SAMPLES ON ICE
(Yes) No

Injection Well IW-1

Packer Test 2,603 – 2,630

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: N0801028
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:

Client Project Name: South Cape Coral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: N0801028 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
J3: The reported value failed to meet the established quality control criteria.
J4: The sample matrix interfered with the ability to make an accurate determination.
J5: The data is questionable because of improper lab or field protocols.
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L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

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Client Project: South Cape Coral
Lab Project: N0801028
Report Date: 01/03/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0801028-01	Pack #6 grab	Ground Water	1/2/08 14:50	1/2/08 12:20

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	SM4500-NH3-D	0.19	I	0.05	mg/L as N	1/3/08 13:15	AG	E84380
Chloride	SM4500Cl-B	18600		1	mg/L	1/3/08 10:45	BB	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.39	I	0.10	mg/L as N	1/3/08 12:03	BB	E84380
pH	SM4500H-B	7.00	Q	0.01	std units	1/2/08 16:45	BB	E84380
Specific Conductivity	SM2510B	50800		0.1	µmhos/cm	1/2/08 16:15	BB	E84380
Sulfate	ASTM-D516-90	2860		2	mg/L	1/2/08 16:49	AG	E84380
Total Dissolved Solids	SM2540C	29900		20	mg/L	1/2/08 17:00	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N08D1028

Page 1 of 1

Client: Youngquist
Address:
Phone: Fax:

Report To:
Bill To:
P.O. #:
Project Name: CC-SW
Project Location: Pack Test #6

Sample Supply: GW
Customer Type:
Field Report #:
Kit #:
REQUESTED DUE DATE: 1/3/08

Sampled By (PRINT): Client
Sampler Signature: Client

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	#	pH, Cond, Cl, SO4, TDS	TKN, NH3	Sample ID #
	Pack #6	1.2.08	1220	G	x					6	1		-01A
	↓	↓	↓	↓			x			2		1	↓ B

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
C512602K	[signature]	1.2.08	1330	Hilary Crook	1.2.08	1330
7-124-001	Hilary Crook	1.2.08	1450	Arteaga	1/2/08	1450

COMMENTS:

OKAY TO RUN AS IS... CLIENT INITIAL:

SAMPLES ~~ON~~ ICE: (Yes) No

Monitor Well DZMW-1

Packer Test 1,320 – 1,360

Client Project: South Cape Coral
Lab Project: N0806032
Report Date: 06/04/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0806032-01	Packer #2 1320-1360 grab	Ground Water	6/3/08 12:00	6/3/08 4:00

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	EPA350.1	0.78		0.01	mg/L as N	6/3/08 14:40	AV	E84380
Chloride	SM4500Cl-E	7010		1	mg/L	6/4/08 12:48	AV	E84380
Nitrogen, Total Kjeldahl	EPA351.2	1.22	J3	0.10	mg/L as N	6/4/08 10:45	BB	E84380
pH	SM4500H-B	7.38	Q	0.01	std units	6/3/08 12:50	AS	E84380
Specific Conductivity	SM2510B	22400		0.1	µmhos/cm	6/3/08 15:00	AV	E84380
Sulfate	ASTM-D516-90	338		2	mg/L	6/3/08 17:43	AV	E84380
Total Dissolved Solids	SM2540C	11700		20	mg/L	6/3/08 15:30	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: N0806032
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:
Client Project Name: South Cape Coral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: N0806032 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
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L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Sanders Laboratories follows DEP standard operating procedures for field sampling.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N080603A

— Rush —

Page 1 of 1

Client Youngqvist
Address
Phone Fax

Report To:
Bill To:
P.O. #
Project Name Packer
Project Location: 1320 - 1360 +2

Sample Supply: GW
Customer Type:
Field Report #:
Kit # FOR LAB USE ONLY
REQUESTED DUE DATE: 6.4.08

Sampled By (PRINT) Dawn James
Sampler Signature

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	pH	ANALYSES REQUEST Cl, Cond, pH, Tds, SO4	NH3, Sol TKN	Sample ID #
	Packer +2 - 1320 - 1360	6.3.08	0400	G	1					6	1		1A
		1	1	1	1		X			1		1	1B

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
7-124601		6308	0950	Hilary Crook	6308	0950
	Hilary Crook	6308	1200		6-8	2000

COMMENTS:

OKAY TO RUN AS IS...
CLIENT INITIAL:
SAMPLES ON ICE (Yes) No

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 10090 Bavaria Rd., Fort Myers, FL 33913 • (239) 590-0337 • FAX (239) 590-0536

Monitor Well DZMW-1

Packer Test 1,442 – 1,500

Client Project: South Cape Coral
Lab Project: N0805377
Report Date: 05/28/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0805377-01	Packer Test 1442'-1500' grab	Ground Water	5/27/08 15:00	5/25/08 17:16

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	EPA350.1	0.95		0.01	mg/L as N	5/27/08 15:33	AV	E84380
Chloride	SM4500Cl-E	7760		1	mg/L	5/28/08 9:30	AV	E84380
Nitrogen, Total Kjeldahl	EPA351.2	1.21		0.10	mg/L as N	5/28/08 10:34	BB	E84380
pH	SM4500H-B	7.47	Q	0.01	std units	5/27/08 15:20	AV	E84380
Specific Conductivity	SM2510B	20900		0.1	µmhos/cm	5/28/08 9:20	BB	E84380
Sulfate	ASTM-D516-90	293		2	mg/L	5/27/08 17:35	AV	E84380
Total Dissolved Solids	SM2540C	13300		20	mg/L	5/27/08 16:00	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT #: N0805377

Page 1 of 1

RUSH

Client: Youngquist Bros, Inc.
Address: 15465 Pine Ridge Rd
Fort Myers Fl. 33908
Phone: 239-489-4444 Fax:

Report To:
Bill To:
P.O. #:
Project Name: Youngquist S.W. Cape Coral
Project Location:

Sample Supply: GW
Customer Type:
Field Report #:
Kit #:
REQUESTED DUE DATE: 5/28/08

Sampled By (PRINT): David Kealey
Sampler Signature: [signature]

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	Cl, TDS, pH	SO4, Cond, Temp	NH3, TKN	Sample ID #
	Packer test @ 1442' TO 1500'	5-27-08	1716	G	1						1		-01A
	~~Packer test @ 1605'~~	~~5-27-08~~	1	G	1		✓					1	-01B

Bottle Lot #: 6291, 7-124-001

COMMENTS:
Onsite Temp ~~28.2~~ 30.1

OKAY TO RUN AS IS...
CLIENT INITIAL:

SAMPLES ON ICE: Yes (circled) No

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
[signature]	52708	1330	Harry Crook	52708	1300
Harry Crook	52708	1500	[signature]	5/27/08	1500

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Monitor Well DZMW-1

Packer Test 1606 – 1,660

Client Project: South Cape Coral
Lab Project: N0805378
Report Date: 05/28/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0805378-01	Packer 1606-1660 grab	Ground Water	5/27/08 15:00	5/27/08 13:21

Analysis	Method	Results	Qual	Detection Limit	Units	AnalysisDate/Time	Analyst	Cert ID
Ammonia	EPA350.1	0.43		0.01	mg/L as N	5/27/08 15:33	AV	E84380
Chloride	SM4500Cl-E	17400		1	mg/L	5/28/08 9:30	AV	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.78		0.10	mg/L as N	5/28/08 10:34	BB	E84380
pH	SM4500H-B	7.34	Q	0.01	std units	5/27/08 15:20	AV	E84380
Specific Conductivity	SM2510B	45900		0.1	µmhos/cm	5/28/08 9:20	BB	E84380
Sulfate	ASTM-D516-90	2630		2	mg/L	5/27/08 17:35	AV	E84380
Total Dissolved Solids	SM2540C	29300		20	mg/L	5/27/08 16:00	AS	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N0805378

RUSH

Page 1 of 1

Client Youngquist Bros
Address
Phone Fax

Report To:
Bill To:
P.O. #
Project Name Packer Testing
Project Location: CCSW

Sample Supply: GW
Customer Type:
Field Report #:
Kit # FOR LAB USE ONLY
REQUESTED DUE DATE: 5/28/08

Sampled By (PRINT) CASEY MATSENSKI
Sampler Signature

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	ANALYSES REQUEST Cl, TDS, SO4	PH, Cond, Temp	NH_3, TKN	Sample ID #
	PACKER		1321	G						1			-01A
	1606-1660	52708	1321	G	+		+					1	-01B

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
6291		52708	1330	Hilary Crook	52108	1330
T-124-001	Hilary Crook	52708	1500	Delivery	5/27/08	1500

COMMENTS:
Onsit temp. 28.9°C

OKAY TO RUN AS IS...
CLIENT INITIAL:
SAMPLES ON ICE
(Yes) No

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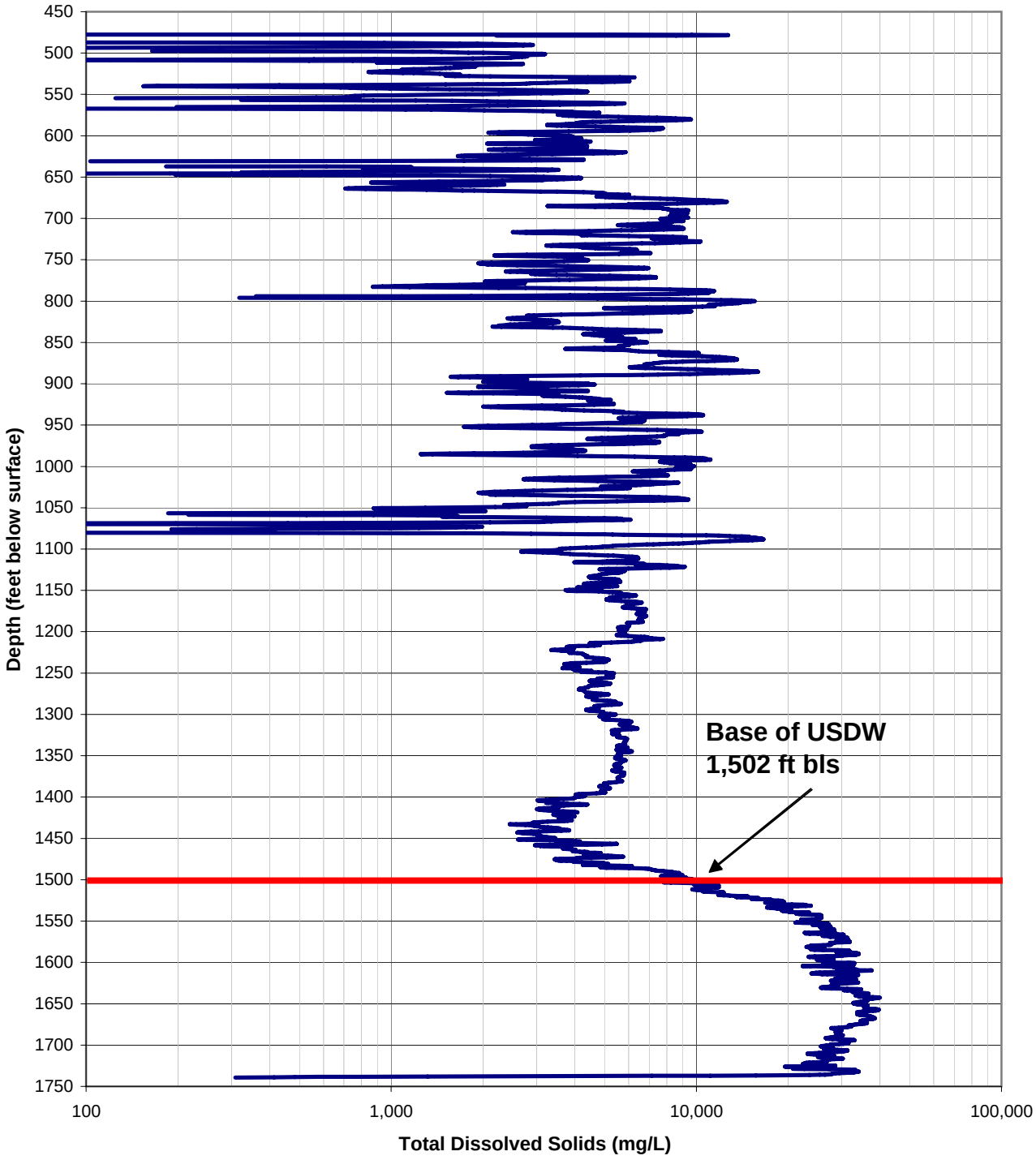
Appendix K

Log Derived Water Quality

Injection Well IW-1

Log Derived Water Quality

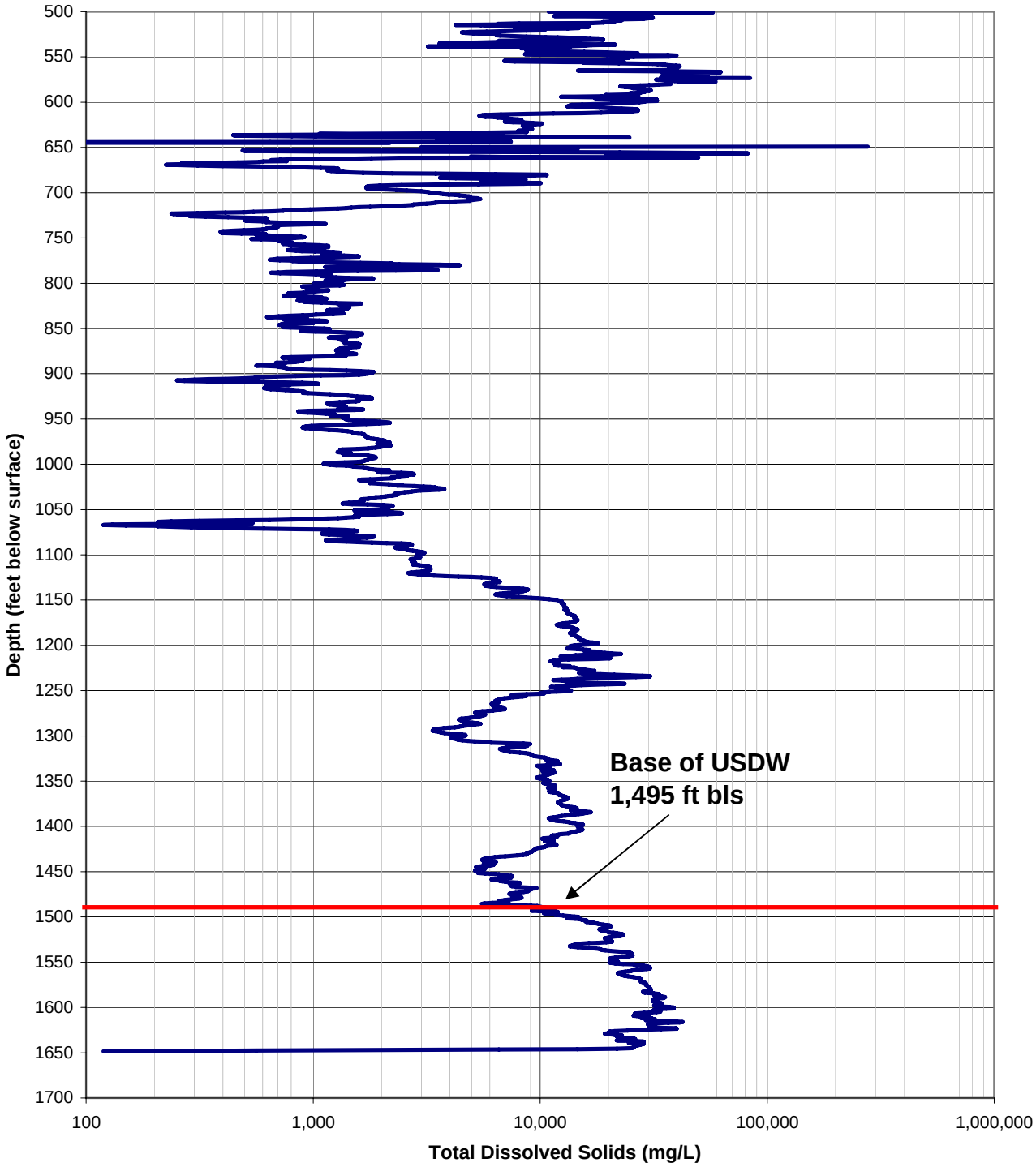
Southwest IW-1
Log Derived TDS



Monitor Well DZMW-1

Log Derived Water Quality

Southwest DZMW-1
Log Derived TDS Determination



Appendix L

Casing Mill Certificates

Injection Well IW-1

Casing and Tubing

Injection Well IW-1

54-inch Pit Pipe

IW-1 54-inch Casing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: Mike Knapp

Casing Diameters (inches): O.D. 54.00 I.D. 53.25
Wall Thickness (inches): 0.375

Pipe No. and Install Order	Heat Number	Mill Certification	Length (ft)	Run Depth (ft bls)	Weld Date	Weld Start Time	Weld Completion Time
2			50.10	50.10	10/12/07	17:45	18:20
1			25.00	75.10			

Total length (ft)	75.10
Floor and elevators (ft)	
54-inch Casing Seat (ft bls)	**75.10**

NOTES:
ft - feet
ft bls - feet below land surface

Injection Well IW-1

44-inch Casing

IW-1 44-inch Casing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: Casey Majewski

Casing Diameters (inches): O.D. 44.00 I.D. 43.25
Wall Thickness (inches): 0.375

Pipe No. and Install Order	Heat Number	Mill Certification	Length (ft)	Run Depth (ft bls)	Weld Date	Weld Start Time	Weld Completion Time
12	238601	X	40.15	34.40	10/21/07	17:24	17:50
11	010501	X	40.17	74.57	10/21/07	16:40	17:06
10	175704	X	40.14	114.71	10/21/07	16:06	16:27
9	238804	X	40.18	154.89	10/21/07	15:24	15:52
8	016604	X	40.07	194.96	10/21/07	14:49	15:13
7	237801	X	40.14	235.10	10/21/07	13:59	14:23
6	238605	X	40.25	275.35	10/21/07	13:22	13:41
5	239001	X	40.10	315.45	10/21/07	12:38	13:05
4	010104	X	40.22	355.67	10/21/07	12:01	12:25
3	088401	X	40.12	395.79	10/21/07	11:23	11:45
2	011902	X	40.17	435.96	10/21/07	10:32	10:54
1	088406	X	39.66	475.62			

Total length (ft)	481.37
Floor and elevators (ft)	-5.75
44-inch Casing Seat (ft bls)	**475.62**

NOTES:
ft - feet
ft bls - feet below land surface

YIEH CORPORATION LIMITED

MILL CERTIFICATE

COMMODITY: CARBON STEEL PIPE PER SALES CONTRACT
NO. SEUSFP6C02TD3 DATED DECEMBER 11, 2006.
CUSTOMER: OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

CERTIFICATE NO:PSCNJN6C01TC5
DATE OF ISSUE:4/29/2007

Invoice No. SEUSFP6C02TD3
LC NUMBER.: 5279996

The CARBON STEEL PIPES are tested according to ASTM A139 GR.B
This is to certify that in accordance with the relevant specifications and contracts.
The CARBON STEEL PIPES manufactured were tested and qualified by our Quality Control Department.

TOTAL : 746 PCS / 29840FT / 1769.619MT

Pipes No.	Heat Numbers	Steel	Size			Quantity			Dimensional	TESTING RESULTS											Flattening	UT Test
			O.D.	W.T.	Langth					CHEMICAL PROPERTIES(%)					PHYSICAL PROPERTIES			Welding properties	Hydrostatic Test Holding time:10s			
		Grade	in	in	ft	Pcs	ft	MT	Inspection	C	Si	Mn	P	S	σs(Mpa)	σb(Mpa)	δ5(%)	σb	P = Psi		Test (B)	Test (B)
205	047905	B	42	0.375	40	2	80	6.056	OK	0.18	0.23	0.46	0.011	0.031	315	430	33	OK	500		OK	OK
206	047703	B	42	0.375	40	5	200	15.137	OK	0.15	0.19	0.42	0.009	0.029	310	420	32	OK	500		OK	OK
207	047702	B	42	0.375	40	2	80	6.056	OK	0.19	0.27	0.47	0.015	0.032	300	425	31	OK	500		OK	OK
208	047701	B	42	0.375	40	2	80	6.056	OK	0.15	0.16	0.41	0.012	0.029	310	420	32.5	OK	500		OK	OK
209	125906	B	42	0.375	40	3	120	9.083	OK	0.19	0.25	0.50	0.012	0.028	325	440	33	OK	500		OK	OK
210	054200	B	42	0.375	40	2	80	6.056	OK	0.18	0.24	0.49	0.013	0.030	320	435	32.5	OK	500		OK	OK
211	175904	B	42	0.375	40	3	120	9.083	OK	0.18	0.20	0.44	0.012	0.031	300	425	31.5	OK	500		OK	OK
212	208801	B	44	0.375	40	2	80	6.346	OK	0.16	0.20	0.43	0.013	0.029	305	425	32	OK	500		OK	OK
213	238802	B	44	0.375	40	2	80	6.346	OK	0.18	0.21	0.44	0.011	0.031	315	425	32	OK	500		OK	OK
214	238803	B	44	0.375	40	3	120	9.521	OK	0.18	0.25	0.45	0.014	0.032	310	425	32	OK	500		OK	OK
215	238804	B	44	0.375	40	2	80	6.346	OK	0.16	0.24	0.42	0.012	0.027	305	420	32	OK	500		OK	OK
216	238804	B	44	0.375	40	2	80	6.346	OK	0.17	0.24	0.46	0.013	0.030	315	420	31.5	OK	500		OK	OK
217	238803	B	44	0.375	40	2	80	6.346	OK	0.19	0.26	0.47	0.015	0.033	320	430	31.5	OK	500		OK	OK
218	238806	B	44	0.375	40	2	80	6.346	OK	0.16	0.23	0.40	0.008	0.027	305	420	32.5	OK	500		OK	OK
219	175706	B	44	0.375	40	3	120	9.521	OK	0.18	0.24	0.46	0.012	0.031	320	435	31.5	OK	500		OK	OK
220	239002	B	44	0.375	40	2	80	6.346	OK	0.17	0.21	0.45	0.010	0.030	275	425	30.5	OK	500		OK	OK
221	086403	B	44	0.375	40	4	160	12.693	OK	0.18	0.20	0.44	0.012	0.031	295	425	31	OK	500		OK	OK

YIEH CORPORATION LIMITED

YIEH CORPORATION LIMITED

MILL CERTIFICATE

COMMODITY: CARBON STEEL PIPE PER SALES CONTRACT
NO. SEUSFP6C02TD3 DATED DECEMBER 11, 2006.
CUSTOMER: OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

CERTIFICATE NO:PSCNJN6C01TC5
DATE OF ISSUE:4/29/2007

Invoice No. SEUSFP6C02TD3
LC NUMBER.: 5279996

The CARBON STEEL PIPES are tested according to ASTM A139 GR.B
This is to certify that in accordance with the relevant specifications and contracts.
The CARBON STEEL PIPES manufactured were tested and qualified by our Quality Control Department.

TOTAL : 746 PCS / 29840FT / 1769.619MT

Pipes No.	Heat Numbers	Steel	Size			Quantity			Dimensional	TESTING RESULTS										Flattening	UT Test
										CHEMICAL PROPERTIES(%)					PHYSICAL PROPERTIES			Welding properties	Hydrostatic Test Holding time:10s		
		Grade	O.D. in	W.T. in	Length ft	Pcs	ft	MT	Inspection	C	Si	Mn	P	S	σs(Mpa)	σb(Mpa)	δ5(%)	σb	P = Psi	Test (B)	Test (B)
222	239001	B	44	0.375	40	2	80	6.346	OK	0.18	0.22	0.45	0.015	0.032	285	420	32	OK	500	OK	OK
223	088402	B	44	0.375	40	2	80	6.346	OK	0.16	0.20	0.43	0.014	0.030	290	420	31.5	OK	500	OK	OK
224	088406	B	44	0.375	40	2	80	6.346	OK	0.18	0.20	0.44	0.016	0.030	290	425	32	OK	500	OK	OK
225	012401	B	44	0.375	40	3	120	9.521	OK	0.17	0.22	0.46	0.013	0.032	285	435	32.5	OK	500	OK	OK
226	010501	B	44	0.375	40	2	80	6.346	OK	0.16	0.17	0.47	0.011	0.032	315	435	31	OK	500	OK	OK
227	238405	B	44	0.375	40	2	80	6.346	OK	0.16	0.16	0.45	0.010	0.031	310	435	31.5	OK	500	OK	OK
228	238805	B	44	0.375	40	2	80	6.346	OK	0.19	0.25	0.50	0.012	0.028	325	440	33	OK	500	OK	OK
229	016604	B	44	0.375	40	2	80	6.346	OK	0.18	0.24	0.49	0.013	0.030	320	435	32.5	OK	500	OK	OK
230	238801	B	44	0.375	40	4	160	12.693	OK	0.16	0.17	0.46	0.010	0.030	315	435	31	OK	500	OK	OK
231	238805	B	44	0.375	40	2	80	6.346	OK	0.20	0.23	0.45	0.007	0.029	305	430	31	OK	500	OK	OK
232	030306	B	44	0.375	40	4	160	12.684	OK	0.16	0.24	0.47	0.014	0.033	310	425	31	OK	500	OK	OK
233	088401	B	44	0.375	40	3	120	9.521	OK	0.15	0.22	0.45	0.012	0.032	300	430	31	OK	500	OK	OK
234	010104	B	44	0.375	40	2	80	6.346	OK	0.18	0.18	0.43	0.016	0.022	325	420	32	OK	500	OK	OK
235	237801	B	44	0.375	40	2	80	6.346	OK	0.17	0.20	0.46	0.014	0.029	315	435	32	OK	500	OK	OK
236	175704	B	44	0.375	40	2	80	6.346	OK	0.17	0.17	0.47	0.017	0.028	315	430	31	OK	500	OK	OK
237	239004	B	44	0.375	40	2	80	6.346	OK	0.18	0.21	0.51	0.013	0.032	320	440	31.5	OK	500	OK	OK
238	011902	B	44	0.375	40	3	120	9.521	OK	0.17	0.21	0.46	0.010	0.030	295	425	30.5	OK	500	OK	OK

YIEH CORPORATION LIMITED

Injection Well IW-1

36-inch Casing

IW-1 36-inch Casing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: Aimee Fratarcangelli

Casing Diameters (inches): O.D. 36.00 I.D. 35.25
Wall Thickness (inches): 0.375

Pipe No. and Install Order	Heat Number	Mill Certification	Length (ft)	Run Depth (ft bls)	Weld Date	Weld Start Time	Weld Completion Time
43	175902	X	40.13	40.13	11/18/07	1:45	2:08
42	1-9160	X	40.15	80.28	11/18/07	0:28	0:53
41	053604	X	38.41	118.69	11/17/07	20:09	20:42
40	009107	X	40.15	158.84	11/17/07	18:03	19:44
39	1-9160	X	38.94	197.78	11/17/07	17:22	17:48
38	1-9160	X	40.09	237.87	11/17/07	16:23	16:54
37	009107	X	40.10	277.97	11/17/07	15:40	16:02
36	1-9106	X	39.08	317.05	11/17/07	15:04	15:15
35	1-9106	X	39.03	356.08	11/17/07	14:31	14:44
34	175901	X	40.13	396.21	11/17/07	13:22	13:47
33	048305	X	40.15	436.36	11/17/07	12:38	12:56
32	238402	X	40.11	476.47	11/17/07	12:01	12:14
31	101010	X	40.08	516.55	11/17/07	11:20	11:36
30	014003	X	40.10	556.65	11/17/07	10:58	11:08
29	238202	X	40.08	596.73	11/17/07	10:07	10:33
28	1-9106	X	39.09	635.82	11/17/07	8:53	9:28
27	048507	X	40.13	675.95	11/17/07	8:01	8:24
26	101010	X	40.12	716.07	11/17/07	7:14	7:38
25	055201	X	40.14	756.21	11/17/07	6:17	6:38
24	055405	X	40.09	796.30	11/17/07	5:24	5:49
23	055804	X	39.99	836.29	11/17/07	4:24	4:50

22	048307	X	40.12	876.41	11/17/07	3:27	3:50
21	014406	X	40.16	916.57	11/17/07	2:37	3:06
20	048704	X	40.09	956.66	11/17/07	1:46	2:11
19	238201	X	40.13	996.79	11/17/07	0:56	1:16
18	010102	X	40.12	1,036.91	11/17/07	0:08	0:27
17	014406	X	40.13	1,077.04	11/16/07	23:19	23:35
16	053604	X	39.99	1,117.03	11/16/07	22:32	22:54
15	048307	X	40.10	1,157.13	11/16/07	21:49	22:08
14	048507	X	40.13	1,197.26	11/16/07	21:08	21:24
13	055405	X	40.14	1,237.40	11/16/07	20:08	20:26
12	055804	X	40.09	1,277.49	11/16/07	18:32	19:31
11	055804	X	40.12	1,317.61	11/16/07	16:16	16:44
10	010102	X	40.07	1,357.68	11/16/07	14:43	15:59
9	010103	X	40.11	1,397.79	11/16/07	13:38	14:10
8	014801	X	40.09	1,437.88	11/16/07	13:12	13:23
7	012201	X	40.06	1,477.94	11/16/07	12:45	13:01
6	044503	X	40.09	1,518.03	11/16/07	11:28	11:49
5	055823	X	40.08	1,558.11	11/16/07	10:44	11:03
4	238202	X	40.09	1,598.20	11/16/07	9:25	9:42
3	048507	X	40.14	1,638.34	11/16/07	8:34	--
2	044503	X	40.04	1,678.38			
1	014801	X	1.66	1,680.04			

Total length (ft)	1,680.04
Floor and elevators (ft)	0.00
36-inch Casing Seat (ft bls)	**1,680.04**

NOTES:
ft - feet
ft bls - feet below land surface

YIEH CORPORATION LIMITED

NO 6, E-DA RD, YA AO TOWNSHIP
KAOHSIUNG COUNTY YANCHAO,
TAIWAN
TEL:886-7-615-1000
FAX:886-7-615-3000

MILL CERTIFICATE

CERTIFICATE NO:PSCNJN7601TC3-3
DATE OF ISSUE:10/23/2007

COMMODITY: CARBON STEEL PIPES AS PER ASTM A139 GR.B SPIRAL WELDED, NORMAL MILL BLACK LACQUER FOR RUST PROTECTION, ONE END OF THE PIPE SHALL HAVE A BEVEL OF 30 DEGREES WITH A TOLERANCE PLUS FIVE, MINUS ZERO DEGREES. THE OTHER END OF THE PIPE WILL BE PLAIN, RIGHT AND ANGLE CUT. ALL BURRS REMOVED.

CUSTOMER: OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

The CARBON STEEL PIPES are tested according to ASTM A139 GR.B
This is to certify that in accordance with the relevant specifications and contracts.
The CARBON STEEL PIPES manufactured were tested and qualified by our Quality Control Department.

Invoice No. SEUSFP7601TD3-3
LC NUMBER.: 64405427
TOTAL : 271 PCS / 10840 FT / 497.812 MT

Pipes No.	Heat Number	Steel	O.D.	W.T.	lenth	Quantity			Dimensional	CHEMICAL PROPERTIES(%)					PHYSICAL PROPERTIES			Welding properties	Hydrostatic Test Holding time/10s	Flattening	UT Test
		Grade	in	in	ft	根(Pcs)	英尺 (ft)	吨(MT)	Inspection	C	Si	Mn	P	S	σs(Mpa)	σb(Mpa)	δ5(%)	ob	P = Psi	Test (B)	Test (B)
1	1-9160	B	62	0.375	40	1	40	3.757	OK	0.16	0.19	0.48	0.029	0.029	330	460	30	OK	505	OK	OK
2	1-9160	B	42	0.375	40	20	800	60.555	OK	0.16	0.19	0.48	0.029	0.029	330	460	30	OK	505	OK	OK
3	1-9160	B	36	0.375	40	21	840	54.418	OK	0.16	0.19	0.48	0.029	0.029	330	460	30	OK	505	OK	OK
4	7-C03099	B	28	0.375	40	27	1080	54.254	OK	0.16	0.19	0.33	0.016	0.027	325	455	33	OK	525	OK	OK
5	7-C03099	B	26	0.375	40	22	880	41.007	OK	0.16	0.19	0.33	0.016	0.027	325	455	33	OK	525	OK	OK
6	7-C03099	B	24	0.375	40	71	2840	122.01	OK	0.16	0.19	0.33	0.016	0.027	325	455	33	OK	525	OK	OK
7	7-C03099	B	20	0.375	40	27	1080	36.643	OK	0.16	0.19	0.33	0.016	0.027	325	455	33	OK	525	OK	OK
8	1-7688	B	16	0.500	40	82	3280	123.268	OK	0.15	0.16	0.42	0.023	0.022	330	485	31.5	OK	525	OK	OK
TOTAL						271	10840	497.812													

YIEH CORPORATION LIMITED

YIEH CORPORATION LIMITED

MILL CERTIFICATE

COMMODITY: CARBON STEEL PIPE PER SALES CONTRACT
NO. SEUSPP6C02TD3 DATED DECEMBER 11, 2006.

CUSTOMER: OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

CERTIFICATE NO:PSCNJN6C01TC5
DATE OF ISSUE:4/29/2007

Invoice No. SEUSFP6C02TD3
LC NUMBER.: 5279996

The CARBON STEEL PIPES are tested according to ASTM A139 GR.B
This is to certify that in accordance with the relevant specifications and contracts.
The CARBON STEEL PIPES manufactured were tested and qualified by our Quality Control Department.

TOTAL : 746 PCS / 29840FT / 1769.619MT

Pipes No.	Heat Numbers	Steel	Size			Quantity			Dimensional	TESTING RESULTS											Flattening	UT Test
			O.D.	W.T.	Length					CHEMICAL PROPERTIES(%)					PHYSICAL PROPERTIES			Welding properties	Hydrostatic Test Holding time:10s			
		Grade	in	in	ft	Pcs	ft	MT	Inspection	C	Si	Mn	P	S	σs(Mpa)	σb(Mpa)	δ5(%)	σb	P = Psi		Test (B)	Test (B)
154	176901	B	34	0.375	40	3	120	7.338	OK	0.15	0.19	0.39	0.010	0.029	315	425	31	OK	500		OK	OK
155	176503	B	34	0.375	40	1	40	2.446	OK	0.18	0.26	0.46	0.015	0.032	300	420	30.5	OK	500		OK	OK
156	014003	B	36	0.375	40	2	80	5.183	OK	0.16	0.24	0.45	0.014	0.032	305	435	31	OK	500		OK	OK
157	009107	B	36	0.375	40	3	120	7.774	OK	0.17	0.19	0.37	0.010	0.028	305	425	31.5	OK	500		OK	OK
158	048507	B	36	0.375	40	2	80	5.183	OK	0.15	0.23	0.44	0.009	0.031	320	430	33	OK	500		OK	OK
159	014801	B	36	0.375	40	3	120	7.774	OK	0.14	0.14	0.35	0.014	0.030	305	425	32	OK	500		OK	OK
160	101010	B	36	0.375	40	3	120	7.774	OK	0.16	0.21	0.43	0.011	0.031	310	425	31	OK	500		OK	OK
161	014406	B	36	0.375	40	2	80	5.183	OK	0.18	0.25	0.46	0.012	0.032	325	435	31.5	OK	500		OK	OK
162	010102	B	36	0.375	40	3	120	7.774	OK	0.16	0.24	0.47	0.014	0.031	300	420	31.5	OK	500		OK	OK
163	043704	B	36	0.375	40	3	120	7.774	OK	0.16	0.23	0.45	0.012	0.028	310	425	31	OK	500		OK	OK
164	055807	B	36	0.375	40	2	80	5.183	OK	0.17	0.24	0.44	0.011	0.029	310	425	32	OK	500		OK	OK
165	055201	B	36	0.375	40	3	120	7.774	OK	0.15	0.23	0.42	0.013	0.029	315	430	32.5	OK	500		OK	OK
166	055804	B	36	0.375	40	3	120	7.774	OK	0.15	0.21	0.41	0.010	0.031	290	430	31	OK	500		OK	OK
167	044503	B	36	0.375	40	3	120	7.774	OK	0.16	0.17	0.35	0.015	0.031	305	420	32	OK	500		OK	OK
168	056001	B	36	0.375	40	2	80	5.183	OK	0.17	0.23	0.45	0.014	0.031	310	425	31	OK	500		OK	OK
169	048107	B	36	0.375	40	2	80	5.183	OK	0.16	0.22	0.46	0.012	0.031	310	425	31	OK	500		OK	OK
170	048307	B	36	0.375	40	3	120	7.774	OK	0.15	0.21	0.43	0.013	0.030	290	430	31	OK	500		OK	OK

YIEH CORPORATION LIMITED

YIEH CORPORATION LIMITED

MILL CERTIFICATE

COMMODITY: CARBON STEEL PIPE PER SALES CONTRACT
NO. SEUSFP6C02TD3 DATED DECEMBER 11, 2006.
CUSTOMER: OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

CERTIFICATE NO:PSCNJN6C01TC5
DATE OF ISSUE:4/29/2007

Invoice No. SEUSFP6C02TD3
LC NUMBER.: 5279996

The CARBON STEEL PIPES are tested according to ASTM A139 GR.B
This is to certify that in accordance with the relevant specifications and contracts.
The CARBON STEEL PIPES manufactured were tested and qualified by our Quality Control Department.

TOTAL : 746 PCS / 29840FT / 1769.619MT

Pipes No.	Heat Numbers	Steel	Size			Quantity			Dimensional	TESTING RESULTS										Flattening	UT Test
			O.D.	W.T.	Length					CHEMICAL PROPERTIES(%)					PHYSICAL PROPERTIES			Welding properties	Hydrostatic Test Holding time:10s		
		Grade	in	in	ft	Pcs	ft	MT	Inspection	C	Si	Mn	P	S	σs(Mpa)	σb(Mpa)	δ5(%)	σb	P = Psi	Test (B)	Test (B)
171	055823	B	36	0.375	40	3	120	7.774	OK	0.14	0.14	0.35	0.018	0.029	305	425	32	OK	500	OK	OK
172	112002	B	36	0.375	40	2	80	5.183	OK	0.17	0.26	0.46	0.012	0.033	320	430	31.5	OK	500	OK	OK
173	010103	B	36	0.375	40	3	120	7.774	OK	0.15	0.19	0.37	0.009	0.028	305	425	31.5	OK	500	OK	OK
174	014402	B	36	0.375	40	3	120	7.774	OK	0.17	0.22	0.44	0.014	0.032	315	420	32	OK	500	OK	OK
175	014401	B	36	0.375	40	2	80	5.183	OK	0.16	0.21	0.41	0.012	0.029	290	420	31.5	OK	500	OK	OK
176	012201	B	36	0.375	40	3	120	7.774	OK	0.15	0.25	0.45	0.015	0.032	285	420	32	OK	500	OK	OK
177	056002	B	36	0.375	40	3	120	7.774	OK	0.17	0.24	0.47	0.011	0.031	320	430	31.5	OK	500	OK	OK
178	048307	B	36	0.375	40	2	80	5.183	OK	0.15	0.19	0.42	0.010	0.028	300	425	31	OK	500	OK	OK
179	048305	B	36	0.375	40	3	120	7.774	OK	0.14	0.17	0.39	0.008	0.030	305	425	32.5	OK	500	OK	OK
180	053604	B	36	0.375	40	3	120	7.774	OK	0.16	0.24	0.43	0.012	0.032	300	420	32.5	OK	500	OK	OK
181	055405	B	36	0.375	40	3	120	7.774	OK	0.15	0.22	0.39	0.012	0.029	300	425	31	OK	500	OK	OK
182	048701	B	36	0.375	40	2	80	5.183	OK	0.17	0.22	0.40	0.011	0.031	305	425	32	OK	500	OK	OK
183	047504	B	36	0.375	40	2	80	5.183	OK	0.16	0.19	0.41	0.008	0.028	310	425	31	OK	500	OK	OK
184	238201	B	36	0.375	40	5	200	12.951	OK	0.18	0.24	0.45	0.013	0.033	320	435	32.5	OK	500	OK	OK
185	238402	B	36	0.375	40	2	80	5.183	OK	0.17	0.17	0.42	0.010	0.030	315	430	31	OK	500	OK	OK
186	238202	B	36	0.375	40	3	120	7.774	OK	0.15	0.19	0.36	0.009	0.028	315	420	31.5	OK	500	OK	OK
187	238002	B	36	0.375	40	3	120	7.774	OK	0.16	0.23	0.45	0.015	0.032	285	420	32	OK	500	OK	OK

YIEH CORPORATION LIMITED

YIEH CORPORATION LIMITED

MILL CERTIFICATE

COMMODITY: CARBON STEEL PIPE PER SALES CONTRACT
NO. SEUSFP6C02TD3 DATED DECEMBER 11, 2006.

CUSTOMER: OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

CERTIFICATE NO:PSCNJN6C01TC5
DATE OF ISSUE:4/29/2007

Invoice No. SEUSFP6C02TD3
LC NUMBER.: 5279996

The CARBON STEEL PIPES are tested according to ASTM A139 GR.B
This is to certify that in accordance with the relevant specifications and contracts.
The CARBON STEEL PIPES manufactured were tested and qualified by our Quality Control Department.

TOTAL : 746 PCS / 29840FT / 1769.619MT

Pipes No.	Heat Numbers	Steel	Size			Quantity			Dimensional	TESTING RESULTS										Flattening	UT Test
			O.D.	W.T.	Length					CHEMICAL PROPERTIES(%)					PHYSICAL PROPERTIES			Welding properties	Hydrostatic Test Holding time: 10s		
		Grade	in	in	ft	Pcs	ft	MT	Inspection	C	Si	Mn	P	S	σs(Mpa)	σb(Mpa)	δ5(%)	σb	P = Psi	Test (B)	Test (B)
188	236003	B	36	0.375	40	2	80	5.183	OK	0.18	0.20	0.43	0.014	0.030	290	420	31.5	OK	500	OK	OK
189	175902	B	36	0.375	40	3	120	7.774	OK	0.18	0.24	0.44	0.016	0.033	280	425	32	OK	500	OK	OK
190	175901	B	36	0.375	40	2	80	5.183	OK	0.17	0.20	0.42	0.012	0.031	295	425	31	OK	500	OK	OK
191	237002	B	40	0.375	40	2	80	5.765	OK	0.19	0.27	0.42	0.016	0.033	300	425	31	OK	500	OK	OK
192	175905	B	40	0.375	40	2	80	5.765	OK	0.18	0.26	0.43	0.013	0.030	305	420	31.5	OK	500	OK	OK
193	237004	B	40	0.375	40	2	80	5.765	OK	0.15	0.17	0.33	0.008	0.028	315	425	31	OK	500	OK	OK
194	237006	B	40	0.375	40	3	120	8.647	OK	0.18	0.25	0.45	0.012	0.032	325	435	31.5	OK	500	OK	OK
195	237003	B	40	0.375	40	2	80	5.765	OK	0.16	0.24	0.39	0.014	0.030	310	425	31	OK	500	OK	OK
196	237401	B	40	0.375	40	3	120	8.645	OK	0.17	0.26	0.47	0.011	0.031	320	430	31.5	OK	500	OK	OK
197	176502	B	40	0.375	40	2	80	5.765	OK	0.18	0.27	0.43	0.014	0.033	300	420	31.5	OK	500	OK	OK
198	237005	B	40	0.375	40	2	80	5.765	OK	0.17	0.23	0.46	0.012	0.031	290	430	31	OK	500	OK	OK
199	176706	B	40	0.375	40	3	120	8.645	OK	0.17	0.24	0.44	0.011	0.030	305	435	31	OK	500	OK	OK
200	237001	B	40	0.375	40	2	80	5.765	OK	0.15	0.21	0.38	0.013	0.029	290	430	31	OK	500	OK	OK
201	176501	B	40	0.375	40	2	80	5.765	OK	0.15	0.22	0.39	0.009	0.028	305	420	33	OK	500	OK	OK
202	054004	B	42	0.375	40	1	40	3.028	OK	0.18	0.25	0.44	0.014	0.033	300	425	31.5	OK	500	OK	OK
203	055406	B	42	0.375	40	3	120	9.083	OK	0.16	0.21	0.37	0.012	0.030	310	425	31	OK	500	OK	OK
204	047705	B	42	0.375	40	2	80	6.056	OK	0.14	0.17	0.39	0.010	0.028	305	425	33	OK	500	OK	OK

YIEH CORPORATION LIMITED

Injection Well IW-1

24-inch Casing

IW-1 24-inch Casing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: King/Largey/James

Casing Diameters (inches): O.D. 24.00 I.D. 23.00
Wall Thickness (inches): 0.50

Pipe No. and Install Order	Heat Number	Mill Certification	Length (ft)	Run Depth (ft bls)	Weld Date	Weld Start Time	Weld Completion Time
51	070613/070709	X	61.08	54.83	3/27/08	22:20	22:40
50	070709/070688	X	66.20	121.03	3/27/08	21:17	21:57
49	070688/070709	X	57.94	178.97	3/27/08	20:18	20:48
48	070688/070709	X	59.80	238.77	3/27/08	19:23	19:49
47	070688/070613	X	61.29	300.06	3/27/08	16:45	17:00
46	070709/070688	X	60.11	360.17	3/27/08	15:15	15:30
45	070712/070709	X	61.27	421.44	3/27/08	12:50	13:03
44	070709/070709	X	60.09	481.53	3/27/08	11:55	12:10
43	070613/070688	X	54.30	535.83	3/27/08	11:13	11:28
42	070688/070709	X	60.55	596.38	3/27/08	10:34	10:53
41	070709/070709	X	67.35	663.73	3/27/08	9:45	10:05
40	070709/070709	X	68.08	731.81	3/27/08	8:35	9:15
39	070709/070635	X	62.07	793.88	3/27/08	7:50	8:10
38	070712/070635	X	59.04	852.92	3/27/08	6:08	6:30
37	070635/070709	X	58.59	911.51	3/27/08	5:20	5:50
36	070688/070709	X	60.82	972.33	3/27/08	4:35	4:50
35	070688/070712	X	53.43	1,025.76	3/27/08	3:56	4:16
34	070712/070712	X	55.61	1,081.37	3/27/08	3:13	3:30
33	070688/070635	X	53.47	1,134.84	3/27/08	2:19	2:45
32	070712/070635	X	52.23	1,187.07	3/27/08	1:39	2:02
31	070688/070635	X	52.87	1,239.94	3/27/08	0:58	1:18

30	070688/070712	**X**	53.29	1,293.23	3/27/08	0:09	0:20
29	070635/070635	**X**	51.98	1,345.21	3/26/08	23:26	23:45
28	070709/070709	**X**	60.24	1,405.45	3/26/08	22:50	23:05
27	070688/070688	**X**	50.98	1,456.43	3/26/08	21:35	21:54
26	070635/070635	**X**	48.85	1,505.28	3/26/08	20:53	21:16
25	070688/070712	**X**	59.93	1,565.21	3/26/08	20:03	20:15
24	070606/070606	**X**	52.64	1,617.85	3/26/08	18:50	19:32
23	070635/070635	**X**	53.57	1,671.42	3/26/08	18:07	18:23
22	070688/070635	**X**	52.96	1,724.38	3/26/08	17:25	17:42
21	070709/070688	**X**	59.20	1,783.58	3/26/08	16:45	17:05
20	070635/070688	**X**	51.95	1,835.53	3/26/08	15:45	16:00
19	070688/070635	**X**	52.02	1,887.55	3/26/08	15:10	15:28
18	070688/070606	**X**	54.62	1,942.17	3/26/08	14:15	14:50
17	070688/070712	**X**	59.41	2,001.58	3/26/08	13:30	13:50
16	070712/070635	**X**	60.69	2,062.27	3/26/08	12:25	12:40
15	070712/070688	**X**	52.38	2,114.65	3/26/08	11:55	12:12
14	070688/070613	**X**	54.02	2,168.67	3/26/08	11:09	11:30
13	070688/070712	**X**	51.96	2,220.63	3/26/08	10:25	10:50
12	0707012/070712	**X**	52.49	2,273.12	3/26/08	9:45	10:05
11	070635/070709	**X**	59.45	2,332.57	3/26/08	9:05	9:25
10	070635/070709	**X**	60.81	2,393.38	3/26/08	8:15	8:30
9	070635/070712	**X**	56.27	2,449.65	3/26/08	7:15	7:30
8	070709/070635	**X**	60.42	2,510.07	3/26/08	5:16	5:53
7	070709/070688	**X**	60.62	2,570.69	3/26/08	4:24	4:54
6	070712/070709	**X**	60.20	2,630.89	3/26/08	3:32	3:58
5	070688/070709	**X**	59.65	2,690.54	3/26/08	2:34	3:03
4	070613/070709	**X**	59.44	2,749.98	3/26/08	1:38	2:07
3	070709/070709	**X**	67.07	2,817.05	3/26/08	0:47	1:16
2	070709/070712	**X**	62.06	2,879.11	3/25/08	22:57	23:17
1	070613/070709	**X**	60.50	2,939.61			
YBI Packer	--		11.03	2,950.64			

Total length (ft)	2,956.89
Floor and elevators (ft)	-6.25
24-inch Casing Seat (ft bls)	2,950.64

NOTES:

ft - feet

ft bls - feet below land surface

无锡德新钢管有限公司
WUXI DEXIN STEEL TUBE CO., LTD.

产品质量证明书
MILL CERTIFICATE

订货单位 CUSTOMER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	产品名称 PRODUCT	无缝钢管 CARBON STEEL PIPE	交货状态 DELIVERY CONDITION	正火 NORMALIZE
收货单位 URCHASER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	合同号码 CONTRACT NO.	WXDX-20070110	质保书号 CERTIFICATION NO.	WXDX07662
标准 ECIFICATION	API5L-2000	钢级 STEEL GRADE	GR.B PSL1	总支数(支) TOTAL PIECES	68

熔炼号 HEAT NO.	批号 LOT NO.	规格 SIZE		数量 QUANTITY			化学成份% CHEMICAL COMPOSITION (*100)											机械性能 PHYSICAL PROPERTIES		
		直径 O.D. IN	壁厚 W.T. IN	支数 PIECES	长度 LENGTH M	重量 WEIGHT T	碳 C	硅 Si	锰 Mn	硫 S	磷 P	铜 Cu	镍 Ni	铬 Cr	钼 Mo	钒 V	铝 Al	抗拉强度 T.S. MPa	伸长率 E.L. δ%	屈服强度 Y.S. MPa
070561	5103	18	0.5	8	62.23	8.618	21	17	54	0.9	0.9	3	2	5				430/435	32.0/32.5	330/3
070606	5221	24	0.5	60	486.49	92.108	22	16	55	1.0	1.1	5	2	3				425/420	31.0/31.5	340/3

超声波探伤 U.T	涡流探伤 E.T	硬度(HB) HARDNESS	热处理工艺 HEAT TREATMENT	外观和尺寸 VISUAL&DIMENSIONS	显微组织 MICROSTRUCTURE	晶粒度 GRAINSIZE	压扁 FLATTENING	水压实验 HYDROSTATIC TEST	冷弯 BENDING	冲击试验 IMPACT TEST AKV ≥(34
合格 GOOD	/	/	/	合格 GOOD	/	/	合格 GOOD	合格 GOOD	合格 GOOD	/ /

注释 NOTES

检验者 IVEROR

兹证明本表所列产品，均依标准规定制造、取样、试验和检验，并符合标准及合同要求。
WE HERE CERTIFY THAT THE MATERIAL HEREIN DESCRIBED HAS BEEN MANUFACTURED, SAMPLED, TESTED AND INSPECTED IN ACCORDANCE WITH THE REQUIREMENTS OF ABOVE SPECIFICATIONS AND PURCHASE ORDER, AND THE REQUIREMENTS.

检验员 INSPECTOR 赵文英

许可证 LICENSE API5L-0573

无锡德新钢管有限公司
WUXI DEXIN STEEL TUBE CO., LTD.

产品质量证明书
MILL CERTIFICATE

4

订货单位 CUSTOMER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	产品名称 PRODUCT	无缝钢管 CARBON STEEL PIPE	交货状态 DELIVERY CONDITION	正火 NORMALIZE
收货单位 PURCHASER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	合同号码 CONTRACT NO.	WXDX-20070110	质保书号 CERTIFICATION NO.	WXDX07693
标准 SPECIFICATION	API5L	钢级 STEEL GRADE	GR.B PSL1	总支数(支) TOTAL PIECES	144

序号 NO.	熔炼号 HEAT NUMBERS	批号 LOT NO.	规格 SIZE		数量 QUANTITY			化学成份 % CHEMICAL COMPOSITION (*100)											机械性能 PHYSICAL PROPERTIES (L)		
			直径 O.D. mm	壁厚 W.T. mm	支数 PIECES	米数 LENGTH M	重量 WEIGHT T	碳 C	硅 Si	锰 Mn	硫 S	磷 P	铜 Cu	镍 Ni	铬 Cr	钼 Mo	钒 V	铝 Al	抗拉强度 T.S. MPa	伸长率 E.L. δ %	屈服强度 Y.S. MPa
1	070613	5286	609.6	12.7	52	414.85	78.364	21	18	54	1.0	1.0	5	2	5				425/430	31.0/30.5	340/330
2	070613	5287	609.6	12.7	54	435.69	81.012	21	18	54	1.0	1.0	5	2	5				425/430	31.0/30.5	340/330
3	070613	5288	609.6	12.7	38	308.28	57.806	21	18	54	1.0	1.0	5	2	5				425/430	31.0/30.5	340/330
4																					

超声波探伤 U.T	涡流探伤 E.T	硬度（HB） HARDNESS	热处理工艺 HEAT TREATMENT	外观和尺寸 VISUAL&DIMENSIONS	显微组织 MICROSTRUCTURE	晶粒度 GRAINSIZE	压扁 FLATTENING	水压实验 HYDROSTATIC TEST	冷弯 BENDING	冲击试验 IMPACT TEST AKV(J) ≥(34)		
合格 GOOD	/	/	/	合格 GOOD	/	/	合格 GOOD	合格 GOOD	合格 GOOD	/	/	/

注释 NOTES	
会验者 SUVEROR	兹证明本表所列产品，均依标准规定制造、取样、试验和检验，并符合标准及合同要求。 WE HERE CERTIFY THAT THE MATERIAL HEREIN DESCRIBED HAS BEEN MANUFACTURED, SAMPLED, TESTED AND INSPECTED IN ACCORDANCE WITH THE REQUIREMENTS OF ABOVE SPECIFICATIONS AND PURCHASE ORDER, AND THE REQUIREMENTS.
检验员 INSPECTOR	王成英
许可证号 LICENSE	5L-0573

无锡德新钢管有限公司
WUXI DEXIN STEEL TUBE CO., LTD.

产品质量证明书
MILL CERTIFICATE

8

订货单位 CUSTOMER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	产品名称 PRODUCT	无缝钢管 CARBON STEEL PIPE	交货状态 DELIVERY CONDITION	正火 NORMALIZE
收货单位 PURCHASER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	合同号码 CONTRACT NO.	WXDX-20070110	质保书号 CERTIFICATION NO.	WXDX07726
标准 SPECIFICATION	API5L	钢级 STEEL GRADE	GR.B PSL1	总支数(支) TOTAL PIECES	65

序号 NO.	熔炼号 HEAT NO.	批号 LOT NO.	规格 SIZE		数量 QUANTITY			化学成份 % CHEMICAL COMPOSITION (*100)											机械性能 PHYSICAL PROPERTIES (L)		
			直径 O.D. mm	壁厚 W.T. mm	支数 PIECES	米数 LENGTH M	重量 WEIGHT T	碳 C	硅 Si	锰 Mn	硫 S	磷 P	铜 Cu	镍 Ni	铬 Cr	钼 Mo	钒 V	铝 Al	抗拉强度 T.S. MPa	伸长率 E.L. δ%	屈服强度 Y.S. MPa
1	070709	6589	609.6	12.7	65	627.85	113.835	22	27	56	0.4	1.9	1.2	1	2.5				480/475	33.0/32.5	260/275
2																					
3																					
4																					

超声波探伤 U.T	涡流探伤 E.T	硬度（HB） HARDNESS	热处理工艺 HEAT TREATMENT	外观和尺寸 VISUAL&DIMENSIONS	显微组织 MICROSTRUCTURE	晶粒度 GRAINSIZE	压扁 FLATTENING	水压实验 HYDROSTATIC TEST	冷弯 BENDING	冲击试验 IMPACT TEST AKV(J) ≥(34)		
合格 GOOD	/	/	/	合格 GOOD	/	/	合格 GOOD	合格 GOOD	合格 GOOD	/	/	/

注释 NOTES	
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检验员 INSPECTOR	无锡德新钢管有限公司
许可证号 LICENSE	STEEL TUBE 5L-0573

无锡德新钢管有限公司
WUXI DEXIN STEEL TUBE CO., LTD.

产 品 质 量 证 明 书
MILL CERTIFICATE

订货单位 CUSTOMER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	产品名称 PRODUCT	无缝钢管 CARBON STEEL PIPE	交货状态 DELIVERY CONDITION	正火 NORMALIZE
收货单位 PURCHASER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	合同号码 CONTRACT NO.	WXDX-20070110/	质保书号 CERTIFICATION NO.	WXDX07708
标准 SPECIFICATION	API5L	钢级 STEEL GRADE	GR.B PSL1	总支数(支) TOTAL PIECES	72

序号 NO.	熔炼号 HEAT NO.	批号 LOT NO.	规格 SIZE		数量 QUANTITY			化学成份 % CHEMICAL COMPOSITION (*100)										机械性能 PHYSICAL PROPERTIES (L)		
			直径 O.D. mm	壁厚 W.T. mm	支数 PIECES	米数 LENGTH M	重量 WEIGHT T	碳 C	硅 Si	锰 Mn	硫 S	磷 P	铜 Cu	镍 Ni	铬 Cr	钼 Mo	钒 V	铝 Al	抗拉强度 T.S. MPa	伸长率 E.L. δ %	屈服强度 Y.S. MPa
1	070688	5883	609.6	12.7	35	287.79	53.804	23	29	59	0.4	2.0	1.2	1	1.9				480/480	33.0/32.5	280/275
2	070688	5885	609.6	12.7	37	302.80	56.162	23	29	59	0.4	2.0	1.2	1	1.9				480/480	33.0/32.5	280/275
3																					
4																					

超声波探伤 U.T	涡流探伤 E.T	硬度（HB） HARDNESS	热处理工艺 HEAT TREATMENT	外观和尺寸 VISUAL&DIMENSIONS	显微组织 MICROSTRUCTURE	晶粒度 GRAINSIZE	压扁 FLATTENING	水压实验 HYDROSTATIC TEST	冷弯 BENDING	冲击试验 IMPACT TEST AKV(J) ≥(34)		
合格 GOOD	/	/	/	合格 GOOD	/	/	合格 GOOD	合格 GOOD	合格 GOOD	/	/	/

注释 NOTES	
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检验员 INSPECTOR	赵战英
许可证号 LICENSE	5L-0573

无锡德新钢管有限公司
WUXI DEXIN STEEL TUBE CO., LTD.

产 品 质 量 证 明 书
MILL CERTIFICATE

4

订货单位 CUSTOMER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	产品名称 PRODUCT	无缝钢管 CARBON STEEL PIPE	交货状态 DELIVERY CONDITION	正火 NORMALIZE
收货单位 PURCHASER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	合同号码 CONTRACT NO.	WXDX-20070110	质保书号 CERTIFICATION NO.	WXDX07695
标准 SPECIFICATION	API5L	钢级 STEEL GRADE	GR.B PSL1	总支数(支) TOTAL PIECES	72

序号 NO.	熔炼号 HEAT NUMBERS	批号 LOT NO.	规格 SIZE		数量 QUANTITY			化学成份 % CHEMICAL COMPOSITION (*100)											机械性能 PHYSICAL PROPERTIES (L)		
			直径 O.D. mm	壁厚 W.T. mm	支数 PIECES	米数 LENGTH M	重量 WEIGHT T	碳 C	硅 Si	锰 Mn	硫 S	磷 P	铜 Cu	镍 Ni	铬 Cr	钼 Mo	钒 V	铝 Al	抗拉强度 T.S. MPa	伸长率 E.L. δ %	屈服强度 Y.S. MPa
1	070635	5395	609.6	12.7	36	291.77	54.560	21	17	55	0.9	1.0	5	2	5				425/435	31.0/31.5	340/330
2	070635	5396	609.6	12.7	36	290.99	54.628	21	17	55	0.9	1.0	5	2	5				425/435	31.0/31.5	340/330
3																					
4																					

超声波探伤 U.T	涡流探伤 E.T	硬度（HB） HARDNESS	热处理工艺 HEAT TREATMENT	外观和尺寸 VISUAL&DIMENSIONS	显微组织 MICROSTRUCTURE	晶粒度 GRAINSIZE	压扁 FLATTENING	水压实验 HYDROSTATIC TEST	冷弯 BENDING	冲击试验 IMPACT TEST AKV(J) ≥(34)		
合格 GOOD	/	/	/	合格 GOOD	/	/	合格 GOOD	合格 GOOD	合格 GOOD	/	/	/

注释 NOTES	
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检验员 INSPECTOR	赵战英
许可证号 LICENSE	SL-0573

无锡德新钢管有限公司
WUXI DEXIN STEEL TUBE CO., LTD.

产 品 质 量 证 明 书
MILL CERTIFICATE

订货单位 CUSTOMER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	产品名称 PRODUCT	无缝钢管 STEEL SEAMLESS PIPES	交货状态 DELIVERY CONDITION	正火 NORMALIZE
收货单位 PURCHASER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	合同号码 CONTRACT NO.	WXDX-20070110	质保书号 CERTIFICATION NO.	WXDX07727
标准 SPECIFICATION	API5L	钢级 STEEL GRADE	GR.B PSL1	总支数(支) TOTAL PIECES	45

序号 NO.	熔炼号 HEAT NO.	批号 LOT NO.	规格 SIZE		数量 QUANTITY			化学成份 % CHEMICAL COMPOSITION (*100)											机械性能 PHYSICAL PROPERTIES (L)		
			直径 O.D. mm	壁厚 W.T. mm	支数 PIECES	米数 LENGTH M	重量 WEIGHT T	碳 C	硅 Si	锰 Mn	硫 S	磷 P	铜 Cu	镍 Ni	铬 Cr	钼 Mo	钒 V	铝 Al	抗拉强度 T.S. MPa	伸长率 E.L. δ%	屈服强度 Y.S. MPa
1	070712	6458	609.6	12.7	45	376.22	69.939	22	26	58	0.9	1.5	1.6	2	4				480/485	32.0/31.0	260/250
2																					
3																					
4																					

超声波探伤 U.T	涡流探伤 E.T	硬度（HB） HARDNESS	热处理工艺 HEAT TREATMENT	外观和尺寸 VISUAL&DIMENSIONS	显微组织 MICROSTRUCTURE	晶粒度 GRAINSIZE	压扁 FLATTENING	水压实验 HYDROSTATIC TEST	冷弯 BENDING	冲击试验 IMPACT TEST AKV(J) ≥(34)		
合格 GOOD	/	/	/	合格 GOOD	/	/	合格 GOOD	合格 GOOD	合格 GOOD	/	/	/

注释 NOTES

会验者 SUVEROR

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检验员 INSPECTOR

许可证号 LICENSE

无锡德新钢管有限公司 WUXI DEXIN STEEL TUBE CO. LTD.

Injection Well IW-1

18-inch Injection Tubing

IW-1 18-inch Tubing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: Dawn James

Casing Diameters (inches): O.D. 18.04-inch I.D. 16.62-inch
Wall Thickness (inches): 0.71-inch

Pipe No. and Install Order	FRP Series Number	Coupling Number	Length (ft)	Run Depth (ft bls)	Field Torque (Ft Lbs)	Makeup Date	Completion Time
Stainless Steel			6.80	6.80	4,000	4/10/08	15:39
Pup Joint	300000539	A.4-11	4.56	11.36	3,085	4/10/08	13:24
102	110000106	A.4.17	28.69	40.05	3,080	4/10/08	12:27
101	110000106	A.4-4	29.02	69.07	3,170	4/10/08	13:40
99	110000106	A.4-16	29.20	98.27	3,120	4/10/08	12:19
98	110000106	A.4-17	29.19	127.46	3,065	4/10/08	12:08
97	110000106	A.4-24	29.16	156.62	3,175	4/10/08	12:00
96	110000106	A.4-24	28.87	185.49	3,050	4/10/08	11:52
95	110000106	A.4-8	29.43	214.92	3,090	4/10/08	11:45
94	110000106	A.4-6	29.27	244.19	3,145	4/10/08	11:37
93	110000106	A.4-1	28.98	273.17	3,120	4/10/08	11:30
92	110000106	A.4-5	29.44	302.61	3,185	4/10/08	11:08
91	110000106	A.4-2	29.19	331.80	3,185	4/10/08	11:00
90	110000106	A.4-22	28.90	360.70	3,080	4/10/08	10:54
89	110000106	A.4-10	28.47	389.17	3,120	4/10/08	10:47
88	110000106	A.5-3	29.37	418.54	3,190	4/10/08	10:38
87	110000106	A.4-20	29.36	447.90	3,070	4/10/08	10:30
86	110000106	A.4-23	28.61	476.51	3,089	4/10/08	10:23
85	110000106	A.4-21	29.11	505.62	3,065	4/10/08	10:16
84	110000106	A.4-7	29.31	534.93	3,055	4/10/08	10:04
83	110000106	A.4-15	29.01	563.94	3,190	4/10/08	9:55

82	110000106	A.4-13	28.80	592.74	3,180	4/10/08	9:45
81	110000106	A.4-25	28.76	621.50	3,075	4/10/08	9:38
80	110000106	A.5-1	29.10	650.60	3,185	4/10/08	9:29
79	110000106	A.4-3	28.67	679.27	3,065	4/10/08	9:21
78	110000106	A.4-18	28.68	707.95	3,160	4/10/08	9:14
77	110000106	A.4-14	29.32	737.27	3,025	4/10/08	9:07
76	210000058	A.1-16	28.99	766.26	3,030	4/10/08	9:00
75	210000058	A.3-11	29.00	795.26	3,130	4/10/08	8:52
74	210000058	A.1-3	28.88	824.14	3,050	4/10/08	8:45
73	210000058	A.1-5	29.11	853.25	3,170	4/10/08	8:37
72	210000058	A.2-6	29.08	882.33	3,200	4/10/08	8:29
71	210000058	A.3-16	29.26	911.59	3,035	4/10/08	8:21
70	210000058	A.1-22	28.99	940.58	3,050	4/10/08	8:13
69	210000058	A.2-5	29.05	969.63	3,035	4/10/08	8:05
68	210000058	A.3-4	29.15	998.78	3,065	4/10/08	7:57
67	210000058	A.1-18	28.85	1,027.63	3,165	4/10/08	7:50
66	210000058	A.1-1	28.30	1,055.93	3,095	4/10/08	7:42
65	210000058	A.3-21	28.92	1,084.85	3,110	4/9/08	17:57
64	210000058	A.1-19	28.87	1,113.72	3,015	4/9/08	17:50
63	210000058	A.1-25	29.03	1,142.75	3,095	4/9/08	17:43
62	210000058	A.1-20	28.78	1,171.53	3,120	4/9/08	17:34
61	210000058	A.3-22	29.06	1,200.59	3,075	4/9/08	17:25
60	210000058	A.3-5	28.99	1,229.58	3,240	4/9/08	17:16
59	210000058	A.2-25	29.00	1,258.58	3,060	4/9/08	17:09
58	210000058	A.3-9	29.03	1,287.61	3,010	4/9/08	16:59
57	210000058	A.3-10	29.06	1,316.67	3,135	4/9/08	16:51
56	210000058	A.3-1	28.93	1,345.60	3,175	4/9/08	16:43
55	210000058	A.2-2	29.13	1,374.73	3,117	4/9/08	16:36
54	210000058	A.3-3	29.15	1,403.88	3,145	4/9/08	16:29
53	210000058	A.3-6	28.75	1,432.63	3,075	4/9/08	16:22
52	210000058	A.1.17	29.18	1,461.81	3,295	4/9/08	16:15
51	210000058	A.2-1	28.89	1,490.70	3,136	4/9/08	16:07
50	210000058	A.3-7	28.85	1,519.55	3,090	4/9/08	15:59
49	210000058	A.1-13	28.24	1,547.79	3,040	4/9/08	15:51
48	210000058	A.3-24	29.09	1,576.88	3,020	4/9/08	15:42
47	210000058	A.1-11	28.98	1,605.86	3,155	4/9/08	15:34
46	210000058	A.3-25	29.22	1,635.08	3,085	4/9/08	15:25
45	210000058	A.2-17	28.95	1,664.03	3,090	4/9/08	15:17
44	210000058	A.1-12	28.46	1,692.49	3,233	4/9/08	15:08
43	210000058	A.2-19	29.09	1,721.58	3,144	4/9/08	14:59

42	210000058	A.3-23	28.98	1,750.56	3,190	4/9/08	14:52
41	210000058	A.2-23	29.06	1,779.62	3,111	4/9/08	14:45
40	210000058	A.2-21	28.97	1,808.59	3,200	4/9/08	14;38
39	210000058	A.2-26	28.98	1,837.57	3,150	4/9/08	14:30
38	210000058	A.2-18	29.04	1,866.61	3,060	4/9/08	14:23
37	210000058	A.2-7	28.96	1,895.57	2,970	4/9/08	14:16
36	210000058	A.3-2	28.97	1,924.54	2,965	4/9/08	14:08
35	210000058	A.3-8	28.90	1,953.44	2,950	4/9/08	14:00
34	210000058	A.1-24	29.05	1,982.49	2,995	4/9/08	13:52
33	210000058	A.2-24	28.96	2,011.45	3,040	4/9/08	13:34
32	210000058	A.1-10	28.96	2,040.41	3,070	4/9/08	12:29
31	210000058	A.2-15	28.96	2,069.37	3,035	4/9/08	12:21
30	210000058	A.1-8	28.93	2,098.30	3,085	4/9/08	12:14
29	210000058	A.1-9	28.97	2,127.27	3,190	4/9/08	12:06
28	210000058	A.1-21	29.02	2,156.29	3,150	4/9/08	11:59
27	210000058	A.1-4	28.88	2,185.17	3,020	4/9/08	11:52
26	210000058	A.1-6	28.88	2,214.05	3,125	4/9/08	11:45
25	210000058	A.3-18	29.02	2,243.07	3,060	4/9/08	11:37
24	210000058	A.3-20	28.83	2,271.90	2,970	4/9/08	11:30
23	210000058	A.1-23	29.05	2,300.95	3,120	4/9/08	11:22
22	210000058	A.2-3	29.01	2,329.96	3,250	4/9/08	11:14
21	210000058	A.3-14	29.02	2,358.98	3,075	4/9/08	11:07
20	210000058	A.2-11	29.02	2,388.00	3,200	4/9/08	10:57
19	210000058	A.3-12	29.28	2,417.28	3,195	4/9/08	10:49
18	210000058	A.3-19	29.10	2,446.38	3,185	4/9/08	10:42
17	210000058	A.3-13	28.96	2,475.34	3,060	4/9/08	10:34
16	210000058	A.3-17	28.90	2,504.24	3,170	4/9/08	10:25
15	210000058	A.3-26	29.22	2,533.46	3,010	4/9/08	10:14
14	210000058	A.2-8	28.99	2,562.45	3,150	4/9/08	10:07
13	210000058	A.2-10	29.20	2,591.65	3,145	4/9/08	9:36
12	210000058	A.1-14	28.29	2,619.94	3,200	4/9/08	9:25
11	210000058	A.2-20	29.23	2,649.17	3,055	4/9/08	9:18
10	210000058	A.2-12	29.12	2,678.29	3,090	4/9/08	9:09
9	210000058	A.2-16	29.17	2,707.46	3,015	4/9/08	8:52
8	210000058	A.1-15	29.05	2,736.51	3,025	4/9/08	8:43
7	210000058	A.1-7	28.93	2,765.44	3,100	4/9/08	8:28
6	210000058	A.2-13	28.57	2,794.01	3,100	4/9/08	7:57
5	210000058	A.3-15	29.02	2,823.03	3,100	4/8/08	20:21
4	210000058	A.1-2	29.05	2,852.08	3,245	4/9/08	7:20
3	210000058	A.2-22	29.01	2,881.09	3,035	4/8/08	18:00

2	210000058	A.2-9	29.01	2,910.10	3,205	4/9/08	8:18
1	210000058	A.2-14	29.03	2,939.13	3,000	4/8/08	17:02
--	--	inner mandrel	2.32	2,941.45			

Total length (ft)	2,941.45
Floor and elevators (ft)	0.00
18-inch Casing Seat (ft bls)	**2,941.45**

NOTES:

ft - feet

Ft-Lbs - foot pounds

ft bls - feet below land surface

FUTURE PIPE INDUSTRIES

Inspection Certificate

Job No: 210000058 — January 24, 2008

Purchaser: Youngquist — SO #: 62L000530

Destination: Cape Corral, Florida

Product: 18" RB 1250 TC — Quantity: 2200 Ft

We hereby certify that the materials & fittings supplied have been tested and comply with API 15 HR spec's.

Material Certificate

Material: 18" RB 1250 TC

Test pressure: 1550 psi

Certificate Number: FPI-2007-40

Customer: Youngquist

Sales Order: 62L000530

Produced By: Future Pipe Industries, Inc. - Houston, TX

FPI Order Number: 210000058

Pipe System: Aromatic Amine heat cured epoxy

YOUNGQUIST BROTHERS, INC.
Has Received This Shop Drawing/Submittal
YBI/Section No# 02633-06-A
Date 1/25/08
Signature

Raw Material Specifications:

Resin type- Epoxy
Curing Agent- Aromatic Amine
Glass Fiber- E-Type

Non Destructive Tests:

Dimensional Exam - ASTM D 3567
Visual Standards – API 15 HR Table 2

We hereby certify that the materials described above have been tested and comply with API 15 HR.

Certificate of conformity Statement:
All items delivered under this certificate number were manufactured in accordance with API 15 HR specifications:

We hereby certify that the materials described above have been tested and comply API 15 HR.

_____

QC Supervisor
Future Pipe Industries
11811 Proctor Rd Houston TX, 77038

FUTURE PIPE INDUSTRIES

Inspection Certificate

Job No: 110000106

March 3, 2008

Purchaser: Youngquist

SO #: 62L000617

Destination: Cape Corral, Florida

Product: 18" RB T&C 1250

Quantity: 750' Ft

We hereby certify that the materials & fittings supplied have been tested and comply with API 15 HR spec's.

Material Certificate

Material: 18" RB T&C 1250

Test pressure: 1500 psi

Certificate Number: FPI-2008-01

Customer: Youngquist

Sales Order: 62L000617

Produced By: Future Pipe Industries, Inc. - Houston, TX

FPI Order Number: 110000106

Pipe System: Aromatic Amine heat cured epoxy

Raw Material Specifications:

Resin type- Epoxy
Curing Agent- Aromatic Amine
Glass Fiber- E-Type

Non Destructive Tests:

Dimensional Exam - ASTM D 3567
Visual Standards – API 15 HR Table 2

We hereby certify that the materials described above have been tested and comply with API 15 HR.

Certificate of conformity Statement:
All items delivered under this certificate number were manufactured in accordance with API 15 HR specifications:

We hereby certify that the materials described above have been tested and comply API 15 HR.

_Raymond Jones_____
QC Supervisor
Future Pipe Industries

FUTURE PIPE INDUSTRIES

Inspection Certificate

Job No: 300000539

March 3, 2008

Purchaser: Youngquist

SQ #: 62L000617

Destination: Cape Corral, Florida

Quantity: 1pc=5ft. Sub Job# 3-539
1pc=10ft. Sub Job# 3-540
1pc=15ft. Sub Job# 3-541

Product: 18" RB T&C 1250

We hereby certify that the materials & fittings supplied have been tested and comply with API 15 HR spec's.

Material Certificate

Material: 18" RB T&C 1250

Test pressure: 1500 psi

Certificate Number: FPI-2008-02

Customer: Youngquist

Sales Order: 62L000617

Produced By: Future Pipe Industries, Inc. - Houston, TX

FPI Order Number: 500000086

Pipe System: Aromatic Amine heat cured epoxy

Raw Material Specifications:

Resin type- Epoxy
Curing Agent- Aromatic Amine
Glass Fiber- E-Type

Non Destructive Tests:

Dimensional Exam - ASTM D 3567
Visual Standards – API 15 HR Table 2

We hereby certify that the materials described above have been tested and comply with API 15 HR.

Certificate of conformity Statement:
All items delivered under this certificate number were manufactured in accordance with API 15 HR specifications:

We hereby certify that the materials described above have been tested and comply API 15 HR.

_Raymond Jones_____
QC Supervisor
Future Pipe Industries
11811 Proctor Rd Houston TX, 77038

Monitor Well DZMW-1

Casing

Monitor Well DZMW-1

34-inch Casing

DZMW-1 34-inch Casing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: Casey Majewski

Casing Diameters (inches): O.D. 34.00 I.D. 33.25
Wall Thickness (inches): 0.375

Pipe No. and Install Order	Heat Number	Mill Certification	Length (ft)	Run Depth (ft bls)	Weld Date	Weld Start Time	Weld Completion Time
2	R7303773	X	38.93	38.03	5/7/08	19:52	20:11
1	R7303773	X	36.97	75.00			

Total length (ft)	75.90
Floor and elevators (ft)	-0.90
34-inch Casing Seat (ft bls)	**75.0**

NOTES:
ft - feet
ft bls - feet below land surface

YIEH CORPORATION LIMITED

MILL CERTIFICATE

COMMODITY: CARBON STEEL PIPE PER PURCHASE CONTRACT OZ110707001
COST AND FREIGHT MIAMI, FLORIDA USA

DATE:2007-12-

CUSTOMER: OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

Invoice No.SEUSFP7B01T
Certificate No.: PSCNJN7B01T
LC NUMBER.: 644054

Pipes No.	Heat Numbers	Steel Grade	(Size)			Quantity			Dimensional	TEST RESULTS												UT T
			O.D.	W.T.	lenth					CHEMICAL PROPERTIES(%)					PHYSICAL PROPERTIES			Welding properties	Hydrostatic Test Holding time:10s	Flattening	
			In	In	ft	(Pcs)	(ft)	(MT)	Inspection	C	Si	Mn	P	S	σs(Mpa)	σb(Mpa)	δ5(%)	σb	P = Psi	Test (B)	Test
1	R7303773	B	34	0.375	39	104	4056	246.137	OK	0.13	0.14	0.39	0.025	0.031	365	425	31.5	OK	505	OK	OI
2	R7303774	B	44	0.375	39	52	2028	160.967	OK	0.14	0.16	0.39	0.013	0.034	365	425	31.5	OK	505	OK	OI
3	R730376	B	54	0.375	39	51	1989	194.056	OK	0.16	0.16	0.42	0.018	0.031	355	420	32.5	OK	505	OK	OI
TOTAL						207	8073	603.160													

Remark: The CARBON STEEL PIPES are tested according to ASTM A139 GR.B
This is to certify that in accordance with the relevant specifications and contracts.
The CARBON STEEL PIPES manufactured were tested and qualified by our Quality Control Department.

Monitor Well DZMW-1

24-inch Casing

DZMW-1 24-inch Casing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: Casey Majewski

Casing Diameters (inches): O.D. 24.00 I.D. 23.25
Wall Thickness (inches): 0.375

Pipe No. and Install Order	Heat Number	Mill Certification	Length (ft)	Run Depth (ft bls)	Weld Date	Weld Start Time	Weld Completion Time
13	7-C03099	X	37.13	30.13	5/14/08	7:10	7:21
12	7-C03099	X	40.10	70.23	5/14/08	--	--
11	7-C03099	X	40.08	110.31	5/14/08	--	--
10	7-C03099	X	40.09	150.40	5/14/08	4:34	4:46
9	7-C03099	X	40.08	190.48	5/14/08	4:05	4:21
8	7-C03099	X	40.08	230.56	5/14/08	3:30	3:48
7	7-C03099	X	40.17	270.73	5/14/08	2:59	3:19
6	7-C03099	X	40.07	310.80	5/14/08	2:26	2:42
5	7-C03099	X	40.08	350.88	5/14/08	1:47	2:06
4	7-C03099	X	40.09	390.97	5/14/08	1:08	1:29
3	7-C03099	X	40.07	431.04	5/14/08	00:32	0:53
2	7-C03099	X	40.07	471.11	5/13/08	23:20	00:13
1	7-C03099	X	28.89	500.00			

Total length (ft)	507.00
Floor and elevators (ft)	-7.00
24-inch Casing Seat (ft bls)	**500.0**

NOTES:
ft - feet
ft bls - feet below land surface

YIEH CORPORATION LIMITED

NO 6, E-DA RD, YA AO TOWNSHIP
KAOHSIUNG COUNTY YANCHAO,
TAIWAN
TEL:886-7-615-1000
FAX:886-7-615-3000

MILL CERTIFICATE

CERTIFICATE NO:PSCNJN7601TC5-3
DATE OF ISSUE:10/23/2007

COMMODITY: CARBON STEEL PIPES AS PER ASTM A139 GR.B SPIRAL WELDED, NORMAL MILL BLACK LACQUER FOR RUST PROTECTION, ONE END OF THE PIPE SHALL HAVE A BEVEL OF 30 DEGREES WITH A TOLERANCE PLUS FIVE, MINUS ZERO DEGREES. THE OTHER END OF THE PIPE WILL BE PLAIN, RIGHT AND ANGLE CUT. ALL BURRS REMOVED.

CUSTOMER: OZONE INDUSTRIES CORPORATION
15465 PINE RIDGE ROAD
FORT MYERS, FL 33908

The CARBON STEEL PIPES are tested according to ASTM A139 GR.B
This is to certify that in accordance with the relevant specifications and contracts.
The CARBON STEEL PIPES manufactured were tested and qualified by our Quality Control Department.

Invoice No. SEUSFP7601TD3-3
LC NUMBER.: 64405427
TOTAL : 271 PCS / 10840 FT / 497.812 MT

Pipes No.	Heat Number	Steel	O.D.	W.T.	lenth	Quantity			Dimensional	CHEMICAL PROPERTIES(%)					PHYSICAL PROPERTIES			Welding properties	Hydrostatic Test Holding time:10s	Flattening	UT Test
		Grade	In	In	ft	根(Pcs)	英尺 (ft)	吨(MT)	Inspection	C	Si	Mn	P	S	σs(Mpa)	σb(Mpa)	δ5(%)	ob	P = Psi	Test (B)	Test (B)
1	1-9180	B	52	0.375	40	1	40	3.757	OK	0.16	0.19	0.46	0.029	0.029	330	460	30	OK	505	OK	OK
2	1-9180	B	42	0.375	40	20	800	60.555	OK	0.16	0.19	0.46	0.029	0.029	330	460	30	OK	505	OK	OK
3	1-9180	B	36	0.375	40	21	840	54.418	OK	0.16	0.19	0.46	0.029	0.029	330	460	30	OK	505	OK	OK
4	7-C03099	B	26	0.375	40	27	1080	54.254	OK	0.16	0.19	0.33	0.016	0.027	325	455	33	OK	525	OK	OK
5	7-C03099	B	28	0.375	40	22	880	41.007	OK	0.16	0.19	0.33	0.016	0.027	325	455	33	OK	525	OK	OK
6	7-C03099	B	24	0.375	40	71	2840	122.01	OK	0.16	0.19	0.33	0.016	0.027	325	455	33	OK	525	OK	OK
7	7-C03099	B	20	0.375	40	27	1080	38.643	OK	0.16	0.19	0.33	0.016	0.027	325	455	33	OK	525	OK	OK
8	1-7585	B	16	0.500	40	82	3280	123.268	OK	0.16	0.19	0.42	0.023	0.022	330	485	31.5	OK	525	OK	OK
TOTAL						271	10840	497.812													

YIEH CORPORATION LIMITED

Monitor Well DZMW-1

16-inch Casing

DZMW-1 16-inch Casing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: Majewski/Crawford

Casing Diameters (inches): O.D. 16.00 I.D. 15.00
Wall Thickness (inches): 0.500

Pipe No. and Install Order	Heat Number	Mill Certification	Length (ft)	Run Depth (ft bls)	Weld Date	Weld Start Time	Weld Completion Time
39	070536	X	34.71	27.16	6/19/08	4:45	5:05
38	070536	X	39.09	66.25	6/19/08	4:15	4:30
37	070536	X	28.37	94.62	6/19/08	3:50	4:07
36	070536	X	37.90	132.52	6/19/08	3:22	0:00
35	070536	X	35.71	168.23	6/19/08	3:00	3:12
34	070536	X	33.82	202.05	6/19/08	2:30	2:45
33	070536	X	33.06	235.11	6/19/08	2:06	2:17
32	070536	X	32.89	268.00	6/19/08	1:38	1:58
31	070536	X	33.93	301.93	6/19/08	1:12	1:27
30	070536	X	34.79	336.72	6/19/08	0:40	0:58
29	070536	X	35.43	372.15	6/19/08	0:15	0:30
28	070423	X	35.06	407.21	6/18/08	23:48	0:05
27	070536	X	28.17	435.38	6/18/08	22:55	23:12
26	070536	X	35.62	471.00	6/18/08	22:27	22:45
25	070536	X	35.51	506.51	6/18/08	22:07	22:17
24	070536	X	27.57	534.08	6/18/08	21:41	22:00
23	070536	X	33.59	567.67	6/18/08	21:05	21:25
22	070423	X	36.44	604.11	6/18/08	20:36	20:51
21	070536	X	32.54	636.65	6/18/08	20:05	20:20
20	070536	X	36.69	673.34	6/18/08	19:30	19:50
19	070423	X	35.15	708.49	6/18/08	18:36	19:00
18	070536	X	33.34	741.83	6/18/08	18:07	18:29
17	070536	X	34.33	776.16	6/18/08	17:41	18:01
16	070536	X	36.96	813.12	6/18/08	17:08	17:26

15	070536	X	34.92	848.04	6/18/08	16:30	16:52
14	070536	X	34.85	882.89	6/18/08	16:05	16:25
13	070423	X	37.00	919.89	6/18/08	15:34	15:54
12	070423	X	35.62	955.51	6/18/08	15:06	15:23
11	070423	X	38.28	993.79	6/18/08	14:37	15:57
10	070423	X	35.40	1029.19	6/18/08	14:00	14:28
9	070423	X	35.11	1064.30	6/18/08	12:58	13:17
8	070423	X	37.23	1101.53	6/18/08	12:12	12:35
7	070423	X	34.95	1136.48	6/18/08	11:33	12:03
6	070423	X	33.10	1169.58	6/18/08	11:03	11:25
5	070423	X	35.53	1205.11	6/18/08	10:32	10:51
4	070536	X	35.68	1240.79	6/18/08	10:00	10:15
3	070536	X	34.86	1275.65	6/18/08	9:28	9:50
2	070423	X	34.86	1310.51	6/18/08	8:45	9:05
1	074023	X	14.49	1325.00			

Total length (ft)	1,332.55
Floor and elevators (ft)	-7.55
16-inch Casing Seat (ft bls)	**1,325.0**

NOTES:

ft - feet

ft bls - feet below land surface

YOUNGQUIST BROTHERS, INC.
Has Received This Shop Drawing/Submittal
For/Section No: 02633-022-A
Date: Aug 31, 2007
Signature:

江苏诚德钢管股份有限公司
JIANGSU CHENGDE STEEL TUBE SHARE CO., LTD

产品质量证明书
INSPECTION CERTIFICATE

江苏省江都市诚德路1号
1 CHENGDE ROAD,JIANGDU CITY JIANGSU PROVINCE
TEL: 0514-6529011, 6529012 FAX: 0514-6520240

订货单位: OZONE INDUSTRIES/YOUNGQUIST BROTHERS
PURCHARSER:

合同号 Order No: WXDX-20070110
签发日期: 2007年5月25日 Date Of Issue:
编号: 48692 No:
Page:1/1

产品名称 Product	无缝钢管 Seamless steel tubes			钢号(级) Steel Gr.	GR.B PSL 1	标准 Specification	API5L-2000	制造方法 Making Method	热轧 Hot Rolled
总捆数 Total		总支数 Total Pieces	20	总重量 (Short Ton) Total Weight	27.730	交货状态 Delivery	正火 Normalize	热处理温度 Heat Temp	

力学性能 Tensile Test

序号 No.	规格 Size (IN)	长度 Length (FT)	调度 卡号 Production No.	冶炼号 Heat No.	批号 Lot No.	捆数 Bundles	支数 Pieces	重量 Weight (Short Ton)	屈服 Y.S MPa	抗拉 T.S MPa	伸长率 E.L %	冲击试验 (AKV) Impact Test(J) 常温	℃低温	压扁 Flattening	扩口 Expansion	冷弯 Bending	环圈拉伸 Ring Tensile Test
1	16" *0.5"	680.58		070536	4896		20	27.730	315 325	440 445	31.0 30.5			合格 Good		合格 Good	

金相 Metallography

序号 No.	显微组织 Microstructure	晶粒度 GrainSize (级)	总脱碳层 (mm) 外壁 OutSide	总脱碳层 (mm) 内壁 InSide	魏氏组织 Weistructure (级)	带状组织 Zonalstructure (级)	非金属夹杂物(级) Non-mepallic Inclusion A粗	A细	B粗	B细	C粗	C细	D粗	D细	低倍检验 Macro-structure	硬度 Hard-ness	外观& 尺寸 Visual& Dimension	涡流探伤 Eddy	超声波探伤 U.T	静水压试验 Hydrostatic Test
																	合格 Good		合格 Good	合格 Good

熔炼成分 % Chemical Composition

	C	Mn	Si	S	P	Cr	Ni	Cu	Mo	Al	V	Ti	Nb	W	As	Sn	Pb	B	Sb	Bi
1	0.22	0.56	0.15	0.01	0.009	0.05	0.03	0.03												
复验																				

备注 Note: 许可证号 License 5L-0369

签发人: 周维青 Signed by:

审核人: Previewed by:

质量负责人: Chief of Previewed by:

盖章: Seal:

江苏诚德钢管股份有限公司 质检专用章

江苏诚德钢管股份有限公司
JIANGSU CHENGDE STEEL TUBE SHARE CO., LTD

产品质量证明书
INSPECTION CERTIFICATE

江苏省江都市诚德路1号
1 CHENGDE ROAD,JIANGDU CITY JIANGSU PROVINCE
TEL: 0514-6529011, 6529012 FAX: 0514-6520240

订货单位: PURCHARSER: OZONE INDUSTRIES/YOUNGQUIST BROTHERS

合同号 Order No: WXDX-20070110 签发日期: Date Of Issue: 2007年5月15日 编号: No: 48675 Page:1/1

产品名称 Product	无缝钢管 Seamless steel tubes			钢号(级) Steel Gr.	GR.B PSL 1	标准 Specification	API5L-2000	制造方法 Making Method	热轧 Hot Rolled
总捆数 Total		总支数 Total Pieces	30	总重量 (Short Ton) Total Weight	43.654	交货状态 Delivery	正火 Normalize	热处理温度 Heat Temp	

力学性能 Tensile Test

序号 No.	规格 Size (IN)	长度 Length (FT)	调度 卡号 Production No.	冷炼号 Heat No.	批号 Lot No.	捆数 Bundles	支数 Pieces	重量 Weight (Short Ton)	屈服 Y.S MPa	抗拉 T.S MPa	伸长率 E.L %	冲击试验 (AKV) Impact Test(J) 常温	冲击试验 (AKV) Impact Test(J) ℃低温	压扁 Flattening	扩口 Expansion	冷弯 Bending	环圈拉伸 Ring Tensile Test
1	16″*0.5″	1069.32		070423	4836		30	39.602	320 325	435 445	31.5 30.5			合格 Good		合格 Good	

金相 Metallography

序号 No.	显微组织 Microstructure	晶粒度 GrainSize (级)	总脱碳层 (mm) 外壁 OutSide	总脱碳层 (mm) 内壁 InSide	魏氏组织 Weistructure (级)	带状组织 Zonalstructure (级)	非金属夹杂物 (级) Non-mepallic Inclusion A粗	A细	B粗	B细	C粗	C细	D粗	D细	低倍检验 Macro-structure	硬度 Hard-ness	外观&尺寸 Visual& Dimension	涡流探伤 Eddy	超声波探伤 U.T	静水压试验 Hydrostatic Test
																	合格 Good		合格 Good	合格 Good

熔炼成分 % Chemical Composition

	C	Mn	Si	S	P	Cr	Ni	Cu	Mo	Al	V	Ti	Nb	W	As	Sn	Pb	B	Sb	Bi	
1	0.21	0.56	0.17	0.01	0.009	0.05	0.03	0.02													
复验																					

备注 Note: 许可证号 License 5L-0369

签发人: 周维青 Signed by:

审核人: Previewed by:

质量负责人: Chief of Previewed by:

盖章: Seal:

江苏诚德钢管股份有限公司 质检专用章

沧州乾成钢管有限公司

CANGZHOU QIANCHENG STEEL PIPE CO.,LTD

产品质量证明书

MILL CERTIFICATE

ORIGINAL

河北省沧州市盐山城南工业区

TEL：86-317-6322101 FAX：86-317-6320919

DATE:2008 02 29

订货单位 CUSTOMER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	产品名称 PRODUCT	无缝钢管 CARBON STEEL PIPE	交货状态 DELIVERY CONDITION	正火 NORMALIZE
收货单位 PURCHASER	OZONE INDUSTRIES CORPORATION/YOUNGQUIST BROTHERS	合同号码 CONTRACT NO.	OZ110707003	质保书号 CERTIFICATION	1306CQ801022
标准 SPECIFICATION	API 5L -2000	钢级 STEEL GRADE	GR.B PSLI	总支数（支） TOTAL PIECES	161

序号 NO.	炉号 HEAT NO.	批号 LOT NO.	规格 SIZE		数量 QUANTITY			化学成分% CHEMICAL COMPOSITION(十100)								机械性能 PHYSICAL PROPERTIES		
			直径 OD IN	壁厚 WT IN	支数 PIECES	长度 LENGTH FT	重量 WEIGHT MT	碳 C	锰 Mn	硫 S	磷 P	镍 Ni	铬 Cr	钒 V	铝 Al	抗拉强度 T.S. Mpa	伸长率 E.L. %	屈服强度 Y.S. Mpa
1	174625	80	24"	0.5"	31	775	44.16	23	54	1.2	1.8	2.4	2.5			430	31	335
2	174265	80	24"	0.5"	17	446.25	25.42	23	54	1.2	1.8	2.4	2.5			430	31	335
3	171526	60	18"	0.5"	14	420	17.81	22	54	1.2	1.2	2.4	3.0			435	35	340
4	074023	80	16"	0.5"	99	3170	178.86	23	55	1.2	1.4	2.5	2.5			430	31	335
Total					161	4841.25	266.25											

超声波探伤 U.T	涡轮探伤 E.T	硬度 HARDNESS	热处理工艺 H.T	表面和尺寸 DIMENSIONAL	显微组织 MICROSTRUCTURE	晶粒度 GRAIN SIZE	压扁 FLATTENING	水压试验 HYDRO TEST	弯曲试验 BENDING	冲击试验 IMPACT TEST AK
合格 GOOD	/	/	/	合格 GOOD	/	/	合格 GOOD	合格 GOOD	合格 GOOD	合格 GOOD

注释 NOTE

兹证明本表所列产品，均依标准规定制造。取样，试验和检验，并符合标准及合同要求

We here certify that material ,herein described has been manufactured, sampled, tested and inspected in accordance with the requirements of above specifications and purchase order, and the requirements

检验员: INSPECTOR: 张德芳

许可证号: LICENCE: API5L-0666

Monitor Well DZMW-1

6.625-inch Casing

DZMW-1 6.625-inch Casing Log

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Observer: Casey Majewski

Casing Diameters (inches): O.D. 6.625 I.D. 5.465
Wall Thickness (inches): 0.58

Pipe No. and Install Order	FRP Series Number	Coupling Number	Length (ft)	Run Depth (ft bls)	Makeup Date	Field Torque (Ft Lbs)	Completion Time
Stainless Steel			26.84	13.06	6/30/2008	1600	14:53
54	110000083		29.42	42.48	6/30/2008	765	14:19
53	110000083		29.42	71.90	6/30/2008	745	14:15
52	110000083		29.43	101.33	6/30/2008	765	14:09
51	110000083		29.42	130.75	6/30/2008	740	14:05
50	110000083		29.42	160.17	6/30/2008	745	14:02
49	110000083		29.42	189.59	6/30/2008	750	13:59
48	110000083		29.41	219.00	6/30/2008	730	13:55
47	110000083		29.44	248.44	6/30/2008	740	13:49
46	110000083		29.44	277.88	6/30/2008	720	13:45
45	110000083		29.42	307.30	6/30/2008	740	13:40
44	110000083		29.43	336.73	6/30/2008	710	13:37
43	110000083		29.43	366.16	6/30/2008	760	13:33
42	110000083		29.42	395.58	6/30/2008	750	13:29
41	110000083		29.43	425.01	6/30/2008	750	12:49
40	110000083		29.43	454.44	6/30/2008	760	12:42
39	110000083		29.42	483.86	6/30/2008	785	12:37
38	110000083		29.43	513.29	6/30/2008	820	12:32
37	110000063		29.45	542.74	6/30/2008	770	12:28
36	110000063		29.45	572.19	6/30/2008	820	12:23
35	110000063		29.45	601.64	6/30/2008	780	12:17
34	110000063		29.44	631.08	6/30/2008	775	11:55
33	110000083		29.43	660.51	6/30/2008	750	11:51
32	110000083		29.41	689.92	6/30/2008	750	11:43

31	110000063		29.45	719.37	6/30/2008	795	11:39
30	110000063		29.45	748.82	6/30/2008	770	11:30
29	110000063		29.45	778.27	6/30/2008	750	11:27
28	110000063		29.45	807.72	6/30/2008	765	11:19
27	110000063		29.44	837.16	6/30/2008	760	11:14
26	110000063		29.44	866.60	6/30/2008	760	11:10
25	110000083		29.43	896.03	6/30/2008	725	11:03
24	110000083		29.43	925.46	6/30/2008	740	10:58
23	110000083		29.44	954.90	6/30/2008	730	10:52
22	110000083		29.42	984.32	6/30/2008	750	10:47
21	110000083		29.43	1,013.75	6/30/2008	730	10:42
20	110000083		29.43	1,043.18	6/30/2008	730	10:33
19	110000083		29.45	1,072.63	6/30/2008	750	10:29
18	110000083		29.42	1,102.05	6/30/2008	720	10:25
17	110000083		29.43	1,131.48	6/30/2008	730	10:20
16	110000083		29.42	1,160.90	6/30/2008	710	10:15
15	110000083		29.42	1,190.32	6/30/2008	740	10:11
14	110000083		29.44	1,219.76	6/30/2008	720	10:06
13	110000083		29.43	1,249.19	6/30/2008	710	10:00
12	110000083		29.43	1,278.62	6/30/2008	730	9:56
11	110000083		29.42	1,308.04	6/30/2008	730	9:50
10	110000083		29.42	1,337.46	6/30/2008	715	9:46
9	110000083		29.39	1,366.85	6/30/2008	700	9:41
8	110000083		29.40	1,396.25	6/30/2008	720	9:37
7	110000083		29.40	1,425.65	6/30/2008	700	9:32
6	110000083		29.41	1,455.06	6/30/2008	710	9:28
5	110000083		29.43	1,484.49	6/30/2008	710	9:21
4	110000083		29.42	1,513.91	6/30/2008	700	9:17
3	110000083		29.42	1,543.33	6/30/2008	730	9:10
2	110000083		29.43	1,572.76	6/30/2008	700	9:05
1	110000083		29.43	1,602.19	6/30/2008	800	8:55
California Packer			7.78	1,609.97			

Total length (ft)	1,623.75
Floor and elevators (ft)	-13.78
6.625-inch Casing Seat (ft bls)	**1,609.97**

NOTES:

ft - feet

ft bls - feet below land surface

Ft Lbs - foot pounds

SUL
3

SUBMITTAL REVIEW

2503 Del Prado Blvd. S.
Suite 430
Cape Coral, Florida 33904
(239) 573-5959

Project:	WW-4C.1 Southwest Class I Deep Injection Well	**MWHA File Number:**	**3220269.19.9.1.1**
Owner:	City of Cape Coral		
Submittal No.:	SUL-YOUBRO-2633-028-B--0		
Description:	6.625 FRP Mill Certificate		
Spec. Section:	02633		
Submitting Company:	Youngquist Brothers, Inc.		
Reviewer:	John Largey		

MWH

NO EXCEPTIONS TAKEN	X	AMEND – RESUBMIT	
MAKE CORRECTIONS NOTED		REJECTED – RESUBMIT	

REVIEWED BY: J. LARGEY	DATE: 10/20/08
RECOMMENDED BY:	DATE:

CORRECTIONS OR COMMENTS MADE ON CONTRACTORS SHOP DRAWINGS DURING THIS REVIEW DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS. THIS SHOP DRAWING HAS BEEN REVIEWED FOR CONFROMANCE WITH DESIGN CONCEPT AND GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS ONLY. CONTRACTOR IS RESPONSIBLE FOR CONFIRMING AND CORRELATING ALL QUANTITIES AND DIMENSIONS, FABRICATION PROCESSES AND TECHNIQUES, COORDINATING WORK WITH OTHER TRADES, AND SATISFACTORY AND SAFE PERFORMANCE OF THE WORK.

Comments:

MWH CONSTRUCTORS

Submittal Transmittal

Detailed, Grouped by Each Number

CC WW - 4C.1 SW Class I DIW 20322 Cape Coral IProject # 7012129 **MWH Constructors**
Tel: Fax:

Date: 9/26/2008 **Reference Number: 0097**

Transmitted To:	John Largey MWH Americas, Inc. 8944 490 Sawgrass Corporate Pkwy. Suite 300 Sunrise, FL 33325 Tel: (954) 846-0401	**Transmitted By:**	Brooke Allen MWH Constructors 1200 Kismet Parkway West CAP-5 Cape Coral, FL 33993 Tel: 239-772-1764

Qty	Submittal Package No	Description	Due Date	Package Action
7	SUL-YOUBRO-02633-0033-A - - 0	6 5/8" FRP RB 2500	10/24/2008	

Transmitted For	Delivered Via	Tracking Number
Review	Federal Express	19.09

Items	Qty	Description	Notes	Item Action
001	7	6 5/8" FRP RB2500		

Cc:	Company Name	Contact Name	Copies	Notes
	MWH Americas, Inc. 8944	Kelly Bremer	1	

Remarks

Dear John:

Please find the attached submittal for your review, approval and return.

Thank you,
Brooke

Brooke Allen
Signature

9/26/08
Signed Date

Submittal Data
from
Youngquist Brothers, Inc.

15465 Pine Ridge Rd.
Ft. Myers, FL. 33908
Tel.: 239-489-4444 Fax: 239-489-4545

Project

Cape Coral SW WRF Class 1 Injection Well

I have reviewed this submittal for general conformance with the design concepts and contract documents. Generally no conflict with materials or dimensions will arise from the approval of this shop drawing submittal.

Date: September 25, 2008 Number of Copies: 8

Submittal Number: 02633-028-B

Specification Section Number: 02633

Item Submitted: 6-5/8" FRP RB2500

New Submittal: _____ Resubmitted: X

Certification Statements: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar date and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.

Youngquist Brothers, Inc.

Representative:

MWH Constructors
MONTGOMERY WATSON HARZA

Wu Fei

CERTIFICATION STATEMENT

By this submittal, we hereby represent that we have determined, verified, reviewed and/or approved applicable field measurements, field construction criteria, materials, products, dimensions, catalog numbers and similar data and have checked and coordinated relevant information for conformance with other applicable approved shop drawings and Contract Requirements.

Project Name & Number: WW4C.1 7012129

Submittal Number: SUL-YOUGRO-02633-00033-A

Specification Section: 2633

Submitted by: _____ Date: 9-26-08

- ☐ Approved
- ☐ Approved with changes
- ☐ Rejected
- ☐ Revise & Resubmit
- ☐ Not Reviewed

By: _____

Firm: _____

Date: _____

FUTURE PIPE INDUSTRIES

Inspection Certificate

Job No: 110000063 & 110000083 June 30, 2008

Purchaser: Youngquist SO #: 62L000530

Destination: Cape Corral, Florida

Product: 6 5/8" RB 2500 Quantity: 1800' Ft

We hereby certify that the materials & fittings supplied have been tested and comply with API 15 HR spec's.

Material Certificate

Material: 6 5/8" RB 2500

Test pressure: 2850psi

Certificate Number: FPI-2008-07

Customer: Youngquist

Sales Order: 62L000530

Produced By: Future Pipe Industries, Inc. - Houston, TX

FPI Order Number: 110000063 & 110000083

Pipe System: Aromatic Amine heat cured epoxy

Raw Material Specifications:

Resin type- Epoxy
Curing Agent- Aromatic Amine
Glass Fiber- E-Type

Non Destructive Tests:

Dimensional Exam - ASTM D 3567
Visual Standards – API 15 HR Table 2

We hereby certify that the materials described above have been tested and comply with API 15 HR.

Certificate of conformity Statement:
All items delivered under this certificate number were manufactured in accordance with API 15 HR specifications:

We hereby certify that the materials described above have been tested and comply API 15 HR.

Raymond Jones
QC Supervisor
Future Pipe Industries
11811 Proctor Rd Houston TX, 77038

Appendix M

Cement Reports

Injection Well IW-1

54-inch Casing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL IW-1

Conductor Casing

Casing Diameter: 54-inches
Casing Depth: 75 feet below pad level
Bit Size: Nominal 60-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 1
Cement Blend: Neat

Cement Density: Neat – 15.6 lb./gal

Theoretical Fill From Calculations: 50 cubic feet
Volume Pumped: Neat – 103 cubic feet

Total – 103 cubic feet
Percent Difference: 51.5%

The 54-inch casing was cemented in one stage. The cement was circulated to surface and was visually confirmed. The difference in the theoretical and actual volume pumped is due to small barrel counter inconsistency, mathematical inaccuracy and small irregularities in the borehole wall.

IW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 54-inch steel casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
10/12/07	Base Plug		Neat	1.18	103	577.8	80 to 0	80	0.0		80 to 0	80.00	100%	0.0%	577.8	RAW

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 54-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.37	(psi)	**Date:**	10/12/2007
Pressure Increase With Theoretical Lift:	29.6	(psi)	**Stage Number:**	Base Plug
Theoretical Collapse Pressure:	19	(psi)	**Observer:**	RAW
Initial Casing Pressure:	0	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
20:00	0				0	Pre-flush 3 bbls of water
20:17	17				0	Pump neat
20:20	20	5.2	15.7	10	0	
20:22	22	5.3	15.6	25	2	
20:26	26	5	15.6	50	11	
20:30	30	4.2	15.6	55	17	
20:40	40			103	24	Stop pumping
20:41	41					Chase with 6.3 bbls of water
20:42	42					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

Injection Well IW-1

44-inch Casing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL IW-1

Surface Casing

Casing Diameter: 44-inches
Casing Depth: 475 feet below pad level
Bit Size: Nominal 52-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 1
Cement Blend: Neat
6% Bentonite
Cement Density: Neat – 15.6 lb./gal
6% Bentonite – 13.6 lb./gal
Theoretical Fill From Caliper Log: 2,205 cubic feet
Volume Pumped: Neat – 1,010 cubic feet
6% Bentonite – 1,100 cubic feet
Total – 2,110 cubic feet
Percent Difference: 4.3%

The 44-inch casing was cemented in one stage. The cement was circulated to surface and was visually confirmed. The difference in the theoretical and actual volume pumped is due to caliper tool's limitations and small irregularities in the borehole wall.

IW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 44-inch steel casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
10/21/08	1A		Neat	1.18	180	1,009.8	481 to 255	226					0%	0.0%	1,009.8	MS
10/21/08	1B		6% Gel	1.73	196	1,099.6	255 to surface	255	0.5		481 to 0.5	480.5	188%	0.0%	2,109.4	MS

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 44-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37/0.27 (psi)
Pressure Increase With Theoretical Lift: 152.5 (psi)
Theoretical Collapse Pressure: 33 (psi)
Initial Casing Pressure: 0 (psi)

Date: 10/21/2007
Stage Number: 1
Observer: GS

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
21:30	0				0	Pre-flush 50 bbls of water
21:45	15	4.0	13.6	33	8	Pump neat
22:00	30	5.0	13.8	97	6	
22:05	35	5.0	13.6	125	17	
22:12	42	5.0	13.7	160	30	
22:19	49	5.0	15.6	196	40	Switch to 6% gel, 196 bbls of neat pumped
22:28	58	5.0	15.7	246	60	
22:36	66	5.2	15.6	286	80	
22:49	79	5.2	15.6	344	90	
22:53	83	5.2	15.6	376	100	Stop pumping
22:55	85					Chase 5 bbls of water
						Pull stands

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

Injection Well IW-1

36-inch Casing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL IW-1

Intermediate Casing

Casing Diameter: 36-inches
Casing Depth: 1,680 feet below pad level
Bit Size: Nominal 42.5-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 10
Cement Blend: Neat
6% Bentonite
Cement Density: Neat – 15.6 lb./gal
6% Bentonite – 13.6 lb./gal
Theoretical Fill From Caliper Log: 8,561 cubic feet
Volume Pumped: Neat – 2,087 cubic feet
6% Bentonite – 7,489 cubic feet
Total – 9,576 cubic feet
Percent Difference: 10.6%

The 36-inch casing was cemented in ten stages. After each stage a temperature log was run downhole and the cement physically tagged to determine the actual fill. On the final stage the cement was circulated to surface and was visually confirmed. The difference in the theoretical and actual volume pumped is due to caliper tool's limitations and small irregularities in the borehole wall.

IW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 36-inch steel casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
11/19/07	1A		6% Gel	1.73	150	841.5	1,420 to 1,180	240					0%	0.0%	841.5	ABF
11/19/07	1B	1	Neat	1.18	185	1,037.9	1,680 to 1,420	260	1,464.0	869.6	1,680 to 1,464	216	83%	470.0%	1,879.4	ABF
11/21/07	2	2	Neat	1.18	187	1,049.1	1,464 to 1,172	292	1,196	931.3	1,464 to 1,196	268	92%	498.0%	2,928.4	RAW
11/21/07	3	3	6% Gel	1.73	220	1,234.2	1,196 to 912	284	982	936.9	1,196 to 982	214	75%	425.9%	4,162.6	MK
11/23/07	4	4	6% Gel	1.73	10	56.1	982 to 970	12	962	84.2	982 to 962	20	167%	841.5%	4,218.7	RAW
11/23/07	5	5	6% Gel	1.73	200	1122.0	962 to 718	244	789	718.1	962 to 789	173	71%	359.0%	5,340.7	RAW
11/24/07	6	6	6% Gel	1.73	145	813.5	789 to 680	109	692	600.3	789 to 692	97	89%	414.0%	6,154.2	MK
11/24/07	7	7	6% Gel	1.73	195	1094.0	692 to 515	177	521	1060.3	692 to 521	171	97%	543.7%	7,248.1	RAW
11/24/07	8	8	6% Gel	1.73	143	802.2	521 to 330	191	449	398.3	521 to 449	72	38%	278.5%	8,050.4	MK
11/25/07	9	9	6% Gel	1.73	220	1234.2	449 to 80	369	80	1234.2	449 to 80	369	100%	561.0%	9,284.6	RAW
11/25/08	10	None	6% Gel	1.73	52	291.7	80 to 0	80	0	291.7	80 to 0	80	100%	561.0%	9,576.3	RAW

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37/0.27 (psi)
Pressure Increase With Theoretical Lift: 161.0 (psi)
Theoretical Collapse Pressure: 58 (psi)
Initial Casing Pressure: 0 (psi)

Date: 11/19/2007
Stage Number: 1
Observer: ABF

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
14:33	0				0	Pre-flush 3 bbls of water
14:54	21	7.0	13.6	0	0	Pump 6% gel
15:01	28	7.0	13.7	50	0	
15:07	34	7.1	13.6	95	0	
15:14	41	7.1	13.7	144	12	Switch to neat, 144 bbls 6% gel pumped
15:19	46	6.9	15.7	225	17	
15:26	53	7.1	15.6	277	26	
15:30	57	7.1	15.6	277	38	
15:41	68	7.1	15.7	335	42	Stop pumping
15:42	69					Chase 9 bbls of water
						Pulled tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37 (psi)
Pressure Increase With Theoretical Lift: 69.2 (psi)
Theoretical Collapse Pressure: 58 (psi)
Initial Casing Pressure: 90 (psi)

Date: 11/21/2007
Stage Number: 2
Observer: RAW

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
9:50	0					Pre-flush 3 bbls of water
10:03	13				90	Pump neat
10:07	17	2.7	15.6	9.7		
10:13	23	2.8	15.6	25		
10:15	25		15.2	31		
10:21	31	2.7	15.8	51		
10:32	42	2.8	15.6	80	95	
10:41	51	2.7	15.6	107		
10:44	54	2.5	15.6	125	100	
10:55	65	1.8	15.6	146	102	
11:07	77	2.4	15.6	162	100	
11:15	85	2.4	15.6	182	102	
11:17	87			187		Stop pumping
11:18	88					Chase 7 bbls of water
11:19	89					Pull 7 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.27	(psi)	**Date:**	11/21/2007
Pressure Increase With Theoretical Lift:	76.7	(psi)	**Stage Number:**	3
Theoretical Collapse Pressure:	58	(psi)	**Observer:**	MK
Initial Casing Pressure:	85	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
19:00	0					Pre-flush water
19:05	5	2.5	13.6	2.5	85	Pump 6% gel
19:10	10	2.6	13.6	50	85	
19:15	15	3.5	13.6	75	85	
19:20	20	3.7	13.6	100	85	
19:25	25	3.7	13.6	116	85	
19:35	35	3.7	13.6	150	85	
19:50	50	4.0	13.6	192	85	
20:00	60	4.0	13.6	220	85	Stop pumping
20:05	65					Chase water
20:06	66					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.27	(psi)	**Date:**	11/23/2007
Pressure Increase With Theoretical Lift:	3.2	(psi)	**Stage Number:**	4
Theoretical Collapse Pressure:	58	(psi)	**Observer:**	RAW
Initial Casing Pressure:	70	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
10:10	0					Pre-flush 3 bbls of water
10:38	28		13.6	10		Pump 6% gel
10:39						Chase 3 bbls of water
10:41						Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.27	(psi)	**Date:**	11/23/2007
Pressure Increase With Theoretical Lift:	54.0	(psi)	**Stage Number:**	5
Theoretical Collapse Pressure:	58	(psi)	**Observer:**	RAW
Initial Casing Pressure:	75	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
18:00	0					Pre-flush 3 bbls of water
18:20	20	4.1	13.7	24	75	Pump 6% gel
18:24	24		14.2	40	75	
18:27	27	4.7	13.6	51	75	
18:40	40	4.7	13.7	75	75	
18:50	50	4.6	13.6	151	75	
18:55	55	4.5	13.6	175	75	
19:00	60	4.5	13.6	200	75	Stop pumping
19:05	65					Chase 3 bbls of water
19:06	66					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.27	(psi)	**Date:**	11/24/2007
Pressure Increase With Theoretical Lift:	39.2	(psi)	**Stage Number:**	6
Theoretical Collapse Pressure:	58	(psi)	**Observer:**	MK
Initial Casing Pressure:	75	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
3:05	0					Pre-flush 3 bbls of water
3:15	10		13.8	33.7	75	Pump 6% gel
3:20	15	5.1	13.6	51	75	
3:28	23	3.7	13.9	75	75	
3:35	30	3.8	13.6	100	75	
3:40	35			121	75	
3:47	42	4.5	13.6	145	75	Stop pumping
3:51	46					Chase 3 bbls of water
						Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.27	(psi)	**Date:**	11/24/2007
Pressure Increase With Theoretical Lift:	47.8	(psi)	**Stage Number:**	7
Theoretical Collapse Pressure:	58	(psi)	**Observer:**	RAW
Initial Casing Pressure:	75	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
12:40	0					Pre-flush 4 bbls of water
12:45	5				75	Pump 6% gel
12:49	9	4.9	13.6	46	75	
13:00	20	4.9	13.6	71	75	
13:10	30	5.0	13.7	122	80	
13:16	36	5.0	13.6	151	80	
13:26	46	4.9	13.6	184	78	
13:28	48	4.9	13.6	195	78	Stop pumping
13:28						Chase 1 bbl of water
						Pull 9 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.27	(psi)	**Date:**	11/24/2007
Pressure Increase With Theoretical Lift:	51.6	(psi)	**Stage Number:**	8
Theoretical Collapse Pressure:	58	(psi)	**Observer:**	MK
Initial Casing Pressure:	75	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
22:25	0					Pre-flush 3 bbls of water
22:30	5	5.7	13.7	22	75	Pump 6% gel
22:33	8	5.7	13.7	31	75	
22:42	17	5.4	13.6	75	75	
22:47	22	5.4	13.7	100	75	
22:50	25	5.4	13.7	121	75	
22:53	28			143	75	Stop pumping
22:54	29					Chase 3 bbls of water
						Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.27	(psi)	**Date:**	11/25/2008
Pressure Increase With Theoretical Lift:	99.6	(psi)	**Stage Number:**	9
Theoretical Collapse Pressure:	58	(psi)	**Observer:**	RAW
Initial Casing Pressure:	120	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
8:45	0					Pre-flush 5 bbls of water
8:53	8		13.6		120	Pump 6% gel
9:02	17	5.7	13.6	50	120	
9:07	22	5.6	13.6	76	120	
9:14	29	5.6	13.6	122	120	
9:20	35	5.4	13.6	154	118	
9:27	42	5.7	13.6	192	120	
9:32	47		13.6	220	120	Stop pumping
						Chase 1 bbl of water
						Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout 36-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.27	(psi)	**Date:**	11/25/2007
Pressure Increase With Theoretical Lift:	21.6	(psi)	**Stage Number:**	10
Theoretical Collapse Pressure:	58	(psi)	**Observer:**	MK
Initial Casing Pressure:	30	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
18:23	0					Pre-flush 6 bbls of water
18:30	7		13.6		30	Pump 6% gel
18:33	10	6.6	13.6	15	30	
18:38	15	6.6	13.6	44	30	
18:40	17		13.6	52	30	Stop pumping
						Chase 0.5 bbl of water
						Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

Injection Well IW-1

24-inch casing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL IW-1

Inner Casing

Casing Diameter: 24-inches
Casing Depth: 2,951 feet below pad level
Bit Size: Nominal 34.5-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 16
Cement Blend: Neat with Calcium Chloride
12% Bentonite
Cement Density: Neat with Calcium Chloride – 15.6 lb./gal
12% Bentonite – 12.7 lb./gal
Theoretical Fill From Caliper Log: 11,074 cubic feet
Volume Pumped: Neat with Calcium Chloride – 1,391 cubic feet
12% Bentonite – 11,887 cubic feet
Total – 13,278 cubic feet
Percent Difference: 16.6%

The 24-inch casing was cemented in sixteen stages. After each stage a temperature log was run downhole and the cement physically tagged to determine the actual fill. On the final stage the cement was circulated to surface and was visually confirmed. The difference in the theoretical and actual volume pumped is due to caliper tool's limitations and small irregularities in the borehole wall.

IW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 24-inch steel casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
3/28/08	Plug	NA	Neat with calcium chloride	1.18	9	50.5	2,951.5 to 2,925	26.5	2,937.0	8.8	2951.5 to 2937	14.5	55%	97.8%	50.5	DEJ
3/29/08	1	1	Neat with calcium chloride	1.18	12	67.3	2,937 to 2,917	20	2,917.0	10.0	2,937 to 2,917	20.0	100%	83.3%	117.8	DEJ
3/29/08	2	2	Neat with calcium chloride	1.18	129	723.7	2,917 to 2,720	197	2,751.1	129.0	2,919 to 2,751.11	167.9	85%	100.0%	841.5	DK
3/29/08	3	3	Neat and 12% Gel	1.18/2.2	120	673.2	2,751.5 to 2,575	176.5	2,603	100.0	2,751.1 to 2,602.5	148.6	84%	83.3%	1,514.7	DEJ
3/30/08	4	4	12% Gel	2.2	179	1,004.2	2,602.5 to 2,335	267.5	2,393	144.0	2,602.5 to 2,393.2	209.3	78%	80.4%	2,518.9	DK
3/30/08	5	5	12% Gel	2.2	179	1,004.2	2,393.2 to 2,118	275.2	2,186	133.0	2,393.2 to 2,186.28	206.9	75%	74.3%	3,523.1	DK
3/31/08	6	6	12% Gel	2.2	119	667.6	2,186 to 2,025	161	2,137	32.0	2,186.28 to 2,137	49.3	31%	26.9%	4,190.7	DEJ
3/31/08	7	7	12% Gel	2.2	60	336.6	2,137.1 to 2,063	74	2,102	31.0	2,137 to 2,102	35.0	47%	51.7%	4,527.3	DK
4/1/08	8	8	12% Gel	2.2	50	280.5	2,102 to 2,025	77	2,074	29.0	2,102 to 2,074	29.0	38%	58.0%	4,807.8	DEJ
4/1/08	9	9	12% Gel	2.2	184	1,032.2	2,073.5 to 1,801	272.5	1,860	147.0	2,074 to 1,860	214.0	79%	79.9%	5,840.0	DK
4/2/08	10	10	12% Gel	2.2	166	931.3	1,860 to 1,650	210	1,689	130.5	1,860 to 1,689	171.0	81%	78.6%	6,771.3	DEJ
4/2/08	11	11	12% Gel	2.2	75	420.8	1,689 to 1,574	115	1,593	71.0	1,689 to 1,593	96.0	83%	94.7%	7,192.0	CLM
4/3/08	12	12	12% Gel	2.2	179	1,004.2	1,593 to 1,293	300	1,331	170.0	1,593 to 1,331	262.0	87%	95.0%	8,196.2	ABF
4/3/08	13	13	12% Gel	2.2	227	1,273.5	1,331 to 981	350	1,001	214.0	1,331 to 1,001	330.0	94%	94.3%	9,469.7	CLM
4/4/08	14	14	12% Gel	2.2	243	1,363.2	1,001 to 626	375	642	232.0	1,001 to 642	359.0	96%	95.5%	10,832.9	ABF

IW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 24-inch steel casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
4/4/08	15	15	12% Gel	2.2	286	1,604.5	626 to 200	426	226	268.0	642 to 226	416.0	98%	93.7%	12,437.4	CLM
4/5/08	16	16	12% Gel	2.2	150	841.5	226 to 0	226	0	146.0	226 to 0	226.0	100%	97.3%	13,278.9	ABF

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37 (psi)
Pressure Increase With Theoretical Lift: 9.8 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/28/2008
Stage Number: Plug
Observer: DEJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
20:18	0			0		Pre-flush 20 bbls water
20:28	10			0		Pump neat with calcium chloride
20:38	20			9		Stop pumping
20:42	24	2.5	16			Chase 12 bbls water
20:44	26					Pull 1 single of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37 (psi)
Pressure Increase With Theoretical Lift: 7.4 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/28/2008
Stage Number: 1
Observer: DEJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
1:28	0			0		Pre-flush 5 bbls water
1:28	0	5.1	12.2	0		Pump neat cement
1:31	3	3.8	15	12		Stop pumping
1:38	10					Chase 12 bbls of water
1:41	13					Pull 1 single

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37 (psi)
Pressure Increase With Theoretical Lift: 72.89 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/29/2008
Stage Number: 2
Observer: DK

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
9:38	0			0		Pre-flush with water
9:43	5	5.8		0		Pump neat with calcium chloride
9:54	16	5.8	16.4	64		
10:01	23	5.7	15.7	100		
10:06	28	5.8	15.6	126		
10:07	29			129		Stop pumping
10:07	29					Chase with water
10:15	37					Pull 7 stands and a single of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37 (psi)
Pressure Increase With Theoretical Lift: 65.3 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/29/2008
Stage Number: 3
Observer: DEJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
20:24	0			0		Pre-flush 7 bbls water
20:31	7	5.1	12.2	0		Begin pumping 12% gel
20:36	12	5.8	12.8	22		Switch to neat, 22 bbls 12% pumped
20:40	16	5.8	15.6	56		
20:45	21	5.8	15.6	79		
20:52	28	5.8	15.7	100		
20:55	31	5.0	15.6	120		Stop pumping
20:57	33					Chase 10 bbls water
21:01	37					Pull 6 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 59.65 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/30/2008
Stage Number: 4
Observer: DK

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
7:25	0			0		Pre-flush 25 bbls water
7:32	7	5.5	12.6	0		Pump 12% gel
7:45	20	6.0	12.6	72		
7:48	23			100		
7:58	33	6.5	12.8	128		
8:04	39	6.6	12.6	170		
8:05	40			179		Stop pumping
8:05	40					Chase with water
8:08	43					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 61.37 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/30/2008
Stage Number: 5
Observer: DK

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
18:09	0			0		Pre-flush 12 bbls water
18:15	6	6.0	12.6	0		Pump 12% gel
18:19	10	6.7	12.8	25		
18:23	14	6.8	12.7	52		
18:26	17	6.7	12.8	75		
18:30	21			100		
18:39	30	7.0	12.9	125		
18:43	34	7.0	12.6	150		Stop pumping
18:47	38			179		Begin chase
18:49	40					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 35.9 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/31/2008
Stage Number: 6
Observer: DEJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
4:54	0			0		Pre-flush 6 bbls water
5:01	7	5.1	12.2	0		Pump 12% gel
5:08	14	6.9	12.8	33		
5:13	19	6.9	12.8	71		
5:16	22	6.9		100		
5:20	26			119		Stop pumping
5:21	27					Chase 8.5 bbls water
5:30	36					Pull 5 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 16.5 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/31/2008
Stage Number: 7
Observer: DK

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
15:56	0			0		Pre-flush with water
15:59	3	6.0		0		Pump 12% gel
16:02	6	6.9	12.8	18		
16:09	13		12.5	60		Stop pumping
16:10	14					Chase with water
16:15	19					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 17.17 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 3/31/2008
Stage Number: 8
Observer: DEJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
2:10	0			0		Pre-flush 8 bbls water
2:12	2			0		Pump 12% gel
2:15	5	6.2	12.6	32		
2:19	9	5.9	12.6	40		
2:22	12			50		Stop pumping
2:24	14					Chase 8.6 bbls of water
2:30	20					Pull 4 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 60.77 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 4/1/2008
Stage Number: 9
Observer: DK

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
17:13	0			0		Pre-flush 8 bbls water
17:16	3	8.0	12.9	0		Pump 12% gel
17:17	4	5.4	12.6	25		
17:26	13	5.4	12.7	50		
17:35	22			100		
17:49	36	5.4	12.8	156		
17:56	43			184		Stop pumping
17:57	44					Chase 7.5 bbls water
18:01	48					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 46.83 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 4/2/2008
Stage Number: 10
Observer: DEJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
5:21	0			0		Pre-flush 6 bbls water
5:25	4	5.6	12.8	24		Pump 12% gel
5:26	5	5.7	12.6			
5:30	9	5.6	12.6	50		
5:38	17	5.8	12.9	100		
5:43	22	5.9	12.7	125		
5:47	26	5.8	12.8	150		
5:50	29			166		Stop pumping
5:50	29					Chase 7.2 bbls water
6:01	40					Pull 5 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 25.64 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 4/2/2008
Stage Number: 11
Observer: CLM

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
16:23	0			0		Pre-flush 5 bbls water
16:41	18	7.3	12.7	28		Pump 12% gel
16:47	24			75		Stop pumping
17:01	38					Chase 6 bbls of water
17:13	50					Pull 5 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 66.9 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 4/3/2008
Stage Number: 12
Observer: ABF

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
3:06	0			0		Pre-flush 10 bbls water
3:10	4			0		Pump 12% gel
3:13	7	5.8	12.7	20		Switch to neat, 22 bbls 12% pumpe
3:18	12	6.1	12.7	40		
3:24	18	6.1	12.6	60		
3:27	21	6.1	12.6	120		
3:33	27	5.0	15.6	140		
3:39	33			179		Stop pumping
3:40	34					Chase 5.8 bbls of water
3:41	35					Pull 9 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 78.05 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 4/3/2008
Stage Number: 13
Observer: CLM

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
13:58	0			0		Pre-flush 6 bbls water
14:00	2			0		
14:05	7	7.3	12.7	25		Pump 12% gel
14:09	11	7.3	12.6	50		
14:12	14	7.3	12.7	75		
14:16	18	7.3	12.6	100		
14:19	21	7.3	12.7	125		
14:26	28		13			Pull 1 stand and one single
14:30	32			150		Resume pumping 12% gel
14:34	36	7.5	12.6	175		
14:37	39	7.5	12.7	200		
14:40	42			227		Stop pumping 12% gel
14:41	43					Chase with 12.6 bbls water
14:42	44					Pull total of 8 stands and 1 single

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pounds per square inch
bbl/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 83.63 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 4/3/2008
Stage Number: 14
Observer: ABF

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
1:00	0			0		Pre-flush 7 bbls water
1:04	4		0	0		Pump 12% gel
1:08	8	7.6	12.7	35		
1:10	10	7.6	12.8	55		
	-60					
1:13	13	7.5	12.7	75		
1:16	16	7.6	12.6	100		
1:20	20	7.5	12.7	125		
1:23	23			150		Stop pumping to pull 1 stand and a single
1:26	26					Resume pumping
1:31	31	7.5	12.7	175		
1:35	35	7.5	12.6	200		
1:38	38	7.5	12.7	225		
1:40	40			243		Stop pumping
1:41	41					Chase 3 bbls of water
1:42	42					Pull 7 stands of tremie (9 total)

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pounds per square inch
bbl/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.223 (psi)
Pressure Increase With Theoretical Lift: 94.99 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 4/4/2008
Stage Number: 15
Observer: CLM

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
12:10	0			0		Pre-flush 7 bbls water
12:14	4			0		Pump 12% gel
12:18	8	7.5	12.8	25		Switch to neat, 22 bbls 12% pumped
12:20	10	7.5	12.6	51		
12:24	14	7.5	12.9	75		
12:27	17	7.5	12.7	101		
12:33	23	7.5	12.6	150		Stop pumping
12:36	26	7.5	12.8	170		Chase 6.5 bbls water
12:37	27			180		Pull 200' of tubing
12:42	32			180		
12:45	35	10.6	12.8	200		
12:48	38	7.6	12.8	225		
12:52	42	7.6	12.7	250		
12:57	47			286		Stop pumping
12:58	48					Chase 1.6 bbls water
12:59	49					Pull 640' of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pounds per square inch
bbl/min - barrels per minute

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 24-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.22 (psi)
Pressure Increase With Theoretical Lift: 50 (psi)
Theoretical Collapse Pressure: 355 (psi)
Initial Casing Pressure: OPEN (psi)

Date: 4/5/2008
Stage Number: 16
Observer: ABF

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
20:32	0			0		Pre-flush 10 bbls water
20:35	3			0		Pump 12% gel
20:43	11	7.5	12.7	52		Switch to neat, 22 bbls 12% pumpe
20:46	14	7.4	12.6	75		
20:49	17	7.4	12.7	100		
20:53	21	7.4	12.6	125		
20:56	24			150		Stop pumping
20:57	25					Chase 0.8 bbls water
						Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pounds per square inch
bbl/min - barrels per minute

Injection Well IW-1

18-inch FRP Injection Tubing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL IW-1

FRP Tubing

Casing Diameter: 18-inches
Casing Depth: feet below pad level
Bit Size: Nominal 24-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 1
Cement Blend: Neat
12% Bentonite with Cemplex C-37
Cement Density: Neat – 15.6 lb./gal
12% Bentonite with Cemplex C-37 – 12.3 lb./gal
Theoretical Fill From Calculations: 3,265 cubic feet
Volume Pumped: Neat – 286 cubic feet
12% Bentonite with Cemplex C-37 – 3,506 cubic feet
Total – 3,792 cubic feet
Percent Difference: 13.9%

The 18-inch FRP tubing was cemented in one stage. The cement was circulated to surface and was visually confirmed. The theoretical volume was over shot to ensure that the annular space was completely filled in one stage as tremmie grouting was not possible. The difference in the theoretical and actual volume pumped is due to this over compensation and small barrel counter inconsistency.

IW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 18-inch FRP tubing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
4/17/08	1	NA	Neat and 12% Gel with Cemplex C-37	1.18/2.2	676	3,792.4	2,939 to surface	2,939	o	718.0	2,939 to surface	2,939	100%	106.2%	3,792.4	NAJ/JL/CLM

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout of 18-inch final casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.218 / 0.374 (psi)
Pressure Increase With Theoretical Lift: 681 (psi)
Theoretical Collapse Pressure: 450 (psi)
Initial Casing Pressure: 0 (psi)

Date: 4/17/2008
Stage Number: 1
Observer: JL/CLM/NAJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
15:12	0	--	--	0	--	Start Preflush
15:13	1	--	--	0	--	Preflush 5 bbls of water
15:31	19	--	12.3	0	--	Mixing 12% gel batch
15:34	22	--	--	0	--	Start pumping 12% gel
15:38	26	--	--	--	3.5	
15:39	27	--	--	--	9.5	
15:41	29	--	--	34	15	
15:42	30	5.2	12.3	38	21	
15:46	34	5.2	12.3	60	40	
15:49	37	5.2	12.3	75	52	
15:53	41	5.3	12.3	100	82	
15:56	44	--	--	115	--	
15:58	46	5.3	12.3	125	106	
15:59	47	--	12.3	--	--	
16:01	49	--	--	140	120	
16:03	51	5.3	12.3	150	135	
16:05	53	--	12.3	--	--	
16:08	56	5.3	12.3	175	159	

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout of 18-inch final casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.218 / 0.374 (psi)
Pressure Increase With Theoretical Lift: 681 (psi)
Theoretical Collapse Pressure: 450 (psi)
Initial Casing Pressure: 0 (psi)

Date: 4/17/2008
Stage Number: 1
Observer: JL/CLM/NAJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
16:12	60	5.2	12.2	199	189	
16:16	64	5.2	12.5	225	205	
16:22	70	5.2	12.3	250	275	
16:27	75	5.2	12.2	275	275	Collect 12% gel sample for cubes
16:32	80	5.1	12.2	300	280	
16:34	82	--	12.3	--	--	
16:37	85	5.1	12.2	325	304	
16:42	90	5.1	12.2	352	331	
16:46	94	5.5	12.2	375	352	
16:51	99	5.0	12.3	400	380	
16:55	103	5.0	12.4	421	400	
16:59	107	--	--	440	425	
17:01	109	5.0	12.3	450	435	
17:07	115	4.9	12.3	478	461	
17:11	119	4.9	12.2	500	489	
17:13	121	4.9	12.4	511	500	
17:17	125	4.9	12.3	527	518	
17:21	129	4.9	12.3	545	538	
17:26	134	4.8	12.2	575	580	

IW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout of 18-inch final casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.218 / 0.374 (psi)
Pressure Increase With Theoretical Lift: 681 (psi)
Theoretical Collapse Pressure: 450 (psi)
Initial Casing Pressure: 0 (psi)

Date: 4/17/2008
Stage Number: 1
Observer: JL/CLM/NAJ

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
17:31	139	4.8	12.3	596	595	
17:34	142	--	--	610	--	
17:37	145	--	--	625	--	Cement returns at surface. Mixing neat
17:45	153	--	--	625	610	Pumping neat cement
17:47	155	--	15.6	649	--	Collect neat sample for cubes
17:50	158	2.2	15.4	653	630	
17:53	161	2.2	15.5	660	--	
17:55	163	2.2	15.6	665	660	
18:03	171	--	--	--	675	
18:06	174	--	--	676	--	Stop pumping cement
18:07	175	--	--	676	--	Begin pumping chase
18:19	187	--	--	676	679	Chase with 13.5 bbls of water

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

Monitor Well DZMW-1

34-inch Casing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL DZMW-1

Conductor Casing

Casing Diameter: 34-inches
Casing Depth: 75 feet below pad level
Bit Size: Nominal 46-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 1
Cement Blend: Neat

Cement Density: Neat – 15.6 lb./gal

Theoretical Fill From Calculations: 393 cubic feet
Volume Pumped: Neat – 639.5 cubic feet

Total – 639.5 cubic feet
Percent Difference: 38.5%

The 34-inch casing was cemented in one stage. The cement was circulated to surface and was visually confirmed. The difference in the theoretical and actual volume pumped is due to small barrel counter inconsistency, mathematical inaccuracy and small irregularities in the borehole wall.

DZMW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 34-inch steel casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
5/7/08	1		Neat	1.18	114	639.5	75 to 0	75	75.0	44.3	75 to 0	75.00	100%	38.9%	639.5	JL

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout of 34-inch casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37 (psi)
Pressure Increase With Theoretical Lift: 27.75 (psi)
Theoretical Collapse Pressure: 68 (psi)
Initial Casing Pressure: 0 (psi)

Date: 5/7/2008
Stage Number: 1
Observer: John Largey

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
21:56	0			0		Preflush 20 bbls of water
22:01	5	5.7	15.7	0		Pump neat
22:03	7	5.7	15.7	10		
22:06	10	5.3	15.6	25	6	
22:10	14	5.3	15.7	50	8	
22:15	19	5.3	15.5	75	14	
22:19	23	5.2	15.6	98	16	
22:24	28			114	22	Stop pumping
22:25	29					Chase 2 bbls of water
22:26	30					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbls/min - barrels per minute

Monitor Well DZMW-1

24-inch Casing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL DZMW-1

Surface Casing

Casing Diameter: 24-inches
Casing Depth: 500 feet below pad level
Bit Size: Nominal 32.5-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 1
Cement Blend: Neat
12% Bentonite
Cement Density: Neat – 15.7 lb./gal
12% Bentonite – 12.6 lb./gal
Theoretical Fill From Caliper Log: 1,655 cubic feet
Volume Pumped: Neat – 892 cubic feet
12% Bentonite – 746 cubic feet
Total – 1,638 cubic feet
Percent Difference: 1.0%

The 24-inch casing was cemented in one stage. The cement was circulated to surface and was visually confirmed. The difference in the theoretical and actual volume pumped is due to caliper tool's limitations and small irregularities in the borehole wall.

DZMW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 24-inch steel casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
5/14/08	1		Neat and 12% gel	2,2	292	1,638.1	500 to -126	626	10.0	227.0	500 to 10	490	78%	77.7%	1,638.1	ABF

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout of 24-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.37/0.21	(psi)	**Date:**	5/14/2008
Pressure Increase With Theoretical Lift:	169	(psi)	**Stage Number:**	1
Theoretical Collapse Pressure:	172	(psi)	**Observer:**	Aimee Fartartangeli
Initial Casing Pressure:	0	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
11:32	0				0	Pre-flush 20 bbls of water
11:46	14			0	0	Pump 12% gel
11:48	16	6.2	12.6	20	0	
11:52	20	6.2	12.7	40	0	
11:56	24	6.2	12.6	60	0	
11:59	27	6.2	12.6	80	42	
12:02	30	6.2	12.7	100	50	
12:08	36	6.2	12.6	140	53	
12:12	40	6.2	15.7	159	57	Switch to neat
12:15	43	5.9	15.7	183	76	Pumping delay
12:26	54				76	Resume pumping
12:30	58	5.9	15.6	220	94	
12:35	63	5.7	15.7	254	135	
12:38	66	5.5	16	270	150	

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Pressure Grout of 24-inch casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.37/0.21	(psi)	**Date:**	5/14/2008
Pressure Increase With Theoretical Lift:	169	(psi)	**Stage Number:**	1
Theoretical Collapse Pressure:	172	(psi)	**Observer:**	Aimee Fartartangeli
Initial Casing Pressure:	0	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
12:41	69	5.5		292	145	Stop pumping
12:42	70					Chase 3 bbls of water
12:43	71					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

Monitor Well DZMW-1

16-inch Casing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL DZMW-1

Intermediate Casing

Casing Diameter: 16-inches
Casing Depth: 1,325 feet below pad level
Bit Size: Nominal 22.5-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 6
Cement Blend: Neat
6% Bentonite
12% Bentonite
Cement Density: Neat – 15.7 lb./gal
6% Bentonite – 13.7 lb./gal
12% Bentonite – 12.8 lb./gal
Theoretical Fill From Caliper Log: 3,787 cubic feet
Volume Pumped: Neat – 1,262 cubic feet
6% Bentonite – 2,188 cubic feet
12% Bentonite – 1,363 cubic feet
Total – 4,813 cubic feet
Percent Difference: 21.3%

The 16-inch casing was cemented in six stages. After each stage a temperature log was run downhole and the cement physically tagged to determine the actual fill. On the final stage the cement was circulated to surface and was visually confirmed. The difference in the theoretical and actual volume pumped is due to caliper tool's limitations and small irregularities in the borehole wall.

DZMW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 16-inch steel casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
6/19/08	Plug	N/A	Neat	1.18	5	28.1	1325 to 1310	15	1,311.0	4.0	1325 to 1311	14	93%	80.0%	28.1	CLM/JC
6/20/08	1	1	Neat	1.18	120	673.2	1311 to 1038	273	1,122.0	88.0	1311 to 1122	189	69%	73.3%	701.3	MK
6/20/08	2	2	Neat	1.18	100	561.0	1122 to 986	136	998.0	75.8	1122 to 998	124	91%	75.8%	1,262.3	CLM
6/21/08	3	3	12% Gel/6% Gel	2.2	200	1,122.0	998 to 791	207	842	160.4	998 to 842	156	75%	80.2%	2,384.3	MK
6/21/08	4	4	6% Gel	2	215	1,206.2	842 to 450	392	567	157.8	842 to 567	275	70%	73.4%	3,590.4	JC
6/22/08	5	5	6% Gel	2	75	420.8	567 to 385	182	454	56.7	567 to 454	113	62%	75.6%	4,011.2	JC
6/22/08	6	6	12% Gel	2.2	143	802.2	454 to 0	454	3	98.8	454 to 3	451	99%	69.1%	4,813.4	MK

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 16-inch Casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37 (psi)
Pressure Increase With Theoretical Lift: 5.6 (psi)
Theoretical Collapse Pressure: 885 (psi)
Initial Casing Pressure: 0 (psi)

Date: 6/19/2008
Stage Number: Plug
Observer: Casey Majewski

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
17:10	0					Pre-flush 6 bbls water
17:11	1		15.8			Mixing neat
17:15	5	6				Pump neat
17:16	6			5		Stop pumping
17:17	7					Chase 6 bbls of water
17:18	8					Pull 3 singles of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 16-inch Casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.37 (psi)
Pressure Increase With Theoretical Lift: 101.0 (psi)
Theoretical Collapse Pressure: 885 (psi)
Initial Casing Pressure: 0 (psi)

Date: 6/20/2008
Stage Number: 1
Observer: Mike Knapp

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
4:27	0			0		Pre-flush 6 bbls water
4:31	4			0		Pumping neat
4:35	8	6.4	15.6	20		
4:37	10	6.5	15.7	40		
4:39	12	6.4	15.8	60		
4:41	14	6.5	15.8	70		
4:52	25	6.4	15.6	80		
4:54	27	6.3	15.7	100		
4:57	30	6.4	15.8	120		
4:58	31	6.4				Chase 4 bbls of water
5:00	33					Pull 10 stands of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 16-inch Casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.37	(psi)	**Date:**	6/20/2008
Pressure Increase With Theoretical Lift:	37	(psi)	**Stage Number:**	2
Theoretical Collapse Pressure:	885	(psi)	**Observer:**	Casey Majewski
Initial Casing Pressure:	0	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
15:15	0					Pre-flush 6 bbls water
15:20	5					Pump neat
15:24	9	6.9	15.7	25		
15:27	12			50		
15:35	20	7	15.7	75		
15:38	23			100		
15:39	24					Chase 4.5 bbls of water
15:40	25					Pull 6 singles of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 16-inch Casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.27/0.21 (psi)
Pressure Increase With Theoretical Lift: 49.68 (psi)
Theoretical Collapse Pressure: 885 (psi)
Initial Casing Pressure: 0 (psi)

Date: 6/21/2008
Stage Number: 3
Observer: Mike Knapp

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
2:49	0					Pre-flush 6 bbls water
2:51	2					Pump 12% gel
2:55	6	10	12.7	25		
2:58	9	7	13	50		
3:03	14	7	12.6	75		
3:07	18	7	12.6	100		Pull 45 feet of tremmie
3:14	25	7	13.7	125		Pump 6% gel
3:18	29	7	13.7	150		Pull 90 feet of tremmie
3:27	38	7	13.7	175		
3:32	43	7	13.7	200		Stop pumping
3:33	44					Chase 6 bbls fresh water
3:35	46					Pull 3 singles of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 16-inch Casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.27 (psi)
Pressure Increase With Theoretical Lift: 106.38 (psi)
Theoretical Collapse Pressure: 885 (psi)
Initial Casing Pressure: 0 (psi)

Date: 6/21/2008
Stage Number: 4
Observer: James Crawford

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
16:56	0					Pre-flush 8 bbls of water
17:02	6					Pump 6%
17:06	10	7.2	13.7	25		
17:09	13	7.3	13.5	50		
17:12	16	7.3	13.6	75		
17:24	28	7.8	13.4	100		
17:27	31	7.9	13.7	126		
17:39	43	8	13.8	172		
17:42	46	8	13.8	200		
17:45	49			215	160	Stop pumping
17:46	50					Chase 3.5 bbls of water
17:47	51					Pull 8 singles of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 16-inch Casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.27 (psi)
Pressure Increase With Theoretical Lift: 49.14 (psi)
Theoretical Collapse Pressure: 885 (psi)
Initial Casing Pressure: 120 (psi)

Date: 6/22/2008
Stage Number: 5
Observer: James Crawford

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
7:54	0				120	Pre-flush 7 bbls of water
7:57	3					Pump 6% gel
8:01	7	7.7	13.7	25		
8:04	10	7.7	13.4	50		
8:07	13			75	120	Stop pumping
8:08	14					Chase 2 bbls of water
8:09	15					Pull 9 singles of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 16-inch Casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.27 (psi)
Pressure Increase With Theoretical Lift: 122.58 (psi)
Theoretical Collapse Pressure: 885 (psi)
Initial Casing Pressure: 0 (psi)

Date: 6/22/2008
Stage Number: 6
Observer: Mike Knapp

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
20:47	0					Pre-flush 3 bbls fresh water
20:50	3					Pump 12% gel
20:53	6	7.5	12.7	22.5		
20:56	9	7.5	12.7	45		Pull 5 stands
21:05	18	7.7	12.8	67.5		
21:08	21	7.7	12.8	90		Pull 5 stands
21:16	29	8.1	12.8	112.5		
21:20	33	8.1	12.8	135		
21:23	36	8.1	12.8	143		Cement returns at surface
21:24	37					Chase with .75 bbls of water
21:25	38					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

Monitor Well DZMW-1

6⅝-inch FRP Casing

APPENDIX M
CEMENT REPORTS
CITY OF CAPE CORAL
SOUTHWEST WATER TREATMENT PLANT
INJECTION WELL DZMW-1

FRP Tubing

Casing Diameter: 6.625-inches
Casing Depth: 1,610 feet below pad level
Bit Size: Nominal 14.75-inch diameter
Cement Specification: ASTM C 150 Type ll
Number of Stages: 3
Cement Blend: Neat

Cement Density: Neat – 15.7 lb./gal

Theoretical Fill From Caliper Log: 528 cubic feet
Volume Pumped: Neat – 555 cubic feet
Total – 555 cubic feet
Percent Difference: 4.9%

The 6.625-inch FRP tubing was cemented in three stages. After each stage a temperature log was run downhole and the cement physically tagged to determine the actual fill. On the final stage the cement was circulated to surface and was visually confirmed. The difference in the theoretical and actual volume pumped is due to caliper tool's limitations and small irregularities in the borehole wall.

DZMW-1 CEMENT RECORD

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

CASING SIZE: 6.625-inch FRP casing

DATE	STAGE NO.	TEMPERATURE LOG NO.	CEMENT (ADDITIVES, BLENDS, MIXTURES)	YIELD (ft^3/sk)	QUANTITY PUMPED (BARRELS)	QUANTITY PUMPED (ft^3)	THEORETICAL FILL INTERVAL	THEORETICAL FILL FOOTAGE	TAG DEPTH PAD LEVEL	ACTUAL FILL (BARRELS)	ACTUAL FILL INTERVAL	ACTUAL FILL FOOTAGE	PERCENT FILLED (LINEAR FEET) Percent %	PERCENT FILLED (VOLUMETRIC) Percent %	CUMULATIVE TOTAL (ft^3)	INSPECTOR'S INITIALS
6/30/08	Plug	N/A	Neat	1.18	2	11.2	1610 to 1603	7	1,605.0	2.0	1610 to 1605	5	64%	100.0%	11.2	ABF
7/1/08	1	1	Neat	1.18	25	140.3	1603 to 1542	61	1,546.0	22.8	1605 to 1546	59	97%	91.2%	151.5	CLM
7/1/08	2	2	Neat	1.18	65	364.7	1543 to 1408	135	1,412.0	60.0	1543 to 1412	131	97%	92.3%	516.1	CLM
7/2/08	3	3	Neat	1.18	7	39.3	1412 to 1406	6	1,406.0	7.0	1412 to 1406	6	100%	100.0%	555.4	JC

NOTES:
ft^3 - cubic feet
ft^3/sk - cubic feet per sack

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 6.625-inch Casing

Differential Pressures:
Pressure Increase per Linear Foot of Fill: 0.4 (psi)
Pressure Increase With Theoretical Lift: 2.6 (psi)
Theoretical Collapse Pressure: 973 (psi)
Initial Casing Pressure: 0 (psi)

Date: 6/30/2008
Stage Number: Plug
Observer: Aimee Fratartangeli

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
23:33	0					Pre-flush 7 bbls water
				0		Start pumping neat
				2		Stop pumping
						Chase 7 bbls of water
						Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 6.625-inch Casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.4	(psi)	**Date:**	7/1/2008
Pressure Increase With Theoretical Lift:	22.6	(psi)	**Stage Number:**	1
Theoretical Collapse Pressure:	973	(psi)	**Observer:**	Casey Majewski
Initial Casing Pressure:	0	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
10:36	0					Pre-flush 7 bbls water
10:41	5			0		Start pumping neat
10:46	10	5.2	15.7	25		Stop pumping neat
10:47	11					Chase 7 bbls of water
10:48	12					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 6.625-inch Casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.37	(psi)	**Date:**	7/1/2008
Pressure Increase With Theoretical Lift:	49.95	(psi)	**Stage Number:**	2
Theoretical Collapse Pressure:	973	(psi)	**Observer:**	Casey Majewski
Initial Casing Pressure:	0	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
21:12	0					Pre-flush 7 bbls water
21:16	4					Start pumping neat
21:18	6	5.4	15.6	16		
21:21	9	5.5	15.7	30		
21:23	11	5.5	15.7	45		
21:26	14			65		Stop pumping neat
21:27	15					
21:28	16					Pull of tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

DZMW-1 CEMENT PUMPING DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGER: Neil Johnson
OWNER: City of Cape Coral

Description of Operations: Tremmie Grout of 6.625-inch Casing

Differential Pressures:

Pressure Increase per Linear Foot of Fill:	0.37	(psi)	**Date:**	7/2/2008
Pressure Increase With Theoretical Lift:	2.22	(psi)	**Stage Number:**	3
Theoretical Collapse Pressure:	973	(psi)	**Observer:**	James Crawford
Initial Casing Pressure:	0	(psi)		

TIME	TOTAL TIME (mins)	PUMPING RATE (bbl/min)	CEMENT WEIGHT (lbs/gal)	VOLUME PUMPED (bbl cement)	CASING PRESSURE (psi)	COMMENTS
10:00	0					Pre-flush 6 bbls water
10:08	8	4.6	15.7	3		Start pumping neat
10:10	10			7		Stop pumping neat
10:16	16					Chase 6 bbls of water
10:17	17					Pull tubing

NOTES:
mins - minutes
bbl - barrels
lbs/gal - pounds per gallon
psi - pound per square inch
bbl/min - barrels per minute

Appendix N

Casing and Tubing Pressure Tests

Injection Well IW-1

Casing and Tubing Pressure Tests and Test Gauge Calibration Certifications

Injection Well IW-1

24-inch Casing Pressure Test

MWH

IW-1 PRESSURE TEST DATA

DATE(S): 4/7/2008

SOUTHWEST DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MGR: Neil Johnson
OWNER: City of Cape Coral

START TIME: 15:15
FINISH TIME: 16:19
CASING SIZE: 24-inch

DESCRIPTION OF OPERATIONS:
Pressure test of 24-inch final steel casing.

INITIAL PRESSURE: 150 psi
GAUGE SERIAL NUMBER: 124635

TIME	TOTAL MINUTES	PRESSURE (psi)	COMMENTS
1515 1315	1	150	Witnessed by David Rhodes (FDEP), Neil Johnson (MWH), and
1316	2	150	Shawn Cerecerez (YBI).
1317	3	150	
1318	4	150	
1319	5	150 149.5	per David Rhodes.
1320	6	149.5	
1321	7	149.5	
1322	8	149.5	
1323	9	149.5	
1324	10	149.5	
1325	11	149.5	
1326	12	149.5	
1327	13	149.5	
1328	14	149.5	
1329	15	149.5	
1330	16	149.5	
1331	17	149.5	
1332	18	149.5	
1333	19	149.5	
1334	20	149.5	
1335	21	149.5	
1336	22	149.5	
1337	23	149.5	
1338	24	149.5	
1339	25	149.5	
1340	26	149.5	
1341	27	149.5	
1542 1342	28	149.5	

Observer's Initials: CLM.

FORM NO. 03-03

MWH

IW-1 PRESSURE TEST DATA

DATE(S): 4/7/2008

SOUTHWEST DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102

CONTRACTOR: Youngquist Brothers, Inc.

PROJECT MGR: Neil Johnson

OWNER: City of Cape Coral

DESCRIPTION OF OPERATIONS:
Pressure test of 24-inch final steel casing.

START TIME: 13:15

FINISH TIME: 16:14

CASING SIZE: 24-inch

INITIAL PRESSURE: 150 PSI

GAUGE SERIAL NUMBER: 124635

TIME	TOTAL MINUTES	PRESSURE (PSI)	COMMENTS
1343	29	149.5	
1344	30	149.5	
1345	31	149.5	
1346	32	149.5	
1347	33	149.5	
1348	34	149.5	
1349	35	149.5	
1350	36	149.5	
1351	37	149.5	
1352	38	149.5	
1353	39	149.5	
1354	40	149.5	
1355	41	149.5	
1356	42	149.5	
1357	43	149.5	
1358	44	149.5	
1359	45	149.5	
1400	46	149.5	
1401	47	149.5	
1402	48	149.5	
1403	49	150	
1404	50	150	
1405	51	150	
1406	52	150	
1407	53	150	
1408	54	150	
1409	55	150	Arrocles 149.5
1410	56	150	

1548

1610

Observer's Initials: CLM.

FORM NO. 03-03

MWH

IW-1 PRESSURE TEST DATA

DATE(S): 4/7/2008

SOUTHWEST DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MGR: Neil Johnson
OWNER: City of Cape Coral

START TIME: 15:15
FINISH TIME: 16:14
CASING SIZE: 24-inch

DESCRIPTION OF OPERATIONS:
Pressure test of 24-inch final steel casing.

INITIAL PRESSURE: 150 PSI
GAUGE SERIAL NUMBER: 124635

TIME	TOTAL MINUTES	PRESSURE (PSI)	COMMENTS
1611	57	150	
1612	58	150	
1613	59	150	
1614	60	150	David Rhodes 149.5

PRESSURE BLEED-OFF

TIME	PRESSURE	VOLUME (GAL)	CUMMULATIVE VOLUME (GAL)	COMMENTS
1617	150	0	0	
1618	-	5	5	
1619	114	5	10	
1620	95	5	15	
1622	75	5	20	
1623	60	5	25	
1624	42	5	30	
1626	20	5	35	
1628	9	5	40	
1637	0	4.5	44.5	

Witnessed by:

FDEP: David Rhodes — DAVID RHODES
MWH: Neil Johnson — NEIL JOHNSON 4/7/08
YBI: Shawn Cerecerez — SHAWN CERECEREZ

Certificate of Calibration

 # KELC-45529

Kimball Electronic Laboratory, Inc.

Precision Measurement Equipment Specialists

Purchase Order # N/A

Calibration Performed By:

KIMBALL ELECTRONIC LABORATORY, INC
8081 W 21 LANE
HIALEAH, FL. 33016

For: YOU410

YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE ROAD
FT MYERS FL 33908

Equipment Information KELI I.D.: KEL-124635

Description: MCDANIEL CONTROLS 300 PSI PRESSURE GAUGE

Manufacturer: MCDANIEL CONTROLS
Model Number: 300 PSI
Part Number: N/A
Range: 0-300 PSI

Serial Number: 124635
Customer I.D.: N/A
Cust. Barcode: N/A
Cust. Location: N/A
Specifications: +/- 0.25% FULL SCALE

Cal Date: 07-Apr-08
Cal. Due Date: 07-Apr-09
Cal. Interval: 12 MONTHS
Received: OUT OF TOL.
Calibration Result: PASS
Environmental Conditions: 74 DEG F / 50 % RH
Performed By: BRUCE CABOT
Procedure: SYN54

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Kimball Electonic Laboratory, Inc Quality Assurance Manual. KELI's Quality system is A2LA-Accredited to ISO/IEC-17025 and compliant with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. TURS when applicable are greater than or equal to 4:1; with expanded uncertainty used to calculate the Test Uncertainty Ratio, with a coverage factor of K=2 at a confidence level of approximately 95%, unless otherwise noted.

Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks

THIS UNIT WAS FOUND TO BE OUT OF TOL. AT THE TIME OF CALIBRATION.
ADJUSTED UNIT PERFORMED ROUTINE CALIBRATION

Standards Used To Calibrate Equipment

Company	I.D.	Description	Last Cal.	Cal. Due Date
KIM001	391	EATON UPS 3000BAA PRESSURE INDICATOR	20-Nov-07	30-Nov-09

Signatures:

Certified by: BRUCE CABOT — Bruce M Cabot — 07-Apr-08 9:20:16 AM

Approved By: JAVIER BALCEIRO — 07-Apr-08 9:20:58 AM

KELI

8081 W. 21 LANE
HIALEAH, FL. 33016
PH # 305-822-5792
FAX # 305-362-3125

CONTROL # : **KEL-124635**

CUSTOMER : **YOU410**

CALIBRATION DATA FORM

MFR:	MCDANIEL CONTROLS	DESCRIPTION :	300 PSI PRESSURE GAUGE
MODEL # :	300 PSI	TECHNICIAN :	012
SERIAL # :	124635	CAL DATE :	07-APR-08
ID #:	KEL-124635	DUE DATE :	07-APR-09

* IF NO "AS LEFT" READING IS SHOWN ON THIS CHART, IT MEANS THE UNIT WAS IN TOLERANCE AND THERE WERE NO ADJUSTMENTS MADE TO IT.

RANGE	NOMINAL	AS FOUND	AS LEFT *	LOW LIMIT	HIGH LIMIT
300 PSI	50	50.5	50.0	49.25	50.75
	100	100.6	100.0	99.25	100.75
	150	150.6	150.0	149.25	150.75
	200	200.7	200.0	199.25	200.75
	300	303.0	300.6	299.25	300.75

Injection Well IW-1

18-inch Tubing Pressure Test

IW-1 TUBING PRESSURE TEST

DATE: 3/22/08

JOB NUMBER:	3220269.77010102
CONTRACTOR:	Youngquist Brothers, Inc.
PROJECT MGR:	Neil Johnson
OWNER:	City of Cape Coral
START TIME:	11:15
FINISH TIME:	12:15
CASING SIZE:	18-inch FRP tubing

INITIAL PRESSURE:	150 psi
GAUGE SERIAL NUMBER:	04105-1
CALCULATED WATER VOLUME:	20.4
OBSERVED WATER VOLUME:	

TIME	Δ TIME (minutes)	PRESSURE (psi)	TIME	Δ TIME (minutes)	PRESSURE (psi)	TIME	Δ TIME (minutes)	PRESSURE (psi)
11:15	0	150+						
11:16	1	150+	11:36	21	150	11:56	41	149.5
11:17	2	150+	11:37	22	150	11:57	42	149.5
11:18	3	150+	11:38	23	150	11:58	43	149.5
11:19	4	150+	11:39	24	150	11:59	44	149.5
11:20	5	150+	11:40	25	150	12:00	45	149.5
11:21	6	150+	11:41	26	150	12:01	46	149.5
11:22	7	150+	11:42	27	150	12:02	47	149.5
11:23	8	150	11:43	28	150	12:03	48	149.5
11:24	9	150	11:44	29	150	12:04	49	149.5
11:25	10	150	11:45	30	149.5	12:05	50	149.5
11:26	11	150	11:46	31	149.5	12:06	51	149.5
11:27	12	150	11:47	32	149.5	12:07	52	149.5+
11:28	13	150	11:48	33	149.5	12:08	53	149.5+
11:29	14	150	11:49	34	149.5	12:09	54	149.5+
11:30	15	150	11:50	35	149.5	1210	55	149.5+
11:31	16	150	11:51	36	149.5	12:11	56	149.5+
11:32	17	150	11:52	37	149.5	12:12	57	149.5+
11:33	18	150	11:53	38	149.5	12:13	58	149.5+
11:34	19	150	11:54	39	149.5	12:14	59	149.5+
11:35	20	150	11:55	40	149.5	12:15	60	149.5+

PRESSSURE BLEED-OFF								
TIME	PRESSURE	VOLUME	TIME	PRESSURE	VOLUME	TIME	PRESSURE	VOLUME
12:18	149.0	0	12:22	96	10	1226	44	20
12:21	120.1	5	12:24	70	15	1228	21	25
						1232	0	30

Witnessed By:

David Rhodes
FDEP Representative

John Largey
MWH Representative

Shawn Cerecerez
YBI Representative

Monitor Well DZMW-1

Casing Pressure Tests and Test Gauge Calibration Certifications

Monitor Well DZMW-1

16-inch Casing Pressure Test

DZMW-1 PRESSURE TEST DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGI Neil Johnson
OWNER: City of Cape Coral

DATE: 6/25/2008
START TIME: 17:00
FINISH TIME: 18:00
CASING SIZE: 16-inch steel tubing

INITIAL PRESSURE: 50 psi
GAUGE SERIAL NUMBER: 05080-3
CALCULATED WATER VOLUME: 2.9 gallons
OBSERVED WATER VOLUME: 3 gallons

TIME	Δ TIME (minutes)	PRESSURE (psi)	TIME	Δ TIME (minutes)	PRESSURE (psi)	TIME	Δ TIME (minutes)	PRESSURE (psi)
17:00	0	50.00						
17:01	1	50.00	17:21	21	49.75	17:41	41	49.50
17:02	2	50.00	17:22	22	49.75	17:42	42	49.50
17:03	3	50.00	17:23	23	49.75	17:43	43	49.50
17:04	4	50.00	17:24	24	49.75	17:44	44	49.50
17:05	5	50.00	17:25	25	49.75	17:45	45	49.50
17:06	6	50.00	17:26	26	49.75	17:46	46	49.50
17:07	7	50.00	17:27	27	49.75	17:47	47	49.50
17:08	8	50.00	17:28	28	49.75	17:48	48	49.25
17:09	9	50.00	17:29	29	49.75	17:49	49	49.25
17:10	10	50.00	17:30	30	49.75	17:50	50	49.25
17:11	11	50.00	17:31	31	49.75	17:51	51	49.25

DZMW-1 PRESSURE TEST DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGI Neil Johnson
OWNER: City of Cape Coral

DATE: 6/25/2008
START TIME: 17:00
FINISH TIME: 18:00
CASING SIZE: 16-inch steel tubing

INITIAL PRESSURE: 50 psi
GAUGE SERIAL NUMBER: 05080-3
CALCULATED WATER VOLUME: 2.9 gallons
OBSERVED WATER VOLUME: 3 gallons

PRESSSURE BLEED-OFF

TIME	PRESSURE	VOLUME	TIME	PRESSURE	VOLUME	TIME	PRESSURE	VOLUME
18:00	49	0						
18:05	0	3						
12:22								

Witnessed By: John Largey
MWH
Dan Keeley
YBI
Jeff Bailey
MWH Constructors

Kimball Electronic Laboratory, Inc.

Precision Measurement Equipment Specialists

Purchase Order # 28719

Calibration Performed By:

KIMBALL ELECTRONIC LABORATORY, INC
8081 W 21 LANE
HIALEAH, FL. 33016

For: YOU410
YOUNGQUIST BROTHERS, INC.
15465 PINE RIDGE ROAD
FT MYERS FL 33908

Equipment Information KELI I.D.: KEL-126535

Description:	PRESSURE GAUGE
Manufacturer:	MCDANIEL CONTROLS
Model Number:	300 PSI
Part Number:	N/A
Range:	0-300 PSI
Serial Number:	N/A
Customer I.D.:	050808-3
Cust. Barcode:	N/A
Cust. Location:	N/A
Specifications:	+/- 0.25 % FS

Cal Date:	06-Jun-08
Cal. Due Date:	06-Jun-09
Cal. Interval:	12 MONTHS
Received:	IN TOLERANCE
Calibration Result:	PASS
Environmental Conditions:	72 DEG F / 50 % RH
Performed By:	ELIU LAGO
Procedure:	SYN54

This is to certify that the above listed instrument meets or exceeds all specifications as stated in the referenced procedure at the points tested (unless otherwise noted). It has been calibrated using measurement standards traceable to the National Institute of Standards and Technology (NIST), or to NIST accepted intrinsic standards of measurement, or derived by the ratio type of self-calibration techniques. This calibration is in accordance with Kimball Electonic Laboratory, Inc Quality Assurance Manual. KELI's Quality system is A2LA-Accredited to ISO/IEC-17025 and compliant with MIL-STD-45662A and ANSI/NCSL Z540-1-1994. TURS when applicable are greater than or equal to 4:1; with expanded uncertainty used to calculate the Test Uncertainty Ratio, with a coverage factor of K=2 at a confidence level of approximately 95%, unless otherwise noted.

Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired.

Calibration Remarks

THIS UNIT WAS FOUND TO BE IN TOLERANCE AT THE TIME OF CALIBRATION.
PERFORMED ROUTINE CALIBRATION/CERTIFICATION

Standards Used To Calibrate Equipment

Company	I.D.	Description	Last Cal.	Cal. Due Date
KIM001	7005	EATON UPC5000 PNEUMATIC CALIBRATOR	29-Apr-08	30-Apr-09

Signatures:

Certified by: ELIU LAGO 06-Jun-08 4:28:16 PM

Approved By: JAVIER BALCEIRO 06-Jun-08 4:29:29 PM

Monitor Well DZMW-1

6.625-inch Casing Pressure Test

DZMW-1 PRESSURE TEST DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGI Neil Johnson
OWNER: City of Cape Coral

DATE: 7/7/2008
START TIME: 12:49
FINISH TIME: 13:49
CASING SIZE: 6.625-inch FRP

INITIAL PRESSURE: 50 psi
GAUGE SERIAL NUMBER: KEL-126532
CALCULATED WATER VOLUME: 0.5 gallons
OBSERVED WATER VOLUME: 0.5 gallons

TIME	Δ TIME (minutes)	PRESSURE (psi)	TIME	Δ TIME (minutes)	PRESSURE (psi)	TIME	Δ TIME (minutes)	PRESSURE (psi)
12:49	0	50.00						
12:50	1	50.00	13:10	21	49.75	13:30	41	49.50
12:51	2	50.00	13:11	22	49.75	13:31	42	49.50
12:52	3	50.00	13:12	23	49.75	13:32	43	49.50
12:53	4	50.00	13:13	24	49.75	13:33	44	49.50
12:54	5	50.00	13:14	25	49.75	13:34	45	49.50
12:55	6	50.00	13:15	26	49.75	13:35	46	49.50
12:56	7	50.00	13:16	27	49.75	13:36	47	49.25
12:57	8	50.00	13:17	28	49.75	13:37	48	49.25
12:58	9	50.00	13:18	29	49.75	13:38	49	49.25
12:59	10	50.00	13:19	30	49.75	13:39	50	49.25
13:00	11	50.00	13:20	31	49.75	13:40	51	49.25
13:01	12	50.00	13:21	32	49.75	13:41	52	49.25
13:02	13	50.00	13:22	33	49.75	13:42	53	49.25
13:03	14	49.75	13:23	34	49.75	13:43	54	49.25
13:04	15	49.75	13:24	35	49.75	13:44	55	49.25
13:05	16	49.75	13:25	36	49.50	13:45	56	49.25
13:06	17	49.75	13:26	37	49.50	13:46	57	49.25
13:07	18	49.75	13:27	38	49.50	13:47	58	49.25
13:08	19	49.75	13:28	39	49.50	13:48	59	49.25
13:09	20	49.75	13:29	40	49.50	13:49	60	49.25

DZMW-1 PRESSURE TEST DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGI Neil Johnson
OWNER: City of Cape Coral

DATE: 7/7/2008
START TIME: 12:49
FINISH TIME: 13:49
CASING SIZE: 6.625-inch FRP

INITIAL PRESSURE: 50 psi
GAUGE SERIAL NUMBER: KEL-126532
CALCULATED WATER VOLUME: 0.5 gallons
OBSERVED WATER VOLUME: 0.5 gallons

PRESSSURE BLEED-OFF

TIME	PRESSURE	VOLUME	TIME	PRESSURE	VOLUME	TIME	PRESSURE	VOLUME
18:00	49	0						
18:05	0	0.5 gallons						
12:22								

Witnessed By: John Largey
MWH
Dan Keeley
YBI
James Crawford
MWH

DZMW-1 PRESSURE TEST DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGI Neil Johnson
OWNER: City of Cape Coral

DATE: 7/7/2008
START TIME: 12:49
FINISH TIME: 13:49
CASING SIZE: 6.625-inch FRP

INITIAL PRESSURE: 50 psi
GAUGE SERIAL NUMBER: KEL-126532
CALCULATED WATER VOLUME: 0.5 gallons
OBSERVED WATER VOLUME: 0.5 gallons

TIME	Δ TIME (minutes)	PRESSURE (psi)	TIME	Δ TIME (minutes)	PRESSURE (psi)	TIME	Δ TIME (minutes)	PRESSURE (psi)
12:49	0	50.00						
12:50	1	50.00	13:10	21	49.75	13:30	41	49.50
12:51	2	50.00	13:11	22	49.75	13:31	42	49.50
12:52	3	50.00	13:12	23	49.75	13:32	43	49.50
12:53	4	50.00	13:13	24	49.75	13:33	44	49.50
12:54	5	50.00	13:14	25	49.75	13:34	45	49.50
12:55	6	50.00	13:15	26	49.75	13:35	46	49.50
12:56	7	50.00	13:16	27	49.75	13:36	47	49.25
12:57	8	50.00	13:17	28	49.75	13:37	48	49.25
12:58	9	50.00	13:18	29	49.75	13:38	49	49.25
12:59	10	50.00	13:19	30	49.75	13:39	50	49.25
13:00	11	50.00	13:20	31	49.75	13:40	51	49.25
13:01	12	50.00	13:21	32	49.75	13:41	52	49.25
13:02	13	50.00	13:22	33	49.75	13:42	53	49.25
13:03	14	49.75	13:23	34	49.75	13:43	54	49.25
13:04	15	49.75	13:24	35	49.75	13:44	55	49.25
13:05	16	49.75	13:25	36	49.50	13:45	56	49.25
13:06	17	49.75	13:26	37	49.50	13:46	57	49.25
13:07	18	49.75	13:27	38	49.50	13:47	58	49.25
13:08	19	49.75	13:28	39	49.50	13:48	59	49.25
13:09	20	49.75	13:29	40	49.50	13:49	60	49.25

DZMW-1 PRESSURE TEST DATA

CITY OF CAPE CORAL
SOUTHWEST WRF AND ROWTP DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269.77010102
CONTRACTOR: Youngquist Brothers, Inc.
PROJECT MANAGI Neil Johnson
OWNER: City of Cape Coral

DATE: 7/7/2008
START TIME: 12:49
FINISH TIME: 13:49
CASING SIZE: 6.625-inch FRP

INITIAL PRESSURE: 50 psi
GAUGE SERIAL NUMBER: KEL-126532
CALCULATED WATER VOLUME: 0.5 gallons
OBSERVED WATER VOLUME: 0.5 gallons

PRESSSURE BLEED-OFF

TIME	PRESSURE	VOLUME	TIME	PRESSURE	VOLUME	TIME	PRESSURE	VOLUME
18:00	49	0						
18:05	0	0.5 gallons						
12:22								

Witnessed By: John Largey
MWH
Dan Keeley
YBI
James Crawford
MWH

Appendix O

Positive Seal Packer

Submittal Data
from
Youngquist Brothers, Inc.

15465 Pine Ridge Rd.
Ft. Myers, FL. 33908
Tel.: 239-489-4444 Fax: 239-489-4545

Project

Cape Coral SW WRF Class 1 Injection Well

I have reviewed this submittal for general conformance with the design concepts and contract documents. Generally no conflict with materials or dimensions will arise from the approval of this shop drawing submittal.

Date: September 21, 2007 Number of Copies: 10

Submittal Number: 02633-017-A

Specification Section Number: 02633-017-A

Item Submitted: YBI PSP, ECP & California Packers Shop Drawings

New Submittal: X Resubmitted: _____

Certification Statements: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar date and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.

Youngquist Brothers, Inc.

Representative:

MWH Constructors
Wu Fei

CERTIFICATION STATEMENT

By this submittal, we hereby represent that we have determined, verified, reviewed and/or approved applicable field measurements, field construction criteria, materials, products, dimensions, catalog numbers and similar data and have checked and coordinated relevant information for conformance with other applicable approved shop drawings and Contract Requirements.

Project Name & Number: WW4C.1 7012129

Submittal Number: SUL-YOUBRO-02633-0015-A

Specification Section: 2633

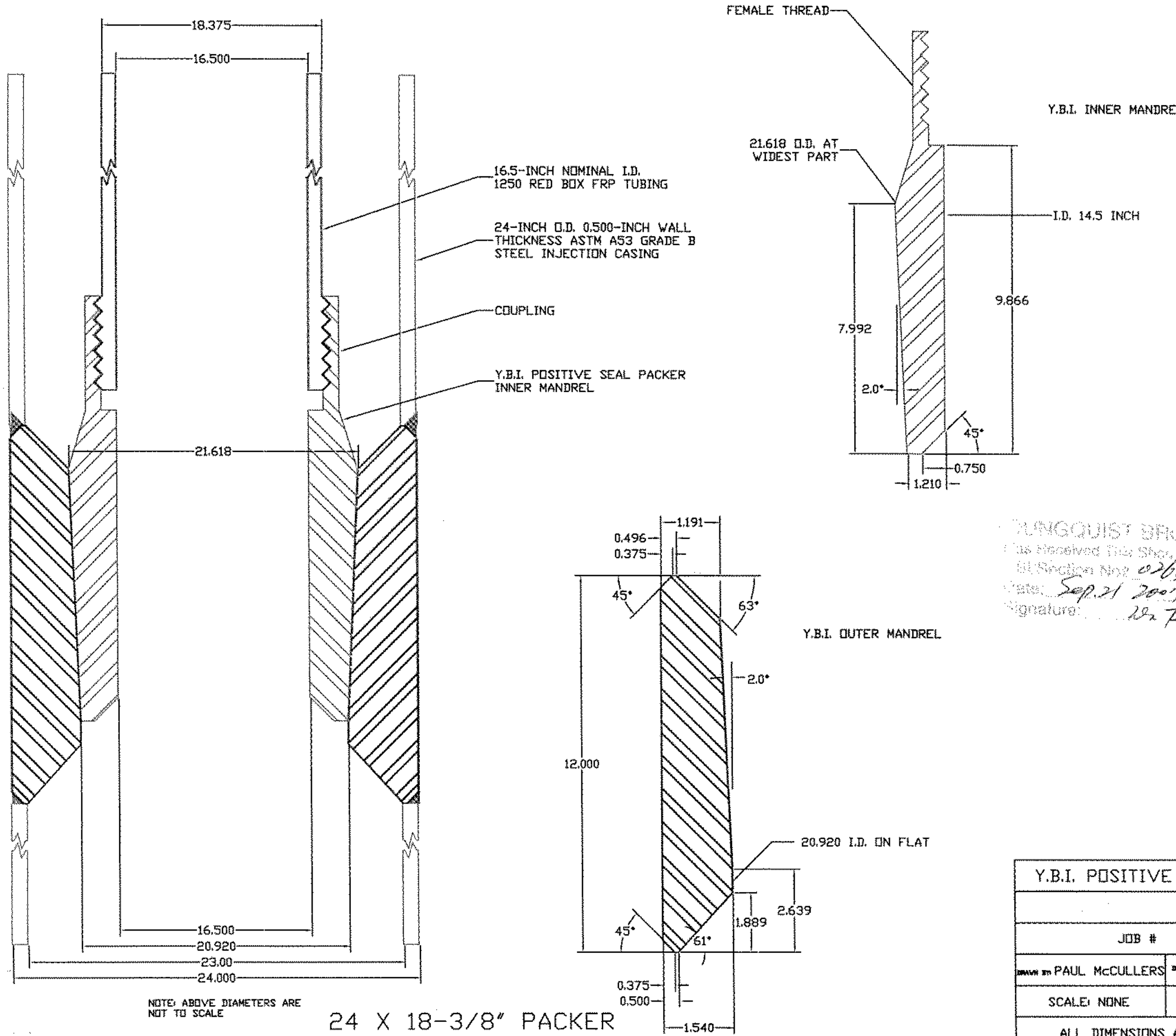
Submitted by: _____ Date: 9.24.07

- ☐ Approved
- ☐ Approved with changes
- ☐ Rejected
- ☐ Revise & Resubmit
- ☐ Not Reviewed

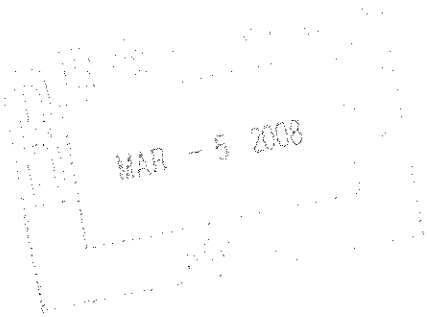
By: _____

Firm: _____

Date: _____



Y.B.I. POSITIVE SEAL PACKER	
JOB #	
DRAWN BY PAUL McCULLERS	DRAWN ON DECEMBER 28, 2004
SCALE: NONE	SHEET 1 of 1
ALL DIMENSIONS ARE IN INCHES	



Submittal Transmittal

Detailed, Grouped by Each Number

CC WW - 4C.1 SW Class I DIW 20322 Cape Coral Project # 7012129 **MWH Constructors**
Tel: Fax:

Date: 3/3/2008 **Reference Number:** 0069

Transmitted To:	Neil Johnson MWH Americas, Inc. 490 Sawgrass Corporate Pkwy. Suite 300 Sunrise, FL 33325 Tel: (954) 846-0401	**Transmitted By:**	Brooke Allen MWH Constructors 1200 Kismet Parkway West CAP-5 Cape Coral, FL 33993 Tel: 239-772-1764

Qty	Submittal Package No	Description	Due Date	Package Action
7	SUL-YOUBRO-02633-0022-A - - 0	Landing Joint Detail Shop Drawing	3/24/2008	

Transmitted For	Delivered Via	Tracking Number
Approval	Federal Express	7012129 / 19.9.1.1

Items	Qty	Description	Notes	Item Action
001	7	Landing Joint Detail Shop Drawing		

Cc:	Company Name	Contact Name	Copies	Notes
	MWH Americas, Inc.	Kelly Bremer	1	

Remarks

Dear Neil:

Please review and return a minimum of 4 copies.

Thank you,
Brooke

Brooke Allen
Signature

3/3/08
Signed Date

Submittal Data
from
Youngquist Brothers, Inc.

15465 Pine Ridge Rd.
Ft. Myers, FL. 33908
Tel.: 239-489-4444 Fax: 239-489-4545

Project

Cape Coral SW WRF Class 1 Injection Well

I have reviewed this submittal for general conformance with the design concepts and contract documents. Generally no conflict with materials or dimensions will arise from the approval of this shop drawing submittal.

Date: February 29, 2008 Number of Copies: 8

Submittal Number: 02633-034-A

Specification Section Number: 02633

Item Submitted: Landing Joint Detail Shop Drawing

New Submittal: X Resubmitted: _____

Certification Statements: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar date and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.

Youngquist Brothers, Inc.

Representative:

MWH Constructors
MONTGOMERY WATSON HARZA

CERTIFICATION STATEMENT

By this submittal, we hereby represent that we have determined, verified, reviewed and/or approved applicable field measurements, field construction criteria, materials, products, dimensions, catalog numbers and similar data and have checked and coordinated related information for each item with other applicable approved shop drawings and Contract requirements.

Project Name & Number: WW4C-1 7012129

Submittal Number: SUL-YOUBRO-02633-002-A

Specification Section: 2633

Submitted by: _____ Date: 3-3-08

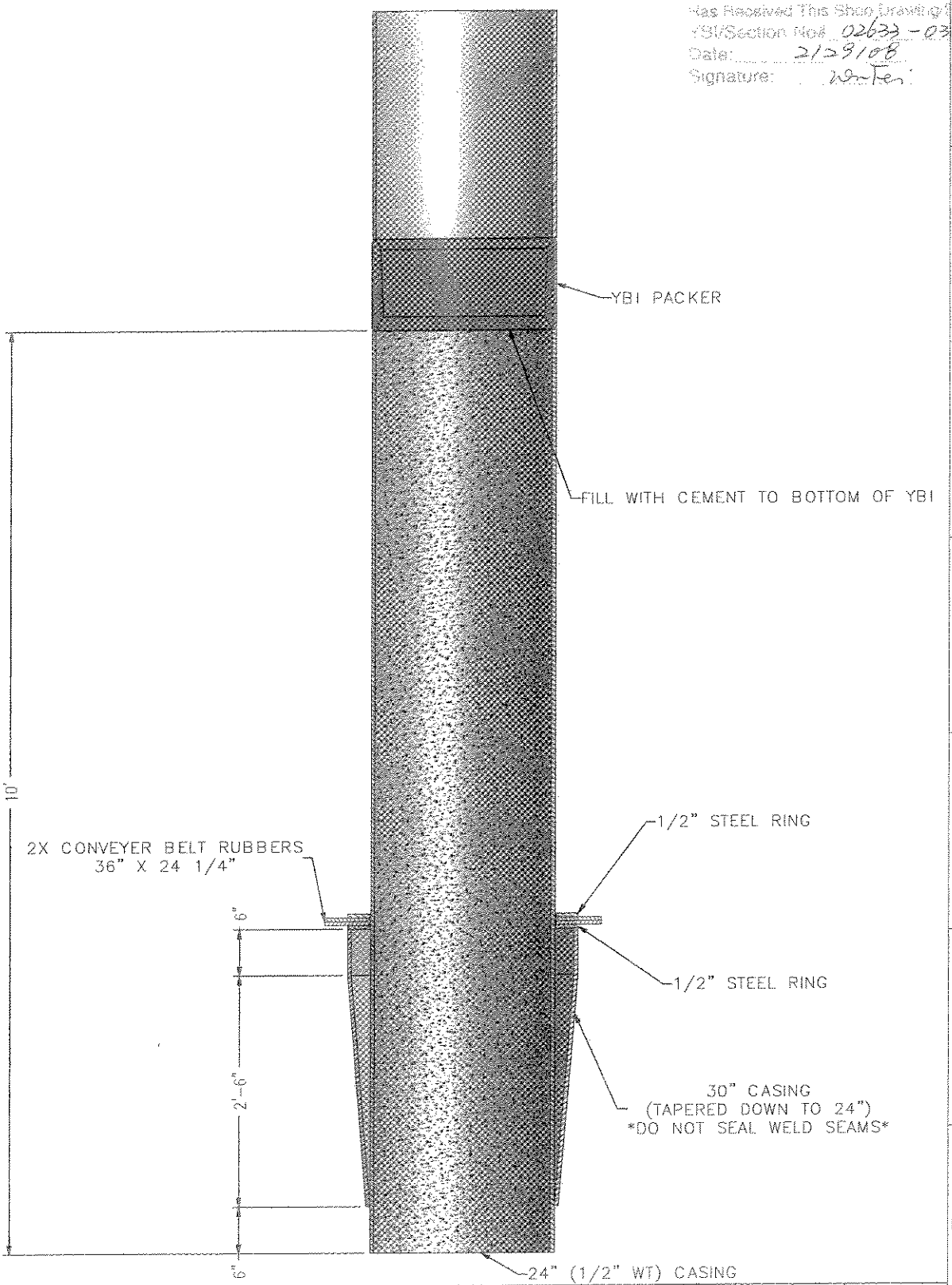
- ☐ Approved
- ☐ Approved with changes
- ☐ Rejected
- ☐ Revise & Resubmit
- ☐ Not Reviewed

By: _____

Firm: _____

Date: _____

YOUNGQUIST BROTHERS, INC
Has Received This Shop Drawing Submittal
YBI Section No# 02633-034-A
Date: 2/29/08
Signature:



TOLERANCES
(UNLESS SPECIFIED)

FRACTIONS:
BELOW 1" 1/64"
1"-12" 1/32"
ABOVE 12" 1/16"

DECIMALS:
.XX ±.01
.XXX ±.005
ANGLES ±1/4°

SURFACE FINISH
VALUES IN Ra MICRONS

Metorist

DRAWN TO ANSI STDS
DIMENSIONS IN INCHES
DO NOT SCALE

YOUNGQUIST BROTHERS, INC.
15465 Pine Ridge Road, Fort Myers, Florida 33908

DRILLING PLANT
DRILLING RIG
—
LANDING JOINT
DETAIL

Drawn	Date
JAM	2/14/2008
Checked	Date
Approved	Date
Sheet Size	Scale	Project No
B		
Drawing Number		
Landing Joint.idw		
Sh 1 of 1		Revision 0

Appendix P

Background Water Quality Test Results

Injection Well IW-1

Injection Zone Background Water Quality

Client Project: South Cape Coral
Lab Project: N0804478
Report Date: 07/17/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0804478-01	Injection Well grab	Ground Water	5/1/08 14:50	5/1/08 13:20

Analysis	Method	Results	Qual	MDL	Units	Analysis Date/Time	Analyst	Cert ID
Air Temperature-field	170.1	28.2		0.1	C	5/1/08 13:20	HC	E84380
Aluminum	EPA200.7	0.009	U	0.009	mg/L	5/9/08 12:22	JPW	E84380
Ammonia	EPA350.1	0.14		0.01	mg/L as N	5/6/08 13:00	AV	E84380
Antimony	EPA200.7	0.002	U	0.002	mg/L	5/9/08 12:22	JPW	E84380
Arsenic	EPA200.7	0.012		0.002	mg/L	5/9/08 12:22	JPW	E84380
Barium	EPA200.7	0.070		0.001	mg/L	5/9/08 12:22	JPW	E84380
Beryllium	EPA200.7	0.0001	U	0.0001	mg/L	5/9/08 12:22	JPW	E84380
Bicarbonate Alkalinity	SM4500CO2-D	114		3	mg/l CaCO3	5/1/08 15:30	AS	E84380
BOD	SM5210B	2	U	2	mg/L	5/2/08 11:30	AS/AV	E84380
Cadmium	EPA200.7	0.001	U	0.001	mg/L	5/9/08 12:22	JPW	E84380
Calcium	EPA200.7	695		0.006	mg/L	5/9/08 12:22	JPW	E84380
Chemical Oxygen Demand	EPA410.4	1740	J3	8	mg/L	5/13/08 8:00	BB	E84380
Chloride	SM4500Cl-E	20200		1	mg/L	5/5/08 11:42	AV	E84380
Chromium	EPA200.7	0.001	U	0.001	mg/L	5/9/08 12:22	JPW	E84380
Color-True	SM2120B	5		5	C.U.	5/1/08 16:30	AV	E84380
Copper	EPA200.7	0.002	I	0.001	mg/L	5/9/08 12:22	JPW	E84380
Dissolved Oxygen-field	360.1	2.76		0.01	mg/L	5/1/08 13:20	HC	E84380
Fluoride	SM4500F-C	0.9		0.1	mg/L	5/7/08 10:45	AV	E84380
Iron	EPA200.7	0.840		0.015	mg/L	5/9/08 12:22	JPW	E84380
Langelier Saturation Index	LSI	0.60		0.01	NONE	7/17/08 14:57	AK	E84380
Lead	EPA200.7	0.001	U	0.001	mg/L	5/9/08 12:22	JPW	E84380
Magnesium	EPA200.7	1040		0.007	mg/L	5/9/08 12:22	JPW	E84380
Manganese	EPA200.7	0.009		0.001	mg/L	5/9/08 12:22	JPW	E84380
Mercury	EPA245.1	0.001	U	0.001	mg/L	5/21/08 9:01	JPW	E84380
Nickel	EPA200.7	0.004		0.001	mg/L	5/9/08 12:22	JPW	E84380
Nitrate+Nitrite-N	EPA353.2	0.02	I	0.01	mg/L as N	5/2/08 16:18	SJ	E84380

Revised August 15th, 2008

Client Project: South Cape Coral
Lab Project: N0804478
Report Date: 07/17/08

Laboratory Results

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0804478-01	Injection Well grab	Ground Water	5/1/08 14:50	5/1/08 13:20

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Nitrate-N	EPA353.2	0.02		0.01	mg/L as N	5/2/08 16:18	SJ	E84380
Nitrite-N	EPA353.2	0.01	U	0.01	mg/L as N	5/2/08 15:48	SJ	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.16	I	0.10	mg/L as N	5/15/08 11:28	AV	E84380
Odor @ 30°C	SM2150B	2		1	TON	5/1/08 16:05	AS	E84380
Organic Nitrogen	EPA351.2/350.1	0.10	U	0.10	mg/L as N	5/15/08 11:28	SJ	E84380
Ortho Phosphate	SM4500P-E	0.010	U	0.010	mg/L as P	5/2/08 12:30	AV	E84380
pH - field	150.1	7.30		0.01	std units	5/1/08 13:20	HC	E84380
Phosphorus, Total	EPA365.4	0.025	U	0.025	mg/L as P	5/15/08 17:04	BB/AV	E84380
Potassium	EPA200.7	565		0.052	mg/L	5/9/08 12:22	JPW	E84380
See attached results	Subcontract					5/5/08 13:18	SUB	
Selenium	EPA200.7	0.003	I	0.002	mg/L	5/9/08 12:22	JPW	E84380
Silver	EPA200.7	0.001	U, J3	0.001	mg/L	5/9/08 12:22	JPW	E84380
Sodium	EPA200.7	11000		0.400	mg/L	5/9/08 12:22	JPW	E84380
Specific Conductance-field	120.1	52800		0.1	µmhos/cm	5/1/08 13:20	HC	E84380
Sulfate	ASTM-D516-90	3180		2	mg/L	5/2/08 16:26	AV	E84380
Thallium	EPA279.2	0.008		0.001	mg/L	5/7/08 9:38	JPW	E84380
Total Coliform, MF	SM9222B	1	U	1	CFU/100ml	5/1/08 15:00	RF	E84380
Total Dissolved Solids	SM2540C	32800		20	mg/L	5/5/08 16:00	AS	E84380
Turbidity - field	EPA180.1	3.4		0.1	NTU	5/1/08 13:20	HC	E84380
Water Temperature-field	170.1	32.7		0.1	C	5/1/08 13:20	HC	E84380
Weather-field	DEPSOP	clear		n/a	none	5/1/08 13:20	HC	E84380
Zinc	EPA200.7	0.065		0.001	mg/L	5/9/08 12:22	JPW	E84380

Revised August 15th 2008

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: N0804478
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:
Client Project Name: South Cape Coral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: N0804478. These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
J3: The reported value failed to meet the established quality control criteria.
J4: The sample matrix interfered with the ability to make an accurate determination.
J5: The data is questionable because of improper lab or field protocols.
K: Off scale low, actual value is less than the value given.
L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Laboratory report shall not be reproduced except in full, without the written approval of Sanders Laboratories.

Sanders Laboratories follows DEP standard operating procedures for field sampling.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Client Project: South Cape Coral
Lab Project: N0804478
Report Date: 05/22/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0804478-01	Injection Well grab	Ground Water	5/1/08 14:50	5/1/08 13:20

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Air Temperature-field	170.1	28.2		0.1	C	5/1/08 13:20	HC	E84380
Aluminum	EPA200.7	0.009	U	0.036	mg/L	5/9/08 12:22	JPW	E84380
Ammonia	EPA350.1	0.14		0.01	mg/L as N	5/6/08 13:00	AV	E84380
Antimony	EPA200.7	0.002	U	0.008	mg/L	5/9/08 12:22	JPW	E84380
Arsenic	EPA200.7	0.012		0.008	mg/L	5/9/08 12:22	JPW	E84380
Barium	EPA200.7	0.070		0.004	mg/L	5/9/08 12:22	JPW	E84380
Beryllium	EPA200.7	0.0001	U	0.000	mg/L	5/9/08 12:22	JPW	E84380
Bicarbonate Alkalinity	SM4500CO2-D	114		3	mg/l CaCO3	5/1/08 15:30	AS	E84380
BOD	SM5210B	2	U	2	mg/L	5/2/08 11:30	AS/AV	E84380
Cadmium	EPA200.7	0.001	U	0.004	mg/L	5/9/08 12:22	JPW	E84380
Calcium	EPA200.7	695		0.024	mg/L	5/9/08 12:22	JPW	E84380
Chemical Oxygen Demand	EPA410.4	1740	J3	32	mg/L	5/13/08 8:00	BB	E84380
Chloride	SM4500Cl-E	20200		1	mg/L	5/5/08 11:42	AV	E84380
Chromium	EPA200.7	0.001	U	0.004	mg/L	5/9/08 12:22	JPW	E84380
Color-True	SM2120B	5		15	C.U.	5/1/08 16:30	AV	E84380
Copper	EPA200.7	0.002	I	0.004	mg/L	5/9/08 12:22	JPW	E84380
Dissolved Oxygen-field	360.1	2.76		0.01	mg/L	5/1/08 13:20	HC	E84380
Fluoride	SM4500F-C	0.9		0.4	mg/L	5/7/08 10:45	AV	E84380
Iron	EPA200.7	0.840		0.060	mg/L	5/9/08 12:22	JPW	E84380
Langelier Saturation Index	LSI	0.60		0.01	NONE	7/17/08 14:57	AK	E84380
Lead	EPA200.7	0.001	U	0.004	mg/L	5/9/08 12:22	JPW	E84380
Magnesium	EPA200.7	1040		0.028	mg/L	5/9/08 12:22	JPW	E84380
Manganese	EPA200.7	0.009		0.004	mg/L	5/9/08 12:22	JPW	E84380
Mercury	EPA245.1	0.001	U	0.0020	mg/L	5/21/08 9:01	JPW	E84380
Nickel	EPA200.7	0.004		0.001	mg/L	5/9/08 12:22	JPW	E84380
Nitrate+Nitrite-N	EPA353.2	0.02	I	0.04	mg/L as N	5/2/08 16:18	SJ	E84380

Client Project: South Cape Coral
Lab Project: N0804478
Report Date: 05/22/08

Laboratory Results

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0804478-01	Injection Well grab	Ground Water	5/1/08 14:50	5/1/08 13:20

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Nitrate-N	EPA353.2	0.02		10	mg/L as N	5/2/08 16:18	SJ	E84380
Nitrite-N	EPA353.2	0.01	U	1	mg/L as N	5/2/08 15:48	SJ	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.16	I	0	mg/L as N	5/15/08 11:28	AV	E84380
Odor @ 30°C	SM2150B	2		3	TON	5/1/08 16:05	AS	E84380
Organic Nitrogen	EPA351.2/350.1	0.10	U	0	mg/L as N	5/15/08 11:28	SJ	E84380
Ortho Phosphate	SM4500P-E	0.010	U	0.010	mg/L as P	5/2/08 12:30	AV	E84380
pH - field	150.1	7.30		0.01	std units	5/1/08 13:20	HC	E84380
Phosphorus, Total	EPA365.4	0.025	U	0.025	mg/L as P	5/15/08 17:04	BB/AV	E84380
Potassium	EPA200.7	565		0.208	mg/L	5/9/08 12:22	JPW	E84380
See attached results	Subcontract					5/5/08 13:18	SUB	
Selenium	EPA200.7	0.003	I	0.008	mg/L	5/9/08 12:22	JPW	E84380
Silver	EPA200.7	0.001	U, J3	0.001	mg/L	5/9/08 12:22	JPW	E84380
Sodium	EPA200.7	11000		1.60	mg/L	5/9/08 12:22	JPW	E84380
Specific Conductance-field	120.1	52800		0.1	µmhos/cm	5/1/08 13:20	HC	E84380
Sulfate	ASTM-D516-90	3180		250	mg/L	5/2/08 16:26	AV	E84380
Thallium	EPA279.2	0.008		0.001	mg/L	5/7/08 9:38	JPW	E84380
Total Coliform, MF	SM9222B	1	U	1	CFU/100ml	5/1/08 15:00	RF	E84380
Total Dissolved Solids	SM2540C	32800		500	mg/L	5/5/08 16:00	AS	E84380
Turbidity - field	EPA180.1	3.4		0.1	NTU	5/1/08 13:20	HC	E84380
Water Temperature-field	170.1	32.7		0.1	C	5/1/08 13:20	HC	E84380
Weather-field	DEPSOP	clear		0	none	5/1/08 13:20	HC	E84380
Zinc	EPA200.7	0.065		0.004	mg/L	5/9/08 12:22	JPW	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

Date issued: May 21, 2008

To: Tami Bright
Sanders Laboratories, Inc.
1050 Endeavor Court
Nokomis, FL 34275

Client: Sanders Laboratories, Inc.
Workorder ID: N0804478 **[2030789]**
Received: 5/02/08 11:30

Dear Tami Bright;

Analytical results presented in this report have been reviewed for compliance with the HBEL Inc. Quality Systems Manual and have been determined to meet applicable Method guidelines and Standards referenced in the July 2003 National Environmental Laboratory Accreditation Program (NELAP) Quality Manual unless otherwise noted. The Analytical Results within these report pages reflect the values obtained from tests performed on Samples As Received by the laboratory unless indicated differently.

FDOH Safe Drinking Water Act, Clean Water Act and RCRA Certification #'s:
E96080, E83509, E84418

Questions regarding this report should be directed to the Report Signatory at (772) 465-2400, Ext. 285 referencing the HBEL Workorder ID [Number].

Respectfully submitted,

Eric Charest
HBEL, Inc. Laboratory Manager

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

Quality Control Summary

Client: Sanders Laboratories, Inc.
Workorder ID: N0804478
Received: 5/02/08 11:30

[2030789]

MB=Method Blank LCS=Laboratory Control Sample LCSD=Laboratory Control Sample Duplicate MS=Matrix Spike MSD=Matrix Spike Duplicate DUP=Sample Duplicate

Method Narratives (If Applicable)

HBEL Sample Number	Sample ID	Analytical Method	Description

Quality Control Summary

Method	HBEL Batch	Analyte	Analytical Issue
EPA 505			
	PEST5115		
2030789001		Decachlorobiphenyl	Surrogate - Outside acceptance Limits.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2030789]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0804478

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Laboratory ID: **2030789001**										
Sample ID: **N0804478-01 Grab**							*Sampled: 05/01/08 13:20*	*Received: 05/02/08 11:30*		
							Matrix: Water	Results reported on Wet Weight Basis		
Cyanide	Y	0.0047U	mg/L	0.0047	EPA 335.2	WCGE29344	05/8/08 11:30	05/8/08 16:35	GG	E96080
Surfactants as LAS, Mol.wt.340		0.064	mg/L	0.022	EPA 425.1	WCGE29315	05/2/08 13:30	05/2/08 17:36	GG	E96080
1,2-Dibromo-3-chloropropane		0.0034U	ug/L	0.0034	EPA 504.1	PEST5118	05/8/08 12:00	05/9/08 4:53	WR	E96080
1,2-Dibromoethane		0.0045U	ug/L	0.0045	EPA 504.1	PEST5118	05/8/08 12:00	05/9/08 4:53	WR	E96080
Aldrin		0.042U	ug/L	0.042	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
Chlordane		0.12U	ug/L	0.12	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
Dieldrin		0.063U	ug/L	0.063	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
Endrin		0.097U	ug/L	0.097	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
gamma-BHC (Lindane)		0.019U	ug/L	0.019	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
Heptachlor		0.035U	ug/L	0.035	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
Heptachlor epoxide		0.026U	ug/L	0.026	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
Methoxychlor		0.042U	ug/L	0.042	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
PCB		0.13U	ug/L	0.13	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
Toxaphene		0.58U	ug/L	0.58	EPA 505	PEST5115	05/6/08 13:00	05/7/08 2:25	JL	E96080
2,4,5-TP		0.19U	ug/L	0.19	EPA 515.1	PEST5116	05/7/08 11:00	05/9/08 12:26	JL	E96080
2,4-D		0.22U	ug/L	0.22	EPA 515.1	PEST5116	05/7/08 11:00	05/9/08 12:26	JL	E96080
Dalapon		2.3U	ug/L	2.3	EPA 515.1	PEST5116	05/7/08 11:00	05/9/08 12:26	JL	E96080
Dinoseb		0.23U	ug/L	0.23	EPA 515.1	PEST5116	05/7/08 11:00	05/9/08 12:26	JL	E96080
Pentachlorophenol		0.39U	ug/L	0.39	EPA 515.1	PEST5116	05/7/08 11:00	05/9/08 12:26	JL	E96080
Picloram		0.23U	ug/L	0.23	EPA 515.1	PEST5116	05/7/08 11:00	05/9/08 12:26	JL	E96080
1,1,1,2-Tetrachloroethane		0.24U	ug/L	0.24	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,1,1-Trichloroethane		0.21U	ug/L	0.21	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,1,2,2-Tetrachloroethane		0.47U	ug/L	0.47	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,1,2-Trichloroethane		0.44U	ug/L	0.44	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,1-Dichloroethane		0.20U	ug/L	0.20	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,1-Dichloroethene		0.23U	ug/L	0.23	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,1-Dichloropropene		0.24U	ug/L	0.24	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,2,3-Trichloropropane		0.30U	ug/L	0.30	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,2,4-Trichlorobenzene		0.41U	ug/L	0.41	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,2-Dichlorobenzene		0.21U	ug/L	0.21	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,2-Dichloroethane		0.29U	ug/L	0.29	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,2-Dichloropropane		0.40U	ug/L	0.40	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,3-Dichlorobenzene		0.23U	ug/L	0.23	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,3-Dichloropropane		0.22U	ug/L	0.22	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,3-Dichloropropene		0.52U	ug/L	0.52	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
1,4-Dichlorobenzene		0.23U	ug/L	0.23	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
2,2-Dichloropropane		0.30U	ug/L	0.30	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
2-Chlorotoluene		0.20U	ug/L	0.20	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
4-Chlorotoluene		0.23U	ug/L	0.23	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2030789]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0804478

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Benzene		0.20U	ug/L	0.20	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Bromobenzene		0.34U	ug/L	0.34	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Bromodichloromethane		0.25U	ug/L	0.25	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Bromoform		0.41U	ug/L	0.41	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Bromomethane		0.30U	ug/L	0.30	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Carbon tetrachloride		0.24U	ug/L	0.24	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Chlorobenzene		0.30U	ug/L	0.30	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Chloroethane		0.46U	ug/L	0.46	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Chloroform		0.25U	ug/L	0.25	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Chloromethane		0.40U	ug/L	0.40	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
cis-1,2-Dichloroethene		0.21U	ug/L	0.21	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Dibromochloromethane		0.30U	ug/L	0.30	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Dibromomethane		0.35U	ug/L	0.35	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Dichlorodifluoromethane		0.28U	ug/L	0.28	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Ethylbenzene		0.21U	ug/L	0.21	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Methyl-tert-butyl-ether		0.21U	ug/L	0.21	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Methylene chloride		0.23U	ug/L	0.23	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Styrene		0.21U	ug/L	0.21	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Tetrachloroethene		0.24	ug/L	0.24	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Toluene		0.22U	ug/L	0.22	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Total THMs		0.25U	ug/L	0.25	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Total Xylenes		0.46U	ug/L	0.46	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
trans-1,2-Dichloroethene		0.35U	ug/L	0.35	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Trichloroethene		0.36U	ug/L	0.36	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Trichlorofluoromethane		0.22U	ug/L	0.22	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Vinyl chloride		0.32U	ug/L	0.32	EPA 524.2	VOC2912		05/9/08 17:42	WR	E96080
Alachlor		0.66U	ug/L	0.66	EPA 525.2	SVOC2641	05/5/08 11:00	05/7/08 12:23	WR	E96080
Atrazine		0.52U	ug/L	0.52	EPA 525.2	SVOC2641	05/5/08 11:00	05/7/08 12:23	WR	E96080
Benzo(a)pyrene		0.075U	ug/L	0.075	EPA 525.2	SVOC2641	05/5/08 11:00	05/7/08 12:23	WR	E96080
bis(2-ethylhexyl)phthalate		1.7	ug/L	0.91	EPA 525.2	SVOC2641	05/5/08 11:00	05/7/08 12:23	WR	E96080
Di(2-ethylhexyl)adipate		0.73U	ug/L	0.73	EPA 525.2	SVOC2641	05/5/08 11:00	05/7/08 12:23	WR	E96080
Hexachlorobenzene		0.33U	ug/L	0.33	EPA 525.2	SVOC2641	05/5/08 11:00	05/7/08 12:23	WR	E96080
Hexachlorocyclopentadiene		0.25U	ug/L	0.25	EPA 525.2	SVOC2641	05/5/08 11:00	05/7/08 12:23	WR	E96080
Simazine		0.68U	ug/L	0.68	EPA 525.2	SVOC2641	05/5/08 11:00	05/7/08 12:23	WR	E96080
Carbofuran		0.41U	ug/L	0.41	EPA 531.1	HPLC2469		05/6/08 18:35	JJM	E96080
Oxamyl		0.13U	ug/L	0.13	EPA 531.1	HPLC2469		05/6/08 18:35	JJM	E96080
Glyphosate		13U	ug/L	13	EPA 547	HPLC2470		05/7/08 17:13	JJM	E96080
Endothall		2.8U	ug/L	2.8	EPA 548.1	SVOC2640	05/5/08 11:00	05/8/08 8:53	WR	E96080
Diquat		1.9U	ug/L	1.9	EPA 549.2	HPLC2471	05/7/08 13:00	05/8/08 11:58	JJM	E96080
Dibromoacetic Acid		0.18U	ug/L	0.18	EPA 552.1	PEST5121	05/19/08 15:28	05/20/08 9:34	JL	E96080
Dichloroacetic Acid		0.66U	ug/L	0.66	EPA 552.1	PEST5121	05/19/08 15:28	05/20/08 9:34	JL	E96080
Monobromoacetic Acid		0.28U	ug/L	0.28	EPA 552.1	PEST5121	05/19/08 15:28	05/20/08 9:34	JL	E96080
Monochloroacetic Acid		0.88U	ug/L	0.88	EPA 552.1	PEST5121	05/19/08 15:28	05/20/08 9:34	JL	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2030789]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0804478

Parameter	Qualifier	Result[1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Total HAAs		0.18U	ug/L	0.18	EPA 552.1	PEST5121	05/19/08 15:28	05/20/08 9:34	JL	E96080
Trichloroacetic acid		0.20U	ug/L	0.20	EPA 552.1	PEST5121	05/19/08 15:28	05/20/08 9:34	JL	E96080
2,4,6-Trichlorophenol		1.1U	ug/L	1.1	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
2,4-Dinitrotoluene		0.77U	ug/L	0.77	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
2-Chlorophenol		0.86U	ug/L	0.86	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
2-Methyl-4,6-dinitrophenol		1.2U	ug/L	1.2	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Anthracene		0.52U	ug/L	0.52	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Butylbenzylphthalate		0.57U	ug/L	0.57	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Di-n-butylphthalate		0.76U	ug/L	0.76	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Di-n-octylphthalate		0.53U	ug/L	0.53	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Diethylphthalate		0.36U	ug/L	0.36	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Dimethyl-phthalate		2.5U	ug/L	2.5	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Isophorone		0.44U	ug/L	0.44	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Naphthalene		0.72U	ug/L	0.72	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Phenanthrene		0.31U	ug/L	0.31	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080
Phenol		1.0U	ug/L	1.0	EPA 625	SVOC2643	05/8/08 12:00	05/14/08 1:10	WR	E96080

[1]Result Qualifiers: U = Not Detected I = Analyte detected between the Laboratory Method Detection Limit and Laboratory Reporting Limit
Applicable Florida Department of Environmental Protection Qualifiers defined below. Statement of Estimated Uncertainty available upon request.

Y Analysis performed on an Unpreserved, or Improperly Preserved sample.

EMSL Analytical, Inc.
19501 NE 10th Ave. Bay A, N. Miami Beach, FL 33179
Phone: (305) 650-0577 Fax: (305) 650-0578 Email: miamilab@emsl.com

Attn: **T. Bright**
Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

Fax: (941) 484-6774 Phone: (941) 488-8103
Project: **N0804478**

Customer ID: SAND53
Customer PO: N0804478
Received: 05/02/08 9:45 AM
EMSL Order: 170802256

EMSL Proj:
Analysis Date: 5/12/2008
Report Date: 5/12/2008

Determination of Asbestos Structures over 10um in Length in Waste Water Performed by the EPA 100.2 Method

Sample ID	Sample Prep Date	# Fibers Asbestos	# Fibers Non-Asbestos	Type(s) Of Asbestos	Analytical Sensitivity (MFL)	Confidence Limits	Concentration Of Asbestos Fibers (MFL)	Comments
N0804478-01 *170802256-0001*	5/2/2008 13:00	0			0.74	0.00-2.70	<0.74	Collection Date 5/1/2008 15:30

Contact Kim Wallace at (305) 650-0577 with any questions.

Analyst(s)
Edgar Rodriguez (1)

Kimberly A. Wallace
Kimberly Wallace, Laboratory Manager
or other approved signatory

THIS IS THE LAST PAGE OF THE REPORT.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

SYNTHETIC ORGANICS 62 - 550.310 (4) (b)

Client: Sanders Laboratories, Inc.
Workorder: N0804478
Sample Location: N0804478-01 Grab
Sample Number: 2030789001
Sampling Date: 5/01/08 13:20
PWS ID (From Page 1): _____
Date Received: 5/02/08 11:30

Contam ID	Contam Name	MCL	Units	Analysis Result	Qual*	Analytical Method	Lab MDL	RDL	Extraction Date	Analysis Date/Time	DOH Lab Cert #
2005	Endrin	[2]	ug/L	**0.097**	U	EPA 505	0.097	0.01	5/06/08	5/07/08 2:25	E96080
2010	gamma-BHC (Lindane)	[0.2]	ug/L	**0.019**	U	EPA 505	0.019	0.02	5/06/08	5/07/08 2:25	E96080
2015	Methoxychlor	[40]	ug/L	**0.042**	U	EPA 505	0.042	0.1	5/06/08	5/07/08 2:25	E96080
2020	Toxaphene	[3]	ug/L	**0.58**	U	EPA 505	0.58	1	5/06/08	5/07/08 2:25	E96080
2031	Dalapon	[200]	ug/L	**2.3**	U	EPA 515.1	2.3	1	5/07/08	5/09/08 12:26	E96080
2032	Diquat	[20]	ug/L	**1.9**	U	EPA 549.2	1.9	0.4	5/07/08	5/08/08 11:58	E96080
2033	Endothall	[100]	ug/L	**2.8**	U	EPA 548.1	2.8	9	5/05/08	5/08/08 8:53	E96080
2034	Glyphosate	[700]	ug/L	**13**	U	EPA 547	13	6		5/07/08 17:13	E96080
2035	Di(2-ethylhexyl)adipate	[400]	ug/L	**0.73**	U	EPA 525.2	0.73	0.6	5/05/08	5/07/08 12:23	E96080
2036	Oxamyl	[200]	ug/L	**0.13**	U	EPA 531.1	0.13	2		5/06/08 18:35	E96080
2037	Simazine	[4]	ug/L	**0.68**	U	EPA 525.2	0.68	0.07	5/05/08	5/07/08 12:23	E96080
2039	bis(2-ethylhexyl)phthalate	[6]	ug/L	**1.7**	I	EPA 525.2	0.91	0.6	5/05/08	5/07/08 12:23	E96080
2040	Picloram	[500]	ug/L	**0.23**	U	EPA 515.1	0.23	0.1	5/07/08	5/09/08 12:26	E96080
2041	Dinoseb	[7]	ug/L	**0.23**	U	EPA 515.1	0.23	0.2	5/07/08	5/09/08 12:26	E96080
2042	Hexachlorocyclopentadiene	[50]	ug/L	**0.25**	U	EPA 525.2	0.25	0.1	5/05/08	5/07/08 12:23	E96080
2046	Carbofuran	[40]	ug/L	**0.41**	U	EPA 531.1	0.41	0.9		5/06/08 18:35	E96080
2050	Atrazine	[3]	ug/L	**0.52**	U	EPA 525.2	0.52	0.1	5/05/08	5/07/08 12:23	E96080
2051	Alachlor	[2]	ug/L	**0.66**	U	EPA 525.2	0.66	0.2	5/05/08	5/07/08 12:23	E96080
2065	Heptachlor	[0.4]	ug/L	**0.035**	U	EPA 505	0.035	0.04	5/06/08	5/07/08 2:25	E96080
2067	Heptachlor epoxide	[.2]	ug/L	**0.026**	U	EPA 505	0.026	0.02	5/06/08	5/07/08 2:25	E96080
2105	2,4-D	[70]	ug/L	**0.22**	U	EPA 515.1	0.22	0.1	5/07/08	5/09/08 12:26	E96080
2110	2,4,5-TP	[50]	ug/L	**0.19**	U	EPA 515.1	0.19	0.2	5/07/08	5/09/08 12:26	E96080
2274	Hexachlorobenzene	[1]	ug/L	**0.33**	U	EPA 525.2	0.33	0.1	5/05/08	5/07/08 12:23	E96080
2306	Benzo(a)pyrene	[.2]	ug/L	**0.075**	U	EPA 525.2	0.075	0.02	5/05/08	5/07/08 12:23	E96080
2326	Pentachlorophenol	[1]	ug/L	**0.39**	U	EPA 515.1	0.39	0.04	5/07/08	5/09/08 12:26	E96080
2383	PCB	[.5]	ug/L	**0.13**	U	EPA 505	0.13	0.1	5/06/08	5/07/08 2:25	E96080
2931	1,2-Dibromo-3-chloropropane	[.2]	ug/L	**0.0034**	U	EPA 504.1	0.0034	0.02	5/08/08	5/09/08 4:53	E96080
2946	1,2-Dibromoethane	[.02]	ug/L	**0.0045**	U	EPA 504.1	0.0045	0.01	5/08/08	5/09/08 4:53	E96080
2959	Chlordane	[2]	ug/L	**0.12**	U	EPA 505	0.12	0.2	5/06/08	5/07/08 2:25	E96080

Reporting Format 62-550.730
Effective January 1995, Revised January 2007

NOTE: Results indicating non-detection with a reported lab MDL >50% of the MCL will not be accepted for compliance with 62-550.310(4)(b).

* Results must be reported with appropriate qualifiers in accordance with Florida Administrative Code Rule 62-160, Table 1. Results Qualified with A, F, H, N, O, T, Z, ?, *, are unacceptable for compliance with 62-550. Results qualified with a J, Q, R, or Y must be accompanied by written justification and will be evaluated on a case by case basis. To avoid a monitoring violation, unacceptable results must be replaced with acceptable results from samples collected during the same monitoring period.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

INORGANIC CONTAMINANTS
62 - 550.310 (1)

Client:	Sanders Laboratories, Inc.	Workorder:	N0804478
Sample Location:	N0804478-01 Grab	Sample Number:	2030789001
Sampling Date:	5/01/08 13:20	PWS ID (From Page 1):	_____
Date Received:	5/02/08 11:30		

Contam ID	Contam Name	MCL	Units	Analysis Result	Qual*	Analytical Method	Lab MDL	Analysis Date/Time	DOH Lab Cert #
1024	Cyanide	[0.2]	mg/L	**0.0047**	UY	EPA 335.2	0.0047	5/08/08 16:35	E96080

Reporting Format 62-550.730
Effective January 1995, Revised January 2007

* Results must be reported with appropriate qualifiers in accordance with Florida Administrative Code Rule 62-160, Table 1. Results Qualified with A, F, H, N, O, T, Z, ?, *, are unacceptable for compliance with 62-550. Results qualified with a J, Q, R, or Y must be accompanied by written justification and will be evaluated on a case by case basis. To avoid a monitoring violation, unacceptable results must be replaced with acceptable results from samples collected during the same monitoring period.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

SECONDARY CONTAMINANTS
62 - 550.320

Client:	Sanders Laboratories, Inc.	Workorder:	N0804478
Sample Location:	N0804478-01 Grab	Sample Number:	2030789001
Sampling Date:	5/01/08 13:20	PWS ID (From Page 1):	_____
Date Received:	5/02/08 11:30		

Contam ID	Contam Name	MCL	Units	Analysis Result	Qual*	Analytical Method	Lab MDL	Analysis Date/Time	DOH Lab Cert #
2905	Foaming Agents	[0.5]	mg/L	**0.064**	I	EPA 425.1	0.022	5/02/08 17:36	E96080

Reporting Format 62-550.730
Effective January 1995, Revised January 2007

* Results must be reported with appropriate qualifiers in accordance with Florida Administrative Code Rule 62-160, Table 1. Results Qualified with A, F, H, N, O, T, Z, ?, *, are unacceptable for compliance with 62-550. Results qualified with a J, Q, R, or Y must be accompanied by written justification and will be evaluated on a case by case basis. To avoid a monitoring violation, unacceptable results must be replaced with acceptable results from samples collected during the same monitoring period.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

Unregulated Group I Analysis
62 - 550.405
(PWS035)

Client:	Sanders Laboratories, Inc.	Workorder:	N0804478
Sample Location:	N0804478-01 Grab		
Sample Number:	2030789001		
Sampling Date:	5/01/08 13:20		
Preservative:	Sodium thiosulfate, or Monochloroacetic Acid		
Date Received:	5/02/08 11:30		

ID	Parameter	Result		Method	MDL	Date	Lab ID
2356	Aldrin	**0.042U**	ug/L	EPA 505	0.042	5/07/08	E96080
2364	Dieldrin	**0.063U**	ug/L	EPA 505	0.063	5/07/08	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-2400 Ext. 285 Fax: (772) 467-1584

Unregulated Group III Analysis
62 - 550.415
(PWS036_037)

Client: Sanders Laboratories, Inc. Workorder: N0804478

Sample Location: N0804478-01 Grab

Sample Number: 2030789001

Sampling Date: 5/01/08 13:20

Preservative: None

Date Received: 5/02/08 11:30

ID	Parameter	Result		Method	MDL	Date	Lab ID
2262	Isophorone	**0.44U**	ug/L	EPA 625	0.44	5/14/08	E96080
2270	2,4-Dinitrotoluene	**0.77U**	ug/L	EPA 625	0.77	5/14/08	E96080
2282	Dimethyl-phthalate	**2.5U**	ug/L	EPA 625	2.5	5/14/08	E96080
2284	Diethylphthalate	**0.36U**	ug/L	EPA 625	0.36	5/14/08	E96080
2290	Di-n-butylphthalate	**0.76U**	ug/L	EPA 625	0.76	5/14/08	E96080
2294	Butylbenzylphthalate	**0.57U**	ug/L	EPA 625	0.57	5/14/08	E96080
9089	Di-n-octylphthalate	**0.53U**	ug/L	EPA 625	0.53	5/14/08	E96080
9108	2-Chlorophenol	**0.86U**	ug/L	EPA 625	0.86	5/14/08	E96080
9112	2-Methyl-4,6-dinitrophenol	**1.2U**	ug/L	EPA 625	1.2	5/14/08	E96080
9115	Phenol	**1.0U**	ug/L	EPA 625	1.0	5/14/08	E96080
9116	2,4,6-Trichlorophenol	**1.1U**	ug/L	EPA 625	1.1	5/14/08	E96080

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

May 22, 2008
Project No: 82011

Laboratory Report

Project Name	N0804478
Sample Description	N0804478-01
Matrix	Groundwater
SAL Sample Number	82011.01
Date/Time Collected	05/01/08 13:32
Date/Time Received	05/02/08 10:00

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Radiochemistry							
Gross Alpha (Incl. Uranium)	pCi/l	200±7.4	EPA 00-02	2.8	05/08/08 13:40	05/06/08 09:10	ARM
Radium-226	pCi/l	48±0.8	EPA 903.1	0.08	05/14/08 12:00	05/07/08 12:45	AWW
Radium-228	pCi/l	1.2±0.2	EPA RA-05	0.5	05/16/08 11:59	05/14/08 16:30	AWW
Combined Uranium	pCi/l	0.17	ASTM D5174	0.04	05/20/08 17:41	05/12/08 09:00	AWW

FDOH Laboratory No. E84129
NELAP Accredited

Francis I. Daniels, Laboratory Director
Leslie C. Boardman, Q. A. Manager

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

May 22, 2008
Project No: 82011

Laboratory Report

Footnotes

*	Test results presented in this report meet all the requirements of the NELAC standards.
**	A statement of estimated uncertainty of test results is available upon request.
***	For methods marked with ***, all QC criteria have been met for this method which is equivalent to a SAL certified method.

FDOH Laboratory No. E84129
NELAP Accredited

Approved By: **Francis I. Daniels, Laboratory Director**
Leslie C. Boardman, Q. A. Manager

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N0804478

Page 1 of 2

Client Youngquist
Address
Phone Fax

Report To:
Bill To:
P.O. #
Project Name Cape Coral SW
Project Location: YQ.ccsw 10/20

Sample Supply: GW
Customer Type:
Field Report #:
Kit # 08-81
REQUESTED DUE DATE: 5/9/08

Sampled By (PRINT) Hilary Crook
Sampler Signature Hilary Crook

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	THIO	ANALYSES REQUEST Bod, Color, Brcarb	TDS, Cl-, SO4, F	Odor	No2, No3, Nox	NH3, O-Nit, TKN	TP, Cod	OP	Metals *	Total Col.	Cn-, MBAS	Vocs, TTHM's	Sample ID #
	Injection Well "Inj.Well"	5/08	1320	G		1					1	1										-01A
						1							1									B
						1								1								C
							1								1	1						D
						1											1					E
								1										1				F
										1									1			G
																				1	1	H

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Hilary Crook	5/08	1450	Manager	5/1/08	1450

COMMENTS:
*As, Ba, Cd, Cr, Pb, Hg
Ni, Se, Na, Sb, Be, Al
Cu, Fe, Mn, Ag, Zn
Ca, K, Mg, Tl (279.2)

OKAY TO RUN AS IS...
CLIENT INITIAL:
SAMPLES ON ICE (Yes) No

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 10090 Bavaria Rd., Fort Myers, FL 33913 • (239) 590-0337 • FAX (239) 590-0536

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N0804478

Page 2 of 2

Client Youngquist

Address

Phone Fax

Report To:

Bill To:

P.O. # Cape Coral SW

Project Name

Project Location: YQCCSW Injection Well

Sample Supply: GW

Customer Type:

Field Report #:

Kit #

REQUESTED DUE DATE:

Sampled By (PRINT) Hilary Crook

Sampler Signature Hilary Crook

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	ANALYSES REQUEST HAAS	SOC's	Gross Alpha	Uranium	Rads 226/228	EPA 625	Asbestos	GW Field	Sample ID #
	Injection Well 'Inj Well'	5108	1320	G						1	1	1	1	1	1	1		-01H
																	X	

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Hilary Crook	5108	1450	[illegible]	5/1/08	1450

COMMENTS:

OKAY TO RUN AS IS...
CLIENT INITIAL:

SAMPLES ON ICE
Yes No

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 10090 Bavaria Rd., Fort Myers, FL 33913 • (239) 590-0337 • FAX (239) 590-0536

Asbestos

SW CC

Specific Conductivity
Total Dissolved Solids
Chlorides
Sulfates

3. Analyses requested for the injection and monitoring zones are as follows:

A. Primary Drinking Water Standards

Alachlor
Aldicarb
Aldicarb sulfoxide
Aldicarb sulfone
Aroclors (Polychlorinated Biphenyls or PCBfs)
Alpha, Gross
Antimony
Arsenic
Asbestos
Atrazine
Barium
Benzene
Benzo(a)pyrene
Beryllium
Cadmium
Carbofuran
Chlordane
Chlorobenzene (Monochlorobenzene)
Chromium
Coliforms, Total
Cyanide
2,4-D (2,4-Dichlorophenoxyacetic acid)
Dalapon (2,2-Dichloropropionic acid)
Dibromochloropropane (DBCP)
1,2-Dibromoethane (EDB, Ethylene Dibromide)
1,2-Dichlorobenzene (o-Dichlorobenzene)
1,4-Dichlorobenzene (p-dichlorobenzene or Para Dichlorobenzene)
1,2-Dichloroethane (Ethylene dichloride)
1,1 Dichloroethene(Vinylidene chloride)
cis-1,2- Dichloroethene (1,2-Dichlorethene)
trans-1,2-Dichloroethene (1,2-Dichloroethene)
Dichloromethane (Methylene chloride)
1,2-Dichloropropane
Di(2-ethylhexyl) adipate (Bis(2-ethylhexyl) adipate)
Di(2-ethylhexyl) phthalate (Bis(2-ethylhexyl) phthalate)
Dinoseb
Diquat
Endothall
Endrin
Ethylbenzene
Fluoride
Glyphosate (Roundup)

Heptachlor
Heptachlor Epoxide
Hexachlorobenzene (HCB)
gamma-Hexachlorocyclohexane (Lindane)
Hexachlorocyclopentadiene
Lead
Lindane
Mercury
Methoxychlor
Nickel
Nitrate (as N)
Nitrite (as N)
Total Nitrate + Nitrite (as N)
Oxamyl
Pentachlorophenol
Picloram
Radium
Selenium
Silver
Silvex (2,4,5-TP)
Simazine
Sodium
Styrene (Vinyl Benzene)
Tetrachloroethene (Perchloroethene)
Tetrachloromethane (Carbon Tetrachloride)
Thallium
Toluene
Toxaphene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene (TCE)
Trihalomethanes, Total
Vinyl Chloride (Chloroethylene)
Xylenes (total)

B. Secondary Drinking Water Standards

Aluminum
Chloride
Color
Copper
Corrosivity
Ethylbenzene
Fluoride
Foaming Agents (MBAS)
Iron
Manganese
Odor
pH
Silver

Sulfate
Toluene
Total Dissolved Solids (TDS)
Zinc

C. Municipal Wastewater Indicator Parameters for Groundwater Monitoring

Ammonia
Nitrogen (organic)
Total Kjeldahl Nitrogen
Total Phosphorus (phosphate)
Chloroethane
Chloroform
Para-Dichlorobenzene (1,4 Dichlorobenzene)
1,2-Dichloroethylene (cis-1,2-Dichloroethylene or trans-1,2-Dichloroethylene
Anthracene
Butylbenzylphthallate
Dimethylphthallate
Naphthalene
Phenanthrene
Aldrin
Dieldrin
2-chlorophenol
Phenol
2,4,6-trichlorophenol
Conductivity
Biochemical Oxygen Demand
Chemical Oxygen Demand
Temperature

OP

3.4 CEMENT

A. **General:** Before each cementing operation, the CONTRACTOR shall submit a cementing program to the ENGINEER for approval.

1. 2 serDVions: TKe C2 1 TRACT2 R's cep enVig STRGTDP sKRuCG Ee GesigneG W provide an effective seal around the casings.

   a. 'Vis We C2 1 TRACT2 R's ressRnsiEOW W cRnGucVWKe cep enVig RSerDVRns in such a manner that the burst strengths of the casing (with safety factor) are not exceeded and the casing is not caused to fail.

   b. The cement shall be pumped as a slurry of thoroughly mixed components in stages that are designed to fill the annular space without exceeding the collapse pressure of the casing pipe to which the cement is applied.

   c. Cement will be pumped or placed so that the pressure of the slurry and the pressure applied inside the casing pipe do not affect the bond.

Monitor Well DZMW-1

Upper Monitor Zone Background Water Quality
(1,325 to 1,406 feet bls)

SANDERS LABORATORIES, INC.
Laboratory Test Report

Lab Project #: N0807193
Client: Youngquist Brothers, Inc.
15465 Pine Ridge Road

Ft. Myers, FL 33908

Phone: 239-489-4444
Fax: 239-489-4545
E-mail:
Client Project Name: South Cape Coral
Laboratory Contact: Andy Konopacki

All subsequent pages are identified by: N0807193 . These pages may include, but are not limited to: Analytical Data, Chains of Custodys, Subcontracted Data and Case Narratives.

QUALIFIER DEFINITIONS

B: Results based upon colony counts outside the acceptable range.
I: The reported value is between the laboratory MDL and the laboratory PQL.
J3: The reported value failed to meet the established quality control criteria.
J4: The sample matrix interfered with the ability to make an accurate determination.
J5: The data is questionable because of improper lab or field protocols.
K: Off scale low, actual value is less than the value given.
L: Off scale high, actual value is known to be greater than the value given.
Q: Sample held beyond acceptable holding time.
U: The compound was analyzed for, but not detected.
V: The analyte was detected in both the sample and the associated method blank.
Y: The sample was unpreserved or improperly preserved.
Z: Too many colonies present (TNTC).
** This result does not meet NELAC standards.
HACH results may not meet NELAC standards.

A statement of estimated uncertainty of results is available upon request.

Analytical results provided relate only to the samples received for this project.

Sanders Laboratories follows DEP standard operating procedures for field sampling.

Laboratory PQL's are available upon request.

Reports are archived for a minimum of 5 years. Copies of reports which are less than 1 year old are available for a fee of $25.00 per report. Reports older than 1 year are available for a fee of $50.00 per report. Copies will be provided within 1 week of the time of the request.

Client Project: South Cape Coral
Lab Project: N0807193
Report Date: 08/11/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0807193-01	Upper Zone grab	Ground Water	7/15/08 11:30	7/15/08 9:37

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Aluminum	EPA200.7	0.114		0.009	mg/L	7/28/08 11:19	JPW	E84380
Ammonia	EPA350.1	0.71		0.01	mg/L as N	7/17/08 16:31	AV	E84380
Antimony	EPA200.7	0.002	U	0.002	mg/L	7/28/08 11:19	JPW	E84380
Arsenic	EPA200.7	0.002	U	0.002	mg/L	7/28/08 11:19	JPW	E84380
Barium	EPA200.7	2.76		0.001	mg/L	7/28/08 11:19	JPW	E84380
Beryllium	EPA200.7	0.0002	I	0.0001	mg/L	7/28/08 11:19	JPW	E84380
Bicarbonate Alkalinity	SM4500CO2-D	82		3	mg/l CaCO3	7/18/08 13:15	AS	E84380
BOD	SM5210B	2	U	2	mg/L	7/15/08 11:45	AS	E84380
Cadmium	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Calcium	EPA200.7	292		0.006	mg/L	7/28/08 11:19	JPW	E84380
Carbonate Alkalinity	SM4500CO2-D	1.44		0.01	mg/l CaCO3	7/18/08 13:15	AS	E84380
Chemical Oxygen Demand	EPA410.4	620		8	mg/L	7/18/08 10:30	BB	E84380
Chloride	SM4500Cl-E	5990		1	mg/L	7/16/08 12:37	AV	E84380
Chromium	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Color-True	SM2120B	10		5	C.U.	7/15/08 14:30	AV	E84380
Copper	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Dissolved Oxygen-field	360.1	3.15		0.01	mg/L	7/15/08 9:37	HC	E84380
Fluoride	SM4500F-C	1.8		0.1	mg/L	7/22/08 15:30	AV	E84380
Iron	EPA200.7	1.05		0.015	mg/L	7/28/08 11:19	JPW	E84380
Langelier Saturation Index	LSI	0.41		0.01	NONE	8/4/08 15:18	AK	E84380
Lead	EPA200.7	0.023		0.001	mg/L	7/28/08 11:19	JPW	E84380
Magnesium	EPA200.7	362		0.007	mg/L	7/28/08 11:19	JPW	E84380
Manganese	EPA200.7	0.078		0.001	mg/L	7/28/08 11:19	JPW	E84380
Mercury	EPA245.1	0.001	U	0.001	mg/L	7/23/08 9:47	JPW	E84380
Nickel	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Nitrate+Nitrite-N	EPA353.2	0.01	U	0.01	mg/L as N	7/16/08 9:40	SJ	E84380

Client Project: South Cape Coral
Lab Project: N0807193
Report Date: 08/11/08

Laboratory Results

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0807193-01	Upper Zone grab	Ground Water	7/15/08 11:30	7/15/08 9:37

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Nitrate-N	EPA353.2	0.01	U	0.01	mg/L as N	7/16/08 9:40	SJ	E84380
Nitrite-N	EPA353.2	0.01	U	0.01	mg/L as N	7/16/08 9:11	SJ	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.88		0.05	mg/L as N	7/18/08 12:49	AV	E84380
Odor @ 30°C	SM2150B	1.4		1	TON	7/15/08 13:30	BB	E84380
Organic Nitrogen	EPA351.2/350.1	0.17		0.05	mg/L as N	7/18/08 12:49	SJ	E84380
Ortho Phosphate	SM4500P-E	0.016	I	0.010	mg/L as P	7/15/08 13:15	AS	E84380
pH - field	150.1	7.59		0.01	std units	7/15/08 9:37	HC	E84380
Phosphorus, Total	EPA365.4	0.043		0.010	mg/L as P	7/18/08 14:39	AV	E84380
Potassium	EPA200.7	101		0.052	mg/L	7/28/08 11:19	JPW	E84380
See attached results	Subcontract					7/15/08 15:06	SUB	
Selenium	EPA200.7	0.002	U	0.002	mg/L	8/9/08 13:37	JPW	E84380
Silver	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Sodium	EPA200.7	3140		0.400	mg/L	7/28/08 11:19	JPW	E84380
Specific Conductance-field	120.1	17700		0.1	µmhos/cm	7/15/08 9:37	HC	E84380
Sulfate	ASTM-D516-90	414		2	mg/L	7/21/08 16:59	BB	E84380
Thallium	EPA279.2	0.001	U	0.001	mg/L	7/20/08 10:05	JPW	E84380
Total Coliform, MF	SM9222B	1	U	1	CFU/100ml	7/15/08 12:00	RF	E84380
Total Dissolved Solids	SM2540C	11000		20	mg/L	7/17/08 15:15	AS	E84380
Turbidity - field	EPA180.1	35.0		0.1	NTU	7/15/08 9:37	HC	E84380
Water Temperature-field	170.1	31.7		0.1	C	7/15/08 9:37	HC	E84380
Weather-field	DEPSOP	rain		n/a	none	7/15/08 9:37	HC	E84380
Zinc	EPA200.7	0.013		0.001	mg/L	7/28/08 11:19	JPW	E84380

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

July 30, 2008
Project No: 84093

Laboratory Report

Project Name	**N0807193**
Sample Description	**N0807193-01 Upper Zone**
Matrix	**Groundwater**
SAL Sample Number	**84093.01**
Date/Time Collected	**07/15/08 09:37**
Date/Time Received	**07/16/08 10:09**

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Radiochemistry							
Gross Alpha (Incl. Uranium)	pCi/l	20±3.0	EPA 00-02	2.8	07/18/08 17:43	07/17/08 09:00	AWW
Radium-226	pCi/l	6.9±0.2	EPA 903.1	0.00	07/24/08 14:30	07/18/08 18:30	AWW
Radium-228	pCi/l	1.8±0.2	EPA RA-05	0.6	07/29/08 14:12	07/25/08 12:35	AWW
Combined Uranium	pCi/l	0.39	ASTM D5174	0.04	07/25/08 13:21	07/21/08 08:00	AWW

FDOH Laboratory No. E84129
NELAP Accredited

Francis I. Daniels, Laboratory Director
Leslie C. Boardman, Q. A. Manager

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

July 30, 2008
Project No: 84093

Laboratory Report

Footnotes

*	Test results presented in this report meet all the requirements of the NELAC standards.
**	A statement of estimated uncertainty of test results is available upon request.
***	For methods marked with ***, all QC criteria have been met for this method which is equivalent to a SAL certified method.

FDOH Laboratory No. E84129
NELAP Accredited

Approved By: **Francis I. Daniels, Laboratory Director**
Leslie C. Boardman, Q. A. Manager

EMSL Analytical, Inc.
19501 NE 10th Ave. Bay A, N. Miami Beach, FL 33179
Phone: (305) 650-0577 Fax: (305) 650-0578 Email: miamilab@emsl.com

Attn: **T. Bright**
Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

Fax: (941) 484-6774 Phone: (941) 488-8103
Project: **N0087193**

Customer ID: SAND53
Customer PO: N0807193
Received: 07/16/08 11:56 AM
EMSL Order: 170803538

EMSL Proj:
Analysis Date: 7/16/2008
Report Date: 7/23/2008

Determination of Asbestos Structures in Water Performed by the 100.2 Method (EPA/600/R-94/134)

Sample ID	Sample Prep Date	# Fibers Asbestos	# Fibers Non-Asbestos	Type(s) Of Asbestos	Analytical Sensitivity (MFL)	Confidence Limits	Concentration Of Asbestos Fibers (MFL)	Comments
N0807193-01 *170803538-0001*	7-16-08 1300	0			0.74	0.00-2.70	<0.74	Collected 7-15-08 0937

Contact Kim Wallace at 305-650-0577 with any questions.

Analyst(s)
Joe McOscar (1)

Kimberly A. Wallace
Kimberly Wallace, Laboratory Manager
or other approved signatory

THIS IS THE LAST PAGE OF THE REPORT.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

Date issued: July 30, 2008

To: Tami Bright
Sanders Laboratories, Inc.
1050 Endeavor Court
Nokomis, FL 34275

Client: Sanders Laboratories, Inc.
Workorder ID: N0807193 Upper Zone **[2031525]**
Received: 7/16/08 10:50

Dear Tami Bright;

Analytical results presented in this report have been reviewed for compliance with the HBEL, Inc. Quality Systems Manual and have been determined to meet applicable Method guidelines and Standards referenced in the July 2003 National Environmental Laboratory Accreditation Program (NELAP) Quality Manual unless otherwise noted. The Analytical Results within these report pages reflect the values obtained from tests performed on Samples As Received by the laboratory unless indicated differently.

FDOH Safe Drinking Water Act, Clean Water Act and RCRA Certification #'s:

E96080, E83509

Questions regarding this report should be directed to the Report Signatory at (772) 465-8584 referencing the HBEL Workorder ID [Number].

Respectfully submitted,

Eric Charest
HBEL, Inc. Laboratory Manager

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

Quality Control Summary

Client: Sanders Laboratories, Inc.
Workorder ID: N0807193 Upper Zone **[2031525]**
Received: 7/16/08 10:50

MB=Method Blank LCS=Laboratory Control Sample LCSD=Laboratory Control Sample Duplicate MS=Matrix Spike MSD=Matrix Spike Duplicate DUP=Sample Duplicate

Method Narratives (If Applicable)

HBEL Sample Number	Sample ID	Analytical Method	Description

Quality Control Summary

Method	HBEL Batch	Analyte	Analytical Issue
EPA 505			
	PEST5159		
2031525001		Decachlorobiphenyl	Surrogate - Outside acceptance Limits.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031525]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807193 Upper Zone

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Laboratory ID: **2031525001**					*Sampled:* 07/15/08 9:37		*Received:* 07/16/08 10:50			
Sample ID: **N0807193-01 Upper Zone Grab**					*Matrix:* Water		Results reported on Wet Weight Basis			
Cyanide		**0.0047U**	mg/L	0.0047	EPA 335.2	WCGE29679	07/17/08 11:30	07/18/08 13:42	GG	E96080
Surfactants as LAS, Mol.wt.340		**0.22**	mg/L	0.022	EPA 425.1	WCGE29672	07/17/08 11:30	07/17/08 16:31	GG	E96080
1,2-Dibromo-3-chloropropane		**0.0035U**	ug/L	0.0035	EPA 504.1	PEST5158	07/24/08 14:00	07/25/08 0:40	JL	E96080
1,2-Dibromoethane		**0.0045U**	ug/L	0.0045	EPA 504.1	PEST5158	07/24/08 14:00	07/25/08 0:40	JL	E96080
Aldrin		**0.043U**	ug/L	0.043	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
Chlordane		**0.13U**	ug/L	0.13	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
Dieldrin		**0.065U**	ug/L	0.065	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
Endrin		**0.10U**	ug/L	0.10	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
gamma-BHC (Lindane)		**0.020U**	ug/L	0.020	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
Heptachlor		**0.035U**	ug/L	0.035	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
Heptachlor epoxide		**0.027U**	ug/L	0.027	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
Methoxychlor		**0.043U**	ug/L	0.043	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
PCB		**0.14U**	ug/L	0.14	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
Toxaphene		**0.59U**	ug/L	0.59	EPA 505	PEST5159	07/22/08 9:00	07/22/08 19:53	JL	E96080
2,4,5-TP		**0.19U**	ug/L	0.19	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 3:01	JL	E96080
2,4-D		**0.22U**	ug/L	0.22	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 3:01	JL	E96080
Dalapon		**2.3U**	ug/L	2.3	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 3:01	JL	E96080
Dinoseb		**0.23U**	ug/L	0.23	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 3:01	JL	E96080
Pentachlorophenol		**0.39U**	ug/L	0.39	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 3:01	JL	E96080
Picloram		**0.23U**	ug/L	0.23	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 3:01	JL	E96080
1,1,1,2-Tetrachloroethane		**0.24U**	ug/L	0.24	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,1,1-Trichloroethane		**0.21U**	ug/L	0.21	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,1,2,2-Tetrachloroethane		**0.47U**	ug/L	0.47	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,1,2-Trichloroethane		**0.44U**	ug/L	0.44	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,1-Dichloroethane		**0.20U**	ug/L	0.20	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,1-Dichloroethene		**0.23U**	ug/L	0.23	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,1-Dichloropropene		**0.24U**	ug/L	0.24	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,2,3-Trichloropropane		**0.30U**	ug/L	0.30	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,2,4-Trichlorobenzene		**0.41U**	ug/L	0.41	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,2-Dichlorobenzene		**0.21U**	ug/L	0.21	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,2-Dichloroethane		**0.29U**	ug/L	0.29	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,2-Dichloropropane		**0.40U**	ug/L	0.40	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,3-Dichlorobenzene		**0.23U**	ug/L	0.23	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,3-Dichloropropane		**0.22U**	ug/L	0.22	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,3-Dichloropropene		**0.52U**	ug/L	0.52	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
1,4-Dichlorobenzene		**0.23U**	ug/L	0.23	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
2,2-Dichloropropane		**0.30U**	ug/L	0.30	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
2-Chlorotoluene		**0.20U**	ug/L	0.20	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
4-Chlorotoluene		**0.23U**	ug/L	0.23	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031525]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807193 Upper Zone

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Benzene		0.20U	ug/L	0.20	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Bromobenzene		0.34U	ug/L	0.34	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Bromodichloromethane		0.25U	ug/L	0.25	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Bromoform		0.41U	ug/L	0.41	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Bromomethane		0.30U	ug/L	0.30	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Carbon tetrachloride		0.24U	ug/L	0.24	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Chlorobenzene		0.30U	ug/L	0.30	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Chloroethane		0.46U	ug/L	0.46	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Chloroform		0.25U	ug/L	0.25	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Chloromethane		0.40U	ug/L	0.40	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
cis-1,2-Dichloroethene		0.21U	ug/L	0.21	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Dibromochloromethane		0.30U	ug/L	0.30	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Dibromomethane		0.35U	ug/L	0.35	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Dichlorodifluoromethane		0.28U	ug/L	0.28	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Ethylbenzene		0.21U	ug/L	0.21	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Methyl-tert-butyl-ether		0.21U	ug/L	0.21	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Methylene chloride		0.23U	ug/L	0.23	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Styrene		0.21U	ug/L	0.21	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Tetrachloroethene		0.24U	ug/L	0.24	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Toluene		0.22U	ug/L	0.22	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Total THMs		0.25U	ug/L	0.25	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Total Xylenes		0.46U	ug/L	0.46	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
trans-1,2-Dichloroethene		0.35U	ug/L	0.35	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Trichloroethene		0.36U	ug/L	0.36	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Trichlorofluoromethane		0.22U	ug/L	0.22	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Vinyl chloride		0.32U	ug/L	0.32	EPA 524.2	VOC2941		07/18/08 18:24	WR	E96080
Alachlor		0.64U	ug/L	0.64	EPA 525.2	SVOC2663	07/16/08 11:00	07/17/08 22:52	CG	E96080
Atrazine		0.51U	ug/L	0.51	EPA 525.2	SVOC2663	07/16/08 11:00	07/17/08 22:52	CG	E96080
Benzo(a)pyrene		0.073U	ug/L	0.073	EPA 525.2	SVOC2663	07/16/08 11:00	07/17/08 22:52	CG	E96080
bis(2-ethylhexyl)phthalate		0.89U	ug/L	0.89	EPA 525.2	SVOC2663	07/16/08 11:00	07/17/08 22:52	CG	E96080
Di(2-ethylhexyl)adipate		0.71U	ug/L	0.71	EPA 525.2	SVOC2663	07/16/08 11:00	07/17/08 22:52	CG	E96080
Hexachlorobenzene		0.32U	ug/L	0.32	EPA 525.2	SVOC2663	07/16/08 11:00	07/17/08 22:52	CG	E96080
Hexachlorocyclopentadiene		0.25U	ug/L	0.25	EPA 525.2	SVOC2663	07/16/08 11:00	07/17/08 22:52	CG	E96080
Simazine		0.66U	ug/L	0.66	EPA 525.2	SVOC2663	07/16/08 11:00	07/17/08 22:52	CG	E96080
Aldicarb		0.54U	ug/L	0.54	EPA 531.1	HPLC2500		07/23/08 17:36	JJM	E96080
Aldicarb sulfone		0.45U	ug/L	0.45	EPA 531.1	HPLC2500		07/23/08 17:36	JJM	E96080
Aldicarb sulfoxide		0.36U	ug/L	0.36	EPA 531.1	HPLC2500		07/23/08 17:36	JJM	E96080
Carbofuran		0.41U	ug/L	0.41	EPA 531.1	HPLC2500		07/23/08 17:36	JJM	E96080
Oxamyl		0.13U	ug/L	0.13	EPA 531.1	HPLC2500		07/23/08 17:36	JJM	E96080
Glyphosate		10U	ug/L	10	EPA 547	SAL1064		07/27/08 3:36	SAL	E84129
Glyphosate		10U	ug/L	10	EPA 547			07/27/08 3:36	SAL	E84129
Endothall		2.8U	ug/L	2.8	EPA 548.1	SVOC2667	07/21/08 8:00	07/28/08 22:54	CG	E96080
Diquat		1.9U	ug/L	1.9	EPA 549.2	HPLC2502	07/21/08 8:00	07/29/08 11:44	JJM	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031525]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807193 Upper Zone

Parameter	Qualifier	Result[1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Dibromoacetic Acid		**0.18U**	ug/L	0.18	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:53	JL	E96080
Dichloroacetic Acid		**0.66U**	ug/L	0.66	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:53	JL	E96080
Monobromoacetic Acid		**0.28U**	ug/L	0.28	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:53	JL	E96080
Monochloroacetic Acid		**0.88U**	ug/L	0.88	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:53	JL	E96080
Total HAAs		**0.18U**	ug/L	0.18	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:53	JL	E96080
Trichloroacetic acid		**0.20U**	ug/L	0.20	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:53	JL	E96080
2,4,6-Trichlorophenol		**1.1U**	ug/L	1.1	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
2-Chlorophenol		**0.85U**	ug/L	0.85	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Anthracene		**0.51U**	ug/L	0.51	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Butylbenzylphthalate		**0.56U**	ug/L	0.56	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Di-n-butylphthalate		**0.75U**	ug/L	0.75	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Di-n-octylphthalate		**0.52U**	ug/L	0.52	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Diethylphthalate		**0.36U**	ug/L	0.36	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Dimethyl-phthalate		**2.5U**	ug/L	2.5	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Naphthalene		**0.71U**	ug/L	0.71	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Phenanthrene		**0.31U**	ug/L	0.31	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080
Phenol		**0.98U**	ug/L	0.98	EPA 625	SVOC2665	07/16/08 11:00	07/21/08 20:58	WR	E96080

[1]Result Qualifiers: U = Not Detected I = Analyte detected between the Laboratory Method Detection Limit and Laboratory Reporting Limit
Applicable Florida Department of Environmental Protection Qualifiers defined below. Statement of Estimated Uncertainty available upon request.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N0807193

Page _____ of _____

Client Youngquist

Address _____

Phone _____ Fax _____

Report To: _____

Bill To: _____

P.O. # _____

Project Name South Cape Coral

Project Location: _____

Sample Supply: GW

Customer Type: _____

Field Report #: _____

Kit # 08-134 LAB USE ONLY

REQUESTED DUE DATE: 7/18/08

Sampled By (PRINT) Hillary Crook

Sampler Signature Hillary Crook

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	PRESERVATIVES UNPRESERVED	PRESERVATIVES H_2SO_4	PRESERVATIVES HNO_3	PRESERVATIVES HCL	PRESERVATIVES THIO	ANALYSES REQUEST: TDS, Cl, SO4	Bal, Color, LSI	Odor	NO2, NO3, NOx	NH3, O-Nit, TKN, TPO4	OP	Metals *	Total Col.	Cn, MBAS, VOCs, TTHMs	HAA5, SOCs, EPA 625	GA, Uranium	Rads 226/228, Asbestos	(Field)	Sample ID #
	Upper Zone	7/15/08	0937	G		1					1	1												-01A
						1							1											B
						1								1										C
							1								1									D
						1										1								E
								1									1							F
										1								1						G
																			1	1	1	1		H

Bottle Lot #	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
	Hillary Crook	7/15/08	1130	Ulrag	7/15/08	1130

COMMENTS:
* As, Ba, Cd, Cr, Pb, Hg
Ni, Se, Na, Sb, Be, Al
Cu, Fe, Mn, Ag, Zn
Ca, K, Mg; TI 279.2

OKAY TO RUN AS IS...
CLIENT INITIAL:

SAMPLES ON ICE (Yes) No

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 10090 Bavaria Rd., Fort Myers, FL 33913 • (239) 590-0337 • FAX (239) 590-0536

Monitor Well DZMW-1

Lower Monitor Zone Background Water Quality
(1,610 to 1,650 feet bls)

Client Project: South Cape Coral
Lab Project: N0807129
Report Date: 08/04/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

Youngquist Brothers, Inc.
15465 Pine Ridge Road
Ft. Myers, FL 33908

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0807129-01	Lower Zone grab	Ground Water	7/10/08 12:05	7/10/08 11:00

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Air Temperature-field	170.1	31.7		0.1	C	7/10/08 11:00	HC	E84380
Aluminum	EPA200.7	0.101		0.009	mg/L	7/12/08 12:16	JPW	E84380
Ammonia	EPA350.1	0.30		0.01	mg/L as N	7/14/08 17:27	AV	E84380
Antimony	EPA200.7	0.002	U	0.002	mg/L	7/12/08 12:16	JPW	E84380
Arsenic	EPA200.7	0.002	U	0.002	mg/L	7/12/08 12:16	JPW	E84380
Barium	EPA200.7	1.73		0.001	mg/L	7/12/08 12:16	JPW	E84380
Beryllium	EPA200.7	0.0003	I	0.0001	mg/L	7/12/08 12:16	JPW	E84380
Bicarbonate Alkalinity	SM4500CO2-D	148		3	mg/l CaCO3	7/18/08 13:15	AS	E84380
Biological Oxygen Demand	SM5210B	2	U	2	mg/L	7/11/08 14:40	CZ	E85457
Cadmium	EPA200.7	0.001	U	0.001	mg/L	7/12/08 12:16	JPW	E84380
Calcium	EPA200.7	538		0.006	mg/L	7/12/08 12:16	JPW	E84380
Carbonate Alkalinity	SM4500CO2-D	0.40		0.01	mg/l CaCO3	7/18/08 13:15	AS	E84380
Chemical Oxygen Demand	EPA410.4	1830		8	mg/L	7/18/08 10:30	BB	E84380
Chloride	SM4500Cl-E	18400		1	mg/L	7/16/08 12:37	AV	E84380
Chromium	EPA200.7	0.001	U	0.001	mg/L	7/12/08 12:16	JPW	E84380
Color-True	SM2120B	5	U	5	C.U.	7/11/08 12:45	RH/KS	E85457
Copper	EPA200.7	0.001	U	0.001	mg/L	7/12/08 12:16	JPW	E84380
Dissolved Oxygen-field	360.1	2.74		0.01	mg/L	7/10/08 11:00	HC	E84380
Fluoride	SM4500F-C	2.4		0.1	mg/L	7/14/08 14:00	AS	E84380
Iron	EPA200.7	0.372		0.015	mg/L	7/12/08 12:16	JPW	E84380
Langelier Saturation Index	LSI	0.36		0.01	NONE	7/28/08 14:09	AK	E84380
Lead	EPA200.7	0.015		0.001	mg/L	7/12/08 12:16	JPW	E84380
Magnesium	EPA200.7	922		0.007	mg/L	7/12/08 12:16	JPW	E84380
Manganese	EPA200.7	0.025		0.001	mg/L	7/12/08 12:16	JPW	E84380
Mercury	EPA245.1	0.001	U	0.001	mg/L	7/23/08 9:47	JPW	E84380
Nickel	EPA200.7	0.002	I	0.001	mg/L	7/12/08 12:16	JPW	E84380

Client Project: South Cape Coral
Lab Project: N0807129
Report Date: 08/04/08

Laboratory Results

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0807129-01	Lower Zone grab	Ground Water	7/10/08 12:05	7/10/08 11:00

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Nitrate+Nitrite-N	EPA353.2	0.02	I	0.01	mg/L as N	7/11/08 15:13	SJ	E84380
Nitrate-N	EPA353.2	0.02		0.01	mg/L as N	7/11/08 15:13	SJ	E84380
Nitrite-N	SM4500NO3-B	0.01	U	0.01	mg/L as N	7/10/08 15:30	KM	E85457
Nitrogen, Total Kjeldahl	EPA351.2	0.63		0.05	mg/L as N	7/15/08 13:32	BB	E84380
Odor @ 42° C	SM2150B	27		1	TON	7/10/08 15:30	RH	E85457
Organic Nitrogen	EPA351.2/350.1	0.33		0.05	mg/L as N	7/15/08 13:32	SJ	E84380
Ortho Phosphate	SM4500P-E	0.017	I	0.010	mg/L as P	7/11/08 12:30	AS	E84380
pH - field	150.1	7.05		0.01	std units	7/10/08 11:00	HC	E84380
Phosphorus, Total	EPA365.4	0.010	U	0.010	mg/L as P	7/15/08 15:19	BB	E84380
Potassium	EPA200.7	443		0.052	mg/L	7/12/08 12:16	JPW	E84380
See attached results	Subcontract					7/11/08 15:33	SUB	
Selenium	EPA200.7	0.002	U	0.002	mg/L	7/12/08 12:16	JPW	E84380
Silver	EPA200.7	0.001	U	0.001	mg/L	7/12/08 12:16	JPW	E84380
Sodium	EPA200.7	10000		0.400	mg/L	7/12/08 12:16	JPW	E84380
Specific Conductance-field	120.1	50500		0.1	µmhos/cm	7/10/08 11:00	HC	E84380
Sulfate	ASTM-D516-90	3010		2	mg/L	7/21/08 16:59	BB	E84380
Thallium	EPA279.2	0.001	U	0.001	mg/L	7/20/08 10:05	JPW	E84380
Total Coliform, MF	SM9222B	1	U	1	CFU/100ml	7/10/08 15:10	KS	E85457
Total Dissolved Solids	SM2540C	28800		20	mg/L	7/15/08 16:00	RH	E85457
Turbidity - field	EPA180.1	14.4		0.1	NTU	7/10/08 11:00	HC	E84380
Water Temperature-field	170.1	32.7		0.1	C	7/10/08 11:00	HC	E84380
Weather-field	DEPSOP	p. cloudy		n/a	none	7/10/08 11:00	HC	E84380
Zinc	EPA200.7	0.016		0.001	mg/L	7/12/08 12:16	JPW	E84380

Client Project: South Cape Coral
Lab Project: N0807129
Report Date: 08/04/08

Laboratory Results

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

EMSL Analytical, Inc.
19501 NE 10th Ave. Bay A, N. Miami Beach, FL 33179
Phone: (305) 650-0577 Fax: (305) 650-0578 Email: miamilab@emsl.com

Attn: **T. Bright**
Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

Fax: (941) 484-6774 Phone: (941) 488-8103
Project: **N0807129**

Customer ID: SAND53
Customer PO: N0807129
Received: 07/14/08 4:49 PM
EMSL Order: 170803494

EMSL Proj:
Analysis Date: 7/16/2008
Report Date: 7/23/2008

Determination of Asbestos Structures in Water Performed by the 100.2 Method (EPA/600/R-94/134)

Sample ID	Sample Prep Date	# Fibers Asbestos	# Fibers Non-Asbestos	Type(s) Of Asbestos	Analytical Sensitivity (MFL)	Confidence Limits	Concentration Of Asbestos Fibers (MFL)	Comments
N0807129-01 *170803494-0001*	7-16-08 1300	0			0.74	0.00-2.70	<0.74	Collected 7-10-08 1100

Samples filtered out of hold time. Contact Kim Wallace at 305-650-0577 with any questions.

Analyst(s)
Joe McOscar (1)

Kimberly A. Wallace
Kimberly Wallace, Laboratory Manager
or other approved signatory

THIS IS THE LAST PAGE OF THE REPORT.

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

July 25, 2008
Project No: 83991

Laboratory Report

Project Name	**N0807129**
Sample Description	**N0807129-01 Lower Zone**
Matrix	**Groundwater**
SAL Sample Number	**83991.01**
Date/Time Collected	**07/10/08 11:00**
Date/Time Received	**07/11/08 10:16**

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Radiochemistry							
Gross Alpha (Incl. Uranium)	pCi/l	12±2.6	EPA 00-02	2.8	07/15/08 15:45	07/14/08 09:55	AWW
Radium-226	pCi/l	3.4±0.2	EPA 903.1	0.03	07/22/08 16:20	07/16/08 13:25	AWW
Radium-228	pCi/l	0.4±0.2 U1	EPA RA-05	0.4	07/24/08 17:51	07/22/08 17:30	AWW
Combined Uranium	pCi/l	0.64	ASTM D5174	0.04	07/25/08 13:13	07/21/08 08:00	AWW

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

Date issued: July 30, 2008

To: Tami Bright
Sanders Laboratories, Inc.
1050 Endeavor Court
Nokomis, FL 34275

Client: Sanders Laboratories, Inc.
Workorder ID: N0807129 **[2031492]**
Received: 7/11/08 10:45

Dear Tami Bright;

Analytical results presented in this report have been reviewed for compliance with the HBEL, Inc. Quality Systems Manual and have been determined to meet applicable Method guidelines and Standards referenced in the July 2003 National Environmental Laboratory Accreditation Program (NELAP) Quality Manual unless otherwise noted. The Analytical Results within these report pages reflect the values obtained from tests performed on Samples As Received by the laboratory unless indicated differently.

FDOH Safe Drinking Water Act, Clean Water Act and RCRA Certification #'s:
E96080, E83509

Questions regarding this report should be directed to the Report Signatory at (772) 465-8584 referencing the HBEL Workorder ID [Number].

Respectfully submitted,

Eric Charest
HBEL, Inc. Laboratory Manager

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

Quality Control Summary

Client: Sanders Laboratories, Inc.
Workorder ID: N0807129 **[2031492]**
Received: 7/11/08 10:45

MB=Method Blank LCS=Laboratory Control Sample LCSD=Laboratory Control Sample Duplicate MS=Matrix Spike MSD=Matrix Spike Duplicate DUP=Sample Duplicate

Method Narratives (If Applicable)

HBEL Sample Number	Sample ID	Analytical Method	Description

Quality Control Summary

Method	HBEL Batch	Analyte	Analytical Issue
EPA 505			
	PEST5153		
2031492001		Decachlorobiphenyl	Surrogate - Outside acceptance Limits.
EPA 515.1			
	PEST5156		
2031492001		Dinoseb	Accuracy - Outside acceptance limits in the MS.
2031492001		Dinoseb	Accuracy - Outside acceptance limits in the MSD.
2031492001		Dinoseb	Precision - Outside acceptance limits between the MS and MSD.

The above due to matrix effects. Accuracy/Precision demonstrated with other QC samples.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031492]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807129

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Laboratory ID: **2031492001**					*Sampled:* 07/10/08 11:00		*Received:* 07/11/08 10:45			
Sample ID: **N0807129-01 Lower Zone Grab**					*Matrix:* Water		Results reported on Wet Weight Basis			
Cyanide		**0.0047U**	mg/L	0.0047	EPA 335.2	WCGE29679	07/17/08 11:30	07/18/08 13:42	GG	E96080
Surfactants as LAS, Mol.wt.340		**0.086**	mg/L	0.022	EPA 425.1	WCGE29671	07/11/08 11:00	07/11/08 15:22	SP	E96080
1,2-Dibromo-3-chloropropane		**0.0034U**	ug/L	0.0034	EPA 504.1	PEST5152	07/14/08 13:00	07/15/08 5:48	JL	E96080
1,2-Dibromoethane		**0.0044U**	ug/L	0.0044	EPA 504.1	PEST5152	07/14/08 13:00	07/15/08 5:48	JL	E96080
Aldrin		**0.043U**	ug/L	0.043	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
Chlordane		**0.13U**	ug/L	0.13	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
Dieldrin		**0.065U**	ug/L	0.065	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
Endrin		**0.099U**	ug/L	0.099	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
gamma-BHC (Lindane)		**0.019U**	ug/L	0.019	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
Heptachlor		**0.035U**	ug/L	0.035	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
Heptachlor epoxide		**0.027U**	ug/L	0.027	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
Methoxychlor		**0.043U**	ug/L	0.043	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
PCB		**0.13U**	ug/L	0.13	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
Toxaphene		**0.59U**	ug/L	0.59	EPA 505	PEST5153	07/15/08 9:00	07/16/08 4:00	JL	E96080
2,4,5-TP		**0.19U**	ug/L	0.19	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 1:56	JL	E96080
2,4-D		**0.22U**	ug/L	0.22	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 1:56	JL	E96080
Dalapon		**2.3U**	ug/L	2.3	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 1:56	JL	E96080
Dinoseb		**0.23U**	ug/L	0.23	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 1:56	JL	E96080
Pentachlorophenol		**0.39U**	ug/L	0.39	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 1:56	JL	E96080
Picloram		**0.23U**	ug/L	0.23	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 1:56	JL	E96080
1,1,1,2-Tetrachloroethane		**0.24U**	ug/L	0.24	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,1,1-Trichloroethane		**0.21U**	ug/L	0.21	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,1,2,2-Tetrachloroethane		**0.47U**	ug/L	0.47	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,1,2-Trichloroethane		**0.44U**	ug/L	0.44	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,1-Dichloroethane		**0.20U**	ug/L	0.20	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,1-Dichloroethene		**0.23U**	ug/L	0.23	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,1-Dichloropropene		**0.24U**	ug/L	0.24	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,2,3-Trichloropropane		**0.30U**	ug/L	0.30	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,2,4-Trichlorobenzene		**0.41U**	ug/L	0.41	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,2-Dichlorobenzene		**0.21U**	ug/L	0.21	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,2-Dichloroethane		**0.29U**	ug/L	0.29	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,2-Dichloropropane		**0.40U**	ug/L	0.40	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,3-Dichlorobenzene		**0.23U**	ug/L	0.23	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,3-Dichloropropane		**0.22U**	ug/L	0.22	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,3-Dichloropropene		**0.52U**	ug/L	0.52	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
1,4-Dichlorobenzene		**0.23U**	ug/L	0.23	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
2,2-Dichloropropane		**0.30U**	ug/L	0.30	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
2-Chlorotoluene		**0.20U**	ug/L	0.20	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
4-Chlorotoluene		**0.23U**	ug/L	0.23	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031492]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807129

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Benzene		0.20U	ug/L	0.20	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Bromobenzene		0.34U	ug/L	0.34	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Bromodichloromethane		0.25U	ug/L	0.25	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Bromoform		0.41U	ug/L	0.41	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Bromomethane		0.30U	ug/L	0.30	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Carbon tetrachloride		0.24U	ug/L	0.24	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Chlorobenzene		0.30U	ug/L	0.30	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Chloroethane		0.46U	ug/L	0.46	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Chloroform		0.25U	ug/L	0.25	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Chloromethane		0.40U	ug/L	0.40	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
cis-1,2-Dichloroethene		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Dibromochloromethane		0.30U	ug/L	0.30	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Dibromomethane		0.35U	ug/L	0.35	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Dichlorodifluoromethane		0.28U	ug/L	0.28	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Ethylbenzene		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Methyl-tert-butyl-ether		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Methylene chloride		0.23U	ug/L	0.23	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Styrene		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Tetrachloroethene		0.24U	ug/L	0.24	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Toluene		0.22U	ug/L	0.22	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Total Xylenes		0.46U	ug/L	0.46	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
trans-1,2-Dichloroethene		0.35U	ug/L	0.35	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Trichloroethene		0.36U	ug/L	0.36	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Trichlorofluoromethane		0.22U	ug/L	0.22	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Vinyl chloride		0.32U	ug/L	0.32	EPA 524.2	VOC2940		07/16/08 17:38	WR	E96080
Alachlor		0.62U	ug/L	0.62	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 21:33	CG	E96080
Atrazine		0.49U	ug/L	0.49	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 21:33	CG	E96080
Benzo(a)pyrene		0.071U	ug/L	0.071	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 21:33	CG	E96080
bis(2-ethylhexyl)phthalate		0.86U	ug/L	0.86	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 21:33	CG	E96080
Di(2-ethylhexyl)adipate		0.69U	ug/L	0.69	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 21:33	CG	E96080
Hexachlorobenzene		0.31U	ug/L	0.31	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 21:33	CG	E96080
Hexachlorocyclopentadiene		0.24U	ug/L	0.24	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 21:33	CG	E96080
Simazine		0.64U	ug/L	0.64	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 21:33	CG	E96080
Aldicarb		0.54U	ug/L	0.54	EPA 531.1	HPLC2500		07/23/08 16:32	JJM	E96080
Aldicarb sulfone		0.45U	ug/L	0.45	EPA 531.1	HPLC2500		07/23/08 16:32	JJM	E96080
Aldicarb sulfoxide		0.36U	ug/L	0.36	EPA 531.1	HPLC2500		07/23/08 16:32	JJM	E96080
Carbofuran		0.41U	ug/L	0.41	EPA 531.1	HPLC2500		07/23/08 16:32	JJM	E96080
Oxamyl		0.13U	ug/L	0.13	EPA 531.1	HPLC2500		07/23/08 16:32	JJM	E96080
Glyphosate		10U	ug/L	10	EPA 547	SAL1064		07/23/08 18:08	SAL	E84129
Glyphosate		10U	ug/L	10	EPA 547			07/23/08 18:08	SAL	E84129
Endothall		2.8U	ug/L	2.8	EPA 548.1	SVOC2664	07/14/08 8:00	07/16/08 2:18	CG	E96080
Diquat		1.9U	ug/L	1.9	EPA 549.2	HPLC2496	07/14/08 9:00	07/16/08 14:46	JJM	E96080
Dibromoacetic Acid		0.18U	ug/L	0.18	EPA 552.1	PEST5157	07/23/08 13:06	07/23/08 21:09	JL	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031492]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807129

Parameter	Qualifier	Result[1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Dichloroacetic Acid		**0.66U**	ug/L	0.66	EPA 552.1	PEST5157	07/23/08 13:06	07/23/08 21:09	JL	E96080
Monobromoacetic Acid		**0.28U**	ug/L	0.28	EPA 552.1	PEST5157	07/23/08 13:06	07/23/08 21:09	JL	E96080
Monochloroacetic Acid		**0.88U**	ug/L	0.88	EPA 552.1	PEST5157	07/23/08 13:06	07/23/08 21:09	JL	E96080
Total HAAs		**0.18U**	ug/L	0.18	EPA 552.1	PEST5157	07/23/08 13:06	07/23/08 21:09	JL	E96080
Trichloroacetic acid		**0.20U**	ug/L	0.20	EPA 552.1	PEST5157	07/23/08 13:06	07/23/08 21:09	JL	E96080
2,4,6-Trichlorophenol		**1.0U**	ug/L	1.0	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
2-Chlorophenol		**0.77U**	ug/L	0.77	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
2-Methyl-4,6-dinitrophenol		**1.1U**	ug/L	1.1	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Anthracene		**0.46U**	ug/L	0.46	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Butylbenzylphthalate		**0.51U**	ug/L	0.51	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Di-n-butylphthalate		**0.68U**	ug/L	0.68	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Di-n-octylphthalate		**0.47U**	ug/L	0.47	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Diethylphthalate		**0.32U**	ug/L	0.32	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Dimethyl-phthalate		**2.2U**	ug/L	2.2	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Naphthalene		**0.64U**	ug/L	0.64	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Phenanthrene		**0.28U**	ug/L	0.28	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080
Phenol		**0.89U**	ug/L	0.89	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 18:41	WR	E96080

[1]Result Qualifiers: U = Not Detected I = Analyte detected between the Laboratory Method Detection Limit and Laboratory Reporting Limit
Applicable Florida Department of Environmental Protection Qualifiers defined below. Statement of Estimated Uncertainty available upon request.

CHAIN-OF-CUSTODY RECORD

Sanders Laboratories INC.
Environmental Testing Services

PROJECT #: N0807129

Page ______ of ______

Client: Youngquist
Address:
Phone: Fax:

Report To:
Bill To:
P.O. #:
Project Name: South Cape Coral
Project Location:

Sample Supply: GW
Customer Type:
Field Report #:
Kit #: 08-133 (FOR ... USE ONLY)
REQUESTED DUE DATE: 7/17/08

Sampled By (PRINT): Hilary Crook
Sampler Signature: Hilary Crook

Bottle #	SAMPLE DESCRIPTION	DATE	TIME	TYPE	ICE	UNPRESERVED	H_2SO_4	HNO_3	HCL	THIO	TDS, Cl-, SO_4, F-	Bod, Color, LSI	Odor	NO_2, NO_3, NOx	NH_3, D-Nit, TKN	TP, Cod	OP	Metals*	Total Col.	CN-MBAS, VOC's, THM's	HAAS, SOC's, EPA 625	GA Rads 226/228, Uranium, Asbestos	Sample ID #
	Lower Zone	7/10/08	1100	G		1					1	1											-01A
	↓	↓	↓	↓		1							1										B
						1								1									C
							1								1	1							D
						1											1						E
								1										1					F
										1									1				G
																				1	1	1	H

Bottle Lot #

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Hilary Crook	7/10/08	1205	Rhonda Hoffart	7/10/08	1205
Rhonda Hoffart	7/10/08	1830		7/10/08	1830
	7/11/08	0700	Aluaga	7/11/08	0700

COMMENTS:
* As, Ba, Cd, Cr, Pb, Hg, Ni, Se, Na, Sb, Be, Al, Cu, Fe, Mn, Ag, Zn, Ca, Tl (279.2)

OKAY TO RUN AS IS...
CLIENT INITIAL:

SAMPLES ON ICE: (Yes) No

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 10090 Bavaria Rd., Fort Myers, FL 33913 • (239) 590-0337 • FAX (239) 590-0536

Injection Test Source Water

Client Project: Southwest WWTP Plant
Lab Project: N0807225
Report Date: 08/04/08

Sanders Laboratories, Inc.
Environmental Testing Services

Laboratory Results

MWH Americas, Inc.
2503 Del Prado Blvd
Suite 430
Cape Coral, FL 33904

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0807225-01	SW Plant composite	Waste Water	7/14/08 12:45	7/14/08 11:00

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Aluminum	EPA200.7	0.009	U	0.009	mg/L	7/28/08 11:19	JPW	E84380
Ammonia	EPA350.1	0.01	U	0.01	mg/L as N	7/17/08 16:31	AV	E84380
Antimony	EPA200.7	0.002	U	0.002	mg/L	7/28/08 11:19	JPW	E84380
Arsenic	EPA200.7	0.002	U	0.002	mg/L	7/28/08 11:19	JPW	E84380
Barium	EPA200.7	0.010		0.001	mg/L	7/28/08 11:19	JPW	E84380
Beryllium	EPA200.7	0.0001	U	0.0001	mg/L	7/28/08 11:19	JPW	E84380
Bicarbonate Alkalinity	SM4500CO2-D	105		3	mg/l CaCO3	7/18/08 13:15	AS	E84380
BOD	SM5210B	2	U	2	mg/L	7/15/08 11:45	AS	E84380
Cadmium	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Calcium	EPA200.7	57.2		0.006	mg/L	7/28/08 11:19	JPW	E84380
Carbonate Alkalinity	SM4500CO2-D	0.51		0.01	mg/l CaCO3	7/18/08 13:15	AS	E84380
Chemical Oxygen Demand	EPA410.4	97		8	mg/L	7/18/08 10:30	BB	E84380
Chloride	SM4500Cl-E	375		1	mg/L	7/16/08 17:28	AV	E84380
Chromium	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Color-True	SM2120B	5		5	C.U.	7/15/08 14:30	AV	E84380
Copper	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Dissolved Oxygen-field	360.1	9.03		0.01	mg/L	7/14/08 11:00	HC	E84380
Fluoride	SM4500F-C	0.6		0.1	mg/L	7/14/08 14:00	AS	E84380
Iron	EPA200.7	0.015	U	0.015	mg/L	7/28/08 11:19	JPW	E84380
Langelier Saturation Index	LSI	-0.18		0.01	NONE	8/4/08 15:18	AK	E84380
Lead	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Magnesium	EPA200.7	23.9		0.007	mg/L	7/28/08 11:19	JPW	E84380
Manganese	EPA200.7	0.016		0.001	mg/L	7/28/08 11:19	JPW	E84380
Mercury	EPA245.1	0.001	U	0.001	mg/L	7/23/08 9:47	JPW	E84380
Nickel	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380

Client Project: Southwest WWTP Plant
Lab Project: N0807225
Report Date: 08/04/08

Laboratory Results

Lab ID	Sample Description	Sample Source	Received Date/Time	Sample Date/Time
N0807225-01	SW Plant composite	Waste Water	7/14/08 12:45	7/14/08 11:00

Analysis	Method	Results	Qual	MDL	Units	AnalysisDate/Time	Analyst	Cert ID
Nitrate+Nitrite-N	EPA353.2	12.8		0.01	mg/L as N	7/14/08 15:10	SJ	E84380
Nitrate-N	EPA353.2	12.8		0.01	mg/L as N	7/14/08 15:10	SJ	E84380
Nitrite-N	EPA353.2	0.01	U	0.01	mg/L as N	7/14/08 14:00	SJ	E84380
Nitrogen, Total Kjeldahl	EPA351.2	0.54		0.10	mg/L as N	7/21/08 15:40	SJ	E84380
Odor @ 30°C	SM2150B	1		1	TON	7/14/08 14:30	AS	E84380
Organic Nitrogen	EPA351.2/350.1	0.54		0.10	mg/L as N	7/21/08 15:40	SJ	E84380
Ortho Phosphate	SM4500P-E	2.60		0.01	mg/L as P	7/15/08 13:15	AS	E84380
pH - field	150.1	7.62		0.01	std units	7/14/08 11:00	HC	E84380
Phosphorus, Total	EPA365.4	2.51		0.05	mg/L as P	7/21/08 15:40	SJ	E84380
Potassium	EPA200.7	18.2		0.052	mg/L	7/28/08 11:19	JPW	E84380
See attached results	Subcontract					7/15/08 15:06	SUB	
Selenium	EPA200.7	0.002	U	0.002	mg/L	7/28/08 11:19	JPW	E84380
Silver	EPA200.7	0.001	U	0.001	mg/L	7/28/08 11:19	JPW	E84380
Sodium	EPA200.7	265		0.400	mg/L	7/28/08 11:19	JPW	E84380
Specific Conductance-field	120.1	1790		0.1	µmhos/cm	7/14/08 11:00	HC	E84380
Sulfate	ASTM-D516-90	73		2	mg/L	7/21/08 16:59	BB	E84380
Thallium	EPA279.2	0.001	U	0.001	mg/L	7/20/08 10:05	JPW	E84380
Total Coliform, MF	SM9222B	1	U	1	CFU/100ml	7/14/08 14:50	RF	E84380
Total Dissolved Solids	SM2540C	928		20	mg/L	7/17/08 15:15	AS	E84380
Total Suspended Solids	SM2540D	0.8		0.6	mg/L	7/18/08 11:30	AS	E84380
Turbidity - field	EPA180.1	2.6		0.1	NTU	7/14/08 11:00	HC	E84380
Water Temperature-field	170.1	Refridgerated		0.1	C	7/14/08 11:00	HC	E84380
Zinc	EPA200.7	0.029		0.001	mg/L	7/28/08 11:19	JPW	E84380

Client Project: Southwest WWTP Plant
Lab Project: N0807225
Report Date: 08/04/08

Laboratory Results

Approved by:

Comments:

Kathrine Bartkiewicz/Lab Manager Fort Myers
Andrew Konopacki/Lab Manager Nokomis

Test Results meet all the requirements of the NELAC standards.

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

July 30, 2008
Project No: 84094

Laboratory Report

Project Name	**N0807225**
Sample Description	**N0807225-01 SW Plant**
Matrix	**Wastewater**
SAL Sample Number	**84094.01**
Date/Time Collected	**07/14/08 11:00**
Date/Time Received	**07/16/08 10:09**

Parameters	Units	Results	Method	Detection Limit	Date/Time Analyzed	Date/Time Prep	Analyst
Radiochemistry							
Gross Alpha (Incl. Uranium)	pCi/l	6.9±2.5	EPA 00-02	2.8	07/18/08 17:43	07/17/08 09:00	AWW
Radium-226	pCi/l	1.2±00.09	EPA 903.1	0.00	07/24/08 14:30	07/18/08 18:30	AWW
Radium-228	pCi/l	0.4±0.2 U1	EPA RA-05	0.4	07/29/08 14:12	07/25/08 12:35	AWW
Combined Uranium	pCi/l	0.50	ASTM D5174	0.04	07/25/08 13:23	07/21/08 08:00	AWW

FDOH Laboratory No. E84129
NELAP Accredited

Francis I. Daniels, Laboratory Director
Leslie C. Boardman, Q. A. Manager

SOUTHERN ANALYTICAL LABORATORIES, INC.
110 BAYVIEW BOULEVARD, OLDSMAR, FL 34677 813-855-1844 fax 813-855-2218

Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

July 30, 2008
Project No: 84094

Laboratory Report

Footnotes

*	Test results presented in this report meet all the requirements of the NELAC standards.
**	A statement of estimated uncertainty of test results is available upon request.
***	For methods marked with ***, all QC criteria have been met for this method which is equivalent to a SAL certified method.
U1	Analyte was not detected; indicated concentration is method detection limit. Radiochemistry MDL is sample specific and matrix dependent.

FDOH Laboratory No. E84129
NELAP Accredited

Approved By: **Francis I. Daniels, Laboratory Director**
Leslie C. Boardman, Q. A. Manager

EMSL Analytical, Inc.
19501 NE 10th Ave. Bay A, N. Miami Beach, FL 33179
Phone: (305) 650-0577 Fax: (305) 650-0578 Email: miamilab@emsl.com

Attn: **T. Bright**
Sanders Laboratories
1050 Endeavor Court
Nokomis, FL 34275-3623

Fax: (941) 484-6774 Phone: (941) 488-8103
Project: **N0807225**

Customer ID: SAND53
Customer PO: N0807225
Received: 07/15/08 1:03 PM
EMSL Order: 170803518

EMSL Proj:
Analysis Date: 7/23/2008
Report Date: 7/24/2008

Determination of Asbestos Structures in Water Performed by the 100.2 Method (EPA/600/R-94/134)

Sample ID	Sample Prep Date	# Fibers Asbestos	# Fibers Non-Asbestos	Type(s) Of Asbestos	Analytical Sensitivity (MFL)	Confidence Limits	Concentration Of Asbestos Fibers (MFL)	Comments
N0807225-01 *170803518-0001*	7/15/08 14:00	0			0.18	0.00-0.68	<0.18	Collected 7/14/08 1100

Analyst(s)
Joe McOscar (1)

Kimberly A. Wallace
Kimberly Wallace, Laboratory Manager
or other approved signatory

100.2-V221

THIS IS THE LAST PAGE OF THE REPORT.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

Date issued: July 30, 2008

To: Tami Bright
Sanders Laboratories, Inc.
1050 Endeavor Court
Nokomis, FL 34275

Client: Sanders Laboratories, Inc.
Workorder ID: N0807225 SW Plant **[2031513]**
Received: 7/15/08 9:45

Dear Tami Bright;

Analytical results presented in this report have been reviewed for compliance with the HBEL, Inc. Quality Systems Manual and have been determined to meet applicable Method guidelines and Standards referenced in the July 2003 National Environmental Laboratory Accreditation Program (NELAP) Quality Manual unless otherwise noted. The Analytical Results within these report pages reflect the values obtained from tests performed on Samples As Received by the laboratory unless indicated differently.

FDOH Safe Drinking Water Act, Clean Water Act and RCRA Certification #'s:

E96080, E83509

Questions regarding this report should be directed to the Report Signatory at (772) 465-8584 referencing the HBEL Workorder ID [Number].

Respectfully submitted,

Eric Charest
HBEL, Inc. Laboratory Manager

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

Quality Control Summary

Client: Sanders Laboratories, Inc.
Workorder ID: N0807225 SW Plant **[2031513]**
Received: 7/15/08 9:45

MB=Method Blank LCS=Laboratory Control Sample LCSD=Laboratory Control Sample Duplicate MS=Matrix Spike MSD=Matrix Spike Duplicate DUP=Sample Duplicate

Method Narratives (If Applicable)

HBEL Sample Number	Sample ID	Analytical Method	Description
2031513001	N0807225 SW Plant Composite	EPA 625	No MS/MSD analyzed in batch. Precision and Accuracy determined with LCS/LCSD

Quality Control Summary

Method	HBEL Batch	Analyte	Analytical Issue
EPA 505			
	PEST5153		
2031513001		Decachlorobiphenyl	Surrogate - Outside acceptance Limits.

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031513]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807225 SW Plant

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Laboratory ID: **2031513001**										
Sample ID: **N0807225 SW Plant Composite**										
Sampled: 07/14/08 11:00 *Received: 07/15/08 9:45*										
Matrix: Water Results reported on Wet Weight Basis										
Cyanide		0.0047U	mg/L	0.0047	EPA 335.2	WCGE29679	07/17/08 11:30	07/18/08 13:42	GG	E96080
Surfactants as LAS, Mol.wt.340		0.070	mg/L	0.022	EPA 425.1	WCGE29672	07/17/08 8:30	07/17/08 16:31	GG	E96080
1,2-Dibromo-3-chloropropane		0.0035U	ug/L	0.0035	EPA 504.1	PEST5158	07/24/08 14:00	07/25/08 0:07	JL	E96080
1,2-Dibromoethane		0.0047U	ug/L	0.0047	EPA 504.1	PEST5158	07/24/08 14:00	07/25/08 0:07	JL	E96080
Aldrin		0.044U	ug/L	0.044	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
Chlordane		0.13U	ug/L	0.13	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
Dieldrin		0.066U	ug/L	0.066	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
Endrin		0.10U	ug/L	0.10	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
gamma-BHC (Lindane)		0.020U	ug/L	0.020	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
Heptachlor		0.036U	ug/L	0.036	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
Heptachlor epoxide		0.027U	ug/L	0.027	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
Methoxychlor		0.044U	ug/L	0.044	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
PCB		0.14U	ug/L	0.14	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
Toxaphene		0.60U	ug/L	0.60	EPA 505	PEST5153	07/15/08 11:00	07/16/08 4:28	JL	E96080
2,4,5-TP		0.19U	ug/L	0.19	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 2:28	JL	E96080
2,4-D		0.22U	ug/L	0.22	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 2:28	JL	E96080
Dalapon		2.3U	ug/L	2.3	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 2:28	JL	E96080
Dinoseb		0.23U	ug/L	0.23	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 2:28	JL	E96080
Pentachlorophenol		0.39U	ug/L	0.39	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 2:28	JL	E96080
Picloram		0.23U	ug/L	0.23	EPA 515.1	PEST5156	07/21/08 8:00	07/23/08 2:28	JL	E96080
1,1,1,2-Tetrachloroethane		0.24U	ug/L	0.24	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,1,1-Trichloroethane		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,1,2,2-Tetrachloroethane		0.47U	ug/L	0.47	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,1,2-Trichloroethane		0.44U	ug/L	0.44	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,1-Dichloroethane		0.20U	ug/L	0.20	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,1-Dichloroethene		0.23U	ug/L	0.23	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,1-Dichloropropene		0.24U	ug/L	0.24	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,2,3-Trichloropropane		0.30U	ug/L	0.30	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,2,4-Trichlorobenzene		0.41U	ug/L	0.41	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,2-Dichlorobenzene		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,2-Dichloroethane		0.29U	ug/L	0.29	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,2-Dichloropropane		0.40U	ug/L	0.40	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,3-Dichlorobenzene		0.23U	ug/L	0.23	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,3-Dichloropropane		0.22U	ug/L	0.22	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,3-Dichloropropene		0.52U	ug/L	0.52	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
1,4-Dichlorobenzene		0.23U	ug/L	0.23	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
2,2-Dichloropropane		0.30U	ug/L	0.30	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
2-Chlorotoluene		0.20U	ug/L	0.20	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
4-Chlorotoluene		0.23U	ug/L	0.23	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031513]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807225 SW Plant

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Benzene		0.20U	ug/L	0.20	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Bromobenzene		0.34U	ug/L	0.34	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Bromodichloromethane		54	ug/L	0.25	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Bromoform		35	ug/L	0.41	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Bromomethane		0.30U	ug/L	0.30	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Carbon tetrachloride		0.24U	ug/L	0.24	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Chlorobenzene		0.30U	ug/L	0.30	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Chloroethane		0.46U	ug/L	0.46	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Chloroform		19	ug/L	0.25	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Chloromethane		0.40U	ug/L	0.40	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
cis-1,2-Dichloroethene		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Dibromochloromethane		95	ug/L	0.30	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Dibromomethane		0.35U	ug/L	0.35	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Dichlorodifluoromethane		0.28U	ug/L	0.28	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Ethylbenzene		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Methyl-tert-butyl-ether		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Methylene chloride		0.23U	ug/L	0.23	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Styrene		0.21U	ug/L	0.21	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Tetrachloroethene		0.24U	ug/L	0.24	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Toluene		0.22U	ug/L	0.22	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Total THMs		200	ug/L	0.25	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Total Xylenes		0.46U	ug/L	0.46	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
trans-1,2-Dichloroethene		0.35U	ug/L	0.35	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Trichloroethene		0.36U	ug/L	0.36	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Trichlorofluoromethane		0.22U	ug/L	0.22	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Vinyl chloride		0.32U	ug/L	0.32	EPA 524.2	VOC2940		07/17/08 0:18	WR	E96080
Alachlor		0.63U	ug/L	0.63	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 16:58	CG	E96080
Atrazine		0.50U	ug/L	0.50	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 16:58	CG	E96080
Benzo(a)pyrene		0.073U	ug/L	0.073	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 16:58	CG	E96080
bis(2-ethylhexyl)phthalate	L	24	ug/L	0.88	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 16:58	CG	E96080
Di(2-ethylhexyl)adipate		0.70U	ug/L	0.70	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 16:58	CG	E96080
Hexachlorobenzene		0.32U	ug/L	0.32	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 16:58	CG	E96080
Hexachlorocyclopentadiene		0.25U	ug/L	0.25	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 16:58	CG	E96080
Simazine		0.65U	ug/L	0.65	EPA 525.2	SVOC2663	07/16/08 5:00	07/17/08 16:58	CG	E96080
Aldicarb		0.54U	ug/L	0.54	EPA 531.1	HPLC2500		07/23/08 17:04	JJM	E96080
Aldicarb sulfone		0.45U	ug/L	0.45	EPA 531.1	HPLC2500		07/23/08 17:04	JJM	E96080
Aldicarb sulfoxide		0.36U	ug/L	0.36	EPA 531.1	HPLC2500		07/23/08 17:04	JJM	E96080
Carbofuran		0.41U	ug/L	0.41	EPA 531.1	HPLC2500		07/23/08 17:04	JJM	E96080
Oxamyl		0.13U	ug/L	0.13	EPA 531.1	HPLC2500		07/23/08 17:04	JJM	E96080
Glyphosate		10U	ug/L	10	EPA 547	SAL1064		07/27/08 3:48	SAL	E84129
Glyphosate		10U	ug/L	10	EPA 547			07/27/08 3:48	SAL	E84129
Endothall		2.8U	ug/L	2.8	EPA 548.1	SVOC2667	07/21/08 8:00	07/28/08 22:31	CG	E96080
Diquat		1.9U	ug/L	1.9	EPA 549.2	HPLC2502	07/21/08 8:00	07/29/08 11:26	JJM	E96080

HBEL, Inc.

5600 U.S. 1 North, Fort Pierce, FL 34946
Phone: (772) 465-8584 Fax: (772) 467-1584

CERTIFICATE OF ANALYSIS

[2031513]

Client: Sanders Laboratories, Inc. *Workorder ID:* N0807225 SW Plant

Parameter	Qualifier	Result [1]	Units	Reporting Limit	Method	Laboratory Batch	Prep Date/Time	Analyzed Date/Time	Analyst	Lab ID
Dibromoacetic Acid		**20**	ug/L	0.18	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:18	JL	E96080
Dichloroacetic Acid		**17**	ug/L	0.66	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:18	JL	E96080
Monobromoacetic Acid		**2.5**	ug/L	0.28	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:18	JL	E96080
Monochloroacetic Acid		**0.88U**	ug/L	0.88	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:18	JL	E96080
Total HAAs		**49**	ug/L	0.18	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:18	JL	E96080
Trichloroacetic acid		**9.7**	ug/L	0.20	EPA 552.1	PEST5157	07/23/08 13:06	07/24/08 1:18	JL	E96080
2,4,6-Trichlorophenol		**1.1U**	ug/L	1.1	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
2-Chlorophenol		**0.84U**	ug/L	0.84	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Anthracene		**0.50U**	ug/L	0.50	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Butylbenzylphthalate		**0.55U**	ug/L	0.55	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Di-n-butylphthalate		**0.74U**	ug/L	0.74	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Di-n-octylphthalate		**0.51U**	ug/L	0.51	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Diethylphthalate		**0.35U**	ug/L	0.35	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Dimethyl-phthalate		**2.4U**	ug/L	2.4	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Naphthalene		**0.70U**	ug/L	0.70	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Phenanthrene		**0.30U**	ug/L	0.30	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080
Phenol		**0.97U**	ug/L	0.97	EPA 625	SVOC2665	07/15/08 11:30	07/21/08 20:13	WR	E96080

[1]Result Qualifiers: U = Not Detected I = Analyte detected between the Laboratory Method Detection Limit and Laboratory Reporting Limit
Applicable Florida Department of Environmental Protection Qualifiers defined below. Statement of Estimated Uncertainty available upon request.

L Off-scale high. Actual value is known to be greater than value given.

Sanders Laboratories INC.
Environmental Testing Services

CHAIN-OF-CUSTODY RECORD

PROJECT # N0807225

Page _____ of _____

Client MWH

Address _____

Phone _____ Fax _____

Report To: _____

Bill To: _____

P.O. # _____

Project Name Southwest Plant

Project Location: _____

Sample Supply: WW

Customer Type: _____

Field Report #: _____

Kit # FOR 08-135 ONLY

REQUESTED DUE DATE: 7/21/08

Sampled By (PRINT) Hilary Crook

Sampler Signature Hilary Crook

Bottle #	SAMPLE DESCRIPTION	Sample DATE	Sample TIME	Sample TYPE	PRESERVATIVES ICE	PRESERVATIVES UNPRESERVED	PRESERVATIVES H_2SO_4	PRESERVATIVES HNO_3	PRESERVATIVES HCL	PRESERVATIVES THIO	ANALYSES REQUEST TDS, Cl-, SO4, F-	ANALYSES REQUEST TSS, Bod, Color, LSI	ANALYSES REQUEST Odor	ANALYSES REQUEST NO2, NO3, NOx	ANALYSES REQUEST NH3, N-Nit, TKN, TP	ANALYSES REQUEST OP	ANALYSES REQUEST Metals *	ANALYSES REQUEST TC	ANALYSES REQUEST CN; MBAS, HAAS	ANALYSES REQUEST VOCs, TTHMs, SOCs	ANALYSES REQUEST Gross Alpha, Rads 226, 228	ANALYSES REQUEST EPA 625	ANALYSES REQUEST As (Field)	Sample ID #
	SW Plant	7/14/08	1100	C		1					1	1												-01A
						1						1												B
						1							1											C
							1							1										D
					1										1									E
								1								1								F
										1							1							G
																		1	1	1				H

Bottle Lot #

COMMENTS:
*As, Ba, Cd, Cr, Pb, Hg
Ni, Se, Na, Sb, Be, Al
Cu, Fe, Mn, Ag, Zn
Ca, Tl

OKAY TO RUN AS IS...
CLIENT INITIAL:
SAMPLES ON ICE
(Yes) No

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME
Hilary Crook	7/14/08	1205	Meag	7/14/08	1245

1050 Endeavor Ct., Nokomis, FL 34275-3623 • (941)488-8103 • FAX 484-6774 • 10090 Bavaria Rd., Fort Myers, FL 33913 • (239) 590-0337 • FAX (239) 590-0536

Appendix Q

Injection Test Data

Calibration Certificates

Flowmeter Calibration Certificate

CERTIFIED TEST REPORT

CUSTOMER: OZONE INDUSTRIES

MODEL NO: ML20-16

METER SERIAL NO: 20081737

CONFIGURATION

METER INSIDE DIAMETER: 15.25

DIAL: GAL X 1000 8000 GPM

GEARS: 17 / 45

TOTALIZER GEARS: 48 / 18-

ACTUAL METER INDEX: 1.3470

TEST DATE: 6/24/2008

TEST FACILITY: Volumetric

CALIBRATION DATA

	FLOW RATE GPM	% ACCURACY
1	6257.00	101.98
2	2501.60	101.70
3	502.90	98.23

CERTIFIED BY: Paul Hobbs **DATE:** 6/24/2008

This calibration was performed on a primary or secondary test facility, traceable to the National Institute of Standards and Technology, USA. The estimated flow measurement uncertainty of the calibration facilities are:
Primary +/- 0.15% Secondary +/- 0.5%

McCROMETER
3255 WEST STETSON AVENUE
HEMET, CA 92545 USA
PHONE (951) 652-6811 / FAX (951) 652-3078
WEB SITE: http://www.mccrometer.com E-MAIL: info@mccrometer.com

20081737

Printed by Don Hawley
6/24/2008 9:37:44 AM
Version 1.0 (3/9/2007)

In-Situ Pressure Transducer Calibration Certificates

In-Situ Inc.

Calibration Report

221 E. Lincoln Ave, Fort Collins, CO 80524 USA, 970-498-1500, 1-800-446-7488 (Toll Free USA & Canada), FAX: 970-498-1598
Visit us on the Internet at **www.in-situ.com**!

Report Number: 2008080208005153 **Calibration Result:** **PASSED**

Calibration Date:	2008-08-02
Model:	PXD-261
Full Scale Pressure Range:	206.8 kPa (30 PSI) Gauge
Manufacturer:	In-Situ
Serial Number:	5153

Calibration Procedures and Equipment Used:

Standards used in this calibration are fraceable to the National Institute of Standards and Technology.

1. Digital Multi-Meter, HP 3457A, s/n 3114A15076
2. Multi-Channel Thermometer, Instrulab 4312A-15, s/n 41039
3. Platinum RTD, Instrulab 832, s/n 12084
4. 100 PSIG/A - Pressure Controller, Ruska 7215xi, s/n 55556
5. Automated software calibration procedures used

Range of Applied Temperatures: 4.74 C to 29.80 C

Range of Applied Pressures: -0.0003 kPa (-0.0000 PSI) to 206.8462 kPa (30.0005 PSI)

Calibration Coefficients:

Linearity	0.2678
Scale	29.7931
Offset	-0.1851

PASS/FAIL Criteria:

	Applied Pressure	Current mA	
Zero Response	-0.0003 kPa (-0.0000 PSI)	4.100	PASSED
Full Scale Response	206.8462 kPa (30.0005 PSI)	20.064	PASSED

	Minimum	Maximum	
Temperature Stability (%FS)	-0.056	0.092	PASSED
Repeatability at 15 C (%FS)	-0.022	0.010	PASSED

Hysteresis (%FS)	0.025	PASSED
Thermal Hysteresis (%FS)	0.027	PASSED

Test Performed By: wr' Test Verified By:

In-Situ Inc.

Calibration Report

221 E. Lincoln Ave, Fort Collins, CO 80524 USA, 970-498-1500, 1-800-446-7488 (Toll Free USA & Canada), FAX: 970-498-1598
Visit us on the Internet at **www.in-situ.com**!

Report Number: 2008021603007550 **Calibration Result:** **PASSED**

Calibration Date:	2008-02-16
Model:	PXD-261
Full Scale Pressure Range:	689.5 kPa (100 PSI) Gauge
Manufacturer:	In-Situ
Serial Number:	7550

Calibration Procedures and Equipment Used:

Standards used in this calibration are traceable to the National Institute of Standards and Technology.

1. Digital Multi-Meter, HP 3457A, s/n 3114A17597
2. Multi-Channel Thermometer, Instrulab 4312A-15, s/n 41039
3. Platinum RTD, Instrulab 832, s/n 12159
4. 300/100 PSIG Pressure Controller - Sensor 1, Mensor PCS-400, s/n 180226
5. Automated software calibration procedures used

Range of Applied Temperatures: 4.36 C to 29.43 C

Range of Applied Pressures: -0.0483 kPa (-0.0070 PSI) to 689.4826 kPa (100.0010 PSI)

Calibration Coefficients:

Linearity	0.3125
Scale	100.4656
Offset	0.2903

PASS/FAIL Criteria:

	Applied Pressure	Current mA	
Zero Response	-0.0483 kPa (-0.0070 PSI)	3.953	PASSED
Full Scale Response	689.4826 kPa (100.0010 PSI)	19.831	PASSED

	Minimum	Maximum	
Temperature Stability (%FS)	-0.022	0.025	PASSED
Repeatability at 15 C (%FS)	-0.008	0.008	PASSED

Hysteresis (%FS)	0.010	PASSED
Thermal Hysteresis (%FS)	0.023	PASSED

Test Performed By: LEH Test Verified By:

This calibration report shall not be reproduced, except in full, without the written approval of In-Situ, Inc.

In-Situ Inc.

221 E. Lincoln Ave, Fort Collins, CO 80524 USA, 970-498-1500, 1-800-446-7488 (Toll Free USA & Canada), FAX: 970-498-1598

Visit us on the Internet at www.in-situ.com!

Calibration Report

Report Number: 2008080208000264 **Calibration Result:** PASSED

Calibration Date:	2008-08-02
Model:	PXD-261
Full Scale Pressure Range:	206.8 kPa (30 PSI) Gauge
Manufacturer:	In-Situ
Serial Number:	264

Calibration Procedures and Equipment Used:

Standards used in this calibration are traceable to the National Institute of Standards and Technology.

1. Digital Multi-Meter, HP 3457A, s/n 3114A15076
2. Multi-Channel Thermometer, Instrulab 4312A-15, s/n 41039
3. Platinum RTD, Instrulab 832, s/n 12084
4. 100 PSIG/A - Pressure Controller, Ruska 7215xi, s/n 55556
5. Automated software calibration procedures used

Range of Applied Temperatures: 4.74 C to 29.80 C

Range of Applied Pressures: -0.0003 kPa (-0.0000 PSI) to 206.8457 kPa (30.0004 PSI)

Calibration Coefficients:

Linearity	0.2559
Scale	29.6397
Offset	-0.0868

PASS/FAIL Criteria:

	Applied Pressure	Current mA	
Zero Response	-0.0003 kPa (-0.0000 PSI)	4.049	PASSED
Full Scale Response	206.8457 kPa (30.0004 PSI)	20.101	PASSED

	Minimum	Maximum	
Temperature Stability (%FS)	-0.094	0.070	PASSED
Repeatability at 15 C (%FS)	-0.013	0.016	PASSED

Hysteresis (%FS)	0.017	PASSED
Thermal Hysteresis (%FS)	0.017	PASSED

Test Performed By: wr' Test Verified By:

In-Situ Inc.

Calibration Report

221 E. Lincoln Ave, Fort Collins, CO 80524 USA, 970-498-1500, 1-800-446-7488 (Toll Free USA & Canada), FAX: 970-498-1598
Visit us on the Internet at **www.in-situ.com**!

Report Number: 2008080208005832 **Calibration Result:** **PASSED**

Calibration Date:	2008-08-02
Model:	PXD-261
Full Scale Pressure Range:	206.8 kPa (30 PSI) Gauge
Manufacturer:	In-Situ
Serial Number:	5832

Calibration Procedures and Equipment Used:

Standards used in this calibration are traceable to the National Institute of Standards and Technology.

1. Digital Multi-Meter, HP 3457A, s/n 3114A15076
2. Multi-Channel Thermometer, Instrulab 4312A-15, s/n 41039
3. Platinum RTD, Instrulab 832, s/n 12084
4. 100 PSIG/A - Pressure Controller, Ruska 7215xi, s/n 55556
5. Automated software calibration procedures used

Range of Applied Temperatures: 4.74 C to 29.80 C

Range of Applied Pressures: -0.0003 kPa (-0.0000 PSI) to 206.8446 kPa (30.0003 PSI)

Calibration Coefficients:

Linearity	0.2543
Scale	29.5720
Offset	-0.0988

PASS/FAIL Criteria:

	Applied Pressure	Current mA	
Zero Response	-0.0003 kPa (-0.0000 PSI)	4.054	PASSED
Full Scale Response	206.8446 kPa (30.0003 PSI)	20.144	PASSED

	Minimum	Maximum	
Temperature Stability (%FS)	-0.108	0.059	PASSED
Repeatability at 15 C (%FS)	-0.014	0.007	PASSED

Hysteresis (%FS)	0.014	PASSED
Thermal Hysteresis (%FS)	0.013	PASSED

Test Performed By: wr' Test Verified By:

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Transducer

In-Situ Inc.

Calibration Report

221 E. Lincoln Ave, Fort Collins, CO 80524 USA, 970-498-1500, 1-800-446-7488 (Toll Free USA & Canada), FAX: 970-498-1598
Visit us on the Internet at **www.in-situ.com**!

Report Number: 2007020802010137 **Calibration Result:** **PASSED**

Calibration Date:	2007-02-08
Model:	PXD-261
Full Scale Pressure Range:	206.8 kPa (30 PSI) Gauge
Manufacturer:	In-Situ
Serial Number:	10137

Calibration Procedures and Equipment Used:

Standards used in this calibration are traceable to the National Institute of Standards and Technology.

1. Digital Multi-Meter, HP 3457A, s/n 3114A16441
2. Multi-Channel Thermometer, Instrulab 4312A-15, s/n 41039
3. Platinum RTD, Instrulab 832, s/n 12072 (RTD-08)
4. 300/100 PSIG Pressure Controller - Ext. 30 PSIG (s/n 280485), Mensor PCS-400, s/n 180226
5. Automated software calibration procedures used

Range of Applied Temperatures: 4.33 C to 29.37 C

Range of Applied Pressures: 0.0021 kPa (0.0003 PSI) to 206.8455 kPa (30.0004 PSI)

Calibration Coefficients:

Linearity	0.2648
Scale	29.5798
Offset	-0.0602

PASS/FAIL Criteria:

	Applied Pressure	Current mA	
Zero Response	0.0021 kPa (0.0003 PSI)	4.033	PASSED
Full Scale Response	206.8455 kPa (30.0004 PSI)	20.114	PASSED

	Minimum	Maximum	
Temperature Stability (%FS)	-0.066	-0.004	PASSED
Repeatability at 15 C (%FS)	-0.005	0.004	PASSED

Hysteresis (%FS)	0.005	PASSED
Thermal Hysteresis (%FS)	0.006	PASSED

Test Performed By: LEH Test Verified By:

In-Situ Inc.

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Calibration Report

Report Number: 2008021203010230

Calibration Result: PASSED

Calibration Date:	2008-02-12
Model:	PXD-261
Full Scale Pressure Range:	689.5 kPa (100 PSI) Gauge
Manufacturer:	In-Situ
Serial Number:	10230

Calibration Procedures and Equipment Used:

Standards used in this calibration are traceable to the National Institute of Standards and Technology.

1. Digital Multi-Meter, HP 3457A, s/n 3114A17597
2. Multi-Channel Thermometer, Instrulab 4312A-15, s/n 41039
3. Platinum RTD, Instrulab 832, s/n 12159
4. 300/100 PSIG Pressure Controller - Sensor 1, Mensor PCS-400, s/n 180226
5. Automated software calibration procedures used

Range of Applied Temperatures: 4.30 C to 29.41 C

Range of Applied Pressures: -0.0345 kPa (-0.0050 PSI) to 689.4826 kPa (100.0010 PSI)

Calibration Coefficients:

Linearity	0.1986
Scale	99.2617
Offset	0.1253

PASS/FAIL Criteria:

	Applied Pressure	Current mA	
Zero Response	-0.0345 kPa (-0.0050 PSI)	3.979	PASSED
Full Scale Response	689.4826 kPa (100.0010 PSI)	20.067	PASSED

	Minimum	Maximum	
Temperature Stability (%FS)	-0.033	0.019	PASSED
Repeatability at 15 C (%FS)	-0.006	0.012	PASSED

Hysteresis (%FS)	0.012	PASSED
Thermal Hysteresis (%FS)	0.006	PASSED

Test Performed By: LEH Test Verified By: JE Hault

In-Situ Inc.

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Calibration Report

Understanding the Transducer Calibration Report

Page 1 provides calibration information for your In-Situ pressure transducer. Page 2 provides an explanation of the results and a brief description of our rigid test procedures. We include this information so that you may have a better understanding of our calibration procedures relative to the high accuracy of our products. We take our published specifications seriously, and in most cases, the actual results of our calibration report exceed those specifications.

The Calibration Procedure

We run six separate cycles (nominally 5°C, 15°C, 30°C, 15°C, 15°C, and 15°C) to test the transducer's performance and ability to repeat readings at constant temperatures. For each cycle, the transducer is temperature-stabilized, then pressure readings are taken from 0 to full scale (FS) pressure and back to 0 in 10% FS steps (22 data points).

The transducer is optimized for operation at 15°C, a temperature that characterizes a majority of groundwater applications.

Calibration Coefficients

The transducer's coefficients are also found on the probe's data tag. These are the coefficients to enter into In-Situ's data loggers before running a test. Instructions for programming Linearity, Scale, and Offset may be found in the data logger operator's manual.

PASS/FAIL Criteria

"Deviation" refers to the difference between the transducer readings and our NIST-traceable (National Institute of Standards and Technology) pressure standard. mA = milliAmps, FS = Full Scale.

Zero Response: Response of the probe, in mA, when 0 PSI pressure is applied.

Full Scale Response: Response of the probe, in mA, when full scale pressure is applied.

Temperature Stability: Minimum and maximum % FS deviation over the first four cycles.

Repeatability at 15°C: Minimum and maximum % FS deviation over the last three cycles.

Hysteresis: Maximum difference between % FS deviations over the last three cycles.

Thermal Hysteresis: Maximum difference between % FS deviations between the first two 15°C cycles.

Integra-QR Memory Gauge Calibration Certificate

Electronic Gauge Calibration Data

GRC #85A75

Gauge Serial Number: 92321
Sensor Number: 92321
Range: 16,000 Psi
Date Calibrated: 11/29/2007
Date Verified: 11/29/2007
Model: Integra QMR
Coefficient type: GRC QUARTZ

GEOPHYSICAL RESEARCH CO., LLC

Corporate Office
6540 E. Apache
Tulsa, Oklahoma 74115 USA

Mailing Address
P. O. Box 581570
Tulsa, Oklahoma 74158 USA

Telephone: 918-834-9600
FAX: 918-838-8846
E-Mail: sales@grcamerada.com
Web Address: www.grcamerada.com

ATTN: JOHN CATHEY

Electronic Gauge Calibration Data

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Sensor Number: 92321
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Date Verified: 11/29/2007
Model: Integra QMR
Coefficient type: GRC QUARTZ

Temperature Specifications

Maximum positive error:	0.0198	°C
Maximum negative error:	-0.0337	°C
Sensitivity:	0.005	°C/Hz
Sensitivity:	182.524	Hz/°C

Pressure Specifications

Maximum positive error:	0.6427	Psi
Occurs at:	75.19	°C
And at:	12015.73	PsiA
Maximum negative error:	-0.3829	Psi
Occurs at:	75.19	°C
And at:	16015.74	PsiA
Hysteresis:	1.51	Psi
Occurs at:	99.77	°C
And at:	8015.95	PsiA
Long Term Repeatability:	2.52	Psi
Occurs at:	99.77	°C
And at:	12015.72	PsiA
Sensitivity:	0.392	Psi/Hz
Sensitivity:	2.552	Hz/Psi

Overall Accuracy

Curve Fit:	0.64	Psi
1/2 Hysteresis:	0.75	Psi
Long Term Repeatability:	2.52	Psi
Overall Accuracy:	3.91	Psi

ote: Overall accuracy is valid only for new gauges from GRC

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Date Verified: 11/29/2007
Model: Integra QMR
Coefficient type: GRC QUARTZ

Temperature Calculation Errors

Temperature Data Point	Temperature Frequency Hz	Temperature Deg. C	Calculated Temperature Deg. C	Temperature Error Deg. C
1	45665.07	24.89	24.89	-0.0024
2	42008.96	50.49	50.51	0.0179
3	38174.80	75.19	75.16	-0.0337
4	33980.46	99.76	99.77	0.0135
5	29373.49	124.30	124.32	0.0198
6	24279.47	148.89	148.87	-0.0201
7	18248.10	175.10	175.10	0.0050
8	33981.63	99.78	99.77	*-0.0131*

Electronic Gauge Calibration Data

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Model: Integra QMR
Coefficient type: GRC QUARTZ

Pressure Calculation Errors

Temperature (#1): 24.89 °C

Pressure Data Point	Pressure Frequency Hz	Pressure PsiA	Calculated Pressure PsiA	Pressure Error Psi
1	13522.31	15.17	15.15	-0.0240
2	14531.00	415.98	415.92	-0.0563
3	18566.43	2015.94	2016.04	0.0990
4	23627.29	4015.88	4015.70	-0.1849
5	28708.53	6015.95	6016.00	0.0475
6	33806.43	8015.79	8015.93	0.1352
7	38920.30	10015.76	10015.64	-0.1177
8	44051.10	12015.87	12015.92	0.0544
9	49195.28	14015.73	14015.74	0.0108
10	54353.70	16015.74	16015.71	-0.0255
11	33806.49	8015.76	8015.95	0.1887

Temperature (#2): 50.49 °C

Pressure Data Point	Pressure Frequency Hz	Pressure PsiA	Calculated Pressure PsiA	Pressure Error Psi
1	13527.50	15.12	15.17	0.0455
2	14518.12	415.98	416.21	0.2262
3	18478.71	2015.95	2016.05	0.0999
4	23450.08	4015.91	4016.01	0.0952
5	28443.42	6015.82	6015.76	-0.0631
6	33459.70	8015.87	8016.05	0.1821
7	38494.35	10015.86	10015.65	-0.2121
8	43548.87	12015.82	12015.77	-0.0513
9	48620.29	14015.71	14015.73	0.0225
10	53709.12	16015.75	16015.91	0.1613
11	33460.07	8015.87	8016.20	0.3300

Temperature (#3): 75.19 °C

Pressure Data Point	Pressure Frequency Hz	Pressure PsiA	Calculated Pressure PsiA	Pressure Error Psi
1	13661.04	15.21	14.91	-0.2981
2	14631.88	416.07	415.91	-0.1592
3	18513.92	2015.86	2015.51	-0.3547
4	23391.01	4015.86	4015.71	-0.1488
5	28294.57	6015.80	6015.91	0.1089
6	33223.24	8015.89	8015.81	-0.0841
7	38175.38	10015.73	10015.49	-0.2396
8	43152.33	12015.73	12016.37	0.6427
9	48145.55	14015.86	14015.66	-0.1958
10	53160.09	16015.74	16015.36	-0.3829
11	33225.02	8015.90	8016.53	0.6284

Electronic Gauge Calibration Data

Gauge Serial Number: 92321
Sensor Number: 92321
Range: 16,000 Psi
Date Calibrated: 11/29/2007
Date Verified: 11/29/2007
Model: Integra QMR
Coefficient type: GRC QUARTZ

Pressure Calculation Errors

Temperature (#7): 175.10 °C

Pressure Data Point	Pressure Frequency Hz	Pressure PsiA	Calculated Pressure PsiA	Pressure Error Psi
1	16488.90	15.08	14.97	-0.1055
2	17336.59	415.87	416.03	0.1627
3	20738.65	2016.04	2016.06	0.0165
4	25036.37	4016.02	4015.98	-0.0352
5	29383.66	6015.93	6015.96	0.0301
6	33778.28	8015.78	8015.83	0.0472
7	38218.27	10015.79	10015.78	-0.0149
8	42701.22	12015.74	12015.72	-0.0162
9	47226.26	14015.84	14015.87	0.0340
10	51792.55	16015.69	16015.67	-0.0226
11	33779.06	8015.77	8016.18	0.4095

Temperature (#8): 99.78 °C

Pressure Data Point	Pressure Frequency Hz	Pressure PsiA	Calculated Pressure PsiA	Pressure Error Psi
1	13973.09	15.21	16.20	0.9860
2	14920.74	415.98	417.30	1.3190
3	18712.39	2015.95	2017.07	1.1211
4	23480.93	4015.92	4017.39	1.4690
5	28279.48	6015.83	6017.44	1.6146
6	33107.94	8015.88	8017.58	1.7049
7	37963.83	10015.86	10017.46	1.6015
8	42847.61	12015.80	12018.05	***2.2475***
9	47752.36	14015.69	14017.27	1.5797
10	52681.79	16015.72	16017.14	1.4220
11	33107.95	8015.84	8017.59	1.7490

Electronic Gauge Calibration Data

Gauge Serial Number: 92321
Sensor Number: 92321
Range: 16,000 Psi
Date Calibrated: 11/29/2007
Date Verified: 11/29/2007
Model: Integra QMR
Coefficient type: GRC QUARTZ

Pressure Calculation Errors

Temperature (#4): 99.76 °C

Pressure Data Point	Pressure Frequency Hz	Pressure PsiA	Calculated Pressure PsiA	Pressure Error Psi
1	13971.20	15.16	15.35	0.1912
2	14918.95	416.00	416.50	0.4969
3	18710.18	2015.99	2016.11	0.1167
4	23477.91	4015.95	4016.11	0.1580
5	28276.01	6015.88	6016.00	0.1187
6	33103.95	8015.95	8015.95	-0.0044
7	37959.50	10015.76	10015.70	-0.0596
8	42841.38	12015.72	12015.53	-0.1899
9	47748.27	14015.83	14015.65	-0.1831
10	52679.35	16015.68	16016.20	0.5226
11	33107.60	8015.92	8017.45	1.5310

Temperature (#5): 124.30 °C

Pressure Data Point	Pressure Frequency Hz	Pressure PsiA	Calculated Pressure PsiA	Pressure Error Psi
1	14497.26	15.12	14.77	-0.3503
2	15417.62	415.96	415.95	-0.0112
3	19102.93	2015.92	2015.83	-0.0904
4	23742.83	4015.88	4015.83	-0.0546
5	28418.27	6015.98	6015.89	-0.0944
6	33127.53	8015.82	8015.85	0.0302
7	37869.48	10015.81	10015.85	0.0387
8	42642.33	12015.75	12015.79	0.0359
9	47445.26	14015.83	14016.04	0.2087
10	52273.15	16015.66	16015.29	-0.3688
11	33127.20	8015.80	8015.71	-0.0873

Temperature (#6): 148.89 °C

Pressure Data Point	Pressure Frequency Hz	Pressure PsiA	Calculated Pressure PsiA	Pressure Error Psi
1	15290.44	15.10	15.16	0.0619
2	16178.58	415.93	416.10	0.1730
3	19738.59	2015.89	2015.80	-0.0910
4	24227.32	4015.83	4015.86	0.0303
5	28758.10	6015.92	6016.03	0.1108
6	33328.18	8015.77	8015.73	-0.0379
7	37937.07	10015.77	10015.72	-0.0453
8	42581.90	12015.70	12015.73	0.0340
9	47261.06	14015.78	14015.68	-0.0960
10	51975.76	16015.81	16015.93	0.1188
11	33326.47	8015.77	8014.99	***-0.7808***

Test Data

Injection Test Field Data

IW-1 INJECTION TEST DATA

September 2, 2008

SOUTHWEST CAPE DEEP INJECTION WELL SYSTEM

JOB NUMBER: 3220269

CONTRACTOR: Youngquist Brothers, Inc.

OBSERVERS: Neil Johnson, John Largey

OWNER: City of Cape Coral

TIME	Δ Time (hr:min)	FLOW (gpm)	METER (gal. x 10,000)	WELLHEAD (psi)	COMMENTS
9:14	0:00	0	31,066	27	Begin pumping
9:20	0:06	6,900	31,099	47	
9:28	0:14	6,900	31,157	47	
9:42	0:28	6,900	31,252	47	
10:04	0:50	6,900	31,419	47	
10:28	1:14	6,900	31,584	47	
11:00	1:46	6,900	31,801	47	
11:30	2:16	6,900	32,000	47	
11:49	2:35	6,900	32,130	47	
12:36	3:22	6,900	32,453	47	
13:43	4:29	6,950	32,906	47	
14:18	5:04	6,950	33,137	47	
14:50	5:36	6,950	33,355	47	
15:20	6:06	6,950	33,556	47	
16:00	2:17	6,950	33,800	47	
16:30	7:16	6,950	34,004	47	
16:58	7:44	6,950	34,240	47	
17:29	8:15	6,950	34,450	47	
18:00	8:46	6,950	34,664	47	
18:30	9:16	6,950	34,884	47	
19:05	9:51	6,950	35,091	47	
19:35	10:21	6,950	35,289	47	
20:07	10:53	6,950	35,508	47	
20:21	11:07	6,950	35,599	47	
20:24	11:04	8,000	35,621	56	Increase flow
20:31	11:17	7,800	35,675	51	
20:43	11:29	7,800	35,765	51	
20:59	11:45	7,800	35,894	51	
21:25	12:11	8,000	36,102	51	
21:30	12:16	0	36,135		Stop Pumping
21:33	12:19	0		29	

Exhibits

IW-1 Injection Test
Box 2
IW-1, UMZ, LMZ, Barometric

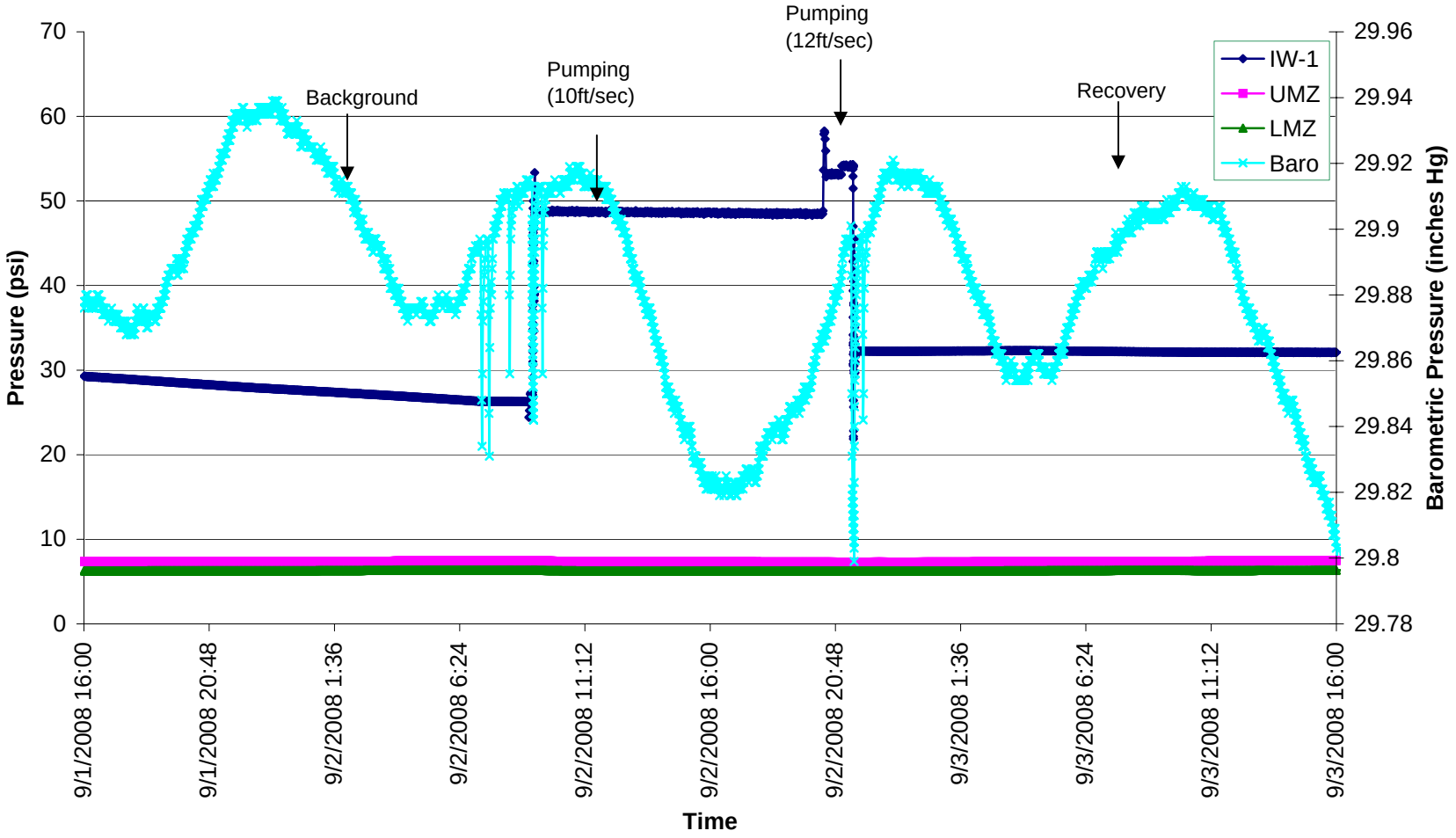

Exhibit 1

IW-1 Injection Test
Box 2
IW-1 UMZ

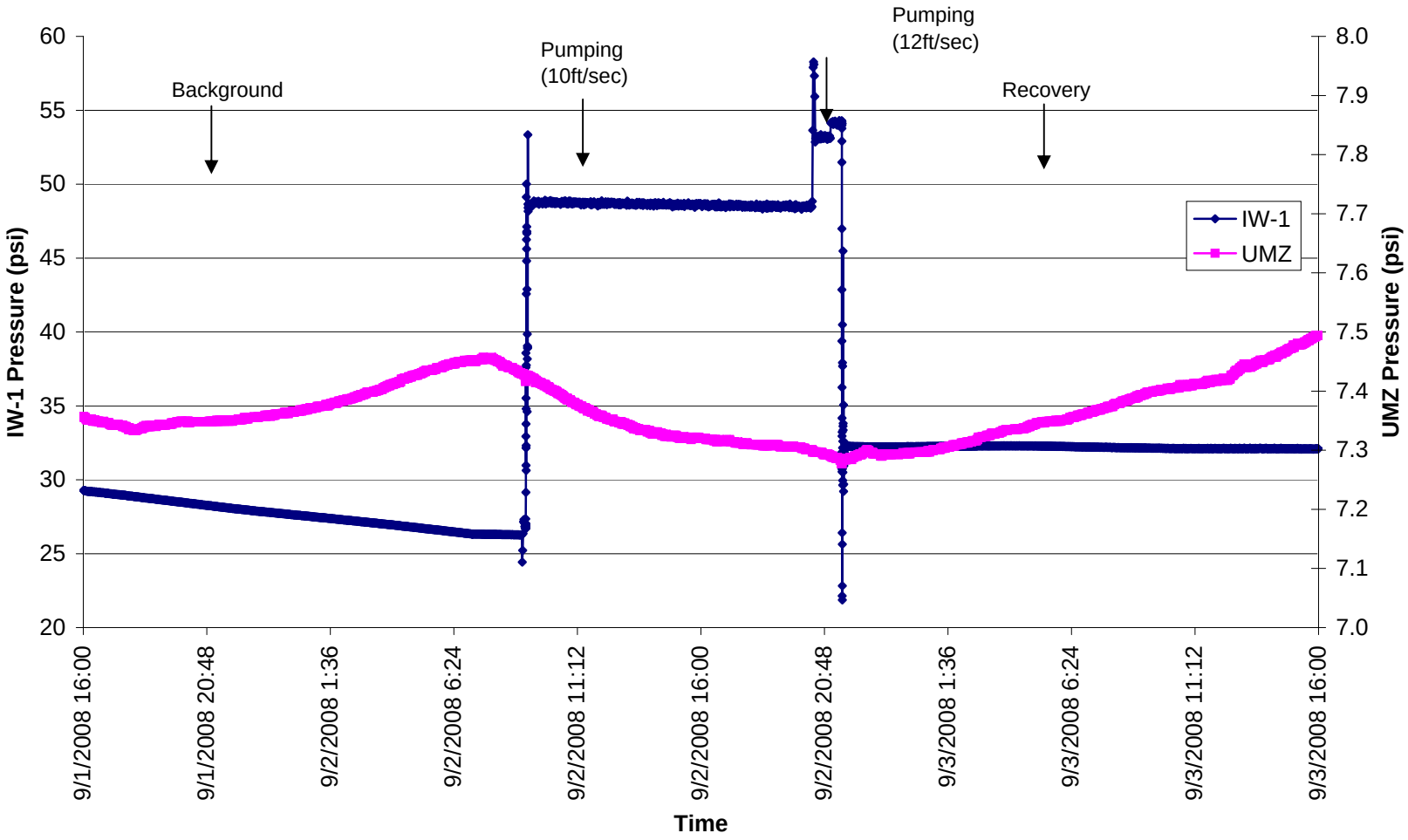

Exhibit 2

IW-1 Injection Test
Box 2
IW-1 LMZ

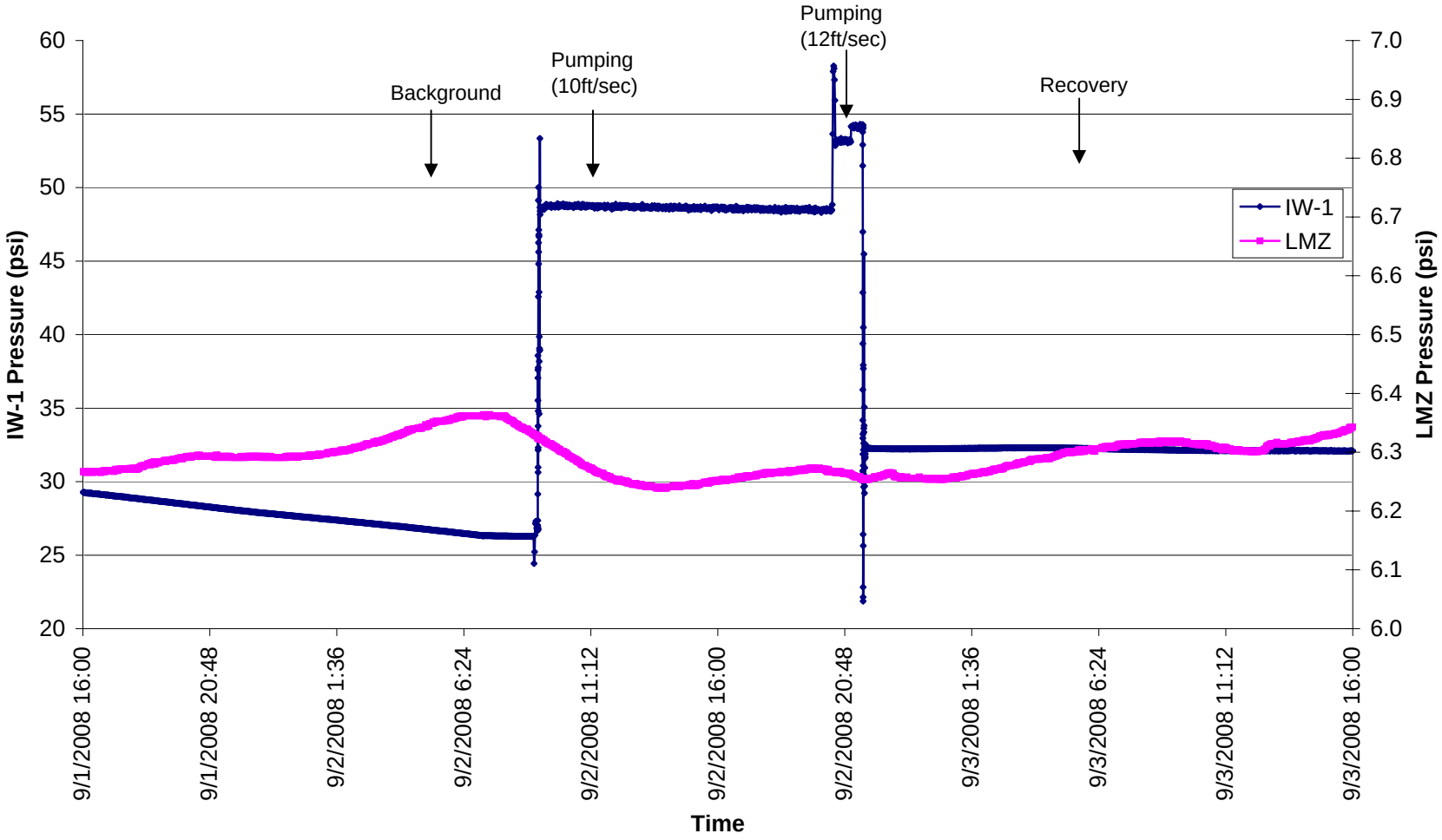

Exhibit 3

IW-1 Injection Test
Box 2
UMZ, Tide Data

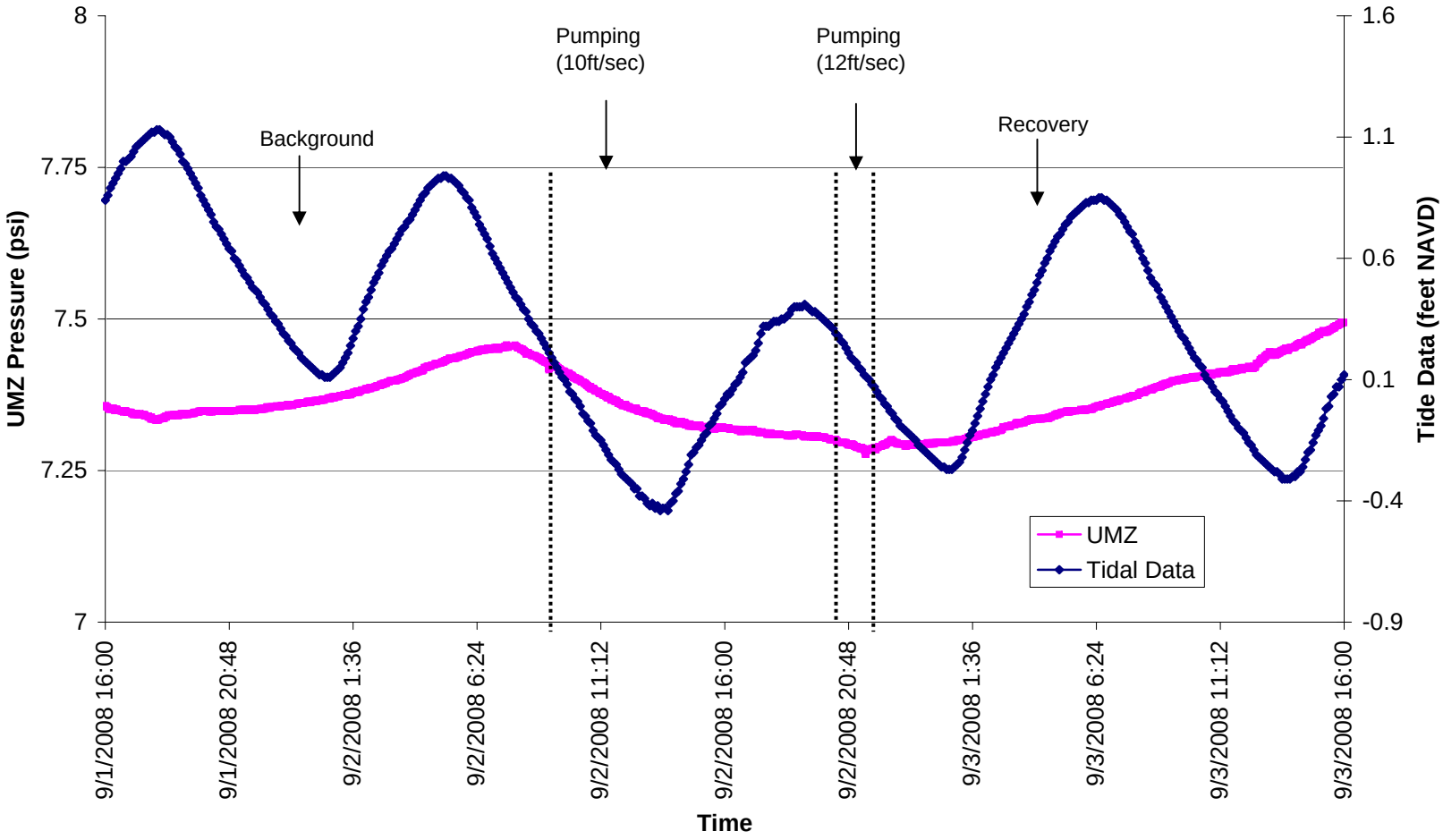

Exhibit 4

IW-1 Injection Test
Box 2
LMZ, Tide Data

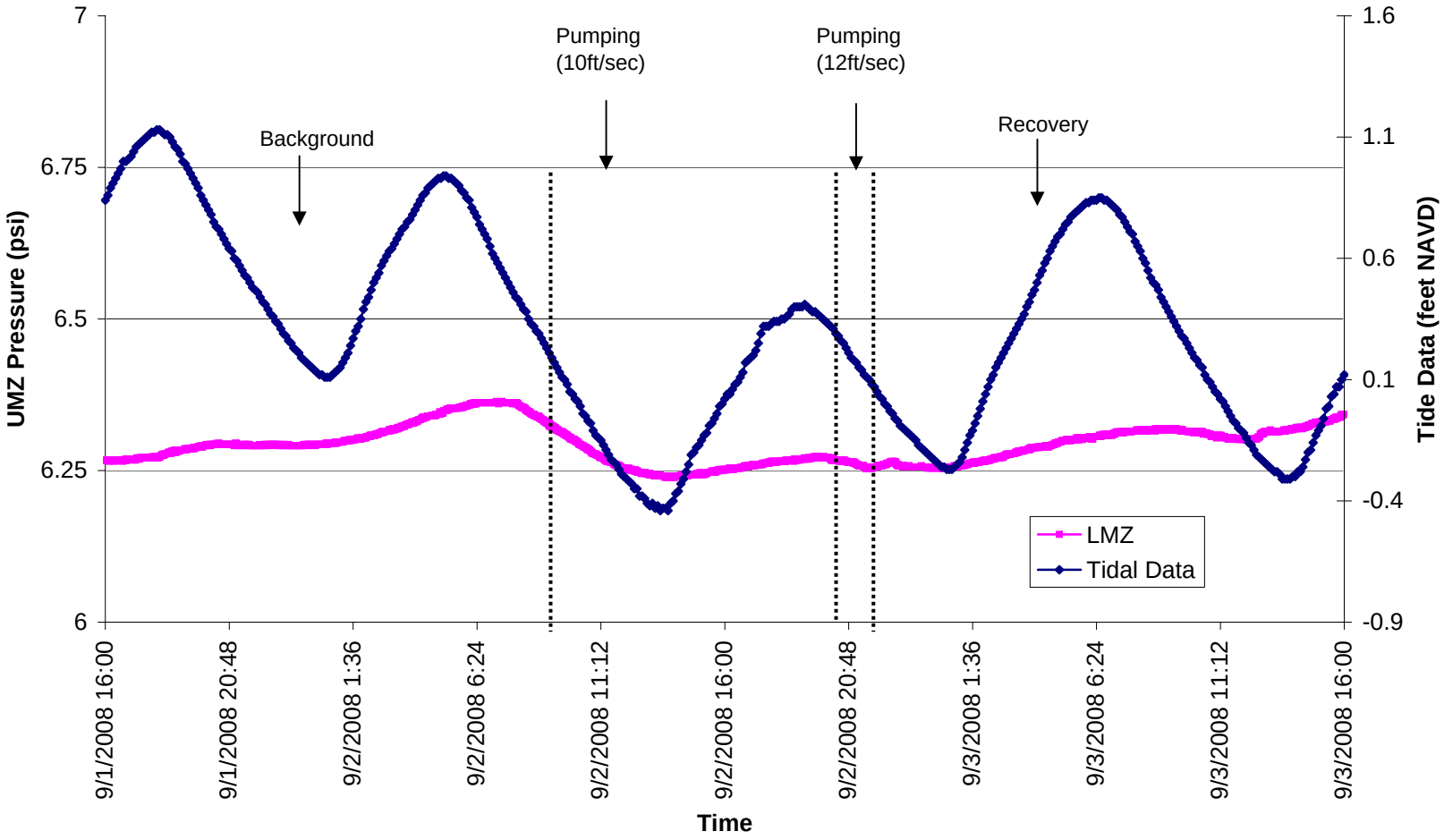

Exhibit 5

IW-1 Injection Test
Box 2
UMZ, Barometric Pressure

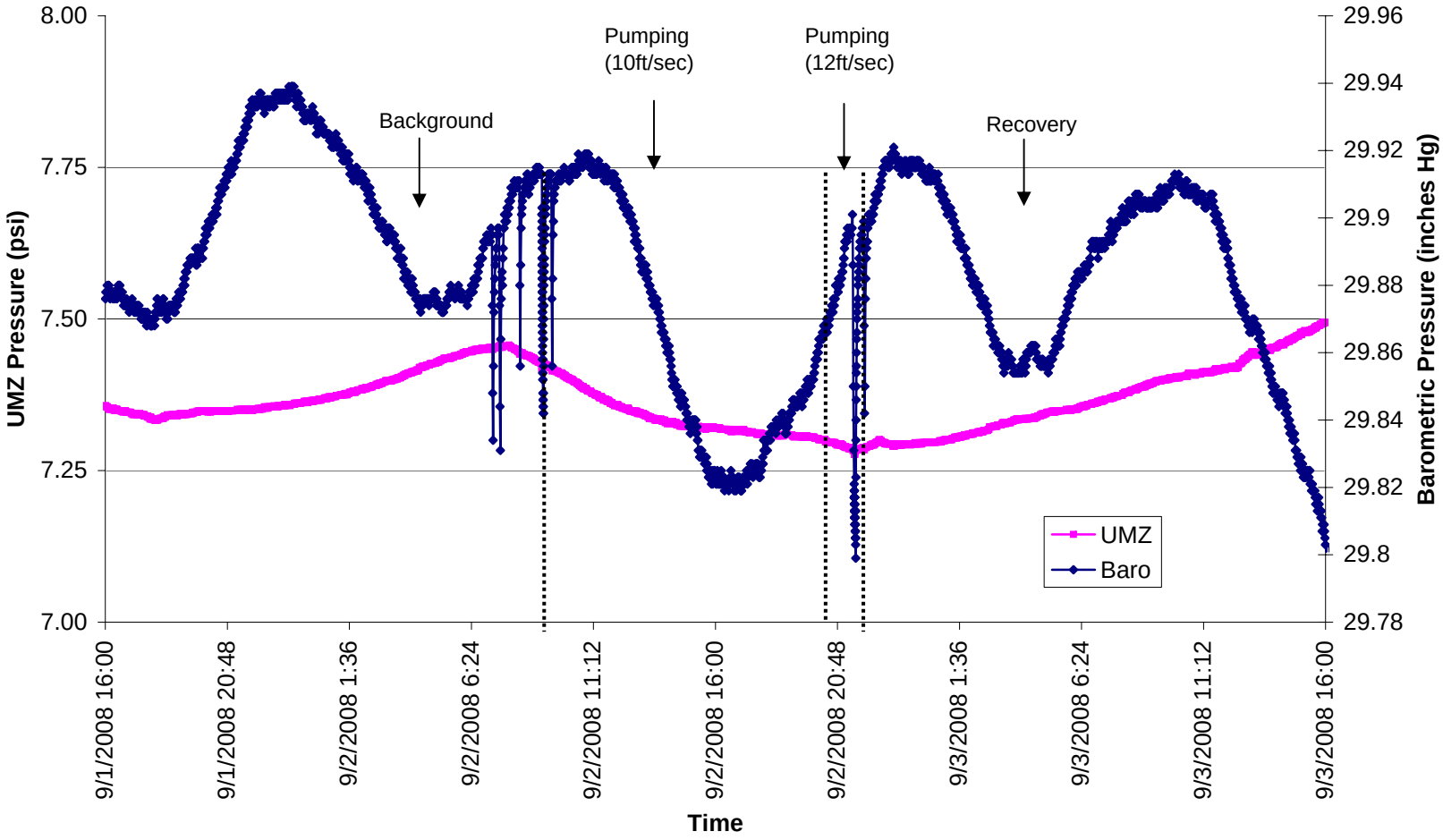

Exhibit 6

IW-1 Injection Test
Box 2
LMZ, Barometric Pressure

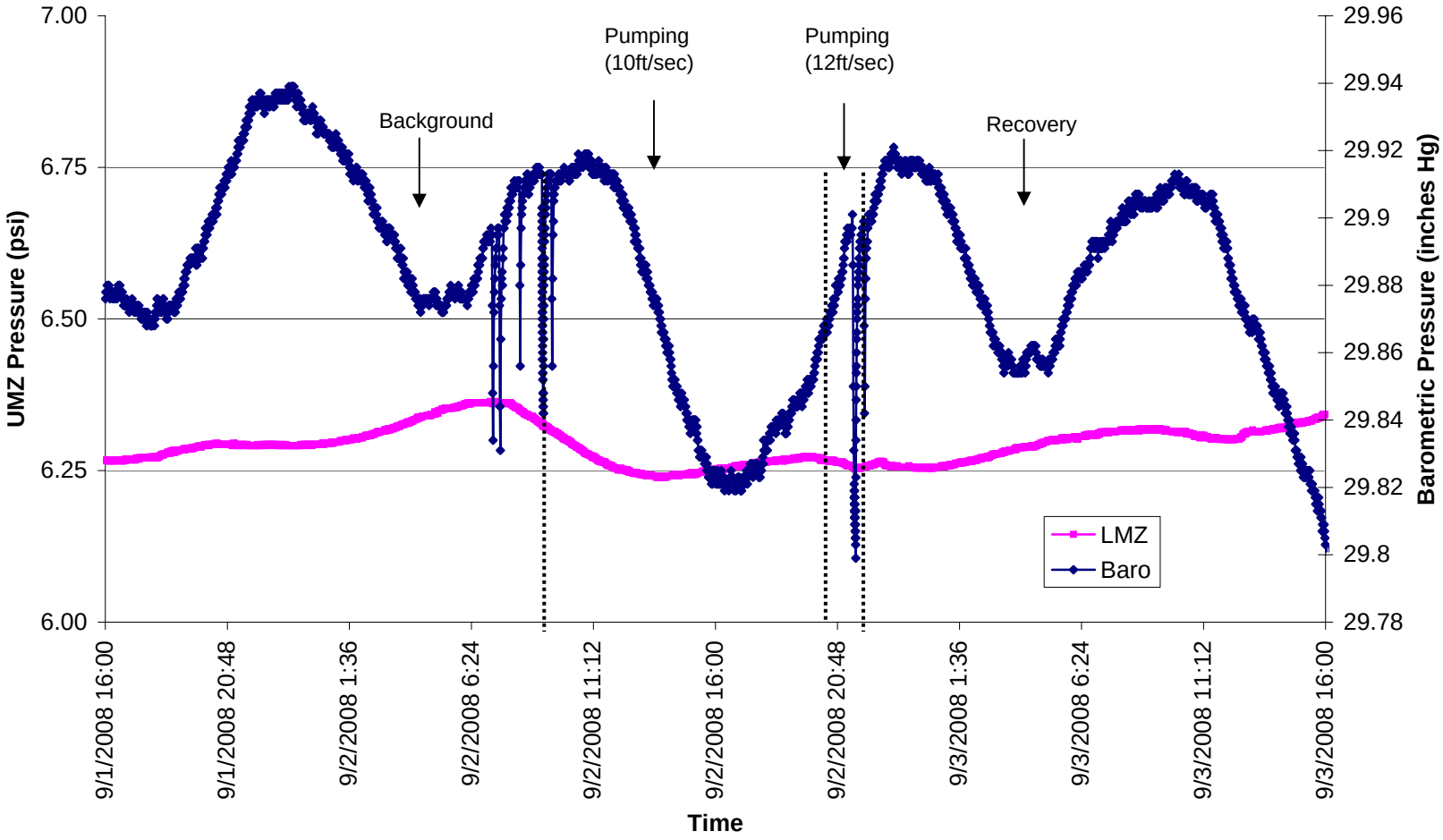

Exhibit 7

IW-1 Injection Test
Box 2
Wellhead and Downhole Pressures

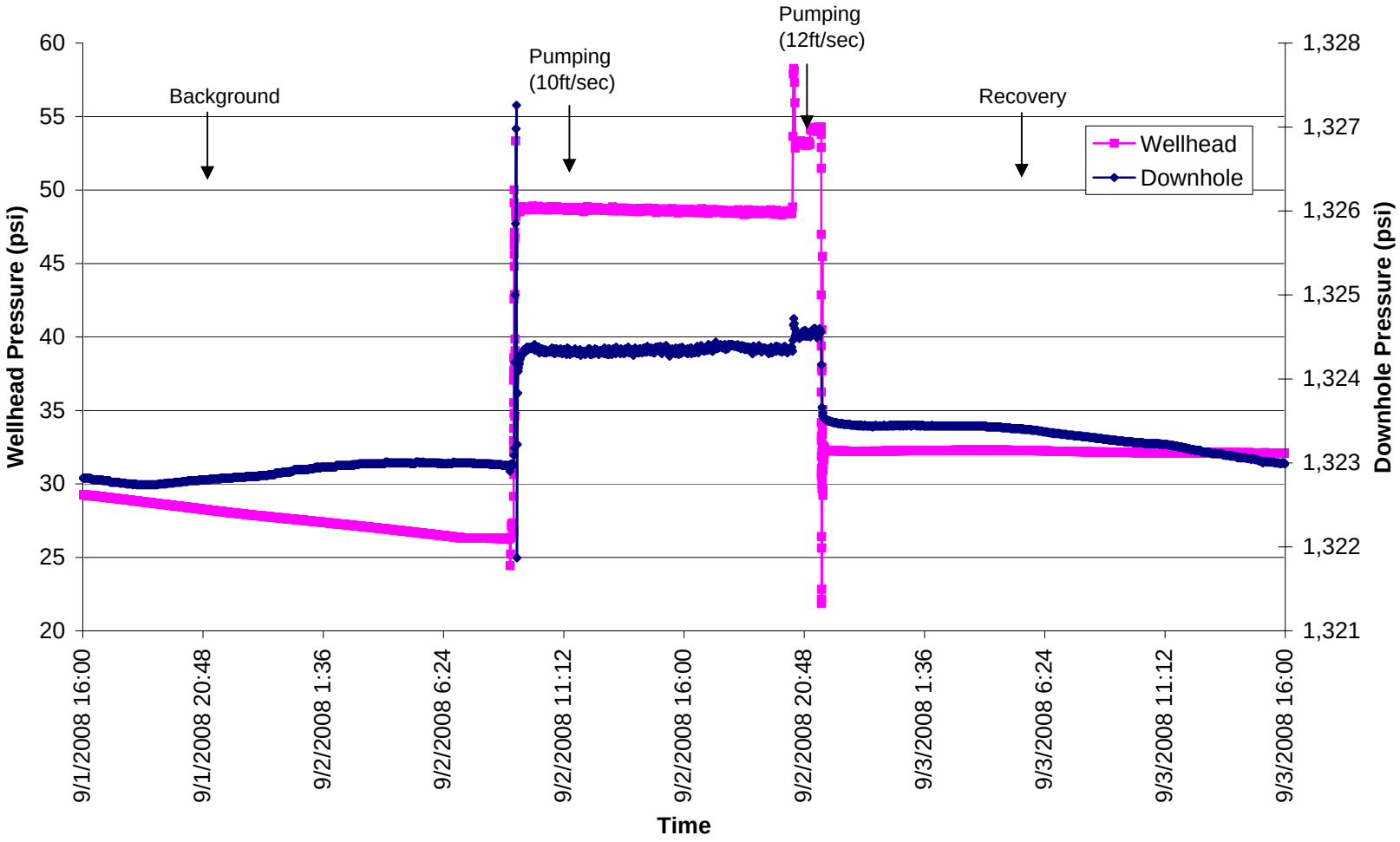

Exhibit 8