

Engineering Report on the Construction and Testing of the Aquifer Storage and Recovery (ASR) System at the BCOES 2A Water Treatment Plant

Prepared for the

Broward County Office of Environmental Services

BCOES Project Number: 1134 ASR

and

Montgomery Watson

Prepared by

CH2M HILL

800 Fairway Drive, Suite 350
Deerfield Beach, Florida 33441

103715.A0
November 1997

Peter J. Howard
11/1/97

Robert W. Hays
11/1/97

Contents

Section	Page
Executive Summary	ES-1
1 Introduction	1-1
Background Information.....	1-1
Project Description.....	1-1
2 Construction Phase	2-1
Temporary Drilling Pads	2-1
Pad Monitor Wells	2-1
Single-Zone Monitor Well (MW-1).....	2-1
ASR Well (ASR-1).....	2-5
3 Geologic Framework	3-1
Geology.....	3-1
Geophysical Logging.....	3-1
Lithostratigraphic Descriptions	3-4
4 Hydrogeologic Testing	4-1
Pad Monitor Wells	4-1
Pilot Hole Data	4-1
Geophysical Logs	4-3
Pumping Tests	4-4
Water Quality	4-6
5 Mechanical Integrity Testing	5-1
6 Cycle Testing Plan	6-1
Appendix A. FDEP and BCDH Permits and WQCE	
Appendix B. Summary of Construction Activities	
Appendix C. Weekly Summaries	
Appendix D. Summary of Casing Depths and Cement Quantities	
Appendix E. Casing Mill Certificates	
Appendix F. Lithologic Logs	
Appendix G. Geophysical Logs	
Appendix H. Pad Monitor Well Water Quality Data	
Appendix I. Pumping Test Data and Analysis	
Appendix J. Background Water Quality Data	
Appendix K. Casing Pressure Test Data	
Appendix L. Pressure Gauge Calibration Certification	
Appendix M. Video Survey Summary and Video Tape	

Contents, continued

Tables		Page
3-1	Summary of Geophysical Logs	3-2
4-1	Pilot Hole Data	4-2
4-2	Summary of Step-Test Results at ASR-1	4-4
4-3	Summary of Aquifer Test Analysis	4-6
4-4	Background Water Quality Analysis at ASR-1 and MW-1	4-7
6-1	Cycle Testing Plan.....	6-1

Figures

Number		Page
1-1	Project Location Map.....	1-2
1-2	Site Plan.....	1-3
2-1	Typical Pad Monitor Well Diagram.....	2-2
2-2	ASR Well and Monitor Well Completion Diagram	2-4
2-3	Monitor Well MW-1 Wellhead Completion Diagram.....	2-6
2-4	ASR Well Wellhead Completion Diagram.....	2-9
2-5	Piping Plan View of ASR System	2-10
3-1	Generalized Subsurface Data and Completion Diagram for ASR-1.....	3-3
4-1	Step-Drawdown Test Data	4-5

Executive Summary

An aquifer storage and recovery (ASR) well system has been constructed at the Broward County Office of Environmental Services (BCOES) 2A Water Treatment Plant (WTP) in Pompano Beach, Florida. The purpose of the ASR system is to store raw Biscayne aquifer water during times of excess, and recover this water during peak, seasonal, or emergency demands. Raw water is provided by surficial wellfields, completed into the prolific Biscayne aquifer. Water is stored in the brackish Floridan Aquifer System, confined by overlying clays of the Hawthorn Group that impede upward migration of stored water.

This facility will be one of the first in Florida to store raw groundwater, whereas most existing ASR systems use treated water. Raw water quality of the Biscayne aquifer water proposed to be stored indicates compliance with primary drinking water standards (DWS), but some secondary DWS (e.g., color, iron, odor) are exceeded. The State of Florida's Underground Injection Control (UIC) program regulates well construction practices, and the State's water quality criteria exemption (WQCE) allows exemption for secondary DWS parameters.

The ASR system consists of two, 1,200-foot wells; one a monitor well (6-inch) and the other an ASR well (16-inch). Surface facilities include piping, a recharge pump, electrically-actuated control valves, a bi-directional flowmeter, electric submersible pump, electrical systems, and instrumentation and control. Raw water is conveyed both to and from the ASR system via an onsite 20-inch raw water main. Stored water is pumped from the ASR well and conveyed to the head of the 2A WTP for treatment and distribution. Recharge and recovery rates are approximately 2.5 to 3.5 mgd.

Construction of the ASR system is now complete. An operations and maintenance (O&M) manual has been prepared as a companion document to the engineering report. It outlines suggested operational, monitoring, and maintenance of the ASR system. The engineering report, O&M manual, and record drawings of the facility are documents presented to FDEP in support of a request for operational testing. Upon approval of operational testing from FDEP, a cycle testing plan will be implemented. This will involve a series of recharge, storage, and recovery cycles to evaluate system performance. Upon successful completion of the cycle testing plan, an application for an operating permit shall be submitted to FDEP. This application will include the cycle testing data as supporting information.

Introduction

Background Information

The Broward County Office of Environmental Services (BCOES) retained the services of Montgomery Watson (and CH2M HILL as a subconsultant) in December 1993 to design and oversee construction of an aquifer storage and recovery (ASR) system at the BCOES 2A water treatment plant (WTP) in Pompano Beach, Florida. The purpose of the project is to store raw Biscayne aquifer water into an ASR well for retrieval during peak, seasonal, or emergency demand periods. The ASR well is completed into the upper portions of the Floridan Aquifer System, separated from the overlying Biscayne aquifer by approximately 600 feet of relatively impermeable clays of the Hawthorn Group.

The location map for the 2A WTP is shown in Figure 1-1. The site layout of the ASR system is shown in Figure 1-2. The ASR well is cased with nominal 16-inch-diameter steel to an approximate depth of 995 feet below pad level (bpl), and is completed with open-hole construction to a depth of approximately 1,200 feet bpl. In addition to the ASR well, an exploratory, single-zone monitor well (MW-1) was constructed to evaluate potential ASR zones, and to monitor water quality of the stored water within the ASR zone. MW-1 is located approximately 275 feet due west of the ASR well on the 2A WTP site as shown in Figure 1-2.

A permit application was submitted to the Florida Department of Environmental Protection (FDEP) for the construction of the ASR system in August 1993. A permit for a treated water ASR system was issued by FDEP (Permit Number UC 06-242411) on July 29, 1994, and modified as UC-06-287325 on May 1, 1996. Subsequent to issuance of the treated water permit, BCOES applied for (August 1995) a water quality criteria exemption (WQCE) to facilitate storage of raw water, which was granted by FDEP on July 31, 1997. Copies of the draft raw water ASR construction permit (UC 06-242418), WQCE, and Broward County Department of Health (BCDH) are presented in Appendix A.

Project Description

Montgomery Watson served as overall project manager, with lead activities in project permitting. CH2M HILL served as the engineer of record for the design and construction activities for the ASR system. Diversified Drilling Corporation (DDC) of Tampa, Florida, selected as the low-bid contractor to construct the ASR system, was issued a Notice to



N.T.S.

PALM BEACH COUNTY

NORTH SYSTEM
REGIONAL WELLFIELD

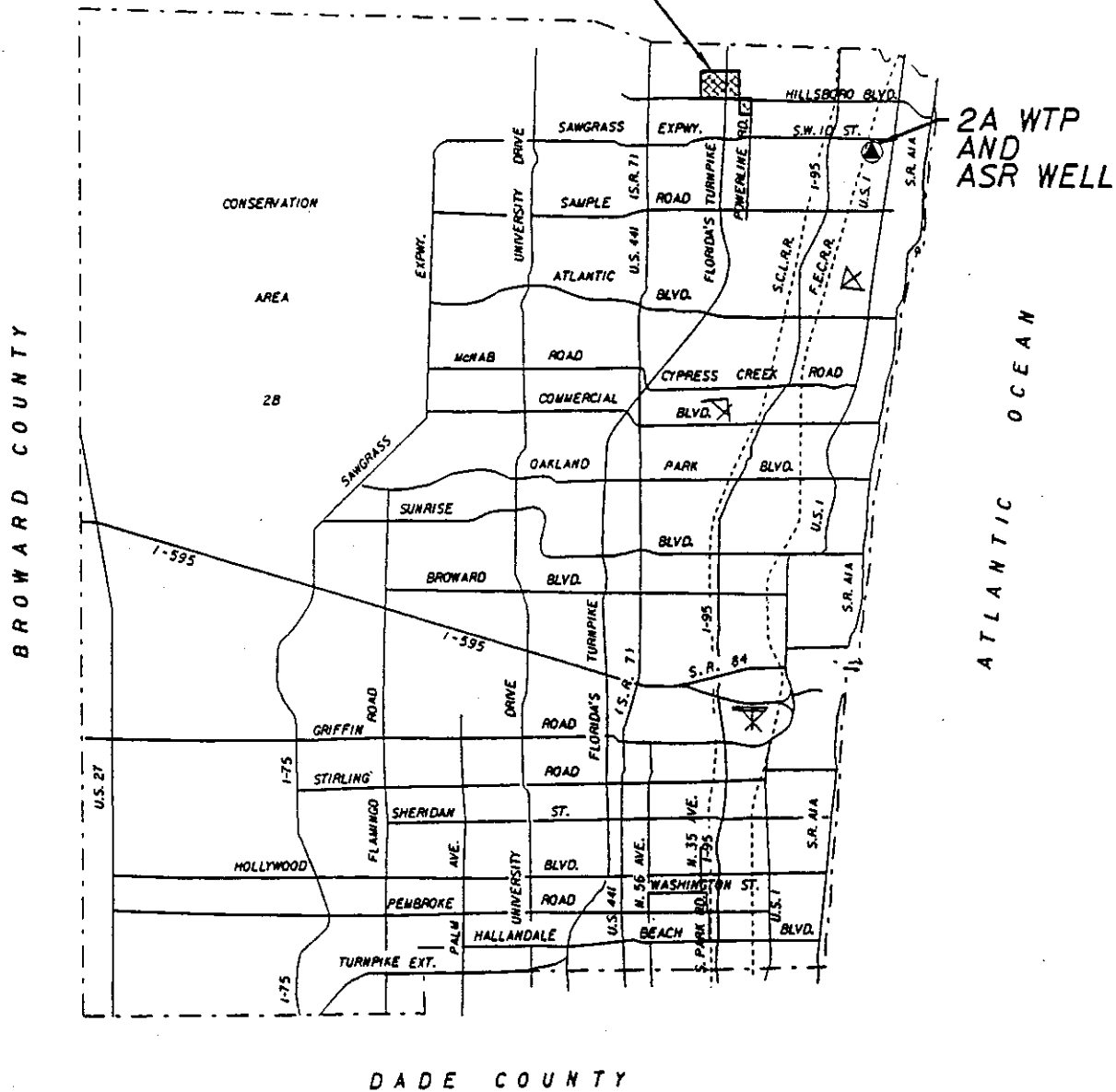


FIGURE 1-1
LOCATION MAP



Proceed on July 10, 1996. Construction was completed in September 1997 at a total construction cost of approximately \$910,000.

Construction activities at MW-1 and ASR-1 included the installation of temporary drilling pads and shallow pad monitor wells; drilling, construction and testing of MW-1 and ASR-1, and the completion of wellhead piping and valves, electrical facilities, and instrumentation and control.

The FDEP Technical Advisory Committee (TAC) coordinated the actions of local, state, and federal; agencies including the Broward County Department of Health (BCDH), Broward County Department of Natural Resource Protection (DNRP), the South Florida Water Management District (SFWMD), the Environmental Protection Agency (EPA), and the United States Geological Survey (USGS). A tabulated summary of construction activities and weekly summaries of the construction progress are presented in Appendix B and C, respectively.

SECTION 2

Construction Phase

The following section describes the construction, drilling, and testing details associated with the construction of the ASR well (ASR-1) and the monitor well (MW-1).

Temporary Drilling Pads

As required by the FDEP construction permit (Appendix A), temporary drilling pads were installed at both the MW-1 and ASR-1 sites prior to well construction. The purpose of these pads was to containerize drilling fluids and prevent migration of brackish groundwater into the Biscayne aquifer—the source of potable water for BCOES. DDC elected to construct the temporary pads by pouring concrete slabs with concrete block walls. Upon cement curing, a relatively impermeable coating was applied to the slab and walls to prevent leakage of drilling fluids. Upon completion of well construction activities, the pads were demolished to facilitate construction of the smaller, permanent well pads.

Pad Monitor Wells

As required by the FDEP construction permit (Appendix A), pad monitor wells (PMWs) were installed at MW-1 and ASR-1. PMWs are monitor wells completed into the Biscayne aquifer at a depth of approximately 20 feet, and installed at each corner of the drilling pads to monitor for discharge of drilling fluids and brackish groundwater during construction. Following installation of the PMWs, surficial groundwater samples were collected and analyzed to establish background water quality data, and sampled weekly during construction. A diagram of a typical PMW is presented in Figure 2-1. Water quality data from the PMWs is discussed in Section 4 of this report.

Single-Zone Monitor Well (MW-1)

Drilling of the 6-5/8-inch single-zone MW-1 commenced on August 19, 1996. Mud rotary techniques were used to drill through the Biscayne aquifer and clay intervals to a depth of approximately 1,000 feet bpl. Mud-rotary drilling is most appropriate while drilling through clay sediments, but yields limited information regarding hydraulic characteristics or water quality data. Reverse-air techniques were used during subsequent drilling stages

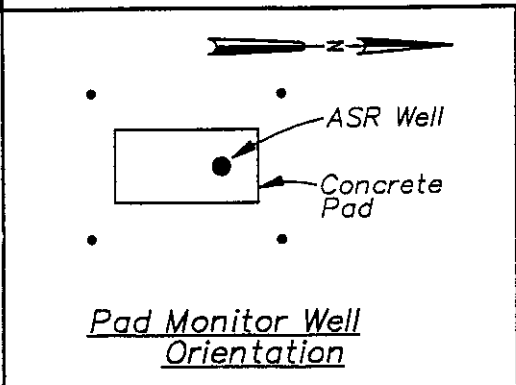
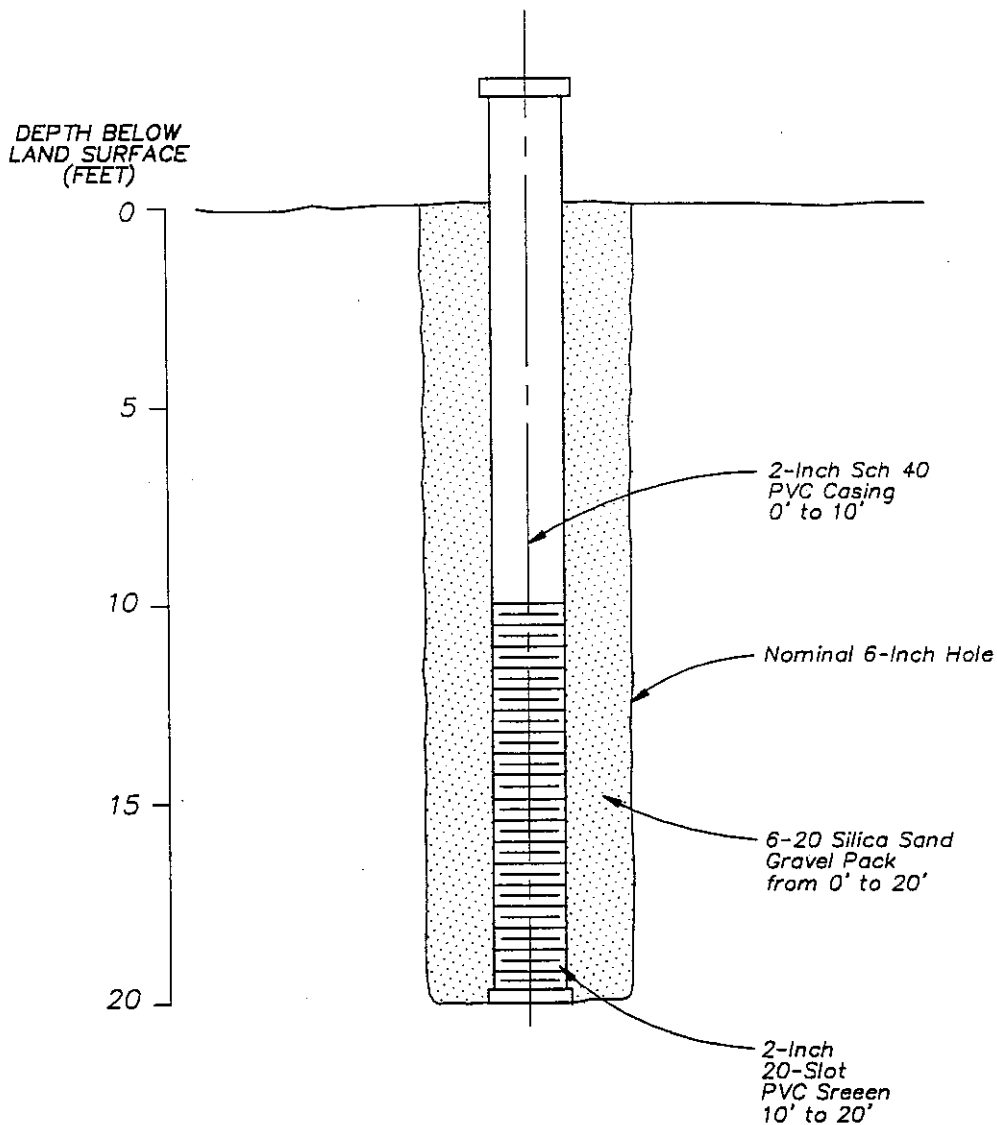


FIGURE 2-1
TYPICAL PAD MONITOR WELL COMPLETION DIAGRAM



to a total depth of 1,200 feet bpl to remove cuttings from the borehole and to collect water samples at 30-foot intervals. An open-circulation system was used during reverse-air drilling to collect more representative water samples during drilling. Water produced while reverse-air drilling was conveyed via temporary piping to an onsite 1 million gallon (MG) storage tank and from there to an onsite lift station for disposal.

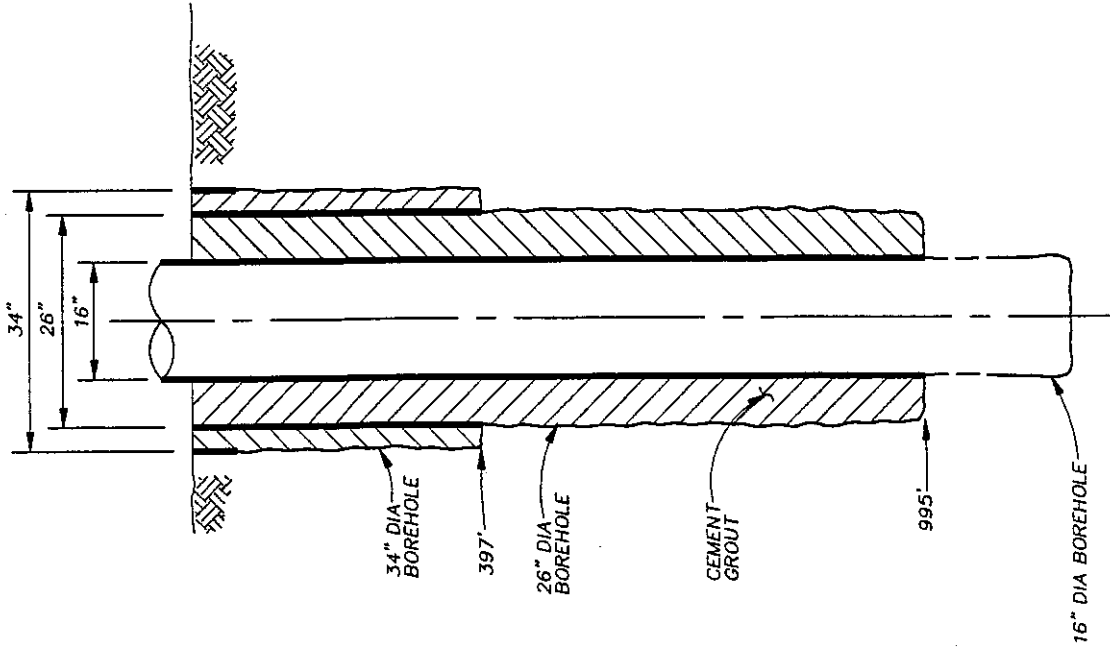
The drilling schedule and casing setting depths were designed to conform to the hydrogeologic features observed at the site, as well as various regulatory agency requirements. Geologic formation samples were collected and described at 10-foot intervals during the drilling of the pilot hole, as more fully described in Section 3, *Geologic Framework*. Data from the pilot hole interval (formation samples [cuttings], water samples, and geophysical logs) were evaluated to provide the basis for describing the geologic formations encountered, to assist in selection of the actual casing setting depths, and to interpret the site lithology and hydrogeology. The pilot hole was then reamed to the specified diameter to the selected final casing setting depth as approved by FDEP.

Construction of MW-1 took place with three concentric steel casings (24-, 14-, and 6-5/8-inch outside diameters). The 24-inch casing was vibrated in place to an approximate depth of 40 feet bpl and did not require cement. The cementing program was specifically tailored for each casing installed. A table summarizing the casing depths and the types and quantities of cement used is presented in Appendix D. Appendix E contains the casing mill certificates for each of the casings used during construction. Refer to the MW-1 completion diagram presented in Figure 2-2 and the casing mill certificates in Appendix E for more precise casing dimensions.

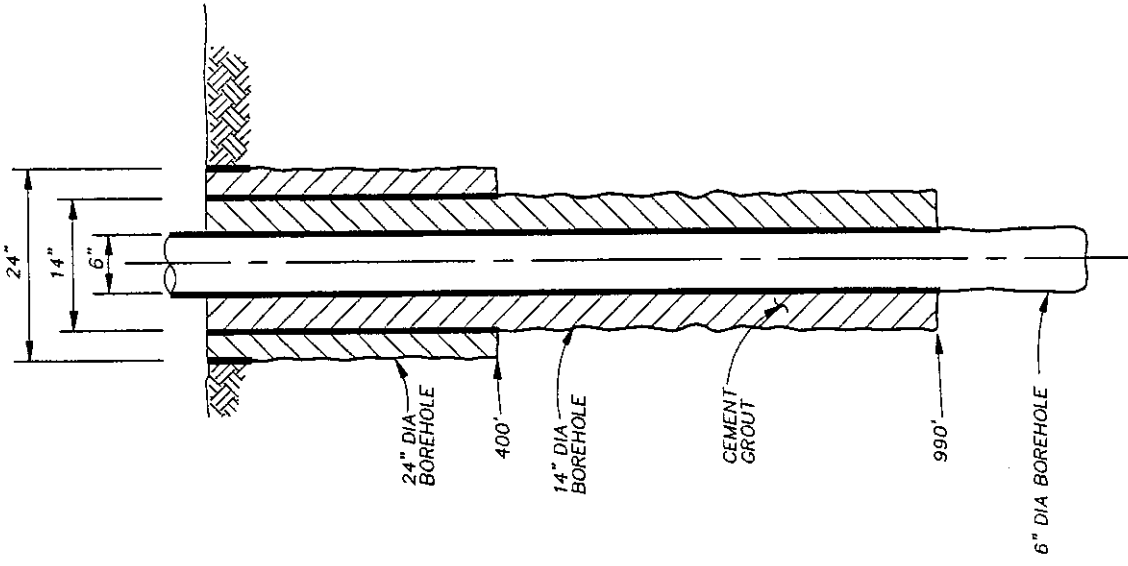
The monitor zone was completed in a permeable zone between 990 and 1,200 feet bpl. Construction of MW-1 began with the drilling of a nominal 12-1/4-inch pilot hole to 430 feet bpl. The pilot hole was then geophysically logged (caliper, gamma ray, spontaneous potential [SP] and long and short normal [LSN] electric logs) and reamed to a nominal 24-inch diameter to a depth of 400 feet bpl. A 14-inch-diameter steel casing was installed and cemented through the surficial aquifer to a depth of 400 feet bpl.

Below the 14-inch casing, drilling of the 12-1/4-inch pilot hole continued within the casing to 1,015 feet bpl. The pilot hole was then geophysically logged (caliper, gamma ray, SP and LSN electric logs) and reamed to a nominal 14-inch diameter to a depth of 990 feet bpl. Installation of the 6-5/8-inch-diameter casing was completed via pressure- and tremie-grout methods through the confining units of the Hawthorn Group to a depth of 990 feet bpl. This setting depth was selected to seal off the overlying clay layers of the Hawthorn Group from

ASR WELL (ASR-1)



MONITOR WELL (MW-1)



DEPTH BELOW
LAND SURFACE
(Feet)



FIGURE 2-2
ASR WELL AND MONITOR
WELL COMPLETION DIAGRAM



the permeable limestone of the storage zone. Following the completion of casing cementing, a successful pressure test on the 6-5/8-inch steel casing was conducted, as described in Section 5, *Mechanical Integrity*.

Reverse-air drilling with open circulation was conducted through the cement plug at the base of the 6-5/8-inch casing to 1,200 feet bpl. The pilot hole was then developed with compressed air to remove cuttings/fines from the borehole and geophysically logged. The logs performed through this interval include caliper, gamma ray, SP, LSN electric, temperature, fluid resistivity, and flowmeter, as more fully described in Section 4, *Hydrogeologic Testing*.

The MW-1 wellhead was completed with the construction of a 6 x 6-foot concrete pad, wellhead piping and valves, sample taps, and the installation of below-grade, 3-inch-diameter PVC discharge piping. Discharge from the monitor zone is conveyed via this 3-inch piping to the onsite lift station (see Figure 1-2) for disposal. A pressure transmitter located at the wellhead transmits pressure readings from MW-1 to the field panel for display and recording. A pressure gauge at the wellhead allows local observation of ambient pressure from MW-1. Figure 2-3 depicts the completion diagram for the MW-1 wellhead.

ASR Well (ASR-1)

Drilling of the 16-inch ASR well (ASR-1) commenced on October 3, 1996. Mud rotary techniques were used to drill through the Biscayne aquifer and clay intervals to a depth of approximately 1,000 feet bpl. Reverse-air techniques were used during subsequent stages to a total depth of 1,200 feet bpl to remove cuttings from the borehole and to collect water samples at 30-foot intervals. An open-circulation system was used during reverse-air drilling to collect more representative water samples during drilling. Water produced while drilling on reverse air was conveyed via temporary piping to an onsite 1 MG storage tank and from there to an onsite lift station for disposal.

The drilling schedule and casing setting depths were designed to conform to the hydrogeologic features observed at the site, as well as various regulatory agency requirements. Geologic formation samples were collected and described at 10-foot intervals during the drilling of the pilot hole, as more fully described in Section 3, *Geologic Framework*. Data from the pilot hole interval (formation samples [cuttings], water samples, and geophysical logs) were evaluated to provide the basis for describing the geologic formations encountered, to

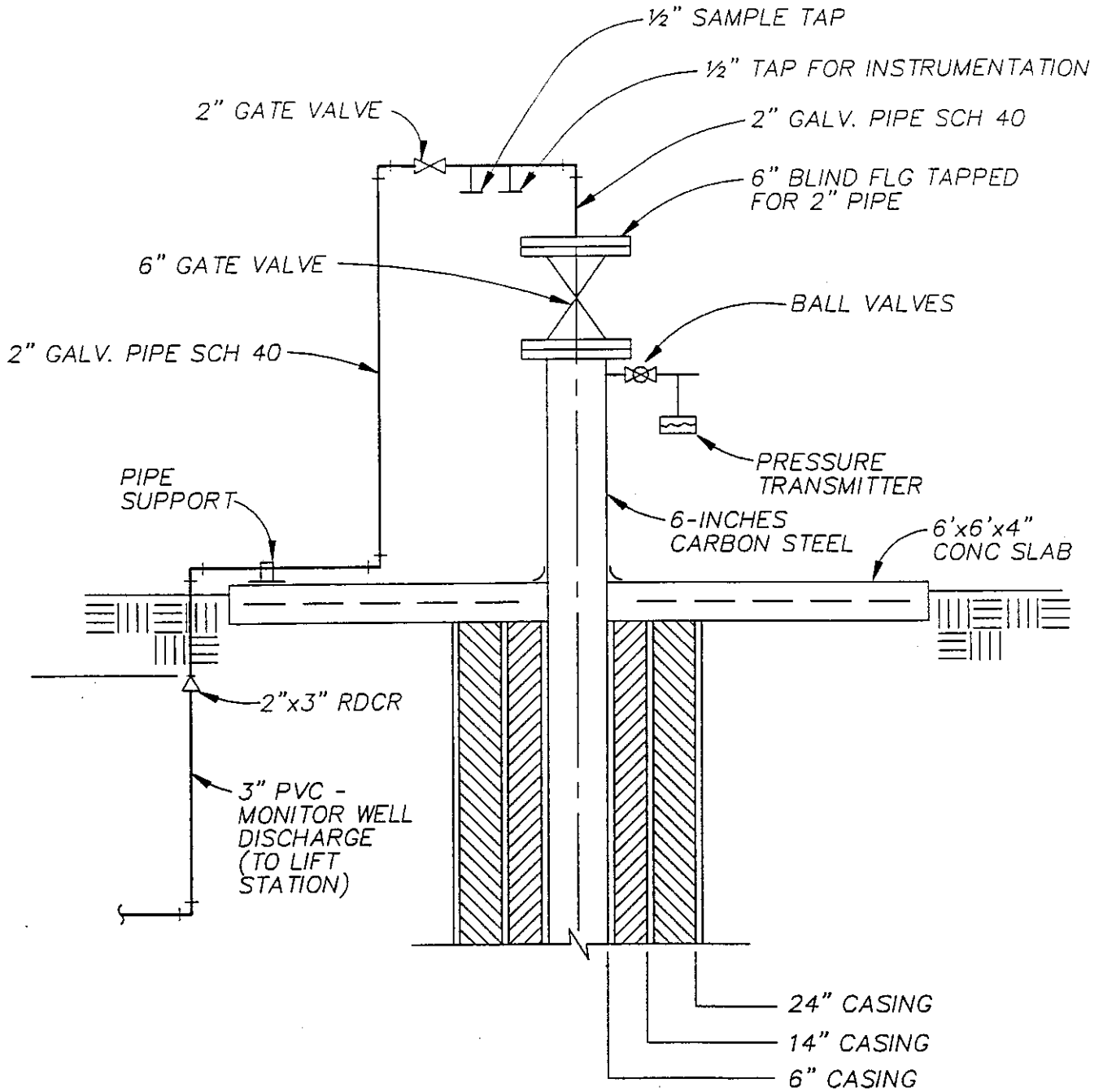


FIGURE 2-3

MONITOR WELL WELLHEAD DETAIL



assist in selection of the actual casing setting depths, and to interpret the site lithology and hydrogeology. The pilot hole was then reamed to the specified diameter to the selected final casing setting depth as approved by FDEP.

Construction of ASR-1 took place with three concentric steel casings (36-, 26-, and 16-inch outside diameters). The 36-inch casing was vibrated in place to an approximate depth of 40 feet bpl and did not require cement. The cementing program was specifically tailored for each casing installed. A table summarizing the casing depths and the types and quantities of cement used is presented in Appendix D. Appendix E contains the casing mill certificates for each of the casings used during construction. Refer to the ASR-1 completion diagram presented in Figure 2-2 and the casing mill certificates in Appendix E for more precise casing dimensions.

The ASR storage zone was completed in a permeable zone between 995 and 1,200 feet bpl. Construction of ASR-1 began with the drilling of a nominal 12-1/4-inch pilot hole to 430 feet bpl. The pilot hole was then geophysically logged (caliper, gamma ray, SP and LSN electric logs) and reamed to a nominal 36-inch diameter to a depth of 400 feet bpl. A 26-inch-diameter steel casing was installed and cemented through the surficial aquifer system to a depth of 397 feet bpl.

Below the 26-inch casing, drilling of the 12-1/4-inch pilot hole continued within the casing to a depth of 1,007 feet bpl. The pilot hole was then geophysically logged (caliper, gamma ray, SP and LSN electric logs) and reamed to a nominal 26-inch diameter to a depth of 1,000 feet bpl. Installation of the 16-inch-diameter casing was completed via pressure- and tremie-grout methods through the confining units of the Hawthorn Group to a depth of 995 feet bpl. This setting depth was selected to isolate the storage zone from the overlying clay layers of the Hawthorn Group. Following the completion of casing cementing, a successful pressure test on the 16-inch steel casing was conducted as more fully described in Section 5, *Mechanical Integrity*.

Reverse-air drilling with open circulation was conducted with a nominal 16-inch-diameter bit through the cement plug at the base of the 16-inch casing to 1,200 feet bpl. The pilot hole was then developed with compressed air to remove cuttings/fines from the borehole and geophysically logged, as more fully described in Section 4, *Hydrogeologic Testing*.

The ASR-1 wellhead was completed with the construction of a 52 x 18-foot concrete pad, wellhead piping, electrically and manually operated valves, bi-directional flowmeter, elec-

trical facilities, and instrumentation and control. A submerged pressure transducer records pressure readings from ASR-1 that are transmitted to the field panel for display and recording. One pressure gauge at the wellhead allows local observation of ambient pressure from ASR-1. Other pressure gauges allow observation of suction and discharge pressure from the recharge pump and discharge pressure from the recovery pump. A conductivity probe continuously transmits conductivity values of stored water to the field panel where it is recorded. Sample taps allow water samples to be obtained for analysis to document water quality per the permit. Figure 2-4 depicts the completion diagram for the ASR-1 wellhead. Figure 2-5 is a plan view of wellhead piping at the site.

16"x1" FLANGED SURFACE PLATE W/ LIFTING LUGS

1 1/2" HUB FOR POWER CABLE

1 1/2" HUB FOR WELL PRESSURE TRANSDUCER

1" COUPLING FOR AIR RELEASE VALVE

1"-V304

PLAN

10" STEEL SUBMERSIBLE PUMP DISCHARGE PIPE

1 1/2" HUB FOR POWER CABLE

1 1/2" HUB FOR WELL PRESSURE TRANSDUCER

1" AIR/VACUUM RELEASE VALVE

1" BALL VALVE

1" STEEL PLATE

ELEV. 22.39' NGVD

CLOTH IMPREGNATED GASKET

1/2" PVC DRAIN LINE TO EDGE OF PAD

16" x 12" DI TEE

2'-0"

CONC. SLAB

10" COLUMN PIPE TO 60'

THREADED COUPLING

34" CASING

26" CASING

16" CASING

FIGURE 2-4

ASR WELLHEAD DETAIL



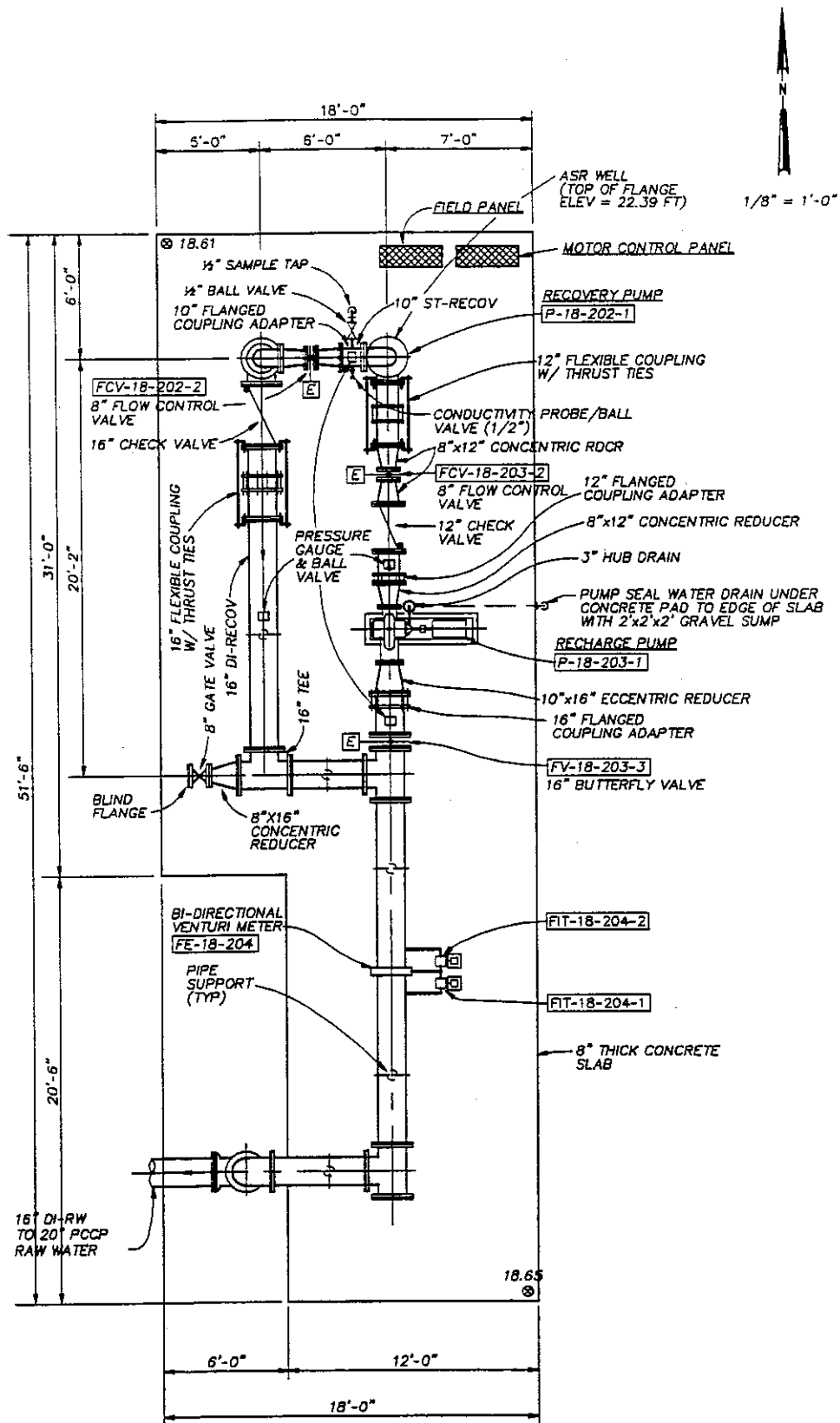


FIGURE 2-5
PIPING PLAN VIEW
OF ASR SYSTEM



Geologic Framework

Geology

Formation cutting samples from MW-1 and ASR-1 were collected at 10-foot intervals from land surface to total depth and were characterized for rock type, color, consolidation, hardness, and fossils. Detailed lithologic descriptions of samples from MW-1 and ASR-1 are provided in Appendix F.

Geophysical Logging

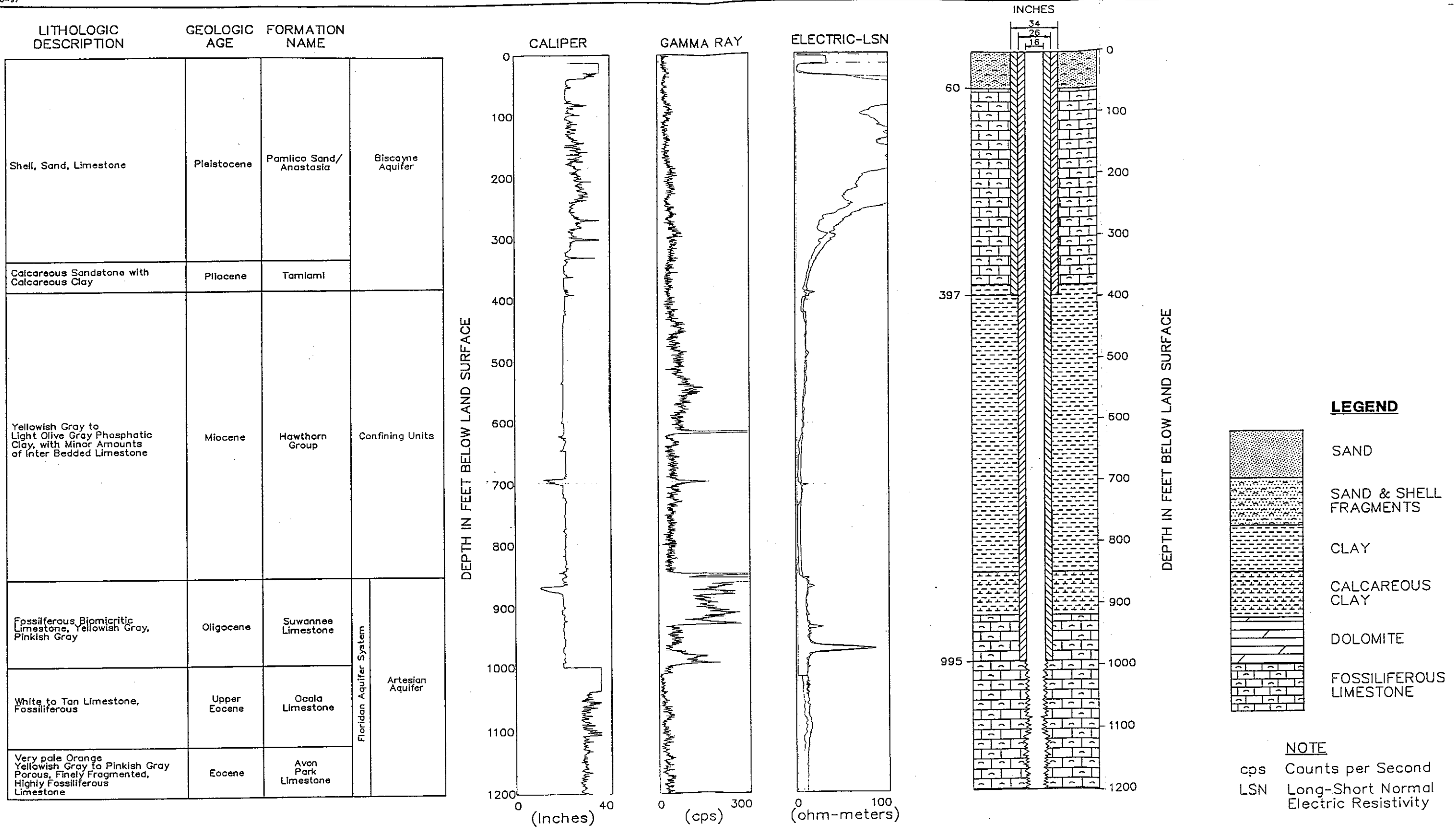
Geophysical logs were performed in the pilot holes of MW-1 and ASR-1 to correlate formation samples collected during drilling, identify formation boundaries, and obtain specific data pertaining to the underground formations. These data were then used to assist in the selection of the optimum casing setting depths for MW-1 and ASR-1. A summary of geophysical logs conducted is shown in Table 3-1. Copies of the pilot hole geophysical logs are presented in Appendix G.

A stratigraphic profile of MW-1 and ASR-1 was derived from the correlation of formation samples with geophysical logs run during pilot hole drilling. Strata encountered during construction of MW-1 and ASR-1 ranged in age from Eocene to Pleistocene deposits. The stratigraphic units and their respective ages (presented in order from youngest to oldest) are as follows: undifferentiated Pleistocene and Pliocene Age sediments; the Hawthorn Group of Miocene Age; the Suwannee Limestone of Oligocene Age; and the Ocala and Avon Park Limestones of Eocene Age. Figure 3-1 contains the general lithologic description, results from geophysical logs (gamma ray, caliper, and LSN electric), and casing setting depths for MW-1 and ASR-1.

Table 3-1
 Summary of Geophysical Logs
 BCOES ASR Demonstration Project

MW-1			
Date	Log(s)	Type	Depth (ft bpl)
8/21/96	Caliper, Gamma, LSN Electric	Pilot Hole	430
8/29/96	Caliper, Gamma, LSN Electric, SP	Pilot Hole	990
9/25/96	Caliper, Gamma, LSN Electric, SP, Temperature, Fluid Resistivity, Flowmeter	Reamed Hole	1,200
ASR-1			
10/9/96	Caliper, Gamma, LSN Electric, SP	Pilot Hole	430
10/22/96	Caliper, Gamma, LSN Electric, SP	Pilot Hole	1,015
11/15/96	Caliper, Temperature, Fluid Resistivity, Flowmeter	Pilot Hole	1,200
12/3/96	Cement Bond Log	Casing	998
12/3/96	Caliper, Gamma, LSN Electric, SP, Dual Induction, Temperature, Fluid Resistivity, Video	Reamed Hole	1,200

Notes:
 SP = Spontaneous Potential
 ft bpl = feet below pad level
 LSN = Long and Short Normal



NOTE: Geophysical Logs have been Generated from Computer Data Collected in Field.

FIGURE 3-1
GENERALIZED SUBSURFACE DATA AND COMPLETION DIAGRAM FOR ASR-1 BCOES ASR DEMONSTRATION PROJECT



Lithostratigraphic Descriptions

Undifferentiated Pleistocene and Pliocene Series

From land surface to a depth of approximately 380 feet bpl, the lithology consists of poorly to well consolidated sandstone, calcareous silt, and limestone. Formations that make up the Pleistocene to Pliocene series at this site include the Pamlico Sand, Miami Limestone, Anastasia Formation, Fort Thompson Formation, Caloosahatchee Marl, and Tamiami Formation, though these formations were not differentiated in this project. These formations comprise the surficial aquifer system, locally known as the Biscayne aquifer. The gamma ray response in this interval is relatively low (0 to 50 counts per second [cps]), consistent with the clay-free formations encountered. The Tamiami Formation-Hawthorn Group boundary is not distinguishable on the gamma ray log, but is selected based on the first occurrence of olive-green sandstone and clays at a depth of 380 feet bpl.

Miocene Series

Hawthorn Group. The Hawthorn Group of Miocene Age constitutes the primary interval of confinement and low permeability between the surficial aquifer system and Floridan aquifer system.

The Hawthorn Group sediments at the site occur from approximately 380 to 850 feet bpl and consist of dense, phosphatic calcareous silt, olive-green clay, and phosphatic limestone. The gamma ray signature through this interval is consistently moderate to high (40 to 600 cps), with sharp off-scale peaks occurring at approximately 610 and 850 feet bpl. These gamma peaks correspond to highly phosphatic clays and limestones.

Oligocene Series

Suwannee Limestone. The Suwannee Limestone of Oligocene Age has variable thickness, ranging from 120 to more than 300 feet in southeast Florida (Miller, 1986). The Suwannee Limestone is characterized by a yellowish-gray silty limestone with diverse marine fauna including bryozoans, gastropods, and pelecypods.

The boundary between the Hawthorn Group and Suwannee Limestone at the site is placed at a depth of 850 feet bpl, coinciding with the largest off-scale peak on the gamma log. From 850 to 920 feet bpl, highly phosphatic zones occur on the gamma log with increasing limestone content with depth. At approximately 920 feet bpl, relatively clean fossiliferous limestone is recorded in the cuttings and where gamma ray response decreases. A slight

increase in gamma ray response is observed at approximately 990 feet bpl, consistent with soft layers interpreted to be silt/clay lenses. Reese (1994) confirms the existence of phosphatic sand zones and coincident increased gamma ray responses at the base of the Suwannee Limestone. The base of the Suwannee Limestone is interpreted to occur at the base of the last gamma ray peak at approximately 990 feet bpl.

Eocene Series

Ocala Limestone. The Ocala Limestone of Upper Eocene Age is lighter colored (white to tan), and possesses less-diverse fauna (forams and echinoids) than the overlying lower Suwannee Limestone. Because of the known relative purity (high calcium carbonate content) of the Ocala Limestone, the upper and lower limits for the Ocala Limestone are placed at approximately 1,000 and 1,120 feet bpl, based on the low gamma ray counts observed on the log, and the chalky, micritic, white limestone observed in the drill cuttings. The 1,000-foot depth identified as the top of the Ocala Limestone is consistent with the regionally identified top of Eocene-age sediments according to Reese (1994).

Avon Park Limestone. The Avon Park Limestone of Eocene Age occurs from a depth of approximately 1,120 feet bpl to below the total depth of the well. The observed lithology closely matches that described by Chih Shan Chen in Florida Geological Bulletin No. 45, *The Regional Lithostratigraphic Analysis of Paleocene and Eocene Rocks of Florida*, 1965. This late- to mid-Eocene age formation is a light gray to grayish-orange, poor to well consolidated limestone with microfauna including forams. Miller (1986) observed that portions of the Avon Park Limestone are fine-grained and have low permeability, thereby acting as intra-aquifer confining units within the Floridan aquifer system.

Hydrogeologic Testing

Pad Monitor Wells

Prior to the start of and during construction at MW-1 and ASR-1, water samples were collected on a weekly basis from the four surficial pad monitor wells (PMWs; one located at each corner of each drilling pad). Samples were sent to the BCOES laboratory for pH, total dissolved solids [TDS], conductivity, and chlorides analysis. In general, slight variability in water quality values were observed, consistent with natural temporal variations in water quality and laboratory precision. One exception to this was a temporary pinhole leak in the temporary concrete pad at MW-1 and observed in the northeast PMW. This leak was identified, regulatory agencies promptly notified, and the leak promptly repaired. Remedial measures included continuous purging for several hours until water quality returned to ambient conditions. A summary of analytical data from each of the PMWs is presented in Appendix H.

Pilot Hole Data

Hydraulic information was obtained while drilling the pilot hole in the Floridan aquifer system in MW-1 and ASR-1. A clear manometer tube was attached to the wellhead to facilitate observation of static artesian head at 30-foot intervals. The well was then allowed to flow under its own artesian pressure, and both flow rate and dynamic head were measured at 60-foot intervals within the drill stem. With this information, specific capacity of the borehole could be estimated with depth.

Artesian head, flows, and estimated specific capacity in the open-hole portion of MW-1 and ASR-1 are presented in Table 4-1. This table indicates that artesian production of water increased significantly at a depth interval of 1,050 to 1,110 feet bpl in MW-1 and ASR-1. The data indicate that flow did not increase appreciably below 1,110 feet bpl.

Water samples were also collected at approximately 30-foot intervals during reverse-air open-circulation drilling of MW-1 and ASR-1. The purpose of these samples was to provide a generalized profile of water quality changes with respect to depth. Water samples were

Table 4-1
Pilot Hole Data
BCOES ASR Demonstration Project

Depth (feet bpl)	Static Head (feet api)	Artesian Flow (gpm)	Dynamic Head (feet api)	Specific Capacity (gpm/ft)
MW-1				
1,050	21.05	50	3.8	3
1,110	22.15	125	6.0	8
1,170	21.9	120	6.1	8
1,200	22.6	120	6.1	7
ASR-1				
1,020	16	30	NA	NA
1,050	24.4	90	NA	NA
1,080	NA	200	NA	NA
1,110	20.5	950	NA	NA
1,140	NA	NA	NA	NA
1,170	22.7	1000	NA	NA
1,200	22.8	1000	NA	NA

Notes:

bpl = below pad level

api = above pad level

gpm = gallons per minute

gpm/ft = gallons per minute per foot of drawdown

MW-1 test conducted September 17, 1996

ASR-1 test conducted November 13, 1996

Head measurements obtained from manometer tube at wellhead

Flows are through 5-inch drill rod in 16-inch casing at ASR-1

Flows are through 3.5-inch drill rod in 6-inch casing at MW-1

N/A = Not Available

field-analyzed for conductivity and chlorides. In general, water quality was fairly consistent with depth.

Geophysical Logs

Geophysical logs were conducted on the open-hole portion of MW-1 and ASR-1 to delineate flow zones. Logs particularly useful in delineating flow zones include caliper, LSN, flowmeter, temperature, and fluid resistivity. By analyzing the flowmeter and caliper logs concurrently, water velocity with depth and therefore the percent contribution of flow within the borehole can be calculated.

MW-1

Based on the results of the geophysical logs, it was apparent that 90-percent of the flow from the open borehole originated from a depth between the base of casing (990 feet bpl) and 1,100 feet bpl. Artesian flow from the 6-5/8-inch well was estimated at 480 gallons per minute (gpm) during dynamic geophysical logging.

ASR-1

Flow logs were conducted at ASR-1 on November 15, 1996. The caliper log indicates a washout below the base of the casing, which is commonly observed following reverse-air drilling operations. A small cavity was identified at an approximate depth of 1,103 feet bpl. Otherwise, the caliper log indicated a relatively gauge hole (i.e., similar to the drilled diameter). The LSN log indicated a relatively high resistivity zone at approximately 1,088 feet bpl. This is consistent with the increased artesian flow observed during drilling near this depth. The temperature log indicated a shift between 1,080 and 1,100 feet bpl, consistent with the producing zone described above. The temperature log also indicated a gradual decrease in borehole fluid temperature (cooler water) with increasing depth.

Based on the results of the flowmeter log, it was apparent that 80 percent of the flow from the open borehole originated from a depth between 1,080 and 1,120 feet bpl. Smaller flow zones exist from 1,180 to 1,200 feet (10 percent) and from 1,080 to the base of the casing at 995 feet bpl (10 percent). A graphic representation of the flow profile is also provided in Appendix G. Artesian flow from the 16-inch well was estimated to be 1,150 gpm during dynamic geophysical logging.

Pumping Tests

Pumping tests were conducted at MW-1 and ASR-1 to evaluate flow characteristics of the storage zone and assist in the final design of the permanent recharge and recovery pumps. The tests included a 6-hour constant rate (480 gpm) test on MW-1, an 8-hour step pumping test on ASR-1, and a 24-hour constant-rate (1,000 gpm) test on ASR-1. Pumping test data is presented in Appendix I.

MW-1

The 6-hour constant rate pumping test was conducted at MW-1 on September 19, 1996. The purpose of this test was to estimate hydraulic characteristics of the production zone below the base of the casing. Results of this test indicated a specific capacity of approximately 20 gpm/ft.

ASR-1 Step Test

The step pumping test was conducted on ASR-1 on November 21, 1996. The purpose of the test was to evaluate water level drawdown in the well at three different pumping rates. From this information, hydraulic characteristics and pumping water level could be determined to assist in final pump design.

To perform the test, a temporary vertical turbine pump was installed at ASR-1, with the pump set to a depth of 100 feet bpl on 14-inch column pipe. A pressure gauge was used to measure and record discharge pressure. Temporary, 16-inch PVC piping was set up to convey water from the drilling pad at ASR-1 to the onsite 1-MG storage tank. During the test, the 1 MG tank was allowed to gravity flow via temporary piping from the 1 MG tank to the onsite lift station for disposal. Static water level prior to the test was approximately 21 feet above pad level. An in-line flowmeter with totalizer was used to measure flow. The test was conducted at three flow rates, and results are summarized in Table 4-2 below:

Table 4-2
Summary of Step-Test Results at ASR-1

Flow Rate (gpm)	Drawdown (feet)	Specific Capacity (gpm/ft)
1,050	11.58	90.6
1,825	29.58	61.6
2,950	57.68	51.1

Figure 4-1 displays drawdown data versus time for the three pumping rates of the step test. From this data, optimum well recharge and recovery rates were determined and assisted in final pump selection. Based on the above information, the final design recharge rate was

Step Drawdown Test at ASR-1

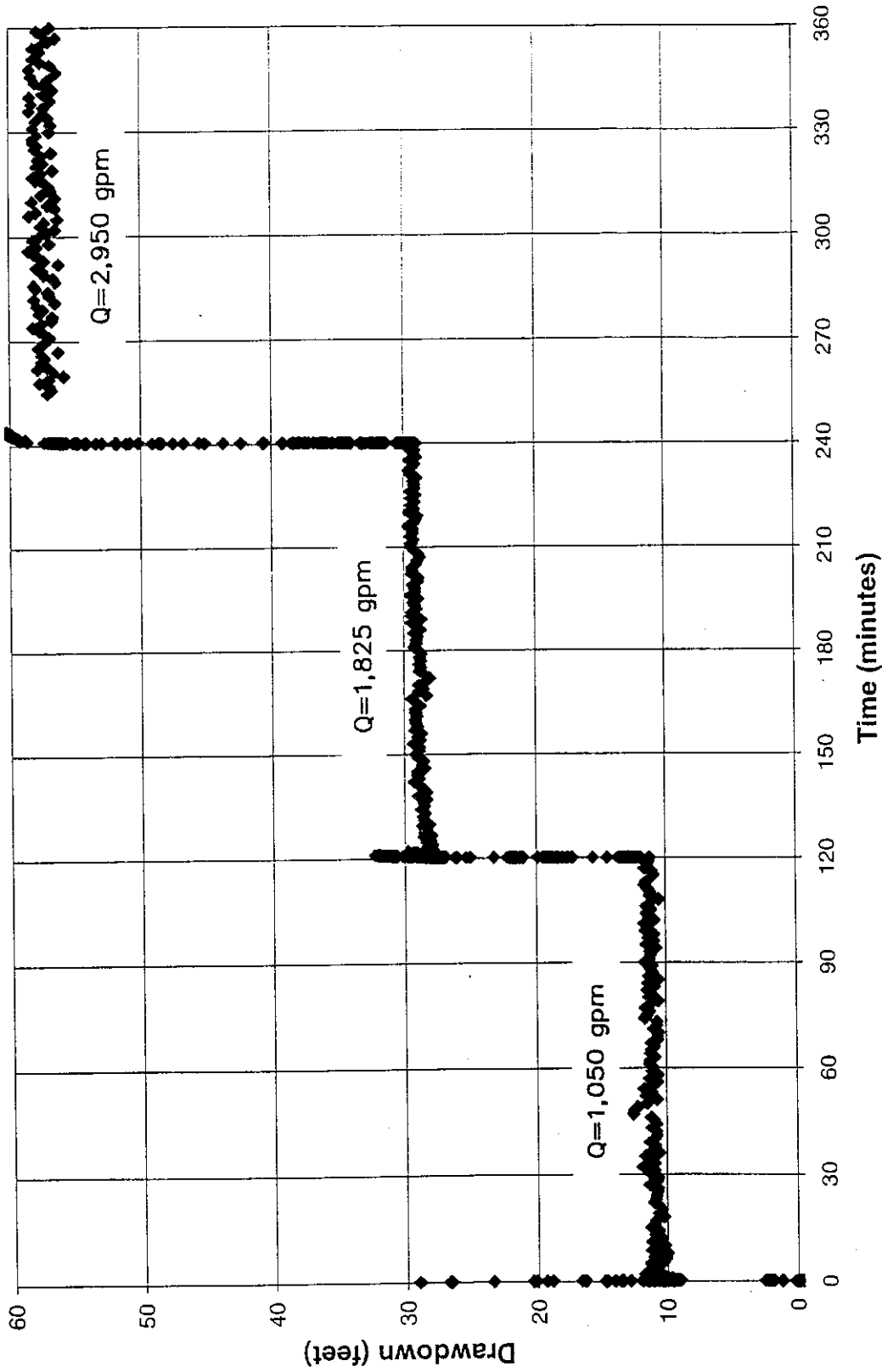


FIGURE 4-1
STEP-DRAWDOWN TEST DATA

1,800 gpm, and the final recovery rate was 2,100 gpm. Water availability and head conditions within the 20-inch raw water main and ASR well will determine actual recharge and recovery rates.

ASR-1 Constant Rate Test

A 24-hour, constant-rate (1,000 gpm) pumping test was conducted at ASR-1 on November 26, 1996. The purpose of this test was to evaluate aquifer characteristics of the proposed storage zone. The 1,000-gpm pumping rate was the greatest flow rate that could be conveyed to the 1-MG storage tank and lift station during a 24-hour period. Water levels were measured in both ASR-1 and MW-1 before, during, and after pumping ASR-1. The same apparatus described for the step test was used for the 24-hour test.

Data from the 24-hour aquifer test are presented in Appendix I. The data were analyzed by the Walton (1962) method for leaky aquifers, the Cooper-Jacob straight-line method, and the Theis recovery method. These data are summarized in Table 4-3 below, and indicate an average transmissivity of 275,000 gallons per day per foot (gpd/ft), and a storage coefficient of 7.95×10^{-5} . These data can be used to evaluate aquifer response based on future operating conditions in the ASR well. The data did not indicate leakance from above or below the storage zone, a positive indicator for the potential to store and retrieve water.

Table 4-3
Summary of Aquifer Test Analysis

Method	Well	Transmissivity (T) (gpd/ft)	Storage Coefficient (S) (dimensionless)
Walton	MW-1	216,000	1.06×10^{-4}
Cooper-Jacob	MW-1	278,000	5.3×10^{-5}
Theis Recovery	MW-1	329,000	NA
Average		275,000	7.95×10^{-5}

Water Quality

Background water quality samples were obtained at both ASR-1 and MW-1 to establish baseline water quality prior to cycle testing. The FDEP construction permit specified that samples be analyzed for primary and secondary drinking water standards (DWS) parameters and the minimum criteria parameters commonly known as "freeforms". Additionally, the BCDH requested that the samples be analyzed for unregulated organic compounds.

ASR-1 was sampled on December 3, 1996, and MW-1 was sampled on March 12, 1997. Results of these analyses are summarized in Table 4-4, and laboratory analytical reports are presented in Appendix J.

**Table 4-4
Background Water Quality Data, BCOES ASR Project**

Primary Drinking Water Standards: Inorganics			
Date Parameter	MCL (mg/L)	ASR-1 12/3/96 (mg/L)	MW-1 3/12/97 (mg/L)
Antimony	0.006	<0.0060	<0.0050
Arsenic	0.05	<0.010	<0.010
Asbestos	7 MFL	0.00	0.00
Barium	2	<0.010	<0.010
Beryllium	0.004	<0.00040	<0.00040
Cadmium	0.005	<0.0050	<0.0050
Chromium	0.10	<0.010	<0.010
Cyanide	0.20	<0.010	<0.010
Fluoride	4.0	1.10	1.10
Lead	0.015	<0.0050	<0.0050
Mercury	0.002	<0.00020	<0.00020
Nickel	0.1	<0.040	<0.040
Nitrate (as N)	10.0	<0.050	<0.050
Nitrite (as N)	1.0	<0.050	<0.050
Selenium	0.05	<0.0020	<0.035
Sodium	160	970	1,100
Thallium	0.002	<0.0020	<0.0020
Turbidity	1 NTU	16	0.59
Coliform, Total (col/100 ml)		<1	720
Primary Drinking Water Standards: Volatile Organics			
Parameter	MCL (ug/L)	ASR-1 (ug/L)	MW-1 (ug/L)
THMs (Total)	100	<0.50	<0.50
Trichloroethene	3	<0.50	<0.50
Tetrachloroethene	3	<0.50	<0.50
Carbon Tetrachloride	3	<0.50	<0.50
Vinyl Chloride	1	<0.50	<0.50
1,1,1-Trichloroethane	200	<0.50	<0.50
1,2-Dichloroethane	3	<0.50	<0.50
Benzene	1	<0.50	<0.50
Cis-1,2-Dichloroethene	70	<0.50	<0.50
1,1-Dichloroethene	7	<0.50	<0.50
1,2-Dichloropropane	5	<0.50	<0.50
Ethylbenzene	700	<0.50	<0.50
Monochlorobenzene	100	<0.50	<0.50
1,2-Dichlorobenzene	600	<0.50	<0.50
1,4-Dichlorobenzene	75	<0.50	<0.50
Styrene	100	<0.50	<0.50
Toluene	1,000	4.4	<0.50
Trans-1,2-Dichloroethene	100	<0.5	<0.5
Xylenes (Total)	10,000	<0.5	<0.5
Dichloromethane (Methylene Chloride)	5	<1.0	<1.0
1,2,4-Trichlorobenzene	70	<0.5	<0.5
1,1,2-Trichloroethane	NA	<0.5	<0.5
Ethylene Dibromide	0.02	<0.020	<0.020
Dibromochloropropane	0.2	<0.020	<0.020

**Table 4-4
Background Water Quality Data, BCOES ASR Project**

Primary Drinking Water Standards: Organics			
Parameter	MCL (ug/L)	ASR-1 (ug/L)	MW-1 (ug/L)
Pesticides/PCBs			
Alachlor	2	<1.0	<1.0
Atrazine	3	<1.0	<1.0
Simazine	4	<1.0	<1.0
Endrin	2	<0.40	<0.020
Lindane	0.2	<0.20	<0.010
Methoxychlor	40	<0.50	<0.50
Toxaphene	3	<1.0	<1.0
Chlordane	2	<0.20	<0.10
Heptachlor	0.4	<0.20	<0.010
Heptachlor Epoxide	0.2	<0.40	<0.020
Aroclor-1016	NA	<10	<0.50
Aroclor-1221	NA	<10	<0.50
Aroclor-1232	NA	<10	<0.50
Aroclor-1242	NA	<10	<0.50
Aroclor-1248	NA	<10	<0.50
Aroclor-1254	NA	<10	<0.50
Aroclor-1260	NA	<0.50	<0.50
Herbicides			
2,4-D	70	<0.50	<0.50
2,4,5-TP (Silvex)	50	<0.50	<0.50
Pentachlorophenol	1	<1.0	<1.0
Picloram	500	<0.50	<0.50
Dalapon	200	<10	<10
Dinoseb	7	<0.50	<0.50
Base Neutrals			
Hexachlorobenzene	1	<1.0	<0.050
Hexachlorocyclopentadiene	50	<1.0	<0.050
Benzo(a)pyrene	0.2	<0.20	<0.20
Di(2-ethylhexyl)phthalate	6	<2.0	<2.0
Di(2-ethylhexyl)adipate	400	<2.0	<2.0
Other Organics			
Carbofuran	40	<1.0	<1.0
Oxamyl (Vydate)	200	<1.0	<1.0
Endothall	100	<10	<10
Glyphosate (Roundup)	700	<150	<150
Diquat	20	<1.0	<1.0
Primary Drinking Water Standards: Radionuclides			
Parameter	MCL	ASR-1	MW-1
Radium 226 and 228	5pCi/l	3.6+/-0.11	3.3+/-0.11
Gross Alpha	15pCi/l	25+/-38	13+/-43

**Table 4-4
Background Water Quality Data, BCOES ASR Project**

Secondary Drinking Water Standards			
Parameter	MCL (mg/L)	ASR-1 (mg/L)	MW-1 (mg/L)
Aluminum	0.2	<0.20	<0.20
Chloride	250	1,900	1,900
Copper	1.0	<0.025	<0.025
Color	15 PCU	5	10
Fluoride	2.0	1.10	1.10
Foaming Agents (MBAS)	0.5	<0.10	0.18
Iron	0.3	0.082	<0.050
Manganese	0.05	<0.010	<0.010
Odor	3 TON	16	16
pH (at Collection Point)	6.5 - 8.5	7.5	7.5
Silver	0.1	<0.010	<0.010
Sulfate	250	380	460
Total Dissolved Solids (TDS)	500	3,200	2,600
Zinc	5	0.05	<0.020
Other Parameters			
2,3,7,8-TCDD	NA	<2.8	<5.0
Ammonia	NA	0.98	0.58
TKN	NA	0.93	0.72
Total Phosphorous	NA	<0.10	<0.10
Total Nitrogen	NA	0.93	0.72
BOD (5-day)	NA	<0.20	<2.0
Chemical Oxygen Demand	NA	NA	60
Group I Unregulated Pesticides			
Parameter	MCL (ug/L)	ASR-1 (ug/L)	MW-1 (ug/L)
Butachlor	NA	<1.0	<1.0
Metolachlor	NA	<1.0	<1.0
Metribuzin	NA	<1.0	<1.0
Aldrin	NA	<0.20	<0.010
Dieldrin	NA	<0.40	<0.020
Group I Unregulated Herbicides			
Dicamba	NA	<0.50	<0.50
Group I Unregulated Carbamates			
Aldicarb	NA	<0.50	<0.50
Aldicarb Sulfone	NA	<0.50	<0.50
Aldicarb Sulfoxide	NA	<0.50	<0.50
Carbaryl	NA	<1.0	<1.0
3-Hydroxycarbofuran	NA	<1.0	<1.0
Methomyl	NA	<1.0	<1.0

**Table 4-4
Background Water Quality Data, BCOES ASR Project**

Group II Unregulated Purgeable Organics			
Parameter	MCL (ug/L)	ASR-1 (ug/L)	MW-1 (ug/L)
Bromobenzene	NA	<0.50	<0.50
Bromodichloromethane	NA	<0.50	<0.50
Bromoform	NA	<0.50	<0.50
Bromomethane	NA	<0.50	<0.50
Chloroethane	NA	<0.50	<0.50
Chloroform	NA	<0.50	<0.50
Chloromethane	NA	<0.50	<0.50
Dibromochloromethane	NA	<0.50	<0.50
DiChlorodifluoromethane	NA	<0.50	<0.50
P-Chlorotoluene	NA	<0.50	<0.50
Dibromomethane	NA	<0.50	<0.50
1,1-Dichloroethane	NA	<0.50	<0.50
cis-1,3-Dichloropropene	NA	<0.50	<0.50
trans-1,3-Dichloropropene	NA	<0.50	<0.50
1,3-Dichloropropylene	NA	<0.50	<0.50
1,3-Dichloropropane	NA	<0.50	<0.50
2,2-Dichloropropane	NA	<0.50	<0.50
Trichlorofluoromethane	NA	<0.50	<0.50
1,2,3-Trichloropropane	NA	<0.50	<0.50
1,3-Dichlorobenzene	NA	<0.50	<0.50
1,1,1,2-Tetrachloroethane	NA	<0.50	<0.50
1,1,2,2-Tetrachloroethane	NA	<0.50	<0.50
Methyl-tert-butyl ether (MTBE)	NA	<0.50	<0.50
1,1-Dichloropropene	NA	<0.50	<0.50
o-Chlorotoluene	NA	<0.50	<0.50
Group III Unregulated Acid Extractables			
2-Chlorophenol	NA	<10	<10
2-Methyl-4, 6-dinitrophenol	NA	<50	<50
Phenol	NA	<10	<10
2,4,6-Trichlorophenol	NA	<10	<10
Group III Unregulated BN Extractables			
Butylbenzylphthalate	NA	<10	<10
Di-n-butylphthalate	NA	<10	<10
Diethylphthalate	NA	<10	<10
Dimethylphthalate	NA	<10	<10
2,4-Dinitrotoluene	NA	<10	<10
Di-n-octylphthalate	NA	<10	<10
Isophorone	NA	<10	<10
Anthracene	NA	<10	<10
Naphthalene	NA	<10	<10
Phenanthrene	NA	<10	<10

1. Maximum Contaminant Level (MCL) per Rules 17-550.310 and 17-550.320, FAC.
2. Analyses conducted by Savannah Laboratories

Water quality data from ASR-1 is consistent with other data from wells completed within the Floridan aquifer system. The brackish waters of the Floridan aquifer system are known to contain higher dissolved solids concentrations than that of the Biscayne aquifer, for example. Inorganic parameters that exceed maximum contaminant levels (MCLs) from the ASR-1 water sample include sodium (970 mg/L), chloride (1,900 mg/L), sulfate (380 mg/L) TDS (3,200 mg/L) and odor (16 TON). The high odor level is consistent with that of a strong hydrogen sulfide odor observed during drilling operations. The only organic parameter detected was toluene (4.4 µg/L), though significantly below its MCL of 1,000µg/L. The gross alpha concentration (25 +/-38 pCi/L) may have exceeded its MCL (15 pCi/L). However, the relatively high turbidity levels in this sample (16 NTUs) may have resulted in a false positive reading for this parameter. Data from MW-1 are consistent with ASR-1, but the gross alpha level in this well (13 +/-3 pCi/L) was below the MCL.

Mechanical Integrity Testing

Mechanical integrity testing (MIT) of MW-1 was performed by conducting a casing pressure test. MIT testing of ASR-1 was performed by conducting a cement bond log (CBL), a casing pressure test, and a video survey of the completed well.

MW-1

On September 10, 1996, a casing pressure test was successfully performed on MW-1 following cementing of the final 6-5/8-inch steel casing. The cement plug at the base of the casing served as a seal to facilitate the test. The pressure test was performed by filling the casing with freshwater to eliminate air from inside the casing, and sealing the wellhead with a welded steel plate. The casing was then pressurized to 100 psi with a high pressure pump. A 200-psi calibrated pressure gauge was used to measure casing pressure. A summary of the casing pressure test data sheet is presented in Appendix K. A copy of the pressure gauge calibration certificate is provided in Appendix L. One hour after establishing the initial pressure at 100 psi, the pressure was recorded at 99 psi. The 1 psi loss was well within the 5 percent limit (5 psi) specified by FDEP. The casing pressure test was observed by Mr. Mark Schilling from CH2M HILL and Mr. Len Fishkin from FDEP. A total of 2.25 gallons of water was drained from the casing while pressure was released.

ASR-1

On November 1, 1996, a casing pressure test was successfully performed on ASR-1 following cementing of the final 16-inch steel casing. The cement plug at the base of the casing served as a seal to facilitate the test. The pressure test was performed by filling the casing with freshwater to eliminate air from inside the casing, and sealing the wellhead with a welded steel plate. The casing was then pressurized to 150.75 psi with a high pressure pump. A 200-psi calibrated pressure gauge was used to measure casing pressure. A summary of the casing pressure test data sheet is presented in Appendix K. A copy of the pressure gauge calibration certificate is provided in Appendix L. One hour after establishing the initial pressure at 150.75 psi, the pressure was recorded at 143.5 psi. The 7.25 psi loss was within the 5 percent limit specified by FDEP. The casing pressure test was observed by Mr. Peter Kwiatkowski from CH2M HILL and Mr. Mark Silverman from FDEP. A total of 4.3 gallons of water was drained from the casing while pressure was released.

On December 3, 1996, the cement behind the ASR-1 casing was evaluated by conducting a CBL log from the base of the 16-inch-diameter steel casing at 995 feet bpl to pad level. The CBL log demonstrates an adequate cement bond around the 16-inch casing from 995 feet bpl to pad level. A copy of the CBL log is presented in Appendix G.

A video survey of ASR-1 was conducted on December 3, 1996. The video survey showed no inconsistencies and the 16-inch steel casing appeared in good condition. Casing joints were visible throughout the casing string. The video survey was conducted from pad level to 1,200 feet bpl at the borehole terminus. Fractures and several large cavities were observed between 1,081 and 1,095 feet bpl. The video survey summary and video tape are provided in Appendix M.

Cycle Testing Plan

Background

Upon approval from FDEP, operational (cycle) testing of the ASR facility will begin. Cycle testing will be conducted to evaluate hydraulic performance of the ASR system, and determine water quality effects of storage of water in the ASR zone. Cycle testing will include variable periods of recharge, storage, and recovery as outlined in Table 6-1, and described below. For planning purposes, the recharge and recovery rates assumed in this cycle testing plan are 3 mgd, based on the actual design. Some variation in these rates should be anticipated, due to water availability and ambient pressure in the 20-inch raw water main used to convey water to the ASR system.

Table 6-1
Cycle Testing Plan

Cycle Number	Recharge (MG)	Recovery (MG)	Recharge (days)	Storage (days)	Recovery (days)
1	30	30	10	0	5
2	270	120	90	0	40
3	270	165	90	0	55
4	270	120	90	30	40
5	270	165	90	30	55
6	450	210	15	120	70

Note: MG = million gallons

A significant change in water quality in the ASR zone is expected to occur during cycle testing as a result of introducing fresh water into the brackish water of the ASR zone. By monitoring water quality parameters in the Floridan Aquifer Monitor Well (MW-1), approximately 270 feet away from the ASR well, the movement of the fresh water bubble will be observed. Recovered water will be monitored to ensure that the recovered water does not exceed drinking water standards for TDS (500 mg/L) or chloride (250 mg/L) for each cycle.

During cycle testing, recovery efficiencies (recovery volume/recharge volume) will be calculated for each cycle. It is anticipated that recovery efficiencies will progressively increase throughout each of the cycles.

Cycle 1

The first cycle will consist of a short recharge and recovery period to allow for a preliminary evaluation of the ASR system hydraulic performance, and to establish the water quality effects of recharge water on the ASR zone. Cycle 1 will begin with recharging the ASR zone for 10 days, followed immediately by recovery at the same rate. Recovery will continue until water quality indicates specific conductance increases to above 1,000 micromhos/cm. This is based on keeping the recovered water from exceeding drinking water standards for chloride and TDS.

Cycle 2

The second cycle will consist of a recharge and recovery mode with no storage period, and begin immediately after Cycle 1. The purpose of this cycle is to obtain baseline data on a cycle with a duration similar to that expected during normal operation. The recharge portion of the cycle is designed to simulate a typical wet season period when excess water is available. Recharge will occur for 90 days, followed immediately by recovery at the same rate. Recovery will continue until specific conductance of the recovered water reaches 1,000 micromhos/cm.

Cycle 3

The third cycle will be the same as Cycle 2. It will consist of a recharge and recovery mode with no storage period, and begin immediately after Cycle 2. The purpose of Cycle 3 is to observe if there is any increase in recovery efficiency over Cycle 2. Recharge will occur for 90 days, followed immediately by recovery at the same rate. Recovery will continue until specific conductance of the recovered water reaches 1,000 micromhos/cm.

Cycle 4

The fourth cycle will be similar to Cycles 2 and 3, but will include a 30-day storage period between recharge and recovery. The purpose of Cycle 4 is to observe the effects of the 30-day storage period on recovery efficiency and water quality. Cycle 3 will begin with recharging for 90 days, followed immediately by recovery at the same rate. Recovery will continue until specific conductance of the recovered water reaches 1,000 micromhos/cm.

Cycle 5

The fifth cycle will be similar to Cycle 4. The purpose of Cycle 5 is to observe if there is any increase in recovery efficiency over Cycle 4. Cycle 5 will begin with recharging for 90 days, followed by a 30-day storage period. Following this, recovery will occur at the same rate until specific conductance of the recovered water reaches 1,000 micromhos/cm.

Cycle 6

The sixth cycle will approximate planned operation of the facility. Recharge will occur for 153 days, corresponding to historical water availability during the wet season. Storage will occur for 120 days after recharge, corresponding to a seasonal, low-demand period. Following this, recovery will occur for 70 days during high-demand periods. Recovery will occur at the same rate until specific conductance of the recovered water reaches 1,000 micromhos/cm.

APPENDIX A
FDEP AND BCDH CONSTRUCTION PERMITS



Department of Environmental Protection

Lawton Chiles
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

Virginia B. Wetherell
Secretary

SEP 17 1997

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

In the Matter of an
Application for Permit by:

Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services
2555 W. Copans Road
Pompano Beach, Florida 33069

BROWARD COUNTY
UIC - BCOES Class V, Group 7
Raw Water ASR Well ASR-1
File: UC 06-242418

INTENT TO ISSUE

The Southeast District Office of the Florida Department of Environmental Protection (Department or FDEP) hereby gives notice of its Intent to Issue a permit (draft copy enclosed) for the proposed project as detailed in the application specified above. The Southeast District is issuing this Intent to Issue for the reasons stated below.

The applicant, the Broward County Office of Environmental Services, applied on December 14, 1993 to the Department for a permit to construct and operationally test, with raw waters from the Biscayne aquifer, a Class V 16-inch outside diameter (O.D.) aquifer storage and recovery (ASR) well, ASR-1, and an associated 6-inch O.D. Floridan aquifer monitor well, ASR MW-1. The ASR well system is located at the Broward County 2A Water Treatment Plant, 1390 NE 50th Street, Pompano Beach, Florida 33064. The well will be used to store and recover raw waters from the Biscayne aquifer, by injection into the interval from 995 to 1,200 feet below land surface in the Upper Floridan aquifer. Under this permit, modification to Monitor Well ASR MW-1 may be authorized and/or an additional Floridan aquifer monitor well may also be constructed.

The Department has permitting jurisdiction under chapter 403 of the Florida Statutes and chapters 62-4, 62-520, 62-522, and 62-528, 62-550, 62-600 and 62-601 of the Florida Administrative Code. The project is not exempt from permitting procedures. The Department has determined that a construction permit is required for the proposed work.

Under section 403.815 of the Florida Statutes and rule 62-103.150 of the Florida Administrative Code, you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit. The notice must be published one time only within 30 days in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of sections 50.011 and 50.031 of the Florida Statutes, in the county where the activity is to take place. Where there is more than one newspaper of general circulation in the county, the newspaper used should be one with significant circulation in the area that may be affected by the permit. If you are uncertain that a newspaper meets these requirements, please contact the Department at the address or telephone number listed below. The applicant must provide proof of publication to the Department, at FDEP, UIC Section, P.O. Box 15425, West Palm Beach, FL 33416 within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

The Department will issue the permit with the attached conditions unless a timely petition for an administrative hearing is filed under sections 120.569 and 120.57 of the Florida Statutes.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative hearing in accordance with sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Department's Office of General Counsel, 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any other person must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. A petitioner must mail a copy of the petition to the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 of the Florida Statutes, or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-106.205 of the Florida Administrative Code.

A petition must contain the following information:

- (a) The name, address, and telephone number of each petitioner, the Department's permit identification number and the county in which the subject matter or activity is located;
- (b) a statement of how and when each petitioner received notice of the Department's action;
- (c) a statement of how each petitioner's substantial interests are affected by the Department's action;
- (d) a statement of the material facts disputed by the petitioner, if any;
- (e) a statement of facts that the petitioner contends warrant reversal or modification of the Department's action;
- (f) a statement of which rules or statutes the petitioner contends require reversal or modification of the Department's action; and
- (g) a statement of the relief sought by the petitioner, stating precisely the action that the petitioner wants the Department to take.

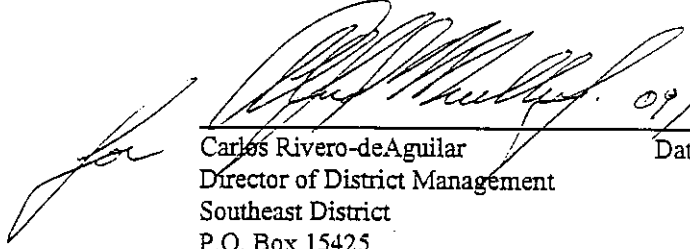
Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice of intent. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

[This space intentionally left blank]

Mediation under section 120.573 of the Florida Statutes is not available for this proceeding.

Executed in the City of West Palm Beach, Florida.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION



Carlos Rivero-de-Aguilar Date 09/17/97
Director of District Management
Southeast District
P.O. Box 15425
West Palm Beach, FL 33416

cc mas
CRA/AM/WWC/mas

Enclosures: Notice of Intent to Issue Permit
Draft Operation Permit

Copies furnished to:

Anne Murray, MW/PLNT
Garth Hinckle, BCDNRP
John Morra, FDEP/WPB

Richard Deuerling, FDEP/TLH
Ron Reese, USGS/MIA
Lynette Ciardulli, OGC

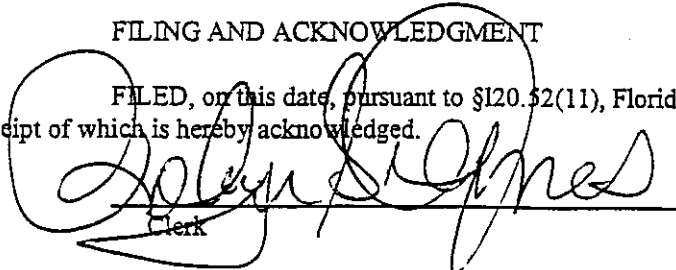
Nancy Marsh, USEPA/ATL
Steve Anderson, SFWMD/WPB
Phong Nguyen, BCPHU

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF INTENT TO ISSUE and all copies were mailed before the close of business on SEP 17 1997 to the listed persons.

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to §120.52(11), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.



Clerk

SEP 17 1997
Date

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF INTENT TO ISSUE PERMIT

The Florida Department of Environmental Protection (Department or FDEP) gives notice of its intent to issue a construction permit (Permit No. UC-06-242418) to Mr. Willie Horton, Director of the Broward County Office of Environmental Services, 2555 W. Copans Road, Pompano Beach, Broward County, Florida 33069, to complete construction and operationally test, with raw waters from the Biscayne aquifer, one Class V, Group 7, 16-inch outside diameter (O.D.) aquifer storage and recovery (ASR) well, ASR-1, and an associated 6-inch O.D., single-zone Floridan aquifer monitor well, ASR MW-1. The ASR system also includes one previously installed Biscayne aquifer monitor well, MW-4. The ASR system is located at the Broward County 2A Water Treatment Plant (WTP), 1390 NE 50th Street, Pompano Beach, Florida 33064.

Under the proposed permit, the purpose of the ASR system will be to store and recover waters from the Biscayne aquifer, by injection into a suitable storage zone in the Upper Floridan aquifer. The proposed injectate is raw water withdrawn from public water supply wells located at the Broward County North System Regional Wellfield (NSRW) and the Broward County 2A WTP.

The ASR well has been constructed with 16-inch diameter steel casing extending to a depth of approximately 995 feet below land surface (bls) and a nominal 16-inch borehole extending to depth of approximately 1,200 feet (bls). The Floridan aquifer monitor well has been completed into the same interval that is to be used for ASR.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative hearing in accordance with sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Department's Office of General Counsel, 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000. Petitions must be filed within fourteen days of publication of this public notice or within fourteen days of receipt of the notice of intent, whichever occurs first. A petitioner must mail a copy of the petition to the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 of the Florida Statutes, or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-106.205 of the Florida Administrative Code.

A petition must contain the following information: (a) The name, address, and telephone number of each petitioner; the Department's permit identification number and the county in which the subject matter or activity is located; (b) a statement of how and when each petitioner received notice of the Department's action; (c) a statement of how each petitioner's substantial interests are affected by the Department's action; (d) a statement of the material facts disputed by the petitioner, if any; (e) a statement of facts that the petitioner contends warrant reversal or modification of the Department's action; (f) a statement of which rules or statutes the petitioner contends require reversal or modification of the Department's action; and (g) a statement of the relief sought by the petitioner, stating precisely the action that the petitioner wants the Department to take.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice of intent. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Mediation under section 120.573 of the Florida Statutes is not available for this proceeding.

The draft permit is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at the Department of Environmental Protection, Southeast District office, 400 North Congress Avenue, West Palm Beach, Florida 33401. Please contact Bill Cocke at (561) 681-6691 for additional information or to obtain a copy of the draft permit.



Department of Environmental Protection

Lawton Chiles
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

Virginia B. Wetherell
Secretary

NOTICE OF PERMIT

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

BROWARD COUNTY
UIC - PLANTATION CENTRAL WTP
FILE: UC-06-242418 (ASR-1, MW-1)

Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services
2555 W. Copans Road
Pompano Beach, Florida 33069

DRAFT

Dear Mr. Horton:

Enclosed is Permit Number UC-06-242418, to complete construction of one Class V, Group 7 ASR well, ASR-1, and an associated Floridan aquifer monitor well, ASR MW-1, and to operationally test the ASR system with raw water, issued pursuant to Section(s) 403.087, Florida Statutes and Florida Administrative Codes 62-4, 62-520, 62-522, 62-528 and 62-550. The system is located at the Broward County 2A Water Treatment Plant (WTP).

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, Mail Stop 35, 3900 Commonwealth Blvd., 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.

Should you have any questions, please contact William W. Cocke, P.G. or Mark A. Silverman, P.G., of this office, telephone (561) 681-6691 or (561) 681-6695, respectively.

Executed in West Palm Beach, Florida.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Carlos Rivero-deAguilar Date
Director of District Management
Southeast District

CRA:AM:WWC:ms:dz

Copies furnished to:

Anne Murray, MW/PL
Garth Hinckle, BCDNRP
John Morra, FDEP/WPB

Richard Deuerling, FDEP/TLH
Ron Reese, USGS/MIA
Lynette Ciardulli, OGC

Nancy Marsh, USEPA/ATL
Steve Anderson, SFWMD/WPB
Phong Nguyen, BCPHU

CERTIFICATE OF SERVICE

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

Clerk Stamp

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

Clerk

Date

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

Printed on recycled paper.



Department of Environmental Protection

Lawton Chiles
Governor

Southeast District
P.O. Box 15425
West Palm Beach, Florida 33416

Virginia B. Wetherell
Secretary

DRAFT

PERMITTEE:
Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services
2555 W. Copans Road
Pompano Beach, FL 33069

I. D. NUMBER: 5006M06093
PERMIT/CERTIFICATION NUMBER: UC-06-242418
DATE OF ISSUE:
EXPIRATION DATE:
COUNTY: Broward
LATITUDE/LONGITUDE: 26°17'35"N/80°06'25"W
PROJECT: Class V, Group 7 ASR Well ASR-1 and
Monitor Well ASR MW-1

PROJECT: Permit to complete construction of Aquifer Storage and Recovery (ASR) Well ASR-1 and associated Floridan Aquifer Monitor Well ASR MW-1, and to operationally test the ASR system with raw waters from the Biscayne aquifer.

This permit is issued under the provisions of Chapter 403.087, Florida Statutes, and Florida Administrative Code (F.A.C.) Rules 62-4, 62-520, 62-522, 62-528 and 62-550. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

TO COMPLETE CONSTRUCTION AND OPERATIONALLY TEST: One Class V, Group 7, 16-inch outside diameter (O.D.) aquifer storage and recovery (ASR) well, ASR-1. The ASR well will be used to store and recover waters from the Biscayne aquifer, by injection at the Broward County 2A Water Treatment Plant (WTP) into a suitable storage zone in the Upper Floridan aquifer. The proposed injectate is water withdrawn from public water supply wells located at the Broward County North System Regional Wellfield (NSRW) and the Broward County 2A WTP. The ASR injection zone is constructed between approximately 995 feet and the total depth of the well at 1,200 feet below land surface (bls). The water quality in the storage zone and the lateral movement of the stored water shall be monitored by a single-zone, 6-inch O.D., Floridan aquifer monitor well, ASR MW-1. This monitor well is completed into the same interval that is to be used for ASR. The migration between underground sources of drinking water (USDWs) of fluids of significantly different water quality shall be monitored by Monitor Well ASR MW-1 and Biscayne Aquifer Monitor Well MW-4. Monitor Well MW-4 has been previously installed to monitor the public water supply wells at the 2A WTP, and has a monitoring interval of 100 feet to 144 feet bls. Under this permit, modification to Monitor Well ASR MW-1 may be authorized and/or an additional Floridan aquifer monitor well may also be constructed.

IN ACCORDANCE WITH: Application to Construct a Class V Aquifer Storage and Recovery Well System received December 14, 1993; contract documents for the construction of the aquifer storage and recovery project received December 14, 1993; a meeting between the Department, the Broward County Office of Environmental Services (BCOES) personnel, South Florida Water Management District (SFWMD) personnel and BCOES's consultants on January 12, 1994; a Request for Information (RFI) sent January 21, 1994; additional information received February 25, 1994; a meeting between the Department, BCOES personnel, SFWMD personnel and BCOES's consultants on March 17, 1994 in which additional information was requested by the Department; additional information received April 29, 1994; correspondence pertaining to a water quality criteria exemption received August 17, 1995, May 29, 1996, September 9, 1996, September 23, 1996, September 24, 1996, and October 2, 1996; additional information received April 23, 1997 and June 25, 1997; publication of the Notice of Draft Permit UC-06-242418 in the Sun Sentinel newspaper on July 23, 1997; and consideration of receipt of public comment received as a result of a public meeting held on August 26, 1997.

LOCATED AT: The Broward County 2A WTP, 1390 N.E. 50th Street, Pompano Beach, Broward County, Florida 33064.

TO SERVE: The Broward County 2A WTP Service Area.

SUBJECT TO: General Conditions 1-17 and Specific Conditions 1-10.

Page 1 of 13

Form 17-1.201(5)
Effective November 30, 1982

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

Printed on recycled paper.

GENERAL CONDITIONS:

The following General Conditions are referenced in Florida Administrative Code Rule 62-4.160.

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

GENERAL CONDITIONS:

9. In accepting this permit, permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source, which are submitted to the Department, may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Section 403.111 and 403.73, FS. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.
10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rule 62-302.500, shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard.
11. This permit is transferable only upon Department approval in accordance with Rule 62-4.120 and 62-730.300 FAC, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.
12. This permit or a copy thereof shall be kept at the work site of the permitted activity.
13. This permit also constitutes:
 - (a) Determination of Best Available Control Technology (BACT)
 - (b) Determination of Prevention of Significant Deterioration (PSD)
 - (c) Certification of compliance with state Water Quality Standards (Section 401, PL 92-500)
 - (d) Compliance with New Source Performance Standards
14. The permittee shall comply with the following:
 - (a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
 - (b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.
 - (c) Records of monitoring information shall include:
 1. the date, exact place, and time of sampling or measurements
 2. the person responsible for performing the sampling or measurements
 3. the dates analyses were performed
 4. the person responsible for performing the analyses
 5. the analytical techniques or methods
 6. the results of such analyses
15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware the relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

GENERAL CONDITIONS:

16. In the case of an underground injection control permit, the following permit conditions also shall apply:

- (a) All reports or information required by the Department shall be certified as being true, accurate and complete.
- (b) Reports of compliance or noncompliance with, or any progress reports on, requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.
- (c) Notification of any noncompliance, which may endanger health or the environment, shall be reported verbally to the Department within 24 hours and again within 72 hours, and a final written report provided within two weeks.
 - 1. The verbal reports shall contain any monitoring or other information which indicate that any contaminant may endanger an underground source of drinking water and any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.
 - 2. The written submission shall contain a description of and a discussion of the cause of the noncompliance and, if it has not been corrected, the anticipated time the noncompliance is expected to continue, the steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance and all information required by Rule 62-528.230(4)(b), FAC.
- (d) The Department shall be notified at least 180 days before conversion or abandonment of an injection well, unless abandonment within a lesser period of time is necessary to protect waters of the state.

17. The following conditions also shall apply to a hazardous waste facility permit.

- (a) The following reports shall be submitted to the Department:
 - 1. Manifest discrepancy report. If a significant discrepancy in a manifest is discovered, the permittee shall attempt to rectify the discrepancy. If not resolved within 15 days after the waste is received, the permittee shall immediately submit a letter report, including a copy of the manifest, to the Department.
 - 2. Unmanifested waste report. Permittee shall submit an unmanifested waste report to the Department within 15 days of receipt of unmanifested waste.
 - 3. Biennial report. A biennial report covering facility activities during previous calendar year shall be submitted by March 1 of each even numbered year pursuant to Chapter 62-730, FAC
- (b) Notification of any noncompliance which may endanger health or the environment, including the release of any hazardous waste that may endanger public drinking water supplies or the occurrence of a fire or explosion from the facility which could threaten the environment or human health outside the facility, shall be reported verbally to the Department within 24 hours, and a written report shall be provided within 5 days. The verbal report shall include the name, address, ID number, and telephone number of the facility, its owner or operator, the name and quantity of materials involved, the extent of any injuries, an assessment of actual or potential hazards, and the estimated quantity and disposition of recovered material. The written submission shall contain:
 - 1. A description and cause of the noncompliance.
 - 2. If not corrected, the expected time of correction, and the steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.
- (c) Reports of compliance or noncompliance with, or any progress reports on, requirements in any compliance schedule shall be submitted no later than 14 days after each schedule date.
- (d) All reports or information required by the Department by a hazardous waste permittee shall be signed by a person authorized to sign a permit application.

PERMITTEE:
Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
PERMIT/CERTIFICATION NUMBER: UC-06-242+18
DATE OF ISSUE:
EXPIRATION DATE:

SPECIFIC CONDITIONS:

DRAFT

1. General Requirements

- a) This permit is to complete construction of the Broward County 2A WTP Class V, Group 7 Aquifer Storage and Recovery (ASR) Well ASR-1, and associated Floridan aquifer Monitor Well ASR MW-1, and to operationally test, with raw waters from the Biscayne aquifer, the ASR system. Under this permit, modification to Monitor Well ASR MW-1 may be authorized and/or an additional Floridan aquifer monitor well may also be constructed. This permit does not authorize the construction or operational testing of any other well or wells associated with the Broward County 2A WTP ASR system.
- b) The measurement points for drilling and logging operations shall be surveyed and referenced to the National Geodetic Vertical Datum (NGVD) of 1929 prior to the onset of drilling activities for the ASR well and associated monitor well.
- c) Hurricane Preparedness - Upon the issuance of a "Hurricane Watch" by the National Weather Service, the preparations to be made include but are not necessarily limited to the following:
 - i) Secure all on-site salt and stockpiled additive materials to prevent surface and/or groundwater contamination.
 - ii) Properly secure drilling equipment and rig(s) to prevent damage to well(s) and on-site treatment process equipment.

2. Construction and Testing Requirements

- a) Blow-out preventers shall be installed on the ASR well during any downhole construction activities.
- b) Pressure gauges and flow meters must be installed on the ASR well prior to initiating ASR activities at the site.
- c) Mechanical integrity of the ASR well shall be determined pursuant to Rule 62-528.300(6)(b)(2), F.A.C. The pressure test for the final casing shall be accepted if tested with a fluid-filled casing at a high enough pressure such that the well operating pressures will never exceed 66% of the test pressure. A test tolerance of not greater than + or - 3% must be certified by the engineer of record. Verification of pressure gauge calibration, representative at the time of the test, must be provided with the certified test report.
- d) Department approval at a scheduled UIC-TAC meeting shall be based on the permittee's presentation that shows compliance with Department rules and this permit.
- e) UIC-TAC meetings are scheduled on the 2nd and 4th Tuesday of each month subject to a five (5) working day prior notice and timely receipt of critical data by all UIC-TAC members and the United States Environmental Protection Agency (EPA), Region IV, Atlanta. Emergency meetings may be arranged when justified to avoid undue construction delays.
- f) Department or Department delegated local program potable water construction permits must be issued for all surface piping and appurtenances upstream of the ASR well-head. Bacteriological clearances must be performed prior to operational testing of the ASR well system.
- g) Within thirty (30) days of permit issuance, the permittee shall submit to the Southeast District office for Department approval a complete set of signed and sealed, revised plan drawings (latest revision), which are in agreement with the most recent design, and which address the following:
 - i) The lack of connection to the finished water system, and
 - ii) The location of permanent sampling points for both the injectate and the recovered waters.

PERMITTEE:
Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
PERMIT/CERTIFICATION NUMBER: UC-06-242418
DATE OF ISSUE:
EXPIRATION DATE:

SPECIFIC CONDITIONS:

DRAFT

3. Quality Assurance/Quality Control Requirements

- a) Pursuant to Rule 62-528.440(5)(b), F.A.C., the Professional Engineer(s) of Record shall certify all documents related to the completion of the ASR well system as an ASR facility. The Department shall be notified immediately of any change of the Engineer(s) of Record.
- b) In accordance with Section 492, Florida Statutes, all documents prepared for the geological/hydrogeological evaluation of the ASR well system shall be signed and sealed by a Florida Licensed Professional Geologist or qualified Florida Licensed Professional Engineer.
- c) Continuous on-site supervision by qualified personnel (engineer and geologist) is required during all testing, geophysical logging, casing installation and cementing operations.

4. Reporting Requirements

- a) All reports and surveys required by this permit shall be submitted concurrently to all members of the UIC-TAC and the United States Environmental Protection Agency, Region IV, Atlanta. The UIC-TAC shall consist of representatives of the following agencies:

Department of Environmental Protection, West Palm Beach and Tallahassee
United States Geological Survey (USGS), Miami
South Florida Water Management District (SFWMD), West Palm Beach
Broward County Department of Natural Resource Protection (BCDNRP), Ft. Lauderdale
Broward County Public Health Unit (BCPHU), Ft. Lauderdale

- b) The Department and other applicable agencies must be notified within twenty-four hours (24) of any unusual or abnormal events occurring during construction, and in the event the Permittee is temporarily unable to comply with the provisions of the permit (e.g., on-site spills, artesian flows, large volume circulation losses, equipment damage due to: fire, wind and drilling difficulties, etc.) A written report describing the incident shall also be given to the Department within five (5) days of the start of the event. The final report shall contain a complete description of the occurrence of the event, a discussion of its cause(s), and the steps being taken to prevent recurrence of the event and all other information deemed necessary by the Department.
- c) An interpretation of all test results and geophysical logs must be submitted with all submittals.
- d) Within one year after the initiation of cycle testing, or prior to obtaining an operation permit, whichever occurs first, an interim report shall be submitted to the Department, the UIC-TAC and EPA. This report shall include the following:
 - i) An evaluation detailing the necessity, or conversely, the lack of necessity of installing an additional well to monitor the Floridan aquifer between the Broward County ASR well and the Deerfield Beach ASR well, for the purpose of monitoring the lateral movement of the stored water and protecting underground sources of drinking water (USDWs). For this evaluation, the permittee shall use the water quality data obtained during operational testing to develop and calibrate a model; which shall update the analytical approach used to predict that the color, odor, and iron standards would not be exceeded at the Deerfield Beach ASR well.
 - ii) An evaluation detailing the necessity, or conversely, the lack of necessity of modifying Floridan Aquifer Monitor Well MW-1, and/or installing an additional Floridan aquifer monitor well, in order to monitor overlying zones (including the uppermost interval of the Floridan aquifer), the water quality in the storage zone, and migration between USDWs of fluids of significantly different water quality. The evaluation shall include the results of water quality monitoring to date, an analysis (which may include modeling), and interpretations.

PERMITTEE:
Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
PERMIT/CERTIFICATION NUMBER: UC-06-242418
DATE OF ISSUE:
EXPIRATION DATE:

DRAFT

SPECIFIC CONDITIONS:

- e) Upon completion of construction and the cycle testing phase of operational testing, a final report shall be submitted to the Department, the UIC-TAC and EPA. The report shall include, but not be limited to, all information and data collected under Rules 62-528.605, 62-528.615, and 62-528.635, FAC, with appropriate interpretations. To the extent possible, the report should include:
- i) Transmissivity test data for the storage zone, with evaluation.
 - ii) Evaluation of the maximum ASR capacity within safe and economical pressure limits.
 - iii) Detailed results and analysis of cycle testing.
 - iv) Operation and maintenance manual.
 - v) Record (as-built) drawings of the ASR well, surface equipment, instrumentation and appurtenances, certified by the engineer of record.
 - vi) Summary of all water quality, water level and well performance data collected, with conclusions and recommendations.
 - vii) Well locations surveyed relative to permanent reference points by a Florida registered land surveyor, and located on a site plan by latitude and longitude.
 - viii) Mill certificates for all casing.
 - ix) Evaluation detailing the necessity, or conversely, the lack of necessity of installing an additional well to monitor the Floridan aquifer between the Broward County ASR well and the Deerfield Beach ASR well, in order to monitor the lateral movement of the stored water. [S.C. 4.f)i]
 - x) Evaluation detailing the necessity, or conversely, the lack of necessity of modifying Floridan Aquifer Monitor Well MW-1, and/or installing an additional Floridan aquifer monitor well, in order to monitor the water quality in the storage zone and to monitor for migration between USDWs of fluids of significantly different water quality. [S.C. 4.f)ii]

5. Operational Testing Requirements

- a) The operational testing of the ASR well system with raw water under this permit shall not commence without written authorization from the Department.
- b) A draft operation and maintenance manual (or an updated version) must be submitted to the Department, the UIC-TAC, and EPA prior to a request for system operational testing approval.
- c) Prior to operational testing approval, the following items must be submitted (with the request for operational testing approval) for Department approval and UIC-TAC and EPA review:
 - i) Downhole television survey of final casing, with interpretations.
 - ii) Geophysical logs with interpretations.
 - iii) Certification of mechanical integrity and interpreted test data.
 - iv) Transmissivity test data with evaluation.
 - v) Background water quality data (monitor and storage zones) to include primary and secondary drinking water standards and minimum criteria parameters as attached.
 - vi) Injectant analysis of primary and secondary drinking water standards and minimum criteria parameters, as attached.
 - vii) Surface equipment completion certification or certification of interim completion for the purposes of testing.
 - viii) Signed and sealed record (as-built) engineering drawings of all well construction, subsurface and surface equipment, and appurtenances. These drawings shall include the location of permanent sampling points for both the injectate and the recovered waters.
 - ix) Cycle testing plan.
 - x) Demonstration that the monitor zone in each monitor well has sufficient yield for collection of a representative sample.
- d) Prior to the authorization of operational testing by the Department, the County will contact the Underground Injection Control Section of the Department, Southeast District, to arrange a site inspection. The inspection will determine if all equipment necessary to operate and monitor the ASR well in compliance with the permit and Department rules has been installed. During the inspection, reporting requirements shall be reviewed.

PERMITTEE:
Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
PERMIT/CERTIFICATION NUMBER: UC-06-242418
DATE OF ISSUE:
EXPIRATION DATE:

SPECIFIC CONDITIONS:

DRAFT

6. Operational Testing Conditions

- a) Upon receipt of written authorization from the Department [S.C. 5.a)], the operational testing of the ASR well system shall be subject to the following conditions:
- i) The progress of the operational testing for the system shall be reviewed during meetings scheduled at the beginning of and within one month of completion of each cycle or every three (3) months after operation has begun, whichever is the shortest period of time. Reports evaluating the system's progress must be submitted to the Department, each member of the UIC-TAC, and EPA at least two (2) weeks prior to the scheduled meeting. The conditions for the operational testing period may be modified by the Department at each of these UIC-TAC review intervals.
 - ii) Flows to the ASR well shall be monitored and controlled at all times to ensure the maximum injection rate does not exceed that rate at which the well was tested.
 - iii) The pressure at the wellhead shall be monitored and controlled at all times to ensure the maximum pressure on the final casing does not exceed 66 percent (%) of the mechanical integrity test pressure.
 - iv) Any failure of the ASR system monitoring and recording equipment for a period of more than forty-eight (48) hours shall be reported within twenty-four (24) hours to the Department. A written report describing the incident shall also be given to the Department within five (5) days of the start of the event. The final report shall contain a complete description of the occurrence, a discussion of its cause(s) and the steps being taken to reduce, eliminate, and prevent recurrence of the event, and all other information deemed necessary by the Department.
 - v) The following data shall be collected and reported to the Department in Monthly Operating Reports (MORs). The MORs shall be submitted to this office (FDEP, Southeast District Office, UIC Section, P.O. Box 15425, West Palm Beach, FL 33416) and our Tallahassee office (FDEP, UIC Program, MS 3530, Twin Towers Building, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400) by the twenty-eighth (28th) day of the month immediately following the end of the sampling period.
 - a) ASR well performance:
 - total daily flow to/from ASR well (MG)
 - monthly maximum daily flow to/from ASR well (MG), , with peak hour flow (MGD) on the day of the month with the maximum flow
 - average, maximum and minimum daily flow rate to/from the ASR well (gpm)
 - daily average, maximum and minimum injection pressure at the ASR well (psig)
 - maximum and minimum daily water level (static head at wellhead)
 - monthly average for the above daily measurements
 - cumulative total volume injected and recovered from the well (MG)
 - b) Operational Testing: ASR Well ASR-1, Floridan Aquifer Monitor Well ASR MW-1, and Biscayne Aquifer Monitor Well MW-4 shall be monitored during each injection, storage and recovery cycle, in accordance with the parameters and frequency listed below:

PERMITTEE:
 Mr. Willie Horton
 Director of Office of Environmental Services
 Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
 PERMIT/CERTIFICATION NUMBER: UC-06-24218
 DATE OF ISSUE:
 EXPIRATION DATE:

SPECIFIC CONDITIONS:

DRAFT

SAMPLING OF ASR WELL ASR-1

Parameter	OPERATIONAL TESTING													
	CYCLE TESTING						NORMAL OPERATIONS							
	DAILY	WEEKLY	MONTHLY	QUARTERLY	BEGINNING OF STAGE	MID STAGE	END OF STAGE	DAILY	WEEKLY	MONTHLY	QUARTERLY	BEGINNING OF STAGE	MID STAGE	END OF STAGE
Chloride (mg/l)		I,S,R						I,S,R						
TDS (mg/l)		I,S,R						I,S,R						
Conductivity (umho/cm)		I,S,R						I,S,R						
Temperature (°F)		I,S,R						I,S,R						
pH (standard units)	I	S,R						I	I,S,R					
Color (color units)	I	S,R						I	I,S,R					
Odor (odor threshold number)		I,S,R						I,S,R						
Total Iron (mg/l)		I,S,R						I,S,R						
Hardness (mg/l)	I		S,R					I			S,R			
Total Alkalinity (mg/l)	I		S,R					I			S,R			
Turbidity (NTU)	I		S,R					I			S,R			
Sulfate (mg/l)			I,S,R								I,S,R			
Fecal coliform (# of colonies/100 ml)			I,S,R							I,S,R				
TKN (mg/l)			I,S,R							I,S,R				
Ammonia-N (mg/l)			I,S,R							I,S,R				
Gross Alpha (pCi/L)					I	S	R					I	S	R
Radium-226 (pCi/L)					I	S	R					I	S	R
Dissolved Oxygen (mg/l)					I	S	R					I	S	R
Iron Hydroxide (mg/l)					I	S	R					I	S	R
Primary, Secondary and Minimum Criteria				I							I			

Explanation

I - denotes sampling of injectate during injection phase

S - denotes sampling of water withdrawn from storage zone during storage phase

R - denotes sampling of water withdrawn from storage zone during recovery phase

PERMITTEE:
 Mr. Willie Horton
 Director of Office of Environmental Services
 Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
 PERMIT/CERTIFICATION NUMBER: UC-06-242418
 DATE OF ISSUE:
 EXPIRATION DATE:

DRAFT

SPECIFIC CONDITIONS:

SAMPLING OF FLORIDAN AQUIFER MONITOR WELL ASR-1 MW-1

Parameter	OPERATIONAL TESTING				
	CYCLE TESTING				NORMAL OPERATIONS
	WEEKLY	BEGINNING OF STAGE	MID STAGE	END OF STAGE	WEEKLY
Chloride (mg/l)	I,S,R				I,S,R
TDS (mg/l)	I,S,R				I,S,R
Conductivity (umho/cm)	I,S,R				I,S,R
Temperature (°F)	I,S,R				I,S,R
pH (standard units)	I,S,R				I,S,R
Color (color units)			I,S,R		I,S,R
Odor (odor threshold number)			I,S,R		I,S,R
Total Iron (mg/l)			I,S,R		I,S,R
Gross Alpha (pCi/L)		I	S	R	
Radium-226 (pCi/L)		I	S	R	
Dissolved Oxygen (mg/l)		I	S	R	
Iron Hydroxide (mg/l)		I	S	R	

SAMPLING OF BISCAYNE AQUIFER MONITOR WELL MW-4

Parameter	OPERATIONAL TESTING				
	CYCLE TESTING				NORMAL OPERATIONS
	WEEKLY	BEGINNING OF STAGE	MID STAGE	END OF STAGE	WEEKLY
Chloride (mg/l)	I,S,R				I,S,R
TDS (mg/l)	I,S,R				I,S,R
Conductivity (umho/cm)	I,S,R				I,S,R
Temperature (°F)	I,S,R				I,S,R
pH (standard units)	I,S,R				I,S,R

Explanation

- I - denotes sampling of water withdrawn from monitor zone during injection stage
- S - denotes sampling of water withdrawn from monitor zone during storage stage
- R - denotes sampling of water withdrawn from monitor zone during recovery stage

PERMITTEE:
Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
PERMIT/CERTIFICATION NUMBER: UC-06-242418
DATE OF ISSUE:
EXPIRATION DATE:

DRAFT

SPECIFIC CONDITIONS:

Samples shall be collected according to the frequency specified in the above tables under the subheading of 'cycle testing' until the Department authorizes a reduction in sampling frequency to that shown under the subheading of 'normal operations'. A request for reduction in sampling frequency shall be accompanied by a minimum of six (6) months of cycle testing data accompanied by technical justification and interpretations.

The MORs shall indicate monthly averages for all parameters sampled daily or weekly.

- c) The Department may require the monitoring of additional parameters if water quality monitoring of the Floridan and/or Biscayne aquifers or the injection fluid indicates any of the following:
- (1) quality of the injectate is deteriorating
 - (2) results of the sampling indicate significant differences in water quality during consecutive sampling events
 - (3) a source of contamination to the ASR storage zone is discovered that was not addressed in the permit
- d) Monitor zone potentiometric surface or water table height relative to NGVD (feet of head) or pressure (psig) referenced to NGVD (for Floridan Aquifer Monitor Well ASR MW-1 and Biscayne Aquifer Monitor Well MW-4):
- daily maximum sustained pressure
 - daily minimum sustained pressure
 - daily average pressure
 - monthly maximum sustained pressure
 - monthly minimum sustained pressure
 - monthly average pressure
- vi) A minimum of three (3) well volumes of fluid shall be evacuated from the monitor systems prior to sampling for the chemical parameters listed above. All samples shall be analyzed by a State-certified laboratory.
- vii) All ASR well system data submissions including Monthly Operating Reports (MORs) shall be clearly identified on each page with facility name, I.D. Number, permit number, operator's name, license number, daytime phone number, date of sampling/recording, and type of data. Monitor zones shall be identified by well and depth interval. The lead plant operator or higher official must sign and date each submittal. An approved summary sheet from the FDEP Southeast District Underground Injection Control (UIC) Section is attached.
- viii) All monthly reports (MORs) shall be submitted to this office (FDEP, UIC Section, P.O. Box 15425, West Palm Beach, FL 33416) and our Tallahassee office (FDEP, UIC Program, Mail Station No. 3530, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400) by the twenty-eighth (28th) day of the month immediately following the end of the sampling period.
- ix) An analysis of the injectate (24 hour composite sample) for primary and secondary drinking water standards (Chapter 62-550, F.A.C.) and minimum criteria, see attached list, must be submitted quarterly.
- x) The permittee shall be subject to all requirements and regulations of Broward County, the City of Pompano Beach, and the South Florida Water Management District regarding the construction, testing and operation of this ASR well system.

PERMITTEE:
Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
PERMIT/CERTIFICATION NUMBER: UC-06-242418
DATE OF ISSUE:
EXPIRATION DATE:

DRAFT

SPECIFIC CONDITIONS:

- xi) If either of the following occur because of injection at the Broward County 2A Water Treatment Plant ASR system, injection into the ASR well shall cease until a water quality criteria exemption has been obtained that addresses any additional parameters exceeding water quality standards, and a well capable of monitoring the Floridan aquifer has been constructed between the Broward County ASR well and the Deerfield Beach ASR well:
 - a) The maximum contaminant level (MCL) or natural background level (whichever is poorer) is exceeded in the Floridan aquifer system monitor well for any parameter contained in the primary or secondary drinking water standards, except parameters which have been exempted (i.e., color, odor, or iron); or
 - b) Parameters already exempted (i.e., color, odor, or iron) exceed the approved alternative levels specified in a water quality criteria exemption.
- xii) Pursuant to Rule 62-4.080(3), a permittee may request that a permit be extended as a modification of an existing permit. A request for an extension is the responsibility of the permittee and shall be submitted to the Department before the expiration of the permit. In accordance with Rule 62-4.070(4) FAC, a permit cannot be extended beyond the maximum 5 year statutory limit. Should operational testing need to continue beyond the 5 years of this permit, the permittee must renew this construction permit.
- xiii) Operational testing of this ASR well shall cease upon expiration of this permit, unless an operation permit is issued by the Department, or a timely renewal application (Rule 62-4.090, FAC) for this construction permit has been submitted to the Department.
- xiv) The permittee shall unconditionally obligate themselves to plug and abandon the ASR and monitoring wells (with the appropriate Department permit) should the well or wells become a threat to the waters of the State, if the wells are no longer used, or if the wells are no longer usable for their intended purpose or other purposes as approved by the Department.
- xv) In the event the ASR well must be plugged and abandoned, the permittee shall obtain an FDEP permit, as required by Rule 62-528.645, FAC.
- xvi) The permittee shall calibrate all pressure gages, flowmeters, chart recorders, and other related equipment associated with the ASR 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 gages, flow meter, and chart records shall be calibrated using standard engineering methods.
- xvii) A qualified representative of the Engineer of Record shall be present for the start-up operations.
- xviii) The Department shall be notified in writing of the date of commencement operations.
- b) No fluids shall be injected without prior written authorization from the Department.
- c) The only source of injectate shall be water meeting all Primary and Secondary drinking water quality standards and minimum criteria unless otherwise exempted.

PERMITTEE:
Mr. Willie Horton
Director of Office of Environmental Services
Broward County Office of Environmental Services

I. D. NUMBER: 5006M06093
PERMIT/CERTIFICATION NUMBER: UC-06-242418
DATE OF ISSUE:
EXPIRATION DATE:

SPECIFIC CONDITIONS:

DRAFT

7. Surface Equipment

- a) The integrity of the monitor zone sampling systems shall be maintained at all times. Sampling lines and equipment shall be kept free of contamination with independent discharges and no interconnections with any other lines. Sampling lines shall be clearly and unambiguously identified by monitoring zone at the point at which samples are drawn. All reasonable and prudent precautions shall be taken to ensure that samples are properly identified by monitor zone and that samples obtained are representative of those zones.
- b) The ASR well and monitoring well surface equipment and piping shall be kept free of corrosion at all times.

8. Financial Responsibility

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

9. Operation Permit Application

- a) An operation permit application with applicable fee must be submitted at least sixty (60) days prior to the expiration of this permit.

10. Signatories

- a) 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.
- b) 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 on 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."

Issued this ___ day of _____, 1997

**STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION**

**Carlos Rivero-deAguilar
Director of District Management**

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

IN RE:

Petition for Water Quality
Exemptions by
Broward County

)
)
)
)
)

OGC File No. 96-3218
Broward County

FINAL ORDER

BY THE DEPARTMENT:

On August 14, 1995, the Department received from Broward County a petition for exemptions, pursuant to rule 62-520.500 of the Florida Administrative Code. The Petitioner requested relief from rule 62-520.420 of the Florida Administrative Code (standards for Class G-I and Class G-II ground water), for an installation that will discharge into a Class G-II ground water. The exemptions are for color at an alternative level of 100 color units (secondary drinking water standard is 15 color units), iron at an alternative concentration of 3.0 mg/L (secondary drinking water standard is 0.30 mg/L), and odor at an alternative level of 6 threshold odor number (secondary drinking water standard is 3 threshold odor number). The installation is the Broward County North Regional 2A Water Treatment Plant aquifer storage and recovery (ASR) facility, which is located at the corner of SW 10 Street and US Route 1, in unincorporated Broward County.

After reviewing the petition, the Department has concluded that the requirements and criteria set forth in rule 62-520.500

of the Florida Administrative Code have been satisfied. A copy of the Department's Intent to Grant is attached as Exhibit I.

The letter with the Notice of Intent, notified the petitioner of the Department's proposed agency action and advised it of its right to a hearing pursuant to sections 120.569 and 120.57 of the Florida Statutes. On April 23, 1997, notice was given in the Sun-Sentinel, Fort Lauderdale, Florida, and on April 18, 1997, notice was published in the Florida Administrative Weekly, informing the public of the Department's intended action and offering an opportunity for hearing pursuant to sections 120.569 and 120.57 of the Florida Statutes. A copy of these notices are attached as Exhibits II and III, respectively.

The petitioner and interested parties having been advised of their rights under chapter 120 of the Florida Statutes, and having failed or declined to file a petition pursuant to sections 120.569 and 120.57 of the Florida Statutes are hereby deemed to have waived those rights.

Any party to this order has the right to seek judicial review of the order pursuant to section 120.68 of the Florida Statutes by the filing of a Notice of Appeal pursuant to rule 9.110 of the Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 3900 Commonwealth Boulevard, Mail Stop #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 Order is filed with the Clerk of the Department.

IT IS THEREFORE ORDERED that the petition of Broward County requesting exemptions from the color, iron, and odor water quality standards set forth in rule 62-550.320 of the Florida Administrative Code as referenced in rule 62-520.420 of the Florida Administrative Code, for the ground waters specified herein is hereby GRANTED, subject to the following conditions:

- (a) The exemptions are granted for the duration of permit UC06-242418 which is for the construction and testing of the Class V raw water ASR system at the Broward County 2A Water Treatment Plant. Future exemptions must be petitioned for by the applicant in conjunction with an operation permit for any ASR project at this site.
- (b) The exemptions provide relief only for the color, iron, and odor standards contained in rule 62-550.320 of the Florida Administrative Code, as referenced in rule 62-520.420 of the Florida Administrative Code. All other ground water quality standards, including the primary drinking water standards contained in rule 62-550.310 of the Florida Administrative Code, and the minimum criteria contained in rule 62-520.400 of the Florida Administrative Code, apply to this ASR project.
- (c) The permittee shall monitor water quality in accordance with the specific conditions of construction permit UC06-242418 and any authorization for operational testing issued under that permit.

(d) If either of the conditions addressed in 1. or 2. below occur because of injection at the Broward County 2A Water Treatment Plant ASR system, injection into the ASR well shall cease until a water quality criteria exemption that addresses any additional parameters exceeding water quality standards has been obtained, and a well capable of monitoring the Floridan aquifer has been constructed between the Broward County ASR well and the Deerfield Beach ASR well.


1. The maximum contaminant level (MCL) or natural background level (whichever is poorer) is exceeded in the Floridan aquifer monitor well for any parameter contained in the secondary drinking water standards except color, iron, or odor; or
2. Color, iron, or odor exceeds the approved alternative level of 100 color units, 3.0 mg/L, and 6 odor threshold number, respectively.

(e) The permittee shall use the water quality data obtained during operational testing to calibrate and update the model that was used to predict that the color, iron, and odor standards would not be exceeded at the Deerfield Beach ASR well. Based on the updated model, the permittee shall determine if additional monitoring is necessary to protect underground sources of drinking water prior to obtaining an operation permit.

These exemptions, unless otherwise ordered, shall be valid for the duration of the Broward County 2A Water Treatment Plant ASR project Class V well construction permit. Additionally, the applicant must petition the Department for exemptions in conjunction with an operation permit for any ASR project at this site.

DONE AND ORDERED this 31st day of July 1997 in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION


f/ VIRGINIA B. WETHERELL
Secretary

3900 Commonwealth Boulevard
Tallahassee, Florida

Telephone: (850)488-1554

Copies furnished to:

Mimi Drew - TLH
Richard Drew - TLH
Carlos Rivero deAguiar - WPB
Cynthia Christen - TLH
Richard J. Deuerling - TLH
Cathy McCarty - TLH
Nancy Marsh - EPA Atlanta



Department of Environmental Protection

COP. 1132 ASR (1134) - 1.7

Lawton Chiles
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Virginia B. Wetherell
Secretary

August 8, 1997

Mr. Doug Andrews
Director
Broward County Environmental
Engineering Division
2555 West Copans Road
Pompano Beach, Florida 33069

Dear Mr. Andrews:

The Department has discovered an error in an exhibit to the Final Order granting the water quality criteria exemptions for Broward County, OGC File No.: 96-3218. Exhibit I was the incorrect Intent to Issue. Enclosed is the correct Intent to Issue which should replace the one that was attached. Please excuse us for any inconvenience this may have caused. If you have any questions, please call me at 850/921-9610.

Sincerely,

Cynthia K. Christen
Assistant General Counsel

CKC/pm

*cc: Rick Kollo
Det Leonard.*

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

In the Matter of a	)	OGC File No. 96-3218
Petition for Water Quality	)	Broward County
Exemption,)	
Broward County 2A Water)	
Treatment Plant:)	

INTENT TO GRANT

The Department of Environmental Protection gives notice of its intent to grant water quality exemptions to Broward County, Mr. Doug Andrews, P.E., Director, Broward County Environmental Engineering Division, 2555 West Copans Road, Pompano Beach, Florida, for the proposed project as detailed in the petition specified above. The Department is issuing this Intent to Grant for the reasons stated below.

On August 14, 1995, the Department received a petition from the applicant, Broward County (County), for the exemption for an installation discharging into Class G-II ground water pursuant to rule 62-520.500 of the Florida Administrative Code. The County requested exemption from the ground water standards contained in rule 62-520.420(1) of the Florida Administrative Code. Specifically, the petition requested exemption from three secondary drinking water standards which are incorporated as ground water standards. The exemption request for color is 100 color units, the maximum contaminant level (MCL) standard is 15 color units. The exemption request for odor is 6.0 odor threshold number, the MCL standard is 3 odor threshold number. The exemption request for iron is 3.0 mg/L, the MCL standard is

0.30 mg/L. As a secondary drinking water standard, the standard is aesthetically based and does not pose a health threat at the requested levels. The installation is the Broward County 2A Water Treatment Plant aquifer storage and recovery (ASR) facility which is located at the corner of SW 10 Street and US Route 1, in unincorporated Broward County.

The Department has permitting jurisdiction under chapter 403 of the Florida Statutes. The project is not exempt from permitting procedures. The Department has determined that in addition to an exemption, a construction permit is required for the facility.

The Department has reviewed the above petition for the exemption under the requirements of rule 62-520.500 of the Florida Administrative Code, and hereby gives notice of its intent to grant the exemptions to the County for its aquifer storage and recovery facility based on the following findings:

- (1) Granting this exemption is clearly in the public interest. Storing excess water of good quality by ASR projects for future use meets the public demand for a reliable supply of water at a reasonable cost, while not adversely affecting the environment.

The water to be used for this ASR operation has a maximum total dissolved solids concentration (TDS) of 750 mg/L. It is expected that the receiving aquifer will have a TDS concentration in the range of 1,000 to 5,000 mg/L. Since the injected fluid is to have a lower concentration of TDS and it

meets all of the primary drinking water standards and minimum standards for ground water, storing this water for future drinking water, via ASR, is in the public interest.

- (2) Compliance with presently specified criteria is unnecessary for the protection of present and future potable water supplies. Native water from the Floridan aquifer in this area is not presently being used. Desalination of water from the Floridan aquifer, in the vicinity of the proposed project, would be necessary to render this water suitable for a potable supply. Desalination is usually accomplished by reverse osmosis. Color, odor, and iron are removed by the reverse osmosis process and granting the exemption is not likely to adversely impact the treatability of water from this aquifer. Color, odor, and iron are removed during the normal treatment process used for rendering water from the Biscayne aquifer potable.

- (3) Granting the exemption will not interfere with existing uses or the designated use of the waters or of contiguous water. The Biscayne aquifer water which is proposed for injection is currently being used as a drinking water source in the Broward County area. The water to be injected is of better quality with respect to total dissolved solids than the ground water in the Floridan aquifer. There are no wells that penetrate the Floridan aquifer within the one mile area of review around this facility, therefore the existing use of the water should not be affected. There will be no impact on

quality of the contiguous water because injected water is recovered as needed and sent to the Broward County 2A Water Treatment Plant.

There should be no adverse effects to aquifers overlying the injection zone because a confining zone immediately overlies the ASR injection zone. There will also be no impact on quality of the aquifers overlying the injection zone because the aquifer overlying the injection zone is the Biscayne aquifer which is the source of the ASR water. In addition, the injected water meets all of the primary drinking water standards and all of the secondary drinking water standards with the exception of color, odor, and iron.

- (4) The economic, environmental and social costs of compliance with existing criteria outweigh the economic, environmental, and social benefits of compliance. Compliance with the criteria would require that the water be treated before being injected. The operation and maintenance costs for the additional treatment process would be 45 cents per 1,000 gallons of water. There also would be energy costs associated with treating the water. Without this ASR operation, additional drinking water may have to be obtained by reverse osmosis (RO) treatment of ground water from the Floridan aquifer, desalination of sea water, or drilling new Biscayne aquifer water supply wells. The cost of using reverse osmosis to treat water from the Floridan aquifer is twice that of lime softening used to treat Biscayne aquifer

water. Desalination of seawater may cost up to ten times as much as the treatment required for water obtained from the Biscayne aquifer. There would also be an additional cost incurred for the disposal of the RO concentrate. The disposal of concentrate also would be an environmental factor. The stored water (even with the requested concentrations of color, iron, and odor) should tend to improve both the quality and yield of water from the Floridan aquifer. The economic, environmental, and social costs of compliance with the criteria, plus the energy costs associated with treating and pumping this water, outweigh the economic, environmental, and social benefits. The economic, environmental, and social benefits are a reliable supply of water at a reasonable cost, while not adversely affecting the environment or public. This is especially relevant because the receiving ground water is not currently used for potable supply, and any future potable use will require appropriate treatment technology.

- (5) An adequate monitoring program approved by the Department has been established to ascertain the location of the stored water, to detect any leakage of the stored water to other aquifers or surface waters, and to detect any adverse effect on underground geologic formations or waters. This program has been designed to meet the requirements set forth in rule 62-528.615 of the Florida Administrative Code. Monitoring of the ASR system will include recharge water quality and recovered water quality. In addition, water quality will be

monitored in many Biscayne water supply wells and in a Floridan aquifer monitor well within the ASR injection zone. Monthly reporting of monitoring data will be required during the operational testing phase of the construction permit and under any subsequent operation permits.

- (6) The exemption will not present a danger to the public health, safety, or welfare. The recharge water is Biscayne aquifer water which meets all primary drinking water standards. Color, odor, and iron are regulated as secondary drinking water standards. Secondary drinking water standards, by definition, are aesthetically based. Exceedence of these secondary drinking water standards at the alternative levels requested should have no adverse affect upon the health or safety of persons, or the Floridan or Biscayne aquifers. The proposed ASR operation will immediately improve public health, safety, and welfare by providing a reliable water source of suitable quality and at a relatively low cost to meet projected public demands.

The Department intends to grant these exemptions subject to the following conditions:

- (a) The exemptions are granted for the duration of permit UC06-242418 which is for the construction and testing of the Class V raw water ASR system at the Broward County 2A Water Treatment Plant. Future exemptions must be petitioned for by the applicant in conjunction with an operation permit for any ASR project at this site.

- (b) The exemptions provide relief only for the color, odor, and iron standards contained in rule 62-550.320 of the Florida Administrative Code, as referenced in rule 62-520.420 of the Florida Administrative Code. All other ground water quality standards, including the primary drinking water standards contained in rule 62-550.310 of the Florida Administrative Code, and the minimum criteria contained in rule 62-520.400 of the Florida Administrative Code, apply to this ASR project.
- (c) The permittee shall monitor water quality in accordance with the specific conditions of construction permit UC06-242418 and any authorization for operational testing issued under that permit.
- (d) If either of the conditions addressed in 1. or 2. below occur because of injection at the Broward County 2A Water Treatment Plant ASR system, injection into the ASR well shall cease until a water quality criteria exemption that addresses any additional parameters exceeding water quality standards has been obtained, and a well capable of monitoring the Floridan aquifer has been constructed between the Broward County ASR well and the Deerfield Beach ASR well.
1. The MCL or natural background level (whichever is poorer) is exceeded in the Floridan aquifer monitor well for any parameter contained in the secondary drinking water standards except color, odor, or iron; or

2. Color, odor, or iron exceeds the approved alternative level of 100 color units, 6 odor threshold number, and 3.0 mg/L, respectively.

(e) The permittee shall use the water quality data obtained during operational testing to calibrate and update the model that was used to predict that the color, odor, and iron standards would not be exceeded at the Deerfield Beach ASR well. Based on the updated model, the permittee shall determine if additional monitoring is necessary to protect underground sources of drinking water prior to obtaining an operation permit.

Pursuant to section 403.815 of the Florida Statutes, and DEP rule 62-103.150 of the Florida Administrative Code, you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Grant the Water Quality Exemption. The notice shall be published one time only within 30 days, in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of sections 50.011 and 50.031 of the Florida Statutes, in the county where the activity is to take place. The applicant shall provide an original copy of the proof of publication to Mr. Richard Deuerling of the Department, at 2600 Blair Stone Road, Twin Towers Office Building, Mail Station 3530, Tallahassee, Florida 32399-2400, within seven days of publication. Failure to publish

the notice and provide proof of publication within the allotted time may result in the denial of the exemption.

The Department will grant the exemption unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of sections 120.569 and 120.57 of the Florida Statutes.

A person whose substantial interests are affected by the Department's proposed exemption decision may petition for an administrative proceeding (hearing) in accordance with sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Stop #35, Tallahassee, Florida 32399-3000. Petitions filed by the exemption applicant and the parties listed below must be filed within 21 days of receipt of this intent. Petitions filed by other persons must be filed within 21 days of publication of the public notice or within 21 days of their receipt of this intent, whichever first occurs. The petitioner must mail a copy of the petition to the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition within the time period shall constitute a waiver of any right of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 of the Florida Statutes, or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will only be at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-5.207 of the Florida Administrative Code.

The Petition shall contain the following information:

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

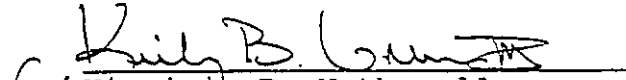
(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this order. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Mediation under section 120.573 of the Florida Statutes is not available for this proceeding.

DONE AND ENTERED this 12th day of March 1997
in Tallahassee, Florida.

Date


✓ Virginia B. Wetherell
Secretary

State of Florida Department
of Environmental Protection
The Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

Copies furnished to:

Carlos Rivero-deAguilar, DEP/WPB
Richard Drew, DEP/TLH
Cynthia Christen, Office of General Counsel, DEP
Richard Deuerling, P.G., DEP/TLH
Nancy Marsh, USEPA/Atlanta
Bill Cocke, P.G. DEP/WPB
Cathy McCarty, P.G. DEP/TLH

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF INTENT TO GRANT WATER QUALITY EXEMPTION

The Department of Environmental Protection gives notice of its intent to grant water quality exemptions for the aesthetically based secondary drinking water standards for color (standard 15 color units, exemption limit 100 color units), iron (standard 0.3 mg/L, exemption limit 3.0 mg/L), and odor (standard 3 threshold odor number, exemption limit 6 threshold odor number) to Broward County, Mr. Doug Andrews Director, for the Broward County North Regional 2A Water Treatment Plant (WTP) aquifer storage and recovery (ASR) project. The exemptions are granted for the duration of the Broward County 2A WTP ASR Class V well construction permit. Future exemptions must be petitioned for by the applicant in conjunction with an operation permit for any ASR project at this site. The ASR wells are located at the Broward County 2A WTP at the corner of SW 10 Street and US Route 1, unincorporated Broward County.

A person whose substantial interests are affected by the Department's proposed exemption decision may petition for an administrative proceeding (hearing) in accordance with sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Stop #35, Tallahassee, Florida 32399-3000, within 21 days of publication of this notice. The petitioner must mail a copy of the petition to

the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition within the time period shall constitute a waiver of any right of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 of the Florida Statutes, or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will only be at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-5.207 of the Florida Administrative Code.

The Petition shall contain the following information;

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by petitioner, stating

precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this order. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Mediation under section 120.573 of the Florida Statutes is not available for this proceeding.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at the Tallahassee Office, 2600 Blair Stone Road, Room 212E, Tallahassee, Florida 32399-2400.

John J. Strickland

SUN - SENTINEL
PUBLISHED DAILY
FORT LAUDERDALE, BROWARD COUNTY, FLORIDA
BOCA RATON, PALM BEACH COUNTY, FLORIDA
MIAMI, DADE COUNTY, FLORIDA

COP. 1132 ASR (1134) - 1.9

STATE OF FLORIDA
COUNTY OF BROWARD/PALM BEACH/DADE
BEFORE THE UNDERSIGNED AUTHORITY PERSONALLY APPEARED

John J. Strickland WHO ON OATH SAYS THAT
HE/SHE IS A DULY AUTHORIZED REPRESENTATIVE OF THE
CLASSIFIED DEPARTMENT OF THE SUN-SENTINEL, DAILY
NEWSPAPER PUBLISHED IN BROWARD/PALM BEACH/DADE COUNTY,
FLORIDA THAT THE ATTACHED COPY OF ADVERTISEMENT, BEING A

NOTICE OF INTENT

IN THE MATTER OF

WATER QUALITY EXEMPT

IN THE CIRCUIT COURT, WAS PUBLISHED IN SAID NEWSPAPER IN
THE ISSUES OF
APRIL 04/23, 1 X

AFFIANT FURTHER SAYS THAT THE SAID SUN-SENTINEL IS A
NEWSPAPER PUBLISHED IN SAID BROWARD/PALM BEACH/DADE
COUNTY, FLORIDA, AND THAT THE SAID NEWSPAPER HAS HERETOFORE
BEEN CONTINUOUSLY PUBLISHED IN SAID BROWARD/PALM BEACH/DADE
COUNTY, FLORIDA, EACH DAY, AND HAS BEEN ENTERED AS SECOND
CLASS MATTER AT THE POST OFFICE IN FORT LAUDERDALE, IN SAID
BROWARD COUNTY, FLORIDA, FOR A PERIOD OF ONE YEAR NEXT
PRECEDING THE FIRST PUBLICATION OF THE ATTACHED COPY OF
ADVERTISEMENT; AND AFFIANT FURTHER SAYS THAT HE/SHE HAS
EITHER PAID NOR PROMISED ANY PERSON, FIRM OR CORPORATION
ANY DISCOUNT, REBATE, COMMISSION OR REFUND FOR THE PURPOSE
OF SECURING THIS ADVERTISEMENT FOR PUBLICATION IN SAID
NEWSPAPER.

John J. Strickland
.....
(SIGNATURE OF AFFIANT)

WORN TO AND SUBSCRIBED BEFORE ME
THIS 23 DAY OF APRIL
A.D. 1997

Barbara Strickland
.....
SIGNATURE OF NOTARY PUBLIC
BARBARA STRICKLAND
Notary Public - State of Florida
My Commission Expires Jul 24, 2000
Commission # CC571307

NAME OF NOTARY TYPED, PRINTED OR STAMPED)

STATE OF FLORIDA
DEPARTMENT OF
ENVIRONMENTAL
REGULATION
NOTICE OF INTENT
TO GRANT WATER
QUALITY EXEMPTION
The Department of Environmental Regulation gives notice of its intent to grant water quality exemptions for the aesthetically based secondary drinking water standards for color (standard 15 color units, exemption limit 100 color units), iron (standard 0.3 mg/L, exemption limit 3.0 mg/L, and odor (standard 3 threshold odor number, exemption limit 6 threshold odor number) to Broward County, Mr. Doug Andrews Director, for the Broward County North Regional 2A Water Treatment Plant (WTP) aquifer storage and recovery (ASR) project. The exemptions are granted for the duration of the Broward County 2A WTP ASR Class V well construction permit. Future exemptions must be petitioned for by the applicant in conjunction with an operation permit for any ASR project at this site. The ASR wells are located at the Broward County 2A WTP at the corner of SW 10 Street and US Route 1, unincorporated Broward County.
A person whose substantial interests are affected by the Department's proposed exemption decision may petition for an administrative proceeding (hearing) in accordance with Section 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mall Stop #35, Tallahassee, Florida 32399-3000, within 21 days of publication of this notice. The petitioner must mail a copy of the petition to the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition within the time period shall constitute a waiver of any right of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57 of the Florida Statutes, or to intervene in this proceeding and participate as a party to it.
Any subsequent intervention will only be at the discretion of the presiding officer upon the filing of a motion in compliance with rule 28-5.207 of the Florida Administrative Code.
The Petition shall contain the following information: (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material

4134



Volume 23, Number 16, April 18, 1997
Section XII Miscellaneous

...previous

Department of Environmental Protection

NOTICE OF AVAILABILITY

FLORIDA FINDING OF NO SIGNIFICANT IMPACT

CITY OF WAUCHULA

RECLAIMED WATER REUSE FACILITIES

The Florida Department of Environmental Protection has determined that the City of Wauchula's proposed Reclaimed Water Reuse Project will not have a significant adverse impact on the environment. The total project cost is estimated at \$8,255,000 consisting of \$1,747,000 for Phase I and \$6,508,000 for Phase II. The project is expected to qualify for a State Revolving Fund loan composed of federal and state matching funds. A full copy of the Florida Finding of No Significant Impact can be obtained by writing to: Dick Smith, Bureau of Water Facilities Funding, Department of Environmental Protection, 2600 Blair Stone Road, MS #3505, Tallahassee, Florida 32399-2400.

NOTICE OF INTENT TO GRANT

WATER QUALITY EXEMPTION

The Department of Environmental Protection gives notice of its intent to grant water quality exemptions for the aesthetically based secondary drinking water standards for color (standard 15 color units, exemption limit 100 color units), iron (standard 0.3 mg/L, exemption limit 3.0 mg/L), and odor (standard 3 threshold odor number, exemption limit 6 threshold odor number) to Broward County, Mr. Doug Andrews, Director, for the Broward County North Regional 2A Water Treatment Plant (WTP) aquifer storage and recovery (ASR) project. The exemptions are granted for the duration of the Broward County 2A WTP ASR Class V well construction permit. Future exemptions must be petitioned for by the applicant in conjunction with an operation permit for any ASR project at this site. The ASR wells are located at the Broward County 2A WTP at the corner of S. W. 10 Street and US Route 1, unincorporated Broward County.

A person whose substantial interests are affected by the Department's proposed exemption decision may petition for an administrative proceeding (hearing) in accordance with sections 120.569 and 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000, within 21 days of publication of this notice. The petitioner must mail a copy of the petition to the applicant at the address indicated above, at the time of filing. The failure of any person to file a petition within the time period shall constitute a waiver of any right of that person's right to request an administrative determination (hearing) under sections 120.569 and 120.57, Florida Statutes, or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will only be at the discretion of the presiding officer upon the filing of

a motion in compliance with rule 28-5.207, Florida Administrative Code.

The Petition shall contain the following information;

- (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and
- (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this order. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Mediation under section 120.573, Florida Statutes is not available for this proceeding.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at the Tallahassee Office, 2600 Blair Stone Road, Room 212E, Tallahassee, Florida 32399-2400.

Department of Children and Family Services

Leon County residents are invited to apply for a seat on the District 2, Health and Human Services Board. The Board oversees Dept. of Children and Families dollars that are spent to meet health and social service needs in the 14-county district.

Board members represent the District's population in terms of age, gender and ethnic background. Persons interested in serving, should have demonstrated an interest in health and social service issues.

Residents of Bay, Gulf, Franklin, Calhoun, Holmes, Washington, Gadsden, Jackson, Liberty, Leon, Jefferson, Wakulla, Madison and Taylor counties also are encouraged to submit an application now for future vacancies.

The deadline for new applications is Monday, May 19, 1997. Persons who have previously applied for Board membership will be considered in the selection process and need not reapply.



STATE OF FLORIDA

DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

WATER TREATMENT PLANT CONSTRUCTION PERMIT

Broward County MW (Log #8611)
BCOES - 2A
(BCOES - 2A/ASR Demonstration Project)
August 6, 1996

PERMITTEE:

Rich Rollo, P.E., Director of Env. Engr.
Broward County Office of Environmental Services
2555 W. Copans Road
Pompano Beach, FL 33069

RE: I.D. NUMBER: 4060163
PERMIT NUMBER: WC-06-288104
DATE OF ISSUE: 08/06/1996
EXPIRATION DATE: 08/06/2001
PROJECT NAME: BCOES - 2A/ASR Demonstration Project
PROJECT LOCATION: 1390 N.E. 50 St., Pompano Beach

Dear Mr. Rollo:

Effective August 6, 1996, this permit is issued according to the provisions of Chapter 403, F.S., and Chapters 62-4, 62-550, 62-555, & 62-560, F.A.C. The above-named permittee is hereby authorized to perform the work or operate the facility shown on the approved applications, engineering plans, and other documents attached hereto or on file with Broward County Public Health Unit (BCPHU) and made a part hereof and specifically described as follows:

CONSTRUCT: One (1) 1,200-foot ASR well with a 16-inch diameter casing (1,000 feet long) using raw water from the Biscayne Aquifer for recharge and recovery; one (1) 1,200-foot monitoring well with a 6-inch diameter casing (1,000 feet long); one (1) submersible pump (1,800 gpm) for recovery; one (1) horizontal split-case centrifugal pump (1,800 gpm) for recharge; approximately 430 ft of 3-inch PVC monitor well discharge pipe and 80 ft of 16-inch DI ASR recharge/recovery pipe; associated pipings; and all related appurtenances as shown on the engineering plans and in the specifications.

SUBJECT TO: General Conditions 1-15 and Specific Conditions 1-15.

HRS Mission: To work in partnership with local communities to help to be self sufficient, experience good health and live in stable families and communities

GENERAL CONDITIONS:

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

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

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

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

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

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

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at

reasonable times, access to the premises where the permitted activity is located or conducted to:

(a) Have access to and copy any records that must be kept under conditions of the permit;

(b) Inspect the facility, equipment, practices, or operations regulated or required under this permit; and;

(c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules. Reasonable time may depend on the nature of the concern being investigated.

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

(a) A description of and cause of noncompliance; and

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

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

10. This permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Rule 62-4.120 and 62-730.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

- (a) Determination of Best Available Control Technology (BACT)
- (b) Determination of Preventions of Significant Deterioration (PSD)
- (c) Certification of compliance with state Water Quality Standards (Section 401, PL 92-500)
- (d) Compliance with New Source Performance Standards

14. The permittee shall comply with the following:

(a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

(b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for the permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

(c) Records of monitoring information shall include:

1. the date, exact place, and time of sampling or measurements;
2. the person responsible for performing the sampling or measurements
3. the date analyses were performed;
4. the person responsible for performing the analyses;
5. the analytical techniques or methods used;
6. the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware the relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

1. The applicant is responsible for retaining a Florida registered professional engineer as the engineer of record in the application for supervision of the construction of this project, and upon completion, the engineer shall inspect the construction for complete conformity to the plans and specifications as approved. Appropriate certification documents [a letter of certification, one (1) set of as-built drawings, a business check or cash for \$ 40.00, copies of pressure test and bacteriological clearance results (when applicable)] shall then be provided to HRS Broward County Public Health Unit (BCPHU).
2. Water system components which come into contact with drinking water shall be certified as being in conformance with ANSI/NSF Standard 61-1995 (Drinking Water System Components).
3. Delete the notes regarding "Additive Alternate" and the 16-inch DI pipe connecting ASR well and the finished water main as shown in red on Sheet C-1 of the engineering plans.
4. Add one (1) 16-inch valve as shown in red on Sheet M-1 of the engineering plans.
5. Revise Sheets E-1 and I-1 to reflect the discussed changes as shown in red.
6. Analyze the native water from the ASR well for primary standards, ammonia as N, total phosphorus as P, BOD, secondary standards, and unregulated organic contaminants for four (4) consecutive quarters and submit the test results to BCPHU.
7. Analyze the recovery stream continuously for conductivity; daily for total and calcium hardness, alkalinity, turbidity, pH, temperature, chloride, color and iron; weekly for sulfate, total nitrate and nitrite, sodium, ammonia as N, total phosphorus as P, TDS, BOD, and H₂S; and monthly for total coliform.
8. Analyze the recharge stream daily for chloride, total and calcium hardness, alkalinity, turbidity, pH, temperature, conductivity, color and iron; weekly for sulfate, total nitrate and nitrite, sodium, ammonia as N, total phosphorus as P, TDS, BOD, and H₂S; and monthly for total coliform.
9. Analyze the water from the monitoring well weekly for chloride, total and calcium hardness, alkalinity, turbidity, pH, temperature, conductivity, color, iron, sulfate, total nitrate and nitrite; sodium, ammonia as N, total phosphorus as P, TDS, BOD, and H₂S; and monthly for total coliform.
10. Submit to BCPHU data on the transmissivity and the water movement (direction and velocity) of the aquifer covering the ASR well and the monitoring well on a quarterly basis.

Rich Rollo

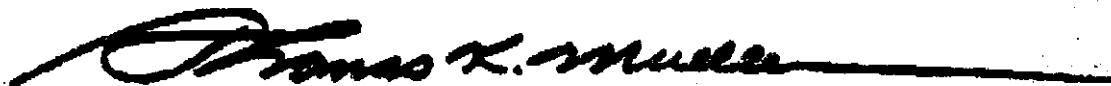
-6-

August 6, 1996

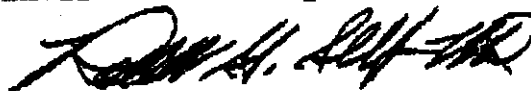
11. Submit to BCPHU daily flow rate data on the recharge and recovery cycles and those in Items 7, 8, and 9 on a monthly basis.
12. The entire recovery stream shall be pumped to the head of the plant and be fully treated along with the raw water from the Biscayne Aquifer.
13. Install an audible alarm to indicate the exceedance of the 100 ppm of chloride or the equivalent conductivity limit on the recovery stream signaling the end of the recovery cycle.
14. Additional tests and requirements may be required as deemed necessary by BCPHU upon further review of submitted data and/or documents. Written approval from BCPHU shall be required before the ASR well can be put into operation on a routine basis.
15. This permit does not indicate a waiver or approval of any permits required by this agency for other aspects of the project.

Executed in Fort Lauderdale, Florida,

HRS Broward County Public Health Unit



Thomas K. Mueller, P.E.
Environmental Engineering Director



Robert G. Self, M.D.
Acting Senior Administrator

TKM/dn

Copies furnished to:

- A. Wayne Welch, P.E., Montgomery Watson
- Alfred Mueller, P.E., DEP
- Gary Back, Engineer III, Broward County Engineering Division
- City of Pompano Beach Building Dept.

8/28/96

Post-It™ brand fax transmittal memo 7871		# of pages	1
To	Anne Murray	From	Bob Leonard
Co.	Montgomery Watson	Co.	DES/EDSD
Dept.		Phone #	831-6969
Fax #	476-9195	Fax #	



STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

NOTICE OF PERMIT ISSUANCE

Broward County - MW (Log #8611)
BCOES - 2A
(BCOES-2A/ASR Demonstration Project)
August 6, 1996

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Rich Rollo, P.E., Director of Env. Engr.
Broward County Office of Environmental Services
2555 W. Copans Road
Pompano Beach, FL 33069

RE: PROJECT NAME: BCOES-2A/ASR Demonstration Project
PROJECT LOCATION: 1390 N.E. 50 Street, Pompano Beach

Dear Mr. Rollo:

Enclosed is Permit Number WC-06-288104 issued pursuant to Chapter 403, F.S.

A person whose substantial interests are affected by this permit may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of Legal Counsel, DHRS/BCPHU, 201 West Broward Boulevard, Suite 513, Fort Lauderdale, FL 33301, within 14 days of receipt of this permit. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The petition shall contain the following information:

- (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

HRS Mission: To work in partnership with local communities to help to be self sufficient, experience good health and live in stable families and communities

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and

(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

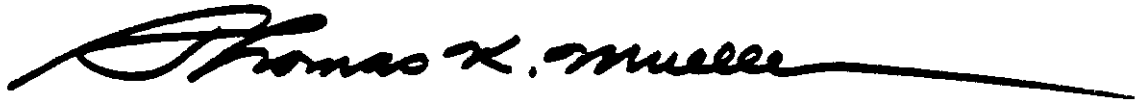
If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this permit. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed must conform to the requirements specified above and be filed (received) within 14 days of receipt of this notice in the Office of Legal Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

This permit is final and effective on the date filed with the Clerk of the Department unless a petition is filed in accordance with the above paragraphs or unless a request for extension of time in which to file a petition is filed within the time specified for filing a petition and conforms to Rule 62-103.070, F.A.C. Upon timely filing of a petition or request for an extension of time, this permit will not be effective until further Order of the Department.

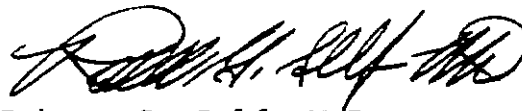
When the Order (Permit) is final, any party to the Order has the right to seek judicial review of the Order pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules and Appellate Procedure, with the Clerk of the Department in the Office of Legal Counsel, DHRS/BCPHU, 201 West Broward Boulevard, Suite 513, Fort Lauderdale, FL 33301, 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 the Final Order is filed with the Clerk of the Department.

Executed in Ft. Lauderdale , Florida,

HRS Broward County Public Health Unit



Thomas K. Mueller, P.E.
Environmental Engineering Director



Robert G. Self, M.D.
Acting Senior Administrator

CERTIFICATE OF SERVICE

This undersigned duly designated deputy agency clerk hereby certifies that this NOTICE OF PERMIT ISSUANCE and all copies are mailed by certified mail before the close of business on August 7, 1996 to listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to Section 120.52(11), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk: Donna L. Dagle Date: August 6, 1996

TKM/dn
Enclosures

Copies furnished to:
A. Wayne Welch, P.E., Montgomery Watson
Alfred Mueller, P.E., DEP
Gary Back, Engineer III, Broward County Engineering Division
City of Pompano Beach Building Dept.

2/17 3/11 3/11

17518

STATE OF FLORIDA
HRS Broward County Public Health Unit
ENVIRONMENTAL ENGINEERING SECTION
 2421 S.W. 6 Avenue
 Ft. Lauderdale, FL 33315

Reference # (Log/Permit)

8611

•• RECEIPT FOR FEES ••

Employee I.D. #

11G

PROJECT NAME ASR Demonstration Project DATE 3/29/96

APPLICANT Montgomery Water UTILITY BC&ES-2A

PUBLIC WATER TREATMENT PLANT FACILITY APPROVAL

CK. NO. 06957

WT1	a.	Exceeds	0.00	MGD - up to and including	0.10 MGD	.....	\$	
WT2	b.	"	0.10	MGD	0.50 MGD	.....	\$	
WT3	c.	"	0.50	MGD	1.00 MGD	.....	\$	
WT4	d.	"	1.00	MGD	2.00 MGD	.....	\$	
WT5	e.	"	2.00	MGD	4.00 MGD	.....	\$	
WT6	f.	"	4.00	MGD	8.00 MGD	.....	\$	
WT7	g.	"	8.00	MGD	20.00 MGD	.....	\$	
WT8	h.	"	20.00	MGD		.....	\$	
<u>WGM</u>	i.	Plant modification - no capacity charge					\$	<u>100.00</u>

WATER STORAGE FACILITY APPROVAL

WS1	a.	Exceeds	0.00	MGD - up to and including	1.00 MGD	.....	\$
WS2	b.	"	1.00	MGD	2.00 MGD	.....	\$
WS3	c.	"	2.00	MGD	3.00 MGD	.....	\$
WS4	d.	"	3.00	MGD	4.00 MGD	.....	\$
WS5	e.	"	4.00	MGD		.....	\$

PUBLIC WATER DISTRIBUTION SYSTEM APPROVAL

DM	a.	Minimum charge				.....	\$
WD1	b.	Mains < 6"	\$0.	X	linear ft.	=	\$	
WD2	c.	Mains 6" to 10"	\$0.	X	linear ft.	=	\$	
WD3	d.	Mains 12" or larger	\$0.	X	linear ft.	=	\$	
WD4	e.	Water project clearance				.....	\$
W05	f.	Resubmittal of plans requiring revision				.....	\$
W10	g.	Review of previously approved plans (revision/renewal)				.....	\$

PRIVATE WATER SYSTEM APPROVAL

PWW	a.	Private water well installation				\$	
-----	----	---------------------------------	--	--	--	-------	----	--

ONSITE SEWAGE TREATMENT AND DISPOSAL SYSTEMS

EHT	a.	Holding tank permit				.....	\$
ESR	b.	Repair permit				.....	\$
ESN	c.	Standard subsurface system				.....	\$
ESP	d.	Prior site evaluation				.....	\$
EDA	e.	Abandoned system				.....	\$
EDS	f.	Single-pump positive dosing system				.....	\$
EDD	g.	Duplex-pump positive dosing system				.....	\$
EDR	h.	Revision due to positive dosing system				.....	\$
EAP	i.	I/M zone annual permit				.....	\$
EAS	j.	Amended sewage permit				.....	\$

SUBDIVISION ANALYSIS AND APPROVAL

EP1	a.	Plats with 5 to 25 building lots				\$	
EP2	b.	"	26 to 50	"	.....	\$	
EP3	c.	"	51 to 75	"	.....	\$	
EP4	d.	"	>75	"	.....	\$	

PUBLIC POOL/BATHING PLACE APPROVAL

SPC	a.	Plan review for original construction				.....	\$
SPR	b.	Plan review for modification/revision				.....	\$
SPI	c.	Issuance of initial operating permit				.....	\$
<u>WMI</u>		Other (specify <u>DEP MINOR MOD.</u>)				.....	\$	<u>300.00</u>

White — CUSTOMER Yellow — ENGINEERING Pink — ACCOUNTING

APPENDIX B

Summary of Construction Activities

Construction Progress Summary
Broward County Office of Environmental Services
Aquifer Storage and Recovery (ASR) Demonstration Project
2A Water Treatment Plant Site

Date	Description of Activities
6/19/96	Preconstruction Conference
7/10/96	Project Initiation (Notice to Proceed)
7/23/96	Vibrate surface casing (40 ft; 24-inch steel) at MW-1 and ASR-1; install 4 pad monitor wells
8/1/96	Pour temporary slab at MW-1.
8/8/96	Set up rig over MW-1 with cranes.
8/8/96	Conduct first sampling of pad monitor wells (PMWs).
8/19/96	Begin mud-rotary drilling with nominal 12-inch bit at MW-1
8/21/96	Complete pilot hole drilling to 430 feet bls.
8/21/96	Conduct geophysical logging of MW-1 pilot hole to 430 feet bls.
8/22/96	Ream pilot hole with 24-inch bit.
8/26/96	Complete reaming and install 14-inch casing to 430 feet bls.
8/27/96	Cement 14-inch casing with 619 sacks of neat cement.
8/28/96	Resume pilot hole drilling with 12-inch bit to 1,000 feet bls.
8/29/96	Conduct geophysical logging of MW-1 pilot hole to 990 feet bls.
8/30/96	Ream 14-inch borehole and install 6-inch casing to 990 feet bls.
8/31/96	Cement 6-inch casing with 625 sacks of neat cement to 990 feet bls.
9/10/96	Conduct 100-psi pressure test of 6-inch casing (1.5 psi drop in 1 hour).
9/11/96	Begin setup of piping/pump system to convey water to 1 MG tank and lift station.
9/16/96	Begin drilling 6-inch pilot hole with reverse-air drilling (open circulation).
9/17/96	Complete pilot hole drilling and begin well development
9/18/96	Complete well development. Set up for pumping test.
9/19/96	Conduct 4-hour pumping test of MW-1 at 525 gpm.
9/24/96	Conduct geophysical logs over open-hole interval at MW-1 to 1,200 feet bls.
10/1/96	Pad monitor wells at ASR well completed and developed.
10/2/96	Sample PMWs and submit to laboratory.
10/3/96	Begin pilot hole drilling (mud-rotary) with 12-1/4-inch bit at ASR-1.
10/9/96	Complete pilot hole to 420 feet bls and conduct geophysical logging.
10/10/96	Ream pilot hole with nominal 36-inch bit to 410 feet bls.
10/11/96	Install and cement 26-inch steel casing to 397 feet bls with 967 sacks neat cement.
10/16/96	Resume pilot hole drilling at ASR well with 12-1/4-inch bit
10/22/96	Complete pilot hole to 1,017 feet bls and conduct geophysical logs
10/23/96	Begin reaming pilot hole to nominal 26-inch diameter to 995 feet bls.
10/25/96	Install 16-inch steel casing to 995 feet bls.
10/26/96	Cement 16-inch casing with 383 sacks neat cement and 743 sacks 4% gel.
10/28/96	Tag cement at 70 feet and tremie grout 116 sacks neat cement to land surface.
11/1/96	Conduct 150-psi pressure test at ASR-1 16-inch casing.
11/12/96	Begin reverse-air drilling with 15-inch bit.
11/13/96	Complete reverse-air drilling to 1,200 feet bpl (TD). Begin air development.
11/14/96	Complete development at 11:00 am and trip out.
11/15/96	Conduct flow logs on open hole. Assemble temp. piping for step test.
11/19/96	Install 14-inch bowl diameter turbine pump for step test.
11/20/96	Conduct step test. Set up data logger/pressure transducers to record background.
11/26/96	Conduct 24-hour constant rate (1,000 gpm) aquifer test.
11/27/96	Record recovery data
12/3/96	Obtain water quality sample at ASR-1 for laboratory analysis.
12/3/96	Conduct final geophysical logs including cement bond log (CBL), caliper, temperature, dual induction, gamma, SP, fluid resistivity, LSN, and video.
12/4/96	Begin demobilization of drill rig and start up of surface facility construction.
3/4/97	Conduct wet tap of 20-inch raw water main and tie into ASR piping.
3/12/97	Obtain water quality sample at MW-1 for laboratory analysis.

APPENDIX C

Weekly Summaries



CH2MHILL

Celebrating
50 Years

CH2M HILL
Hillsboro Executive Center North
300 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

December 12, 1996
103715.A0

Mr. William W. Cocke, P.G.
Program Manager-UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration Project; FDEP File # UC 06-242411; BCOES #1134 ASR

Weekly Summary (November 21 - November 28)

The drilling contractor (Diversified Drilling Corp. [DDC]), conducted the 24-hour constant rate aquifer test on the ASR well. A data logger/pressure transducer system was set up to record background data, test data, and recovery data from MW-1 and ASR-1. A background water quality was obtained and will be analyzed for primary/secondary drinking water standards parameters per the permit.

Upcoming Schedule

DDC will demobilize drilling equipment including drill rig, pumps, temporary piping etc. The temporary concrete pad will be decommissioned. Subcontractors will mobilize January 1997 to construct the surface facilities for the ASR system per the contract documents, which should be completed over the next 4 months. Upon completion, an engineering report, surface facility construction certification, and record drawings will be forwarded to FDEP per the permit. We will switch from weekly to monthly sampling of the pad monitor wells now that well activities are complete-per Mr. Kwiatkowski's conversation with Mr. Bill Cocke/FDEP.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB11776.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



CH2MHILL

50

CH2M HILL
Hillsboro Executive Center North
300 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

November 26, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager - UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration Project; FDEP File # UC 06-242411; BCOES #1134 ASR

Weekly Summary (November 11 - November 15)

The drilling contractor (Diversified Drilling Corp. [DDC]) conducted reverse-air drilling with a 15-inch-diameter bit from base of casing to total depth (1,200 feet bpl). The well was developed to remove fines from the borehole. Conducted flow logs (caliper, temperature, fluid resistivity, and flowmeter) on the open borehole to delineate flow zones.

Schedule for Next Week

Set up temporary piping to convey pumping test waters to the 1 million gallon storage tank.
Set up test pump to conduct step pumping test. Conduct step test.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB/11679.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



MONTGOMERY WATSON

WELL # ASR #1 DAILY SHIFT REPORT

DATE(S): 11-14-96
 HOURS WORKED: 8:00-15:00

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
				X		

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
		X	X	
Temp.	32-60	50-70	70-85	>85
		X	X	
Wind	still	med	high	
		X	X	
Humidity	dry	moderate	humid	Report No.
	X			

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1200
 DRILLER: Joe Schmidt END DEPTH: 1200
 ACTIVITY: Development
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME	DESCRIPTION
------	-------------

0800	Talked w/ Joe Schmidt, development is proceeding.
1000	On site for meeting. Cond 5500. CI 7500, waiting for Pete K.
1100	Pete on site. Development has been terminated. - Progress Mtg.
1330	Talked w/ Pete about details for testing.
1400	Talked w/ Joe Schmidt about logging schedule
1500	Off site



MONTGOMERY WATSON

WELL # ASR #1 DAILY SHIFT REPORT

DATE(S): 11-13-96

HOURS WORKED: 0700 - 1430

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			X			

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast X	rain X	heavy rain
Temp.	32-50	50-70	70-85 Y	>85
Wind	sun	mod	high	
Humidity	dry X	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1170'
 DRILLER: Joe Schmidt END DEPTH: 1200'
 ACTIVITY: Pilot hole - Development
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: Every 10'
 WATER SAMPLES: Every 30'
 TESTING: Static Head - Flow

TIME

DESCRIPTION

0730 - Static head at 1170 22.4', flow @ +1000 gpm
 0830 - Killing Well.
 1000 - Drilling to 1200
 1130 - 1200' CI 3500, Card 5500, Sample is cloudy.
 Begin well development.
 1300 - Pulling off bottom (wiper trip).

Post-it Fax Note	1671	Date	11-11-96	# of pages	2
To	Pat K.	From	Randy S		
City/Dept		Co.			
Phone #		Phone #			
Fax #		Fax #			

Observer's Initials RS



BC ASR #2

Notes

Lith- Description AS2 ZONE Date 11-13-96

1070 - 1070	Limestone, pale white to Very pale Orange/gray, Recrystallized (secondary porosity contains Reducing ^{50%} log tooth) Fossiliferous. Wackestone to pack stone containing Gephyrids, sponges, smaller Forams, coral, and Bryozoa - Secondary porosity includes micro Vug to Vug - moldic - Inter-granular Inter-crystalline, Secondary spar is porous Reducing Granular to well indurated. Contains minor muscit.
	→ Unit Contains Echinoids ←
1030 - 1040	As Above
1040 - 1050	As Above
1050 - 1060	As Above, Fossils Include Forams + Echinoids
1060 - 1070	As Above
1070 - 1080	As Above, Pale white to Grayish Orange
1080 - 1090	As Above
1090 - 1100	Limestone, Very pale Orange to Grayish Orange As Above with 50% Granular poorly indurated Wackestone. 50% Well indurated micrite-Vuggy Wackestone Unit Contains Forams + Echinoids.
1100 - 1110	As Above
1110 - 1120	As Above
1120 - 1130	No Echinoids
1130 - 1140	Orange-Tan micrite to granular, Recrystallized - pack stone, Porosity is Intergranular + Secondary, has been Reduced. Contains Forams + Echinoids.
1140 - 1150	As Above
1150 - 1160	As Above
1160 - 1170	As Above
1170 - 1180	As Above
1180 - 1190	As Above
1190 - 1200	As Above

TD



MONTGOMERY WATSON

WELL # ASR #1 DAILY SHIFT REPORT

DATE(S): 11-12-96

HOURS WORKED: 7:00 - 18:00

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
		X				

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast X	rain	heavy rain
Temp.	32-50	50-70	70-85 X	>85
Wind	still	med X	high	
Humidity	dry X	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner

START DEPTH: 1050'

DRILLER: Joe Schmidt

END DEPTH: 1170'

ACTIVITY: Drill Pilot hole

SUB CONTRACTORS: _____

FORMATION SAMPLES: Every 10'

WATER SAMPLES: Every 30'

TESTING: Head & Flow Every 60'

TIME

DESCRIPTION

- 0700 - Testing Flow & Head at 1050' bpl. Flow is 90gpm, static head @ 24.4'. Water sample is sulfur enriched (black). Cond 5500, CI 3500.
- 1030 - Drilling pilot hole at 1075' bpl. Increased Flow from 90gpm to ~200gpm.
- 1200 - Water Sample @ 1080' bpl - Cond 5500, CI 3500. Increased Flow while drilling from 1080' to 1105'. Stopped drilling to Kill Well.
- 1410 - Sample at 1110', Cond - 5500, CI - 3500. Sample is clean, Flow @ 950gpm. Static Head ~20.5' Aql. - Killing well to drill below 1110'.
- 1630 - Kelly down @ 1140', CI 3500. Cond 5500
- 1800 - Kelly down @ 1170' → well will be brought Alive & Flowed tomorrow

Observer's initials RS

WRTC401W



MONTGOMERY WATSON

WELL # ASL #2 DAILY SHIFT REPORT

DATE(S): 11-11-96
HOURS WORKED: 1530 - 1800

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
	X					

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear X	overcast X	rain	heavy rain
Temp.	32-50	50-70	70-85 X	>85
Wind	still	med X	high	
Humidity	dry X	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: M Randal Skinner START DEPTH: 1020'
 DRILLER: Joe Schmidt END DEPTH: 1050'
 ACTIVITY: Pilot hole
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: Every 10'
 WATER SAMPLES: Every 30'
 TESTING: Static Head - Flow Rate

TIME

DESCRIPTION

1530 - Talked w/ Joe Schmidt, drilling from 1020' shall begin at 1600
 1620 - On site. Not drilling. Still installing new Kelly hose.
 1700 - Drilling from 1020' bpt. Limestone
 1740 - Drilling @ 1040' bit is plugging off in soft formation.
 1800 - Kelly down @ 1050'. Will check Flow & Head in the morning.



CH2MHILL

CH2M HILL

Hillsboro Executive Center North

800 Fairway Drive

Suite 350

Deerfield Beach, FL

33441-1831

Tel 954.426.4008

Fax 954.698.6010

November 20, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager - UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411; BCOES #1134 ASR

Weekly Summary (November 4 - November 8) /

The drilling contractor (Diversified Drilling Corp. [DDC]) completed rigging up for reverse-air drilling and drilled out the cement plug at the base of the casing. Pumped down the 1 million gallon storage tank. Repaired pump and kelley hose.

Schedule for Next Week

Conduct reverse-air drilling with 15-inch-diameter bit from base of casing to total depth (1,200 feet bpl). Conduct flow logs on open borehole.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB/11607.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



MONTGOMERY WATSON

WELL # ASR-1 DAILY SHIFT REPORT

DATE(S): 11-8-96
HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
					X	

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1020
 DRILLER: Joe Schmitt END DEPTH: 1020
 ACTIVITY: Set-up for Reverse Air
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME

DESCRIPTION

*Rig up for Reverse air, circulate hole clean
 Changing out Kelly hose.*



MONTGOMERY WATSON

WELL # ASR #2 DAILY SHIFT REPORT

DATE(S): 11-7-96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
				X		

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear X	overcast X	rain	heavy rain
Temp.	32-50	50-70	70-85 X	>85
Wind	still	med X	high	
Humidity	dry X	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner

START DEPTH: 1010

DRILLER: Joe Schmidt

END DEPTH: 1020

ACTIVITY: Set-up Reverse Air

SUB CONTRACTORS: _____

FORMATION SAMPLES: _____

WATER SAMPLES: _____

TESTING: _____

TIME

DESCRIPTION

Circulating in hole at 1020' BPL. Clean up hole, preparing for Reverse Air



MONTGOMERY WATSON

WELL # ASD #1 DAILY SHIFT REPORT

DATE(S): 11-6-96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
			X			

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast X	rain X	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner

START DEPTH: _____

DRILLER: Joe Schmidt

END DEPTH: _____

ACTIVITY: Drilling out cement

SUB CONTRACTORS: _____

FORMATION SAMPLES: _____

WATER SAMPLES: _____

TESTING: _____

TIME

DESCRIPTION

(Phone conversation)
Drilling out cement, Repairing circulation pump.



MONTGOMERY WATSON

WELL # BC 121 DAILY SHIFT REPORT

DATE(S): 11-5-96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
		X				

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain X	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner

START DEPTH: 1020

DRILLER: Joe Schmidt

END DEPTH: _____

ACTIVITY: _____

SUB CONTRACTORS: _____

FORMATION SAMPLES: _____

WATER SAMPLES: _____

TESTING: _____

TIME

DESCRIPTION

Cement Top at 920', begin drilling cement.



MONTGOMERY WATSON

WELL # ASR #1 DAILY SHIFT REPORT

DATE(S): 11-4-96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
	X					

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner

START DEPTH: _____

DRILLER: Joe Schmidt

END DEPTH: _____

ACTIVITY: _____

SUB CONTRACTORS: _____

FORMATION SAMPLES: _____

WATER SAMPLES: _____

TESTING: _____

TIME

DESCRIPTION

Drillers are preparing to drill pilot hole

→ Valve was left open, allowing mil-gal tank to fill, need to drain tank to drill & test well.



CH2MHILL

50

CH2M HILL
Hillsboro Executive Center North
900 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

November 15, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager - UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411; BCOES #1134 ASR

Weekly Summary (October 28 - November 1)

The drilling contractor (Diversified Drilling Corp. [DDC]) completed cementing of the 16-inch steel casing with neat cement via the tremie method from 70 feet bpl to pad level. The well was allowed to set 24 hours prior to set up for the pressure test. A successful pressure test was conducted on November 1, 1996, as witnessed by Mr. Mark Silverman/FDEP. Cleaned mud pit of cuttings. Rigged up for reverse-air drilling.

Schedule for Next Week

Complete set up for reverse-air drilling and drill out cement plug at base of casing.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB/11606.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC

CASING PRESSURE TEST

Project: BCOES ASR Demonstration Project
Well: Class V ASR Well (16-inch Diameter)
Driller: Diversified Drilling Corp. (Joe Schmidt)
Date: 1-Nov-96
Casing Depth: 995 feet bpl
Witnessed By: Mark Silverman, P.G./FDEP/West Palm Beach
 Peter Kwiatkowski, P.G./CH2M HILL
Remarks: Cement plug at base of casing
Gauge: Ashcroft 200-psi gauge; 0.5 psi increments
Results: 4.81% PASSED

Time	Elapsed Time (min)	Pressure (psi)	Differential (psi)	Comments
9:13 AM	0	150.75	0.00	Start test
9:18 AM	5	150.10	0.65	
9:23 AM	10	149.50	1.25	
9:28 AM	15	148.75	2.00	
9:33 AM	20	148.25	2.50	
9:38 AM	25	147.75	3.00	
9:43 AM	30	147.00	3.75	
9:48 AM	35	146.50	4.25	
9:53 AM	40	146.00	4.75	
9:58 AM	45	145.25	5.50	
10:03 AM	50	144.75	6.00	
10:08 AM	55	144.25	6.50	
10:13 AM	60	143.50	7.25	End test.
10:14 AM		143	0	Bleed off pressure
10:15 AM		108	1 gallon	
10:15 AM		77	1 gallon	
10:16 AM		44	1 gallon	
10:16 AM		12.5	1 gallon	
10:17 AM		0	0.3 gallon	4.3 gallons total



CH2MHILL

CH2M HILL
Hillsboro Executive Center North
300 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

October 31, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager - UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (October 21 – October 26, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) completed pilot hole drilling within the 26-inch casing with a 12-1/4-inch bit with mud circulation to approximately 1,017 feet bls. Conducted geophysical logs. Submitted casing seat request to FDEP for concurrence. Reamed nominal 26-inch hole to approximately 1,000 feet bls. Install 995 feet of 16-inch steel casing. Cemented in place with 4-percent gel and neat cement via pressure grout method.

Schedule for Next Week

Conduct pressure test on 16-inch casing. Clean mud pit of cuttings. Rig up for reverse-air drilling.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB/11516.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



MONTGOMERY WATSON

WELL # ASR-1 DAILY SHIFT REPORT

DATE(S): 10-26-96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
						X

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear X	overcast X	rain X	heavy rain
Temp.	32-50	50-70	70-85 X	>85
Wind	still	med X	high	
Humidity	dry	moderate X	humid	Report No.

SHIFT SUMMARY

OBSERVER: M. Randal Skinner START DEPTH: 1017
 DRILLER: Joe Schmidt - Bob Schmidt END DEPTH: 1017
 ACTIVITY: 16" Casing & Cement
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: Cement Samples

TIME

DESCRIPTION

0000 → Running 16" Casing. Joint # 5 has been put in the Well. (see casing tally for details).
 1200 → at Joint # 19.
 1524 → End Casing Run at 24 joints. Mule shoe @ 995' bpl.
 1630 → Rig up for cement.
 2030 - Start cement
 2130 - End cement. 20S bbls 4 1/2, 86 bbls neat.
 2200 - pulling Trench
 Will tag cement on 10-28-96.

CEMENT PUMPING DATA FOR: BC-ASR #2 16" SHEET 1 OF 1

JOB NUMBER: _____
 DATE: 10-26-96
 START TIME: _____
 STOP TIME: _____
 CEMENT CONTRACTOR: Diversified
 STAGE NUMBER: 1
 DESCRIPTIONS OF OPERATIONS: _____

CEMENT PUMPER: Rambo
 NUMBER OF GAUGES: _____
 INITIAL READINGS: _____
 (HEADER PRESSURE)
 THEORETICAL PRESSURES: _____
 (CEMENT/COLLAPSE)
 GAUGE ELEVATION: _____
 SITE ELEVATION: _____

Time	Total Minutes	Header Pressure	LBS/GAL	BAR/MIN	Total Barrels	Comments
8:34		15		5		4% 4%
8:37	3	10		5.75	20	
8:40	6		14.60			
8:41	7		14.00	6	44	Sample #1
8:47	13	20	14.30	6	82	
8:50	16	50		6	108	
9:00	26			5	153	
9:02	28			4.5		
9:05	31	150		4.7	180	Head Gasket will Fail @ 300 psi
9:09	35				200	Neet @ 205 bbls - 203 bbls
9:12	38	200			220	
9:15	41	212			234	
9:18	44	225	15.30	4.7	252	Sample #2
9:20	46	234			279	
9:24	50	246				
9:26	52	250			285	Shutting down Cement for Safety Reason
9:28	54	250		End →	291	— Going to Flush
			Flush			Slight Returns from 285 to 291 bbls
						+143 + 148 = 291
						Neet @ 205
						≈ 86 bbls Neet
9:30		225	Flush			205 bbls 4%
9:31		270				
9:34	→	290	End			21.5 bbls
						Shutting in well
						4.5 bbls → Trieni
						32 bbls → Plug
						Lack of flush will make a large plug to Drill out.
						Temp log required

OBSERVER: M. Randel Skinner
 PROJECT MANAGER: _____



Casing Tally
 Broward County ASR Demonstration Project

Well: ASR Well
 Depth: 995' feet bls
 Diameter: 24" inch (O.D.)
 Project No.: 103715.A0
 Date: *Down Time*

10-25-96
 10-26-96

Pipe Number	Welding Completed (time)	Centralizer Location (ft from bottom)	Heat Number	Length (feet)	Total Length (feet)
1	10:35 pm	5', 20"	Y69147	42.10'	37.6
2	11:05 pm	40'	A81027	42.05'	79.65
3	11:40 pm	120'	Y69147	42.10'	121.75
4	12:25 pm		Y69147	42.10'	163.85
5	12:55 pm	200'	Y69147	42.10'	205.95
6	1:35 pm		A81027	42.05'	248
7	2:10		A81027	42.05'	290.05
8	2:42	310'	A81027	42.10'	332.15
9	3:37		A81027	42.05'	374.20
10	4:35	415'	A81027	42.10'	416.30
11	5:25		Y69147	42.10'	458.40
12	6:30	500'	Y69147	42.05'	500.45
13	7:25		Y69147	42.10'	542.55
14	8:20		Y69147	42.05'	584.60
15	9:00	620'	Y69147	42.10'	626.70
16	9:50		Y69147	42.10'	668.80
17	10:26	710'	Y69147	42.10'	710.90
18	11:08		Y69147	42.10'	753.00
19	11:48		Y69147	42.10'	795.10
20	12:30	830'	Y69147	42.05'	837.15
21	13:05		A81027	42.05'	879.20
22	13:45	920'	Y69147	42.05'	921.25
23	14:49		Y69147	42.10'	963.35
24	15:24		Y69147	42.05'	1005.4'
25					
26					- 7'
27					- 3'
28					= - 10'
29					
30					1005.4'
31					- 12.0'
32					= 993.4'
33					
34					
35					
36					
37					
38					
39					
40					

- 4.5'
 Substratum
 Stick-up

M. Randol Skinner



MONTGOMERY WATSON

WELL # ASR-1 DAILY SHIFT REPORT

Broward County ASR WELL

DATE(S): 10-25-96
HOURS WORKED: _____

Sun	Mon	Tue	Wed	Thr	Fri	Sat
					X	

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear X	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85 X	>85
Wind	still	med X	high	
Humidity	dry	moderate X	humid	Report No.

SHIFT SUMMARY

OBSERVER: M. Randy Skinner START DEPTH: 1017
 DRILLER: Joe Schmidt - Bob Schmidt END DEPTH: 1017
 ACTIVITY: Ream hole - set casing.
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME

DESCRIPTION

0700 - On site to Run 24" casing in ASR-1. Reaming will not be completed until 10:00 AM
 1000 - Preparing to Trip out of hole. Will Run casing at 1400 hr.
 1400 - Hole is tight on TOOT, Re-reaming to bottom. Run casing at 1900 HR.
 1900 - Tony is broken, waiting for part. Casing Run to start at 2100 HR.
 2200 - picking up first joint of casing. Bob Schmidt. Taking over Drill from Joe Schmidt.
 2400 - 3 Joints in hole. 3 welders on site.
 (see casing tally for Heat #, Weld Times & Depths).



MONTGOMERY WATSON

WELL # ASR-1 DAILY SHIFT REPORT

Broward County ASR WELL

DATE(S): 10-24-96
HOURS WORKED: _____

Sun	Mon	Tue	Wed	Thr	Fri	Sat
				X		

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
		X		
Temp.	32-50	50-70	70-85	>85
			X	
Wind	still	med	high	
		X		
Humidity	dry	moderate	humid	Report No.
		X		

SHIFT SUMMARY

OBSERVER: M. Randal Skinner START DEPTH: 1017
 DRILLER: Joe Schmidt - Bill Schmidt END DEPTH: 1017
 ACTIVITY: Reaming hole.
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME

DESCRIPTION

→ 1500 - update, Reaming at 810' bpl. Talked with Joe Schmidt, will be ready to run casing at 0700/Friday (10-25-96). Reaming through Hard clay is going slow but steady.
 Casing is on site.
 - Drillers are going 24HR a day.



MONTGOMERY WATSON

WELL # ASR-1 DAILY SHIFT REPORT

Broward County ASR WELL

DATE(S): 10-23-96

HOURS WORKED: _____

Sun	Mon	Tue	Wed	Thr	Fri	Sat
			X			

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast X	rain	heavy rain
Temp.	32-50	50-70	70-85 X	>85
Wind	still	med X	high	
Humidity	dry	moderate X	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner

DRILLER: Joe Schmidt - Rubby Schmidt

ACTIVITY: _____

START DEPTH: 1017

END DEPTH: 1017

SUB CONTRACTORS: _____

FORMATION SAMPLES: _____

WATER SAMPLES: _____

TESTING: _____

TIME

DESCRIPTION

1000 Rigging up to Ream pilot hole TD=1000' for ~~2 1/2~~ casing.

Night crew will arrive to drill 24 HR/day tonight, so casing can be set by weekend.



MONTGOMERY WATSON

WELL # ASR-1 DAILY SHIFT REPORT

Broward County ASR WELL

DATE(S): 10-22-96

HOURS WORKED: _____

Sun	Mon	Tue	Wed	Thr	Fri	Sat
		X				

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast X	rain	heavy rain
Temp.	32-50	50-70	70-85 X	>85
Wind	still	med X	high	
Humidity	dry	moderate X	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 900
 DRILLER: Joe Schmidt END DEPTH: 1017
 ACTIVITY: pilot hole
 SUB CONTRACTORS: Greene 10'
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME

DESCRIPTION

0800 On Site Drilling pilot hole from 8:30. Clay is very solid.
 Drilling is going very slow through the lower Hawthorn. Drilling at 15 min/ft.
 1200 - Still Drilling in clay. TR amounts of Limestone. Drilling at 10 min/ft -
 1330 - Increasing Limestone, Drilling rate at 3 min/ft. at 900'.
 Should TD hole by 2:00 pm
 1500 - TD pilot hole at 1017' bpl. Relayed info to pete
 - Logger to be on site at 17:30.



MONTGOMERY WATSON

WELL # AS2-1 DAILY SHIFT REPORT

DATE(S): 10-21-96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
	X					

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast X	rain	heavy rain
Temp.	32-50	50-70	70-85 X	>85
Wind	still	med X	high	
Humidity	dry	moderate X	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 740
 DRILLER: Joe Schmitt END DEPTH: 800
 ACTIVITY: pilot hole
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: Every 10'
 TESTING: _____

TIME

DESCRIPTION

1200 - Drillers on site After Weekend, Tilt from casing. Hole is a little tight in clay. Spinning to bottom.
 1700 - Drilling at 830' bpt. Very slow. Drilling at 15min/ft. Should TD hole tomorrow.



Lithologic Log - BC ASR 2

System 2A

Date 10/22/86

0-10	No Sample
10-20	As Above
20-30	As Above
30-40	Limestone, white to yellowish orange, moderate to well cemented, well indurated, texture is micritic. Appears to be recrystallized. Contains 15% by volume - broken shell material. Moderate density.
40-50	As Above, with 25-35% white, broken shell material.
50-60	As Above
60-70	Limestone, pale white to yellowish orange, orange to translucent. Recrystallized wackestone & packstone. Diagenetic success texture is minimal. Rock is mostly x-ls calcite spar. Well cemented, but cement is secondary. Density is moderate, & grains include shell debris, Forams, & calc sand. Tr amounts of phosphate. Diagenesis is meteoric driven with vadose components & includes porosity evolution & recrystallization. Biotics total 15-25%.
70-80	As Above with Tr amounts of Quartz Sand & silt.
80-90	As Above
90-100	As Above, but mostly pale white. Very little yellowish orange & Biotics total 5-15%, possibly due to chemical destruction.
100-110	As above
110-120	"
120-130	"
130-140	"
140-150	"
150-160	"
160-170	"
170-180	As Above
180-190	Limestone, pale white to light gray. Successive texture. Limestone is sand rich (pack stone) & is recrystallized. Biotics make up 5% of Rock volume and are mostly better. porosity is low & is intra-granular. Contains minor phosphate & is locally micritic.
190-200	As Above



Date _____

200-210	As Above
210-220	As Above
220-230	As Above, but color is light grey to grey
230-240	As Above
240-250	As Above
250-260	As Above
260-270	"
270-280	"
280-290	"
290-300	As Above bionics Enclosed to 15% of total volume
300-310	As Above
310-320	80% of Volume As Above 20% Silty Limestone, olive green to light Green. Calcite cement, moderately cemented. Contains some sand size material & Tr phosphate. Shell material is rare unit is locally clastic based
320-330	As Above but with 30% limestone - 70% Silty Limestone -
330-340	As Above but 10% - 90% -
340-350	Unit is comprised of all green silty limestone. As Above Tr amounts of grey limestone are rounded & are due to contamination in borehole.
350-360	As Above
360-370	"
370-380	"
380-390	" but dominantly clastic based.
390-400	" material is clay based - vs - lime mud based. Montmorillonite
400-410	"
410-420	"
420-430	"
430-440	"
440-450	" Clay is very dry.
450-460	"



Date _____

460-470	As Above
470-480	"
480-490	"
490-500	"
<hr/>	
500-650	As Above. Unit becomes wetter towards bottom, but maintains Mottled like features, & Green color.
650-660	Clay, deforms plastically, olive green to light green. Contains minor amount of above, clay stone, no fossils, no porosity
660-670	As Above
670-680	"
680-690	"
690-700	"
<hr/>	
700-800	As Above
<hr/>	
800-810	As Above
810-820	"
820-830	"
830-840	"
840-850	95% As Above 5% Limestone to silty limestone, medium to dark grey, also porosity. Chalky texture, poor cementation, no fossils.
850-860	As Above
860-870	As Above
870-880	As Above with 70% clay 30% Limestone
880-890	50% / 50%
890-900	25% clay 75% Limestone. Tan to green, phosphate rich, containing "few" brachiopods including shell debris & brachiopods. Porosity is low, poorly indicated, cement is reduced. Texture is granular to silty.
900-910	As Above



Notes

Date _____

910 - 920 As Above

920 - 930 As Above

930 - 940 As Above with 15% clay
85% Limestone Increase in biotica & porosity

940 - 950 As Above

950 - 960 Limestone, pale white to light grey, Recrystallized, micritic limestone to pinkish porosity is common - as Intergranular, Interparticle, & moldic. Density is dominantly secondary. Well Indurated locally. Contains coarse grained cement, & Indilling (possibly Reducing colloid). biotica include Reef fauna (Ctenophora, Gastropoda, bryozoa, & smaller forams).

960 - 970 As Above

970 - 980 As Above

980 - 990 "

990 - 1000 "

1000 - 1010 "

1010 - 1017 "

TD of Borehole

CH2M HILL
Hillsboro Executive Center North
800 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010



CH2MHILL

*Celebrating
50 Years*

October 29, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager-UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (October 14–October 18, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) resumed pilot hole drilling within the 26-inch casing with a 12-1/4-inch bit with mud circulation.

Schedule for Next Week

Complete pilot hole to approximately 1,000 feet bls. Conduct geophysical logs. Submit casing seat request to FDEP for concurrence. Ream nominal 26-inch hole to approximately 1,000 feet bls. Install approximately 1,000 feet of 16-inch steel casing. Cement in place with neat cement via pressure grout method.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB11499.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



CH2MHILL

*Celebrating
50 Years*

CH2M HILL

Hillsboro Executive Center North

800 Fairway Drive

Suite 350

Deerfield Beach, FL

33441-1831

Tel 954.426.4008

Fax 954.698.6010

October 16, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager-UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (October 7 – October 11, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) conducted pilot hole drilling to approximately 430 feet bls. Conducted geophysical logs on the mudded borehole. Reamed pilot hole to a nominal 35 inches to 400 feet bls. Installed approximately 400 feet of 26-inch-diameter steel casing. Cemented in place with neat cement via pressure grout method.

Schedule for Next Week

Resume pilot hole drilling within 26-inch casing with 12-1/4-inch bit with mud circulation to approximately 1,000 feet bls. Conduct geophysical logs. Submit casing seat request to FDEP for concurrence.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB11419.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



DAILY OPERATIONS REPORT

Project No. 103715.A Date 10-11-96

Client BROWARD COUNTY ASB DEMONSTRATION PROJECT

Contractor DIVERSIFIED DRILLING

Well No. ASR-1

Weather <u>PARTLY CLOUDY, ≈ 85°F</u>	Time	Description of Operations
Shift No. <u>1</u> Time <u>0700-1900</u>	0800	M. SCHILLING ARRIVES AT THE SITE. THE CON-TRACTOR IS IN THE PROCESS OF TRIPPING THE 33-INCH BIT FROM THE BOREHOLE AFTER REACHING A TOTAL DEPTH OF 40 ¹⁰ / ₄ FEET B.P.L. DURING THE PREVIOUS NIGHT SHIFT.
Driller <u>JOE SCHMIDT</u>	0915	DRILL BIT REMOVED FROM BOREHOLE. THE CONTRACTOR STARTS PREPARING TO INSTALL THE 26-INCH CASING.
Activity <u>INSTALLING 26" CASING</u>	1000	START 26-INCH CASING INSTALLATION.
Starting Depth <u>PAD LEVEL</u>	1735	26-INCH CASING INSTALLATION IS COMPLETED. THE TOTAL DEPTH OF THE CASING IS 397 FEET B.P.L.
Shift No. _____ Time _____		THE CONTRACTOR STARTS PREPARING TO CEMENT THE 26-INCH CASING IN PLACE.
Driller _____	2030	START CEMENTING OF THE 26-INCH CASING.
Activity _____	2135	CEMENTING COMPLETED WITH CEMENT RETURNS AT LADD SURFACE.
Starting Depth _____	2145	M. SCHILLING LEAVES THE SITE. THE CONTRACTOR WILL FINISH TRIPPING OUT THE TREMIE PIPE AND THEN LEAVE THE SITE FOR THE WEEKEND.
Formation samples collected _____		
Water samples collected _____		
Deviation Survey _____		
Drilling fluid additives _____		
Well water level		
Time	Depth	
Measurement reference point _____		
elevation _____		
Supply deliveries _____		



DAILY OPERATIONS REPORT

Project No. 103715 AQ Date 10-9-96

Client BROWARD COUNTY ASR

Contractor DIVERSIFIED DRILLING

Well No. ASR-1

Weather <u>PARTLY CLOUDY = 85°F</u>	Time	Description of Operations
Shift No. <u>1</u> Time <u>0700-1900</u>	1145	P. KWIAKOWSKI ARRIVES ON SITE FOR A PROGRESS MEETING (SEE MEETING MINUTES). THE CONTRACTOR IS IN THE PROCESS OF DRILLING THE PILOT HOLE USING A 12.25-INCH. THE CURRENT DEPTH IS 270 FEET B.P.L.
Driller <u>JOE SCHMIDT</u>		
Activity <u>DRILLING PILOT HOLE; GEOPHYSICAL LOGGING</u>		
Starting Depth _____		
Shift No. <u>2</u> Time <u>1900-0700</u>	1345	P. KWIAKOWSKI LEAVES THE SITE. PILOT HOLE DRILLING CONTINUES WITH THE CURRENT DEPTH AT ³¹⁰ FEET B.P.L.
Driller <u>BOBBY SCHMIDT</u>		
Activity <u>REAMING PILOT HOLE</u>	1730	M. SCHILLING ARRIVES ON SITE WITH THE CHAM HILL GEOPHYSICAL LOGGING EQUIPMENT TO CONDUCT LOGGING ON THE PILOT HOLE. THE CONTRACTOR HAS COMPLETED DRILLING TO A DEPTH OF 430 FEET B.P.L. START GEOPHYSICAL LOGGING. THE LOGS TO BE CONDUCTED ARE THE CALIPER, GAMMA RAY, AND LONG & SHORT NORMAL ELECTRIC.
Starting Depth <u>35 FEET B.P.L.</u>	2030	GEOPHYSICAL LOGGING SUCCESSFULLY COMPLETED. THE CONTRACTOR STARTS PREPARING TO REAM THE PILOT HOLE TO A NOMINAL 34-INCH BOREHOLE.
Formation samples collected _____	2100	M. SCHILLING OFFSITE. THE CONTRACTOR IS STILL SETTING UP TO START REAMING. HE WILL WORK A SECOND SHIFT TONIGHT AND WILL START REAMING WHEN ALL PREPARATIONS ARE COMPLETED.
Water samples collected _____		
Deviation Survey _____		
Drilling fluid additives _____		
Well water level		
Time	Depth	
Measurement reference point _____		
elevation _____		
Supply deliveries _____		

RESIDENT - MARK SCHILLING
M.S. Schilling



DAILY OPERATIONS REPORT

Project No. 103715.A0 Date 10-7-96

Client BROWARD COUNTY ASR

Contractor DIVERSIFIED DRILLING

Well No. ASR-1

Weather <u>Partly Cloudy, BREEZY, = 90°F</u>	Time	Description of Operations
Shift No. <u>1</u> Time <u>0700-1900</u>	1500-	M. SCHILLING ARRIVES ON SITE. THE CONTRACTOR IS CURRENTLY DRILLING THE PILOT HOLE USING A 12.25" WGH BIT. THE CURRENT DEPTH OF THE PILOT HOLE IS 150 FEET B.P.L. J. SCHMIDT HAS STATED THAT HE IS EXPERIENCING SOME DIFFICULTY IN GETTING THE CUTTINGS OUT OF THE BOREHOLE DUE TO THE LOSS OF VELOCITY IN THE SURFACE CASING. DRILLING IS SLOWER DUE TO THIS.
Driller <u>JOE SCHMIDT</u>		
Activity <u>DRILLING PILOT HOLE</u>		
Starting Depth <u>90 FEET B.P.L.</u>		
Shift No. _____ Time _____	1540-	M. SCHILLING OFFSITE
Driller _____		
Activity _____		
Starting Depth _____		
Formation samples collected _____		
Water samples collected _____		
Deviation Survey _____		
Drilling fluid additives _____		
Well water level		
Time _____ Depth _____		
Measurement reference point _____		
elevation _____		
Supply deliveries _____		

RESIDENT - MARK SCHILLING
M. Schilling

Casing Tally

Broward County ASR Demonstration Project

Well: ASR Well

Depth: 597.0 feet bls

Diameter: 26 inch (O.D.)

Project No.: 103715.A0

Date: 10-11-96

CASING INSTALLATION START TIME: 10:00

CASING INSTALLATION RESUMPTION TIME: 17:25

Pipe Number	Welding Completed (time)	Centralizer Location (ft from bottom)	Heat Number	Length (feet)	Total Length (feet)
1	1045	5,2040	078080	40.1	40.1
2	1135		078080	40.0	80.1
3	1213	100	078082	40.0	120.1
4	1250		078082	40.0	160.1
5	1345	200	078080	40.0	200.1
6	1425		078080	39.9	240.0
7	1510		078080	40.0	280.0
8	1545	300	078082	40.0	320.0
9	1630		078080	40.0	360.0
10			078080	40.1	400.1
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

CEMENT RUN

BROWARD COUNTY ASR DEMONSTRATION PROJECT

WELL: ASR WELL

PROJECT NO: 103715.AX

DATE: 10-11-96

Cementing of 26-inch CASING

Time	TOTAL min	HEADER PRESSURE (psi)	WEIGHT OF CEMENT (lbs/gal)	RATE OF PUMPING (BBL/min)	TOTAL BBLs	COMMENTS
2035	0					TRENCH SET AT 346 FEET B.P.L
2038	3					START FLUSHING WITH H ₂ O
2041	6					STOP FLUSHING. 10 BBLs PUMP
2043	8		15	≈ 3		START PUMPING CEMENT
2046	11	∅	-	= 3	14	
2048	13	∅	15.2	-	40	
2051	16	∅	-	≈ 5	65	
2056	21	5	15.4	5	90	
2101	26	13	-	5		
2103	28	19	-	-		
2104	29	-	15.1	-		
2105	30	25	-	-		
2106	31	35	-	4	110	
2110	35	40	-	-		
2111	36	-	15.1	5	135	
2112	37	45	-	-		
2114	39	50	-	-		
2116	41	60	-	≈ 5	162	
2118	43	65	15.4	-		
2121	46	65	-	-		
2122	47				20	START SEEING HEAVIER MUD IN RETURNS AT SURFACE
2124	49				200	START SEEING SMALL TRACES C
2126	51	80	15.2		217	STOP PUMPING CEMENT SWITCH TO CHASE w/ H ₂ O
2132		90				STOP CHASING 21 BBLs OF H ₂ O PUMPED



CH2MHILL

*Celebrating
50 Years*

CH2M HILL
Hillsboro Executive Center North
800 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

October 16, 1996
103715.A0

Mr. William W. Cocke, P.G.
Program Manager - UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (September 30 – October 4, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) installed, developed, and sampled four pad monitor wells at the ASR well site. Completed setup of equipment and begin pilot hole drilling with 12-1/4-inch bit with mud circulation at the ASR well.

Per General Condition 16(c) of the construction permit, this letter also serves to notify FDEP that remedial measures of the northeast pad monitor well at MW-1 have been completed. Water quality per the attached table demonstrates that water quality has returned to background levels.

Schedule for Next Week

Conduct pilot hole drilling to approximately 400 feet bls. Conduct geophysical logs on the mudded borehole. Ream pilot to nominal 35 inches and install approximately 400 feet of 26-inch-diameter steel casing. Cement in place with neat cement via pressure grout method.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB/11406.DOC
Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



CH2MHILL

*Celebrating
50 Years*

CH2M HILL
Hillsboro Executive Center North
800 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

October 10, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager - UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (September 23 - 27, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) conducted geophysical logs of the open-hole interval of MW-1 to evaluate production horizons. DDC disassembled temporary piping to 1 million gallon storage tank. Mobilized drilling rig from MW-1 to the ASR well site. Constructed concrete-block walls on ASR well pad and mobilized other drilling equipment. Removed cuttings from monitor well pad.

Remedial measures were implemented on the northeast pad monitor well. These included purging of water and conveyance to the 1 million gallon storage tank for disposal. Water quality samples were obtained on 9/24/96 and indicate lower conductivity levels consistent with remediation.

Schedule for Next Week

Install, develop, and sample pad monitor wells at ASR well site. Complete setup of equipment and begin pilot hole drilling at ASR well.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB11362.DOC
Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



CH2MHILL

*Celebrating
50 Years*

CH2M HILL
Hillsboro Executive Center North
800 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

October 2, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager - UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; ASR Well.

This letter serves to notify FDEP that drilling is scheduled to begin on Wednesday, October 2, 1996 at the ASR well at the subject site. Previously, FDEP has been notified regarding drilling commencement for the project monitor well, associated pad monitor wells, as well as documentation for the approved disposal site for drill cuttings.


A temporary concrete pad has been constructed at the ASR well site to contain drill cuttings and fluids. Also, four shallow pad monitor wells have been constructed at the corners of the pad for the required weekly monitoring during construction. Water quality samples have been obtained, and we are awaiting results from the laboratory. We will provide this information upon receipt from the laboratory.

Due to the documented increase in conductivity from the northeast pad monitor well at the MW-1 drilling site (MWNE), we will continue to sample this well until background readings are obtained.

Please call me at (561) 737-6665 if you have any questions.

Sincerely,

CH2M HILL


Peter J. Kwiatkowski, P.G.
Project Manager

DFB/11317.DOC
Enclosures

c: Anne Murray/Montgomery Watson
Members of the TAC

CH2M HILL
Hillsboro Executive Center North
800 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010



CH2MHILL

*Celebrating
50 Years*

September 25, 1996
103715.A0

Mr. William W. Cocke, P.G.
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (September 16 -- 20, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) conducted reverse-air drilling (open-hole circulation) in the Floridan Aquifer System from the base of casing to 1,200 feet at MW-1. MW-1 was developed to remove cuttings, fines etc. A 4-hour, constant-rate pumping test was conducted to estimate specific capacity of the formation. All flows were conveyed to the onsite 1-million-gallon storage tank and thence to the onsite lift station for disposal. A temporary concrete drilling pad was constructed for drilling at the ASR well.

Pad monitor well water quality data was reviewed upon receipt from the laboratory on September 24, 1996. It was observed that the Northeast (NE) pad monitor well exhibited elevated conductivity of approximately 1,000 umhos/cm. This is above the approximately 500 umhos/cm value exhibited as a background concentration. The source of this increase in conductivity was traced to pinholes observed in the mortar of the concrete block walls of the temporary pad. The other 3-pad monitor wells exhibit normal water quality and appear unaffected.

Mr. Mark Silverman/FDEP was notified via telephone of this occurrence on September 24, 1996, at approximately 4:00 p.m. Remedial measures have been implemented and include purging of the pad monitor well until background water quality is obtained.

Schedule for Next Week

Conduct geophysical logs of the open-hole interval of MW-1 to evaluate production horizons.
Disassemble temporary piping. Mobilize drilling rig from MW-1 to the ASR well site.
Construct concrete-block walls on ASR well pad and mobilize other drilling equipment.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB11278.DOC
Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



MONTGOMERY WATSON

WELL # Mon 2 DAILY SHIFT REPORT

DATE(S): 9-16-96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
	X					

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner

START DEPTH: 1025'

DRILLER: Jim Schmidt

END DEPTH: 1075'

ACTIVITY: D. let hole

SUB CONTRACTORS: _____

FORMATION SAMPLES: Even 10'

WATER SAMPLES: Even 30'

TESTING: Head Pressure edge 60'

TIME

DESCRIPTION

1500 - On site. As-per Driller's instructions. Drillers are preparing to go into hole.
 1600 - Circulating on bottom cleaning hole.
 1700 - Drilling from 1025'. First Echinoids in cuttings. Top of Corals.
 1800 - Drilling @ 1040'. White/tan limestone, forams + corals.
 1830 - Kelly down @ 1050'. Circulating.
 1835 - Well flows @ 50 gpm (40' above pad). with a head of 44.5" above pad.
 - closed in. Static = 21.05"
 1900 - Off site.

WRTC401W

Observer's initials RSK



WELL # M-1070 DAILY SHIFT REPORT

DATE(S): 5-17-86
HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
		X				

BID PACKAGE: _____
CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1070'
 DRILLER: Joe Schmitt END DEPTH: _____
 ACTIVITY: DIR L-12
 SUB CONTRACTORS: _____
 INFORMATION SAMPLES: Every 10'
 WATER SAMPLES: Every 20'
 TESTING: Every 60' - pressure & head

TIME	DESCRIPTION
------	-------------

0730	on site. Drillers are preparing to drill from 1070'
0735	Kelly down @ 1080'. Taking Water Sample.
0820	Resume Drilling from 1080'
	2-3 min/Ft. Very smooth. Well is making more work. Tan limestone. Formations.
0930	Kelly down @ 1110'. Static head \approx 22.15" (increase of 1"). Well flows at 125 gpm with 6' of head (Flowing at 40")
1000	Drilling from 1120'
1100	Kelly down @ 1140' Taking Water Sample.
1100	Drilling from 1140'
1200	Kelly down @ 1170' Taking Water Sample. Static Head \approx 21.9", Flow is @ 125 gpm w/ 6' of head
145	Drilling from 1170'

WH7C401W

Observer's initials RS

1336 - Tol hole @ 1200'

1400 - Date K. on site to confirm final depth.

- Final head @ $\approx 22.7'$

- Drillers have been instructed to begin development.

1600 - Date ~~of~~ Site

- Development began @ 1600 H12

1645 - ~~of~~ Site.



WELL # Monitor DAILY SHIFT REPORT

DATE(S): 9-18-96
HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
			X			

BID PACKAGE: _____
CONTRACTOR: _____

Weather	<u>clear</u>	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	<u>>85</u>
Wind	<u>still</u>	med	high	
Humidity	dry	<u>moderate</u>	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1200'
 DRILLER: Joe Schmidt END DEPTH: 1200
 ACTIVITY: Development
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: Water sample for Background
 TESTING: _____

TIME

DESCRIPTION

0900 - On site to check development
 0930 - Water appears to be free of particulate material.
 1000 - Talked to Pete K., End Development, Drillers are preparing for
 Pump Test tomorrow
 1100 - off site.



WELL # Monitor DAILY SHIFT REPORT

DATE(S): 9-19-96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
				X		

BID PACKAGE: _____

CONTRACTOR: _____

Weather	<u>clear</u>	<u>overcast</u>	rain	heavy rain
Temp.	32-50	50-70	70-85	<u>>85</u>
Wind	<u>still</u>	<u>med</u>	high	
Humidity	dry	<u>moderate</u>	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1200'
 DRILLER: Joe Schmidt END DEPTH: 1200'
 ACTIVITY: Pump Test
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: At End of Test
 TESTING: _____

TIME	DESCRIPTION
------	-------------

0800	On site for Test
0945	Start Test. Static head @ 20.10 <u>20.10 1/2"</u> Well flows @ 300 gpm. pumping @ 540 gpm. Draw down to 9.3' TOC.
1100	Test is going fine, draw down @ 9.83'
345	End Test, Specific capacity \approx 540 gal / <u>27'</u> = 19.8' / gal.
130	Recovered Water level - <u>20.6"</u>
100	Off site.



CH2MHILL

5/2/96

CH2M HILL
Hillsboro Executive Center North
800 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

September 18 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager-UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (September 9-13, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) completed rigging up for reverse-air drilling. Conducted a casing pressure test (100 psi) for one hour on the 6-inch casing of MW-1. FDEP was notified of the test but did not witness it. Also, DDC constructed a 6-inch temporary pipeline to convey brackish water to the 1 million gallon above-ground storage tank and thence to the onsite lift station for disposal.

Schedule for Next Week

Conduct reverse-air drilling in the Floridan Aquifer-System from the base of casing to 1,200 feet. Develop the well and conduct a short-term pumping test. Conduct geophysical logs of the open-hole interval.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB11212.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



MONTGOMERY WATSON

WELL # Monitor DAILY SHIFT REPORT

DATE(S): 9/9/96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
	X					

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	<u>overcast</u>	rain	heavy rain
Temp.	32-50	50-70	70-85	<u>>85</u>
Wind	<u>still</u>	<u>med</u>	high	
Humidity	dry	<u>moderate</u>	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: -
 DRILLER: Joe Schmidt END DEPTH: -
 ACTIVITY: Construction Mtg - Prelim Pressure Test
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME

DESCRIPTION

1330 - On site. Construction mtg scheduled for 1400.
 1400 - Construction mtg.
 - Ann Murray
 - Stuart Anderson
 - Pete K.
 - Randy Skinner.
 Discussion of Reverse Air drilling, testing & development.
 1500 - End Mtg.
 - Waiting on preliminary pressure test
 1620 - Start Test
 1720 - End Test, 4.1 psi in 1 hr @ 100 psi to start
 - Will run official test @ 0900, off site

WRTC401W

Observer's initials msj



MONTGOMERY WATSON

WELL # Monitor PRESSURE TEST DATA

Broward County

ASR Monitor Well

Date: _____

9/10/96

BID PACKAGE 95-68

CONTRACTOR: Diversified Drilling

PROJECT MANAGER: Anne Murray

COUNTY: Broward

OWNER: Broward County

START TIME: 9:00

FINISH TIME: 10:00

DESCRIPTION OF OPERATIONS: 6" casing pressure

test

INITIAL READINGS: 100 psi

(HEADER PRESSURE)

TIME	TOTAL MINUTES	HEADER PRESSURE	COMMENTS
9:00	0	100 psi	
9:01	1	100 psi	
9:02	2	100 psi	
9:03	3	100 psi	
9:04	4	100 psi	
9:05	5	100 psi	
9:06	6	100 psi	
9:07	7	100 psi	
9:08	8	100 psi	
9:09	9	100 psi	
9:10	10	100 psi	
9:11	11	100 psi	
9:12	12	100 psi	
9:13	13	100 psi	
9:14	14	100 psi	
9:15	15	100 psi	
9:16	16	99.75 psi	
9:17	17	99.75 psi	
9:18	18	99.75 psi	
9:19	19	99.75 psi	
9:20	20	99.75 psi	
9:21	21	99.75 psi	
9:22	22	99.75 psi	
9:23	23	99.75 psi	
9:24	24	99.75 psi	
9:25	25	99.75 psi	
9:26	26	99.75 psi	
9:27	27	99.5 psi	
9:28	28	99.5 psi	
9:29	29	99.5 psi	
9:30	30	99.5 psi	

TIME	TOTAL MINUTES	HEADER PRESSURE	COMMENTS
9:31	31	99.5 psi	
9:32	32	99.5 psi	
9:33	33	99.5 psi	
9:34	34	99.5 psi	
9:35	35	99.25 psi	
9:36	36	99.25 psi	
9:37	37	99.25 psi	
9:38	38	99.25 psi	
9:39	39	99.25 psi	
9:40	40	99.25 psi	
9:41	41	99.25 psi	
9:42	42	99.25 psi	
9:43	43	99.25 psi	
9:44	44	99.25 psi	
9:45	45	99.25 psi	
9:46	46	99.25 psi	
9:47	47	99.25 psi	
9:48	48	99.0 psi	
9:49	49	99.0 psi	
9:50	50	99.0 psi	
9:51	51	99.0 psi	
9:52	52	99.0 psi	
9:53	53	99.0 psi	
9:54	54	99.0 psi	
9:55	55	99.0 psi	
9:56	56	98.75 psi	
9:57	57	98.75 psi	
9:58	58	98.75 psi	
9:59	59	98.75 psi	
10:00	60	98.75 psi	

Certified By: *M. Randal Skinner*
 M. Randal Skinner

Pressure Decrease: 1.25 psi



MONTGOMERY WATSON

WELL # Monitor DAILY SHIFT REPORT

DATE(S): 9/10/96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
		X				

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: —
 DRILLER: Joe Schmidt END DEPTH: —
 ACTIVITY: 6" Pressure Test
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: Casing pressure test

TIME

DESCRIPTION

0800 - On site for pressure test. Casing is @ 104 psi, & has been losing 1-2 psi/hr.
 - Called Pete K. D.E.P. has been notified of test, we will wait until 0900 to start test.
 0900 - Starting pressure test.
 1000 - End Test. loss of 1.5 psi in 1hr
 1020 - Drillers will be ready to drill on Thursday
 - off site



MONTGOMERY WATSON

WELL # Monitor DAILY SHIFT REPORT

DATE(S): 9/11/96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
			X			

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: _____
 DRILLER: Joe Schmidt END DEPTH: _____
 ACTIVITY: Work on Rig
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME

DESCRIPTION

- No Observer on site.
- Driller is changing over to reverse air.
- No drilling activity.



MONTGOMERY WATSON

WELL # Monitor DAILY SHIFT REPORT

DATE(S): 9/12/96
HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
				X		

BID PACKAGE: _____
CONTRACTOR: _____

Weather	clear	<u>overcast</u>	rain	heavy rain
Temp.	32-50	50-70	70-85	<u>>85</u>
Wind	still	<u>med</u>	high	
Humidity	dry	<u>moderate</u>	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1000'
 DRILLER: Joe Schmidt END DEPTH: 1025'
 ACTIVITY: Pilot hole
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: Every 10'
 WATER SAMPLES: Every 30'
 TESTING: Head pressure

TIME	DESCRIPTION
------	-------------

1500	- On site, Starter is still not on site. Waiting for replacement
1600	- Rob Dennis (MW) on site. - Still waiting on starter
1635	- Starter on site. it will be 1800 hr before drilling can resume. - Will start drilling in the morning. Driller is going to repair drill & Proceed from cement plug to 1025' to try to flow well. Will drill from 1025' in the morning.
1640	- off site.

WRTC401W

Observer's initials RS



MONTGOMERY WATSON

WELL # Monitor DAILY SHIFT REPORT

DATE(S): 9/13/96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
					X	

BID PACKAGE: _____

CONTRACTOR: _____

Weather	<u>clear</u>	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	<u>>85</u>
Wind	<u>still</u>	med	high	
Humidity	dry	<u>moderate</u>	humid	Report No.

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1025
 DRILLER: Joe Schmidt END DEPTH: _____
 ACTIVITY: Drill out monitor zone.
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: Every 10'
 WATER SAMPLES: Every Kelly down.
 TESTING: Head pressure test.

TIME

DESCRIPTION

- 0700 - On site, Preparing to Drill reverse air from 1025'. Well flows @ ≈ 25 gpm
- 0730 - Air Compressor broken, Down for Repair
- 1000 - New Air Compressor on site, preparing to Drill.
- 1040 - Problem with air line, Rig is down again.
- 1100 - Drillers are looking for new air line.
- 1245 - New air line on site. Preparing to drill from 1025'
- 1345 - Drill bit is plugged off. Trying to open drill pipe.
- 1415 - Unable to open drill pipe, - TOOK
- 1530 - Still work off site

WRTC401W

Observer's initials RS

CH2M HILL
Hillsboro Executive Center North
800 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010



CH2MHILL

September 16, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager - UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (September 2 - 6, 1996)

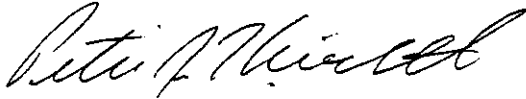
The drilling contractor, Diversified Drilling Corp. (DDC), rigged up for reverse-air drilling (i.e., exchanged drill rods and bit, mobilized frac tank and air compressor, etc.) during this short week following Labor Day weekend. Notified FDEP of pending pressure test on 6-inch casing of MW-1.

Schedule for Next Week

Conduct casing pressure test on 6-inch casing. Also, construct 6-inch temporary pipeline to convey brackish water to the 1 million gallon above-ground storage tank and thence to the onsite lift station for disposal.

Sincerely,

CH2M HILL



Peter J. Kwiatkowski, P.G.
Project Manager

DFB/11185.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



CH2MHILL

*Celebrating
50 Years*

CH2M HILL
Hillsboro Executive Center North
800 Fairway Drive
Suite 350
Deerfield Beach, FL
33441-1831
Tel 954.426.4008
Fax 954.698.6010

September 4, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager-UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (August 23-30, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) continued pilot hole drilling at the monitor well (MW-1) on August 23, 1996. The 12-inch pilot hole was extended with mud-rotary drilling to 1,000 feet below land surface (bls). Geophysical logs (caliper, gamma, LSN) were conducted on the pilot hole. The borehole was reamed to 13-inches. Casing seat was approved by the TAC on August 30, 1996. Approximately 990 feet of 14-inch casing was cemented in place with neat cement (625 sacks) to land surface.

Schedule for Next Week

Rig up for reverse-air drilling and conduct casing pressure test on 6-inch casing.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB11127.DOC
Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC



MWS

Lithologic Description

MW-1; BCOES ASR

Notes

Date 8/23/46

- Identification: This unit is composed of undifferentiated Pleistocene sediments (Tanner Equivalent).

Interval: 410' - 440' No Recovery

Interval: 440' - 550'

- Description: Limy mudstone (Tennessee). Light olive green, partly indurated, mic. bedded, calcite cemented clay. Few fossils including *Planorbis* & *Gastropoda*. Calcite (common) has possible diagenetic origin. Unit contains 5% - 10% (grey/tau) white limestone interbedded or contaminated from above. Clay appears to be Kaolinitic to Montmorillonitic (possible Si-dilling clay).
- Identification: Upper Peace River (Hawthorn) interval.

Interval: 550' - 700'

- Description: Yellowish to Gray to Olive clay. Plastic, contains trace amounts of white chalky limestone. No fossils visible. Clay is nodular & sticky in cuttings appearing as typical Peace River form. No discoloration.
- Identification: Peace River formation (Upper Hawthorn)

Interval: 700' - 900'

- Description: Green Gray to Light/Dark Olive clay. Plastic contains up to 35% limestone, locally abundant. No fossils visible. Clay is nodular & sticky in cuttings. Limestone is soft, near white & non-descript.
- Identification: Arcadia formation (Lower Hawthorn). distinguished from the Peace River by the marked increase in limestone.

Interval: 900' - 1000' (TD)

- Description: White to medium gray limestone. Highly indurated, including fossiliferous packstones & blockstones. Bio-clasts are locally represented as mudstone matrix, & total porosity varies



Handwritten initials

10/28

Notes

_____ Date 8/28/00

from low to high locally. Diagenetically the rock has experienced dissolution, Recrystallization, & cementation. Iron cements are common (dog tooth). Bioclasts include small - forams, Platyrota, Saccinella, & Crinoids. Forams Ret. // w- fine size material.

- Identification: Sunjanee Limestone.



MONTGOMERY WATSON

WELL # Monitor DAILY SHIFT REPORT

DATE(S): 8/26/96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat

BID PACKAGE: _____

CONTRACTOR: Nixesified

Weather	<u>clear</u>	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	<u>>85</u>
Wind	<u>still</u>	med	high	
Humidity	dry	moderate	<u>humid</u>	Report No. 0

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: _____
 DRILLER: Bob Schmidt END DEPTH: _____
 ACTIVITY: Pilot hole.
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: Every 10'
 WATER SAMPLES: _____
 TESTING: _____

TIME

DESCRIPTION

- Drillers were on-site by 10:00 am. Mixed mud & Tripped into hole to drill out cement plug. & start pilot hole to 1000'.
- Drillers are to inform Randy Skinner of progress, so he can be on site for all drilling below 800'. This depth will not be reached until tomorrow

COPY
 Observer's initials ms

wRTC401W



MONTGOMERY WATSON

WELL # MW-1 DAILY SHIFT REPORT

DATE(S): 8/27/96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
		X				

BID PACKAGE: _____

CONTRACTOR: Divers Eied

Weather	<u>clear</u>	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	<u>>85</u>
Wind	<u>still</u>	mod	high	
Humidity	dry	<u>moderate</u>	humid	Report No. <u>1</u>

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: _____
 DRILLER: Bob Schmidt END DEPTH: 840'
 ACTIVITY: Pilot hole
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: Every 10'
 WATER SAMPLES: -NA-
 TESTING: -NA-

TIME	DESCRIPTION
------	-------------

12:30 - Randy Skinner onsite Met with Bob Schmidt. Drilling @ approx 630' bpl.
 - Samples are Green Hawthorn clay and Limestone. Drilling at 11:00/11:15

14:00 Off Site.

16:30 - On Site Driller were at 809' bpl. A substantial Limestone interval was encountered at 700'. Formation is still Hawthorn.

18:00 Kelly Dawn at 840' bpl. Formation still Hawthorn.

18:30 - Off Site, Drilling halted til the morning.

COPY
 Observer's initials R.S.

WRTC401W



MONTGOMERY WATSON

WELL # MW-1 DAILY SHIFT REPORT

DATE(S): 8/28/96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			X			

BID PACKAGE: _____

CONTRACTOR: Diamond

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No. 2

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 840'
 DRILLER: Joe Schmitt END DEPTH: 1000'
 ACTIVITY: Pilot hole - logging
 SUB CONTRACTORS: Geophysical
 FORMATION SAMPLES: Every 10'
 WATER SAMPLES: _____
 TESTING: _____

TIME	DESCRIPTION
------	-------------

- 11:00 - Randy Skinner on site. Drillers are preparing to Drill
- 12:45 - Drilling from 840'. 1-2 min/ft. Hawthorn Formation.
- 14:10 - Drilling at 918' formation changing to Limestone (Suwannee Fm.)
- Mark Seilling on site.
- 15:30 - Drilling at 935'. Talked to Pete about Formation Samples (Suwannee Fm.)
Pete wants to look for clay layer at 982'. Mark off site
- 16:10 - Drilling at 965'. Drilling rate at 30 min/ft. possible clay zone.
- No clay in Drill cuttings.
- Kelly down at 985'. 5-8 min/ft. Suwannee Fm.

WRTC401W

Observer's initials

COPY
PAGE 1 of 2

- 1745 - TD @ 1000'. Circulating hole for loggers.
1830 - TDOK.
1900 - Logger onsite
2000 - Laying down bit.
- Logger over the hole.
2100 - Tool has been stuck at 445' for 30min.
2130 - Driller will clear hole + Re log in the morning.
- off site

wvRTC401W

Observer's initials mw

PAGE 1 of 2



MONTGOMERY WATSON

WELL # 441111 DAILY SHIFT REPORT

DATE(S): 9/29/96
 HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				X		

BID PACKAGE: _____

CONTRACTOR: Diversified

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No. 3

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 1000
 DRILLER: Steve Schmidt END DEPTH: 1020
 ACTIVITY: log pilot hole
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME DESCRIPTION

1405 - On site.
 - Driller's crew comming out of hole for loggers.
 1545 - Tool on bottom @ 988'.
 - called Pete. Tool is below suspect clay zone, but not at bottom.
 - This is acceptable.
 1800 - Logging completed. Logger Rigg up Down.
 - Diversified has ~~new~~ modified drilling assembly & will ^{run} tonight.
 2200 - OFF SITE

COPY

Observer's initials RS

WRTC401W



MONTGOMERY WATSON

WELL # MW-1 DAILY SHIFT REPORT

DATE(S): 8/30/96

HOURS WORKED: _____

Broward County ASR WELL

Sun	Mon	Tue	Wed	Thr	Fri	Sat
					X	

BID PACKAGE: _____

CONTRACTOR: _____

Weather	clear	overcast	rain	heavy rain
Temp.	32-50	50-70	70-85	>85
Wind	still	med	high	
Humidity	dry	moderate	humid	Report No. 4

SHIFT SUMMARY

OBSERVER: Randy Skinner START DEPTH: 100'
 DRILLER: Scott P. Schmidt END DEPTH: 100'
 ACTIVITY: Run cement to casing
 SUB CONTRACTORS: _____
 FORMATION SAMPLES: _____
 WATER SAMPLES: _____
 TESTING: _____

TIME	DESCRIPTION
------	-------------

1400 - Tool, Randy Skinner on site. Casing approx depth of 99' has been received.

1512 - Joint #1 in hole w/ centralizers.

1610 - Welding 1 & 2

1635 - Welding 2 & 3

1647 - Welding 3 & 4

1701 - Welding 4 & 5

1714 - Welding 5 & 6

1731 - " 6 & 7

1747 - " 7 & 8

1800 - Welding 8 & 9

WRTC401W

Observer's initials Randy Skinner

- 1817 - 9 to 10
 1835 - 10 to 11
 1847 - 11 to 12
 1904 - 12 to 13
 1917 - 13 to 14
 1933 - 14 to 15
 1948 - 15 to 16
 2000 - 16 to 17
 2015 - 17 to 18
 2030 - 18 to 19
 2045 - 19 to 20
 2100 - 20 to 21
 2115 - 21 to 22
 2133 - 22 to 23
 2147 - 23 to 24
 2200 - completed casing Run to 990'
 - Start to Run Tremie pipe.
 2345 - Tremie is in hole. Rigging up Cementer.
 0025 - Welding on header plate.
 0052 - Turning over mud (Bottom's up).
 0045 - End circulating of mud.
 0100 - pre-flush
 0106 - Sending cement.
 0124 - @ 15 lb/gal 5 bbl-min.
 0135 - Full Rotlin at 130 bbl
 0137 - End cement at 135 bbl
 0200 - off site.

WRTC401W

COPY
 Observer's Initials mls

PAGE 1 of 2



CH2MHILL

*Celebrating
50 Years*

September 4, 1996

103715.A0

Mr. William W. Cocke, P.G.
Program Manager-UIC
Florida Department of Environmental Protection
P.O. Box 15425
West Palm Beach, FL 33416

Dear Bill:

Subject: Broward County Office of Environmental Services (BCOES) ASR Demonstration
Project; FDEP File # UC 06-242411

Weekly Summary (August 19-23, 1996)

The drilling contractor (Diversified Drilling Corp. [DDC]) began drilling at the monitor well (MW-1) on August 19, 1996. The 12-inch pilot hole was extended with mud-rotary drilling to 430 feet below land surface (bls). Geophysical logs (caliper, gamma, LSN) were conducted on the pilot hole. The borehole was reamed to 24-inches. Approximately 400 feet of 14-inch casing was cemented in place with neat cement (620 sacks) to land surface by the pressure grout method.

Schedule for Next Week

Continue pilot hole inside 14-inch casing to approximately 1,000 feet bls. Conduct geophysical logs (caliper, gamma, LSN) and evaluate casing setting depth for final 6-inch casing. Ream borehole to nominal 13 inches and cement 6-inch casing in place.

Sincerely,

CH2M HILL

Peter J. Kwiatkowski, P.G.
Project Manager

DFB11127.DOC

Enclosures

c: Bob Leonard/BCOES
Anne Murray/Montgomery Watson
Members of the TAC

CH2M HILL

Hillsboro Executive Center North

800 Fairway Drive

Suite 350

Deerfield Beach, FL

33441-1831

Tel 954.426.4008

Fax 954.698.6010



DAILY OPERATIONS REPORT

Project No. 103715-00-10 Date 8-19-91

Client BROWNS POINT

Contractor DIVERSIFIED

Well No. MW-1 & WTP 3A

Weather <u>Partly Cloudy = 90°F</u>		Time	Description of Operations
Shift No. <u>1</u>	Time <u>0700</u>	<u>1300</u>	<u>SITE SAFETY MEETING COMPLETED (SEE MTG. 8-19-91)</u>
Driller <u>JOE SCHMIDT</u>		<u>1400</u>	<u>MEETING COMPLETED. CENT-BATTERY WELLS START</u>
Activity <u>Monitor Pilot-Hole</u>			<u>PILOT-HOLE DRILLING THIS AFTERNOON</u>
Starting Depth <u>40 FEET B.W.L.</u>		<u>1430</u>	<u>M. SCHILLING OFFSITE</u>
ENDING DEPTH <u>90 FEET B.W.L.</u>			
BIT SIZE <u>12.25"</u>			
Shift No. _____	Time _____		
Driller _____			
Activity _____			
Starting Depth _____			
Formation samples collected _____			
Water samples collected _____			
Deviation Survey _____			
Drilling fluid additives _____			
Well water level			
Time	Depth		
Measurement reference point _____			
elevation _____			
Supply deliveries _____			

MARK SCHILLING - INSPECTOR



DAILY OPERATIONS REPORT

Project No. 103715.AV34 Date 8-21-76

Client BROWARD COUNTY

Contractor DIVERSIFIED

Well No. MW-1 L WTP 2A

Weather <u>Partly Cloudy Breezy = 90°F</u>		Time	Description of Operations
Shift No. <u>1</u> Time <u>7:00-1900</u>		1030	M SCHILLING ARRIVES ON SITE WITH THE CH2M Hill GEOPHYSICAL LOG
Driller <u>ROBERT SCHMIDT</u>			CONDUCT GEOPHYSICAL LOGGING ON THE 14" HOLE. THE CONTRACTOR IS CURRENTLY AT 420 FEET B.C.L. AND HAS BEEN DRILLING WITH AN
Activity <u>Drilling Post Hole Geophysical From</u>			RETURNED SINCE 240 FEET B.C.L. M SCHILLING
Starting Depth <u>240 FEET B.C.L. 1125" BIT</u>			ADVISES THE CONTRACTOR TO STOP DRILLING AND
Ending Depth <u>420 FEET B.C.L.</u>			CIRCULATE THE BENCHES UNTIL THE CUTTINGS ARE
Starting Depth <u>38 FEET B.C.L.</u>			REMOVED AND THE FOREHOLE IS REINTEGRATED FOR
Shift No. <u>1</u> Time <u>7:00</u>			THE GEOPHYSICAL LOGGING
Driller		1045	M. SCHILLING OFFSITE
Activity		1300	M SCHILLING RETURNS TO THE SITE THE CONTRACTOR
Starting Depth			IS STILL IN THE PROCESS OF TRIPPING THE DRILL
Formation samples collected			RODS AND BIT PARTS STEEL IS ON SITE WITH
Water samples collected			THE DELIVERY OF THE 14-INCH CASING
Deviation Survey <u>270' 300 FEET B.C.L.</u>		1330	START GEOPHYSICAL LOGGING LOGS TO BE
Drilling fluid additives			CONDUCTED ARE THE CALIPER, NATURAL GAMMA RAY,
Well water level			AND THE LOG'S SHORT NORMAL ELECTRIC RESISTIVITY
Time	Depth		LOGS
		1100	GEOPHYSICAL LOGGING COMPLETED THE CONTRACTOR
			IS BEGINNING TO START REAMING THE NOMINAL
			12" PILE TO A NOMINAL 23 INCHES M SCHILLING
			OFFSITE
Measurement reference point			
elevation			
Supply deliveries			

MARK SCHILLING - INSPECTOR



DAILY OPERATIONS REPORT

Project No. 103 #15 AK 7 Date 5-22-11

Client BROWN COUNTY

Contractor DIVERSIFIED

Well No. MCS-16 WTP 2A

Weather <u>Partly Cloudy Bar 24 = 90°F</u>		Time	Description of Operations
Shift No. <u>1</u>	Time <u>0700-1900</u>	1125	M. SCHILLING ARRIVES ON SITE. THE CONTRACTOR IS CURRENTLY REAMING THE PILE- HOLE TO A
Driller <u>FRANK SCHMIDT</u>			APPROX 23 INCHES. FRANK SCHMIDT IS EXAMINING
Activity <u>Reaming Pile- Hole</u>			BY M. SCHILLING TO COLLECT FORMATION SAMPLES
Starting Depth <u>75 FEET P.C.L.</u>			FROM THE DEPTHS THAT WERE MISSED DURING
ENDING DEPTH <u>340 FEET P.C.L.</u>			PILE- HOLE DRILLING
BIT SIZE <u>2 1/2"</u>			1130 RAY BRATZEL AND BOB HARPER OF BROWN
Shift No. <u>2</u>	Time <u>1900-0700</u>		ARRIVE ON SITE TO SAMPLE THE SHALLOW M.C.J. HOLE
Driller <u>MAX</u>			(WELL SURROUNDING THE DRILL PAD)
Activity <u>Reaming Pile- Hole</u>		1145	M. SCHILLING OFF SITE
Starting Depth <u>340 FEET P.C.L.</u>		1545	BOB MATHEWS OF DIVERSIFIED PHONES P. KWIATKOWSKI
ENDING DEPTH <u>405 FEET P.C.L.</u>			AT CHAM HILL AND INFORMS HIM THAT A NIGHT
BIT SIZE <u>2 1/2"</u>			SHIFT WILL BE RUN TONIGHT TO COMPLETE THE
Formation samples collected _____			REAMING IS COMPLETE. THIS DECISION WAS
			MADE TO ALLOW THE 14-INCH PILE TO BE SET
Water samples collected _____			TOMORROW
Deviation Survey _____			
Drilling fluid additives _____			
Well water level			
Time	Depth		
0700	30 FEET P.C.L.		
Measurement reference point _____			
elevation _____			
Supply deliveries _____			

MARK SCHILLING - INSPECTOR



MWS

Lith-10-3

Notes

Date 8/28/90

1
43

Interval: 0'-20' No Recovery

Interval: 20'-70'

- Description: Limestone with sand. Variable amounts of white & broken Gastropods/plecyroda. Unit is Tan to pale grey. Moderately cemented. Most CaCO₃, including Brachiopods has been Recrystallized (metam.). Dissolution & cementation have also occurred.
- Identification: This unit is comprised of undifferentiated Pleistocene sediments.

Interval: 70'-200' No Recovery 100'-100'

- Description: Limestone (85%), Sandstone (5%), Calcite (5%) Shell (5%). Whaley to partially recrystallized limestone with variable amounts of moderately cemented sand, Calcite spar (fracture & void fill), and Brachiopods. Unit is Tan/gray to pale orange in color. Well cemented, and Hard. Porosity, including mudic is present (total volume is not obtainable from cutting). ~~There~~ Diagenesis, including dissolution, recrystallization, & cementation have been wide spread. Gastropods & Plectyroda are present.
- Identification: This unit is comprised of undifferentiated Plio-Pleistocene Sediments. ~~There is no recovery~~

Interval: 200'-240' No Recovery

Interval: 240'-400'

- Description: Limestone: Light Olive to white (60%), Recrystallized Limestone devoid of Brachiopods. Very Hard & Well indurated.
- Gray-mucritic, with phosphate. Very Hard. Depositional low Mg Calcite, few fossils moderately Hard. Granular (30%)
- Olive Green - Contains Terrestrial material and sand. Poorly indurated (10%) crumbly, increases to 30% at Base of unit.

APPENDIX D

Summary of Casing Depths and Cement Quantities

Appendix D
Summary of Casing Depths and Cement Quantities
BCOES ASR Demonstration Project

Well	Casing Diameter (inches)	Casing Wall Thickness (inches)	Casing Depth (feet)	Date of Cement Event	Cement Type	Cement Interval (feet)	Cement Quantity (sacks)	Cement Quantity (barrels)	Comments
MW-1	14	0.375	400	8/23/96	Neat	0 to 400	619	130	Primary Pressure Grout
MW-1	6	0.575	990	8/30/96	Neat	0 to 990	635	135	Primary Pressure Grout
ASR-1	26	0.375	397	10/11/96	Neat	0 to 397	1020	217	Primary Pressure Grout
ASR-1	16	0.5	995	10/26/96	Neat	0 to 990	404	86	Primary Pressure Grout
ASR-1	16	0.5	995	10/26/96	4% gel	0 to 990	742	205	Primary Pressure Grout
ASR-1	16	0.5	995	10/28/96	Neat	0 to 70	122	26	Tremie Grout

APPENDIX E

Casing Mill Certificates

INSPECTION CERTIFICATE

Supplier : HYUNDAI CORPORATION
 Contract No (L/C No) NY6035539K
 Specification : ASTM A53B/API 5LB
 Kind of Article : E. R. W. Steel pipe

주식회사 신호스틸
 Shin Ho Steel Co., Ltd
 C.P.O.Box904Seoul, Korea.
 DAEBUL PLANT

Customer : HYUNDAI CORPORATION, U.S.
 Issued Date : JUN. 08. 1996
 Certificate No : D960608 - 069
 Manufactured No : 96 - 5 - 211

Lot No. (Heat)	Q.TY (pcs)	Type	Nominal Size (in)	Dimension		Weight (kg/m)	Chemical							Tension Test							
				O.D (mm)	W.T (in)		Length (ft)	C	Si	Mn	Cu	Ni	Cr	Mo	P	S	V	Tensile Strength (kgf/mm ²)	Yield Strength (kgf/mm ²)	Elongation (%)	WTS (kg/L)
A87147	73	EPFB	14	355.6	0.250	42	15	TR	75	3	2	2	TR	16	7	3	51	37	33	52	
A87508	11	EPFB	14	355.6	0.375	21	16	TR	76	2	3	2	TR	17	6	2	52	37	32	53	
A83655	143	EPFB	14	355.6	0.375	42	17	TR	74	3	3	2	TR	15	5	3	50	36	34	51	
A87069	112	EPFB	16	406.4	0.250	42	18	TR	76	3	3	3	TR	17	6	3	52	38	32	53	
A81079	52	EPFB	16	406.4	0.500	42	16	TR	73	2	3	2	TR	15	7	2	49	35	35	50	
				14 in																	

We hereby certify that the above products have been made in accordance with requirements called for the order.

- (1) O.D : Outside Diameter.
- (2) W.T : Wall Thickness.
- (3) WTS : Weld Tensile Test.
- (4) F(B) : Flattening (Bend).
- (5) V.I : Visual Inspection.
- (6) WDT : Weld Ductility Test.
- (7) NDT : Non Destructive Test.
- UST : Ultrasonic Test.

Nominal Size (in)	NDT (UST)	F(B) Test	WDT	Hydrostatic Test (psi)	Ring Gage Test	Straight- ness (%)	V.I	REMARK
14	pass	G	G	750	pass	0.1	G	
14	pass	G	G	1120	pass	0.1	G	
14	pass	G	G	1120	pass	0.1	G	
16	pass	G	G	660	pass	0.1	G	
16	pass	G	G	1310	pass	0.1	G	
				LAST ITEM				

COED
 Y. R. KIM
 Inspector in charge

Monitor Well MW-1

1m = 3.281 ft
 1kg = 2.205 lb.

INSPECTION CERTIFICATE

Supplier : HUNDAI CORPORATION
 Contract No (L/C No) NY6036539K
 Specification : ASTM A53B & API 5L B
 Kind of Article : E. M. W. Steel pipe

한국철강사
 Shinho Steel Co., Ltd.
 C. P. O. Box 904 Seoul, Korea

Customer : HUNDAI CORPORATION U.S.A
 Issued Date : MAY. 18. 1996.
 Certificate No : 960311 - 061
 Manufactured No : 96-3-24

Lot No. (Heat No.)	Q.T.V (PCS)	Type	Nominal Size (---, in)	Dimension			Weight 'kg/ft. (---)	Chemical						Tension Test						
				O.D. (in)	W.T. (in)	Length (ft)		C	Si	Mn	Cu	Ni	Cr	Mo	P	S	V	Tensile Strength (kgf/cm ²)	Yield Strength (kgf/cm ²)	Elonga- tion (%)	WTS (kgf/cm^{2})
A-82784	1191	BFB	2-3/8	2.375	0.154	21	1.66	TR	65	2	2	2	TR	10	5	2	47	31	36	*
A-83321	57	"	4-1/2	4.500	0.137	21	6.79	1	66	3	3	3	TR	11	6	3	48	32	35	*
P-513526	42	"	6-5/8	6.625	0.280	21	8.60	2	69	4	2	2	1	12	7	2	49	33	34	*
B-07430	416	"	6-5/8	6.625	0.280	42	8.60	TR	70	2	2	3	TR	13	3	4	47	31	36	*
A-86330	186	"	8-5/8	8.625	0.322	21	12.95	12	71	3	3	3	TR	14	6	2	50	34	33	54
B-07430	276	"	8-5/8	8.625	0.322	42	12.95	13	68	4	3	2	TR	11	7	3	48	32	35	52
A-86328	87	"	12-3/4	12.75	0.250	42	15.14	14	TR	65	2	2	1	17	8	4	49	33	34	51
A-85920	100	"	12-3/4	12.75	0.373	42	22.48	15	2	73	3	2	2	15	6	2	30	34	33	54

We hereby certify that the above products have been made in accordance with the requirements called for the order.

- (1) O.D : Outside Diameter.
- (2) W.T : Wall Thickness.
- (3) WTS : Weld Tensile Test.
- (4, F(B) : Flattening (Bend).
- (5) V.I : Visual Inspection.

- (6) WDT : We-M Ductility Test.
- (7) WDT : Non Destructive Test.
- ECT : Eddy Current Test
- UST : Ultrasonic Test

Nominal Size (in)	WDT	F(B) Test	Hydrost- atic Test (psi)	Ring Gage Test	Straigh- t-ness (%)	V.I	REMARK
2-3/8	G	G	2500	pass	0.1	G	
4-1/2	G	G	2800	pass	0.1	G	
6-5/8	G	G	1780	pass	0.1	G	
6-5/8	G	G	1780	pass	0.1	G	
8-5/8	G	G	1370	pass	0.1	G	
8-5/8	G	G	1370	pass	0.1	G	
12-3/4	G	G	820	pass	0.1	G	
12-3/4	G	G	1240	pass	0.1	G	

[Signature]

Inspector In Charge

Monitor Well MW-1

LAST ITEM

Broward County Job 16X500

INSPECTION CERTIFICATE
SeAH SeAH Steel Corp.
 世亞製鋼

PAGE : 1/2
 CERTIFICATE NO. : E9604-0140-000814 (E96010036)
 COMMODITY : E.R.V STEEL PIPE
 SPECIFICATION : API 5L B31.1M ASB

SHOUL OFFICE 40-11100A HANGANG-RO
 YONGSAN-CU SHINIL-KO BBA
 POHANG PLANT 14-1, JAKCHEWU-POONG, NAK-GU POHANG
 CHANGWON PLANT 36, WONGNAM-RO, CHANGWON

DATE OF ISSUE: 06/01/79
 CUSTOMER :
 SHIPPER : INDAI CORP.

ITEM NO.	HEAT (LOT) NO.	ORDER SIZE	QUANTITY		REMARK
			PCS	WEIGHT (N/T)	
1	D04056	12.314" X 0.375" X 21'	54	25.492	Metric Ton = 2205 pounds 22.074 MT = 48,673.17 pounds Divided by 588.0 Feet 82.77 pounds/foot ✓
2	Y7086	16" X 0.375" X 21'	30	17.886	
3	Y7083	16" X 0.500" X 41'	14	22.074	

ITEM NO.	HEAT (LOT) NO.	ZINC COATING TEST	R-FLATTENING	FLANGE	GRUSH	DRIFT	BENDING	WELD DUCTILITY	FLATTENING	VISUAL DIMENSION	HYDROSTATIC TEST	TENSILE TEST (Gage length: 10cm)		TENSILE TEST (C)	HEAT TREAT
												TENSILE STRENGTH (Psi)	YIELD POINT STRENGTH (Psi)		
1	D04056	174	11	8	2	2	2	2	2	2	1	11306.0	57556.0	34	0
2	Y7086	175	9	9	2	1	1	1	1	1	1	76278.0	48721.0	40	0
3	Y7083	15	13	7	1	1	1	1	1	1	1	69218.0	56372.0	34	0
4	Y7083	15	13	7	1	1	1	1	1	1	1	72869.0	57130.0	38	0

WE HEREBY CERTIFY THAT THE MATERIAL HEREIN HAS BEEN MADE AND TESTED IN ACCORDANCE WITH ABOVE SPECIFICATION AND THE RESULTS OF ALL TEST ARE ACCEPTABLE.

ASR-1

Manager of Q.A Dept. J. H. KUH

PS-A-631-F1

BROWARD County Job 16 X.500

PAGE : 5/5
 증명서번호 CERTIFICATE NO. : B9602-0171-000419 (B96010036)
 제품명 BRAND : B.R.N STEEL PIPE
 제품규격 SPECIFICATION : API 5LBIASTM A53B

INSPECTION CERTIFICATE
Seah Steel Corp.
世亞製鋼

SEOUL OFFICE 40-153ACA HANGANG-RO, YONGSAN-GU, SEOUL, KOREA
 POHANG PLANT 14-1 JANGCHUNG-DONG, NAM-GU POHANG CHANGWON PLANT 56, WONGWNAI-DONG, CHANGWON

발급일자 DATE OF ISSUE: 96102127
 계약서번호 L/C No. (P/O No.) :
 수요자가 CUSTOMER :
 주분회사 SHIPPER : HUNDI CORP.

ITEM NO.	HEAT(LOT) NO.	관련 TYPE	주문처수 ORDER SIZE	수량 QUANTITY		비고 REMARK
				PCS	중량(M/T) TOTAL LENGTH	
14	Y69147	B0B	16" X 0.500" X 42'	35	1470.000FT	82.77 lbs./ft ✓
15	Y70649 Y7242	B0B	20" X 0.500" X 42'	50	2160.000FT	99.183

ITEM NO.	HEAT(LOT) NO.	HYDROSTATIC TEST RESULT	VISUAL DIMENSION	WELD DUCTILITY	BENDING	DRIFT	CRUSH	FLARING	FLATTENING	ZINC COATING TEST	CHEMICAL COMPOSITION (%)										TENSILE TEST (Gage Length: 30mm)			IMPACT TEST (°C)			PROTECTIVE COATING DRAG					
											C	SI	Mn	P	S	CU	NI	CR	MO	V	T	R	D	YIELD STRENGTH	TENSILE STRENGTH	YIELD POINT STRENGTH		E.L. %	HARDNESS TEST	END-SHEAR REGY AREA	Joule	
14	Y69147	1210.0 G	G G G	G G G							DR	14	2	70	15	8	2	1	3	2	2	2	3	68009.0	75710.0	49006.0	40	40	G			
15	Y70649 Y7242	1050.0 G	G G G	G G G							PH	14	1	69	14	7	2	1	3	2	1	4	2	69004.0	75000.0	51420.0	40	40	G			
		1050.0 G	G G G	G G G							PH	13	2	67	20	8	2	1	1	2	1	1	2	70170.0	77414.0	52130.0	37		0			

NOTE: REFER TO THE BACK SIDE

OTHERS

ASR-1

Surveyor : J. H. KUM
 Manager of Q.A Dept

본 제품은 관련 규격에 정한 시험 및 검사에 합격하였음을 증명합니다.
 WE HEREBY CERTIFY THAT THE MATERIAL HEREIN HAS BEEN MADE AND TESTED IN ACCORDANCE WITH ABOVE SPECIFICATION AND THE RESULTS OF ALL TEST ARE ACCEPTABLE.

PS-A-831-F1



BROWARD COUNTY JOB 16 X 510
 검사명서
 INSPECTION CERTIFICATE

동부제강주식회사
 DONGBU STEEL CO., LTD
 • HEAD OFFICE : 21-9, CHO-DONG, JUNG-KU, SEOUL 100-300, KOREA.
 • SEOK WORKS : 123 ORYU-DONG, GURO-GU, SEOUL 152-102, KOREA.
 • INCHEON WORKS : 690-1, KA-JWA-DONG, SEO-KU, INCHEON 403-251, KOREA.
 • BUSAN WORKS : 725-4, HAK-JANG-DONG, BUK-GU, BUSAN 616-020, KOREA.

증명서 번호 : M93-10-014
 발행일 : 9.3.10.30
 주문번호 : PFC04J15X
 계약번호 : 1816-8039 C
 품명 : F.R.W. STEEL PIPE
 제품규격 : A53 GR. D/API 5L
 SPECIFICATION : 5LX-42

수요자 : DARTON STEEL
 CUSTOMER
 취급상사 : DAENOO CORP.
 SHIPPER

ITEM NO.	ITEM TYPE	ORDER SIZE	QUANTITY		WEIGHT (kg)	HEAT NO.	TENSILE TEST		CHEMICAL COMPOSITION (%)	ZINC COATING TEST	REMARKS
			PIECES	TOTAL LENGTH			Y.S. or T.P.	T.S. or E.L.			
1	HP10	12-3/4" X 0.500" X 40'	33	1,320'	39,204.6505	GA29517	인장강도	연신율	C: 0.151	인양도	도막 두께
2	HP10	14" X 0.500" X 40'	91	3,640'	103,376.9806	GA28766	인장강도	연신율	Si: 0.041	인양도	도막 두께
3	HP10	16" X 0.500" X 40'	27	1,080'	40,580.3105	GA29401	인장강도	연신율	Mn: 0.061	인양도	도막 두께
			159	6,040'	183,166	111M					
					40586 kg						
					1080 feet						
					82.77 lbs/feet						

ASR-1

UNIFORMITY (포일성)
 ALK : ALUMINUM
 P.D : PINHOLE DETECTOR
 S.T.T : SALT DAMPNESS TEST (HOUR)

REMARKS
 01.3:29.5
 02:28.0

성기 장관은 지방관 규격의 시험을 위하여 일관성을 증명합니다.
 We hereby certify that the material herein has been made and tested in accordance with the above specification and also with the requirements called for by the above order.

Surveyor to.

MANAGER OF QUALITY CONTROL

INSPECTION CERTIFICATE

Supplier: HYUNDAI CORPORATION. Contract No (L/C No) NY6031539K. Specification: ASTM A538/API 5LB. Kind of Article: B. R. V. Steel pipe.

Customer: HYUNDAI CORPORATION, U.S.A. Issued Date: JUN. 08. 1996. Certificate No: D960608 - 049. Manufactured No: 96 - 5 - 311.

Shin Ho Steel Co., Ltd
C.P.O. Box 904 Seoul, Korea.
DAEBU. PLANT

Lot No. (Heat)	Q. TV (pcs)	Type	Nominal Size (in)	Dimension		Weight (kg/m)	Chemical								Tension Test						
				O.D (mm)	W.T (in)		Length (ft)	C	Si	Mn	Cu	Ni	Cr	Mo	P	S	V	Tensile Strength (psi)	Yield Strength (psi)	Elongation (%)	WTS (psi)
A87117	73	BPBB	14	355.6	0.250	42	54.6	15	TR	75	3	2	1	TR	16	7	3	73000	53000	33	74000
A87508	11	BPBB	14	355.6	0.375	73	81.2	16	TR	76	2	3	2	TR	17	6	2	74000	53000	32	73000
A83651	143	BPBB	14	355.6	0.375	42	81.2	17	TR	74	3	3	2	TR	15	3	3	74000	51000	34	73000
A87049	112	BPBB	16	406.4	0.250	42	62.6	18	TR	76	3	3	3	TR	17	6	3	74000	54000	32	75000
A81027	52	BPBB	16	406.4	0.508	42	123.3	18	TR	73	2	3	3	TR	13	7	1	70000	50000	35	71000

We hereby certify that the above products have been made in accordance with the requirements called for the order.

- (1) O.D : Outside Diameter.
- (2) W.T : Wall Thickness.
- (3) WTS : Weld Tensile Test.
- (4) F(B) : Flattening (Bend).
- (5) V.I : Visual Inspection.
- (6) WDT : Weld Ductility Test.
- (7) NDT : Non Destructive Test.
- UST : Ultrasonic Test.

Nominal Size (in)	NDT (UST)	F(B) Test	WDT	Hydrostatic Test (psi)	Ring Gage Test	Straightness (mm)	V.I	REMARK
14	pass	G	G	758	pass	0.1	G	
14	pass	G	G	1120	pass	0.1	G	
16	pass	G	G	1120	pass	0.1	G	
16	pass	G	G	660	pass	0.1	G	
16	pass	G	G	1310	pass	0.1	G	
LAST ITEM								

→ (123.3 kg/m) (67192) = 82.85 lbs./ft ✓
conversion factor

[Signature]
Inspector in charge

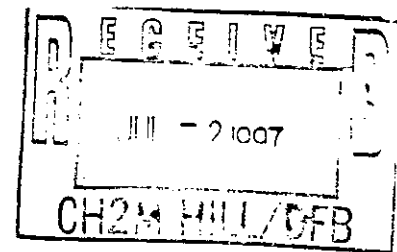
ASR-1

APPENDIX F

Lithologic Logs



MONTGOMERY WATSON



WELL # ASR-1 LITHOLOGY DESCRIPTION

BROWARD COUNTY UTILITIES

WTP ASR WELL

CONTRACTOR: Diversified

TOTAL DEPTH: 1140 feet
 COUNTY: Broward
 OWNER: Broward County Utilities
 DRILLING METHOD: Mud/Reverse Air Drilling
 DRILLER(S): Joe Schmidt
 DATUM POINT: Pad level
 HYDROLOGIC UNITS: Biscayne/Upper Floridan

0-10	Sand 70%, white to light tan, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean but has been mixed with drilling mud. Soil 30%, brown to black, organic rich.
5'-10'	Sand 95%, white to light tan, fine grained, well rounded and well sorted, unimodal, quarts based with trace lithics-heavies-and feldspar. Sand is mostly clean but has been mixed with drilling mud. Shell 5%, tan opaque, recrystalized and low Mg calcite constituents, some are etched, breakage is common (possibly secondary), including gastropods and plecy pods.
10-20	as above
20-30	as above
30-40	Shell, tan opaque, recrystalized and low Mg calcite constituents, some are etched, breakage is common (possibly secondary), including gastropods and plecy pods.
40-50	as above
50-60	as above
60-70	Limestone 90%, tan to medium gray, wackestone to recrystalized packstone, contains carbonate sand- bioclasts- and trace quarts and lithics, possible Mn, recrystalized (clear tan rhombus, can make up as much as 40% of total volume), cemented with abundant pore filling calcite spar cement (white to tan), moderately cemented, porosity is present. Shell 10%, tan opaque, recrystalized and low Mg calcite constituents, some are etched, breakage is common (possibly secondary), including gastropods and plecy pods.
70-80	as above
80-90	as above
90-100	as above
100-110	as above
110-120	as above
120-130	as above
130-140	as above
140-150	as above
150-160	as above
160-170	as above
170-180	as above

180-190	Limestone, medium to dark gray, wackestone to recrystallized packstone, contains carbonate sand- bioclasts- and trace quartz and lithics, possible Mn, recrystallized (clear tan rhombus, can make up as much as 25% of total volume), cemented with abundant pore filling calcite spar cement (white), moderately cemented, porosity is present.
190-200	as above
200-210	as above
210-220	as above
220-230	as above
230-240	as above with abundant shell material.
240-250	as above
250-260	as above
260-270	as above
270-280	as above
280-290	as above
290-300	as above
300-310	as above
310-320	as above
320-330	as above
330-340	Yellowish gray to olive clay. The clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecyopoda material, and calcite and dolomite cement. Contains isolated occurrences of plecyopods. Clay is dominantly montmorillonite.
340-350	as above
350-360	as above
360-370	as above
370-380	as above
380-390	as above
390-400	as above
400-410	as above
410-420	as above
420-430	as above
430-440	as above
440-450	as above
450-460	as above
460-470	as above
470-480	as above
480-490	as above
490-500	as above
500-510	as above. Unit grades from montmorillonite to kaolinite with depth. Maintains green color.
510-520	as above
520-530	as above
530-540	as above
540-550	as above
550-560	as above
560-570	as above
570-580	as above
580-590	as above
590-600	as above
600-610	as above
610-620	as above
620-630	as above
630-640	as above

650-660	Light green to dark olive clay. The clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecyopoda material (fragmented), and calcite and dolomite cement. Porosity and permeability are absent due to plastic nature of clay
660-670	as above
670-680	as above
680-690	as above
690-700	as above
700-710	as above
710-720	as above
720-730	as above
730-740	as above
740-750	as above
750-760	as above
760-770	as above
770-780	as above
780-790	as above
790-800	as above
800-810	as above
810-820	as above
820-830	as above
830-840	as above
840-850	95 % Light green to dark olive clay. The clay is plastic, and is interbedded with minor amounts of light olive gray to white limestone. The clay contains quartz sand, silt, and minor plecyopoda material (fragmented), and calcite and dolomite cement. Porosity and permeability are absent due to plastic nature of clay 5% Complexly interbedded, argillaceous limestone. Limestone is generally light gray to white, poor to moderately indurated, mudstones and wackstones. Porosity is low. Grains include minor fossil debris, and peloids.
850-860	as above
860-870	as above
870-880	as above with 70% clay, and 30% limestone.
880-890	as above with 50% clay, and 50% limestone.
890-900	as above with 25% clay, and 75% limestone. Limestone is Tan to green, phosphate rich, containing few biotics including mollusk debris and forams. Porosity is low. Poorly indurated. Cement is spar, and is porosity reducing. Texture is granular to sucrosic.
900-910	as above
910-920	as above
920-930	as above
930-940	as above with 15% clay, and 75% limestone.
940-950	as above
950-960	Limestone, white to medium gray, moderately indurated boundstones to wackstones, locally grades to packstone and grainstone. Contains phosphate nodules. Some bioclasts are represented as moldic porosity, and high secondary porosity and permeability are present (intergranular, interparticle and moldic). Locally the rock is recrystallized. Well indurated, and contains coarse spar cement (reducing). Biotics include reef fauna assemblage (diverse mollusk, foram, bryozoan, corals).
960-970	as above
970-980	as above
980-990	as above
990-1000	as above
1000-1010	as above Limestone is dominantly white. Unit has fine grained (chalky) texture.
1010-1020	as above.

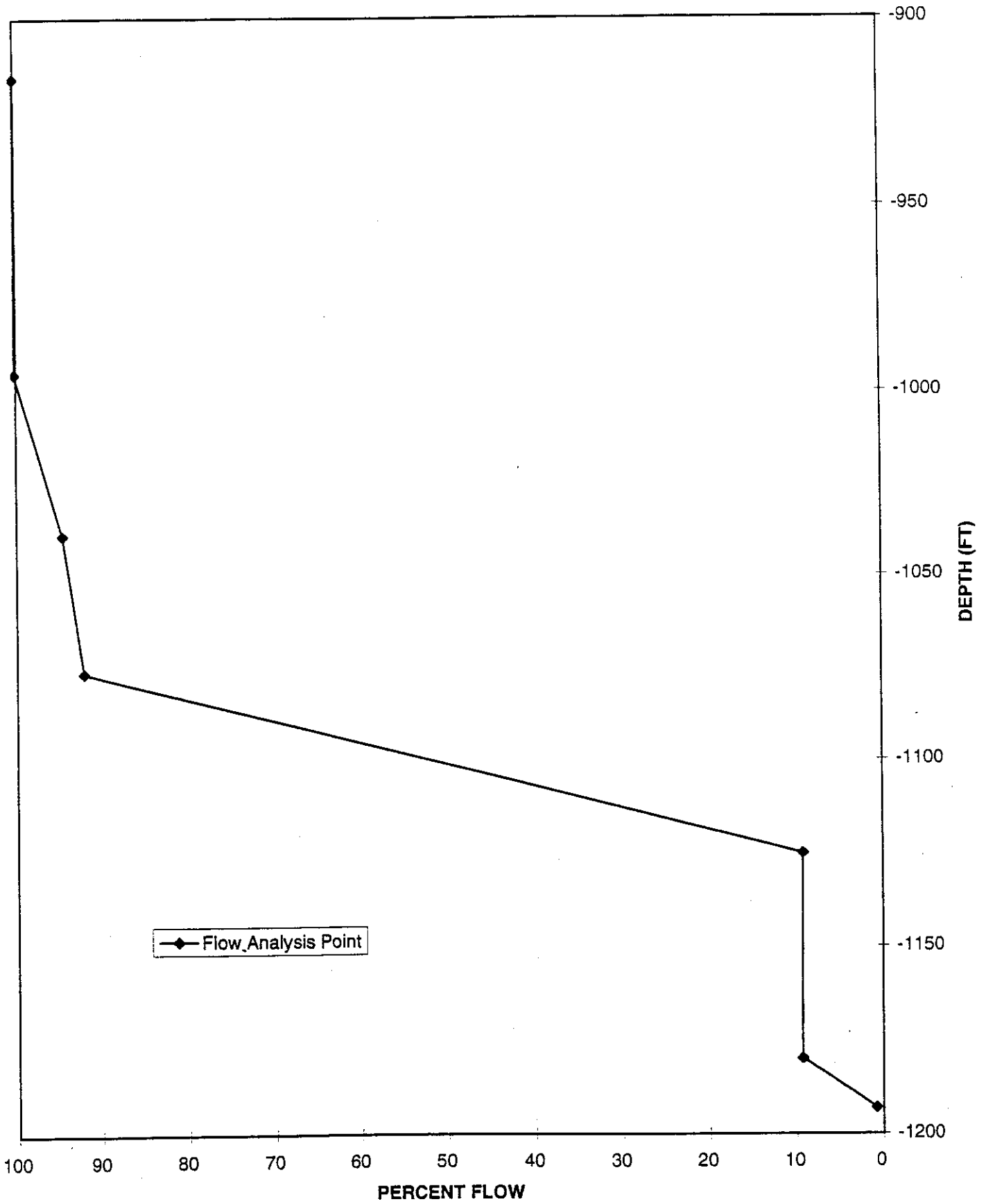
1020-1030	as above. Limestone is white to very pale orange, and contains few echinoids.
1030-1040	as above
1040-1050	as above
1050-1060	as above
1060-1070	as above
1070-1080	as above
1080-1090	as above
1090-1100	as above
1100-1110	as above
1110-1120	as above
1120-1130	as above
1130-1140	Moderately soft, highly fossiliferous, very pale orange to tan, pelletal, wackestones and packstones, with 15% to 40% intergranular porosity. Locally, the unit is composed of thin layers of very hard micrite, of low porosity and permeability. Abundant foraminifera, and echinoids.
1140-1150	as above
1150-1160	as above
1160-1170	as above
1170-1180	as above
1180-1190	as above
1190-1200	as above.

APPENDIX G

Geophysical Logs

Not scanned

FLOW PROFILE BROWARD COUNTY ASR-1



APPENDIX H

Pad Monitor Well Water Quality Data

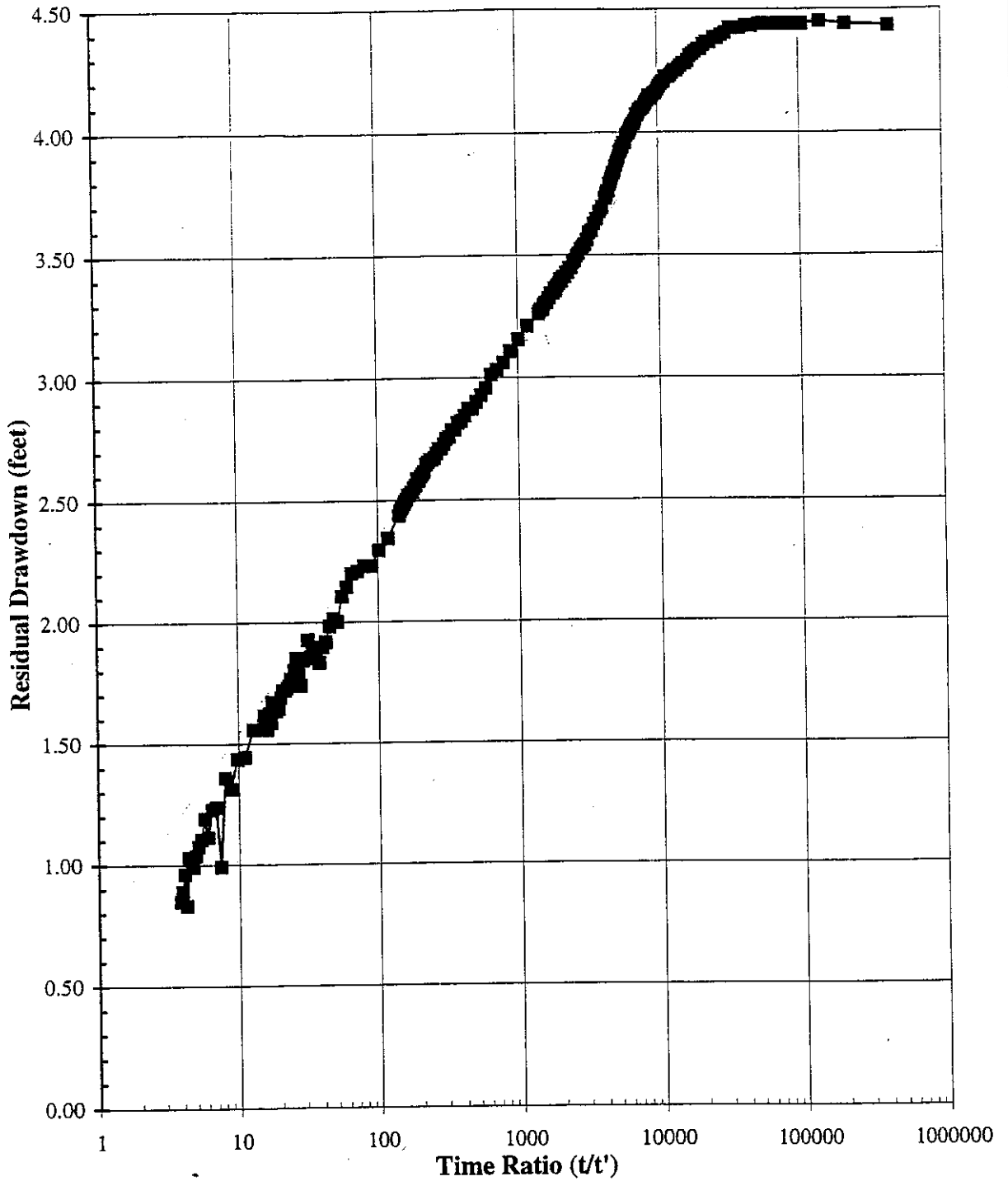
**Broward County ASR Demonstration Project
Pad Monitor Well Water Quality Data**

Well	Date	PMW-NE				PMW-NW				PMW-SE				PMW-SW				Comments
		Chloride (mg/l)	Conductivity (umho/cm)	pH	TDS (mg/l)	Chloride (mg/l)	Conductivity (umho/cm)	pH	TDS (mg/l)	Chloride (mg/l)	Conductivity (umho/cm)	pH	TDS (mg/l)	Chloride (mg/l)	Conductivity (umho/cm)	pH	TDS (mg/l)	
MW-1	8/8/96	18	495	7.2	400	150	6.56	144	190	259	7.31	190	18	439	7.25	352	Initial Sampling	
MW-1	8/22/96	21.5	542	6.93	452	175	6.65	260	264	307	7.13	264	44.5	467	7.12	364		
MW-1	8/29/96	20	533	7.14	308	158	6.64	410	246	322	7.16	246	52	445	7.18	378		
MW-1	9/4/96	14	337	8.28	272	8.5	6.74	274	222	332	7.48	222	56.5	515	7.37	410		
MW-1	9/11/96	24	486	8.81	362	194	6.61	146	224	364	7.17	224	44	494	7.20	348		
MW-1	9/18/96	180	1002	7.92	606	8	6.49	262	284	402	7.08	284	29	459	7.25	316		
MW-1	9/24/96	99	538	7.71	596	6	6.6	248	276	372	7.27	276	29	460	7.21	322		
MW-1	10/2/96	25.5	534	7.11	382	182	6.51	150	276	408	7.19	276	23.5	460	7.28	308		
MW-1	10/8/96	16	151	8.45	140	7	6.75	170	218	323	7.42	218	20	452	7.18	268		
MW-1	10/15/96	13	139	8.39	96	7	6.8	148	214	385	7.37	214	26	473	7.30	262	Final Sampling	
ASR-1	10/2/96	44.5	455	7.33	314	37	7.27	366	260	379	7.18	260	39	418	7.29	292	Initial Sampling	
ASR-1	10/8/96	6	448	10.65	276	500	7.28	278	234	387	7.13	234	30	395	6.91	242		
ASR-1	10/15/96	7	330	10.29	220	15	9.61	204	240	386	7.21	240	40	414	7.42	256		
ASR-1	10/22/96	11	235	9.48	166	24	7.28	282	236	391	7.24	236	38	382	7.07	244		
ASR-1	10/31/96	25	308	7.56	196	27	7.5	256	344	376	7.39	344	33	389	7.12	270		
ASR-1	11/5/96	38	463	7.21	308	35	7.2	426	254	401	7.31	254	34	381	7.15	258		
ASR-1	11/13/96	36.2	445	7.26	306	49.5	6.98	304	570	420	7.21	570	35	354	7.17	264		
ASR-1	11/20/96	36	458	7.70	314	60	6.98	628	320	432	7.09	320	39	457	7.08	318		
ASR-1	11/26/96	35	462	7.22	352	1051	7.01	682	320	448	7.11	320	51	506	7.06	346		
ASR-1	12/4/96	35	450	7.19	342	82	7.01	730	298	433	7.15	298	96	675	7.03	496		
ASR-1	12/11/96	34	459	7.19	334	1124	7.08	712	216	333	7.09	216	93	667	7.00	432		
ASR-1	12/17/96	28.5	458	7.38	306	1179	7.16	770	226	332	7.25	226	116.5	708	7.15	480		
ASR-1	12/23/96	24	462	7.42	290	114	7.12	818	216	315	7.41	216	152	850	7.25	536		
ASR-1	12/31/96	24	447	7.27	278	112	7.42	796	248	326	7.56	248	125	769	7.25	482		
ASR-1	1/7/97	19.5	471	7.26	330	270	7.14	1060	248	326	7.07	248	177.5	821	7.23	560		
ASR-1	1/14/97	26	406	7.19	270	405	7.14	1366	264	356	7.34	264	82	722	7.46	438		
ASR-1	1/22/97	22	477	7.06	315	370	6.87	1186	220	345	7.07	220	115	722	7.25	420		
ASR-1	1/29/97	21	531	7.28	386	455	7.05	1406	262	350	7.29	262	75	567	7.18	368		
ASR-1	2/4/97	22	552	7.06	340	515	1372	6.9	1028	402	7.50	1028	40	457	7.24	222		
ASR-1	2/11/97	115	855	7.38	300	525	7.12	1338	370	507	7.37	370	40	457	7.18	298		
ASR-1	2/18/97	18	421	7.46	336	250	7.15	956	406	559	7.32	406	33	420	7.42	296		
ASR-1	2/25/97	24	543	7.61	352	255	7.64	928	448	545	7.24	448	28	465	7.17	346		
ASR-1	3/4/97	26	497	7.39	328	265	7.04	1046	488	552	7.30	488	28	465	7.12	250		
ASR-1	3/11/97	22	571	7.46	330	265	7.46	936	346	552	7.46	346	28	465	7.12	250		
ASR-1	3/18/97	24	557	7.48	366	120	7.23	596	234	356	7.46	234	25.5	407	7.24	288		
ASR-1	3/25/97	31	494	7.41	324	130	7.12	706	340	394	7.40	340	24.5	401	7.24	456		
ASR-1	4/15/97	21	451	7.31	302	107.5	7.12	618	366	486	7.21	366	27.5	421	7.18	314		
ASR-1	4/22/97	24	527	7.58	234	47.5	7.57	294	334	453	7.35	334	32	412	7.77	298		
ASR-1	4/29/97	36.5	428	7.57	260	85	7.57	518	336	526	7.48	336	33	415	7.51	284		
ASR-1	5/6/97	31.5	477	7.19	280	83	6.18	618	348	541	7.21	348	33.5	430	7.06	272		
ASR-1	5/15/97	30	486	7.29	280	86	7.14	572	366	541	7.15	366	33	440	7.15	256		
ASR-1	5/20/97	33	500	7.23	298	86	7.09	546	440	509	7.19	440	33	401	7.13	368		
ASR-1	5/29/97	38	525	7.24	338	72	7.07	402	532	501	7.14	532	33	375	7.08	294		
ASR-1	6/4/97	32	552	7.25	314	46	7.15	656	340	530	7.26	340	29	435	7.20	540		
ASR-1	6/13/97	25	441	7.66	284	49	7.29	448	392	538	7.46	392	32	483	7.28	300		
ASR-1	6/19/97	27	521	7.28	302	62	7.21	502	270	408	7.42	270	32	382	7.42	304	Final Sampling	

APPENDIX I

Pumping Test Data and Analysis

Monitor Well MW-1



Q = 1000 gpm = 192,513 cu ft/day

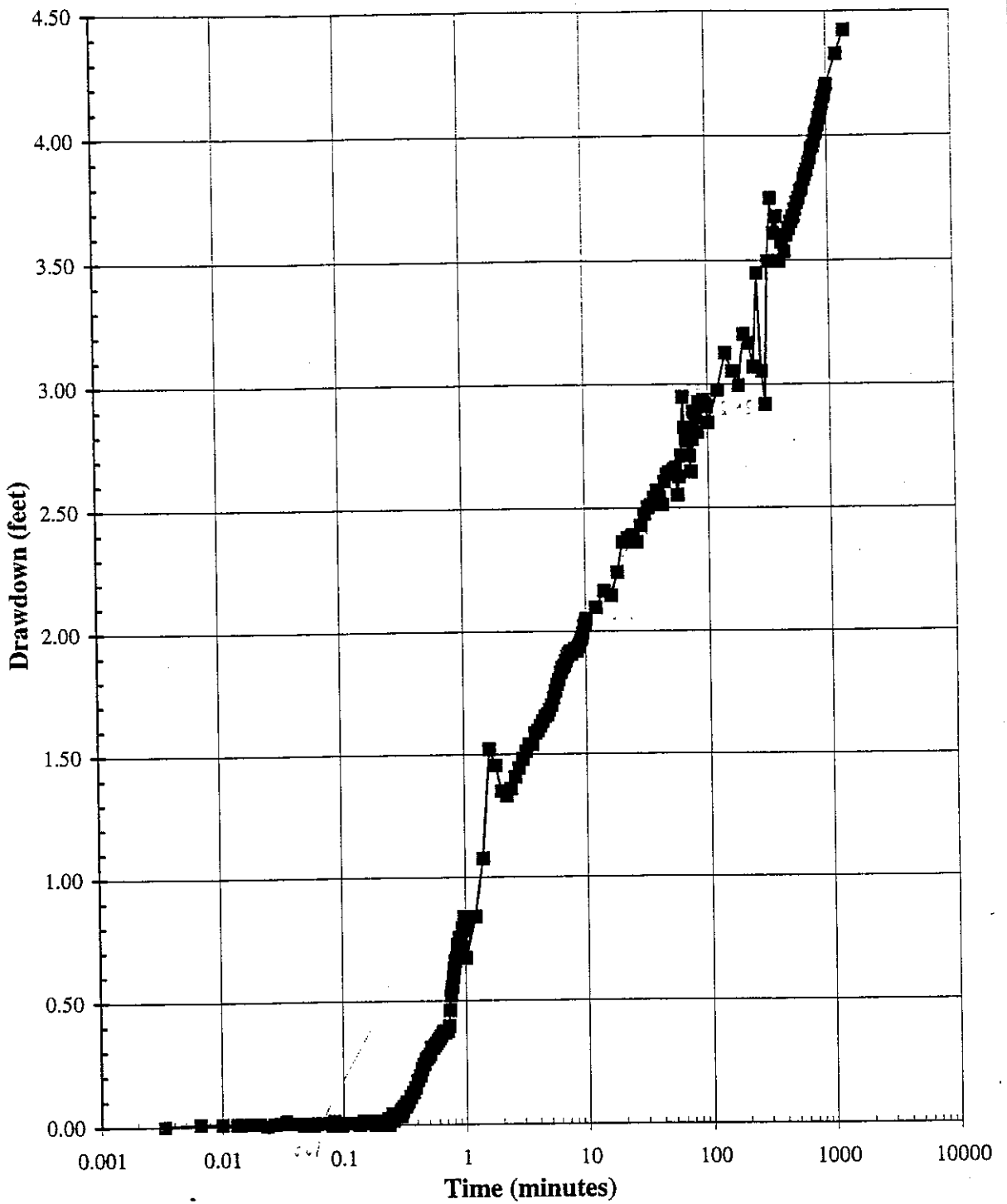
$$T = \frac{2.3Q}{4s} = \frac{2.3 \times 192,513}{4 \times 0.30} = 329,450 \text{ gpd/ft}$$

FIGURE 1
This Recovery Method

Broward County Office of Environmental Services
ASR Demonstration Project



Monitor Well MW-1



Q = 1000 gpm

$$T = 264Q/s = \frac{264(1000)}{0.95} = 278,000 \text{ gal/F} =$$

$$S = \frac{T \cdot s}{2.303 r^2} = \frac{278,000(0.07)^2}{2.303(275)^2} = 6.3 \times 10^{-5}$$

FIGURE 2
Cooper-Jacob Method

Broward County Office of Environmental Services
ASR Demonstration Project





SUBJECT Aquifer Test Analysis
BCOES ASR Project

BY P. Kwiatkowski DATE 5/1/97
SHEET NO. 1 OF
PROJECT NO. 103715.A0.30

Walton (1962) Method for Leaky Aquifers
Type-Curve Match, $Q = 1,000$ gpm, $r = 275$ Feet

$$\begin{aligned}w(u, r/B) &= 1 \\1/u &= 1 \\s &= 0.53 \text{ ft.} \\t &= 0.1 \text{ min} \\r/B &= 0\end{aligned}$$

$$s = \frac{114.6 Q}{T} w(u, r/B)$$

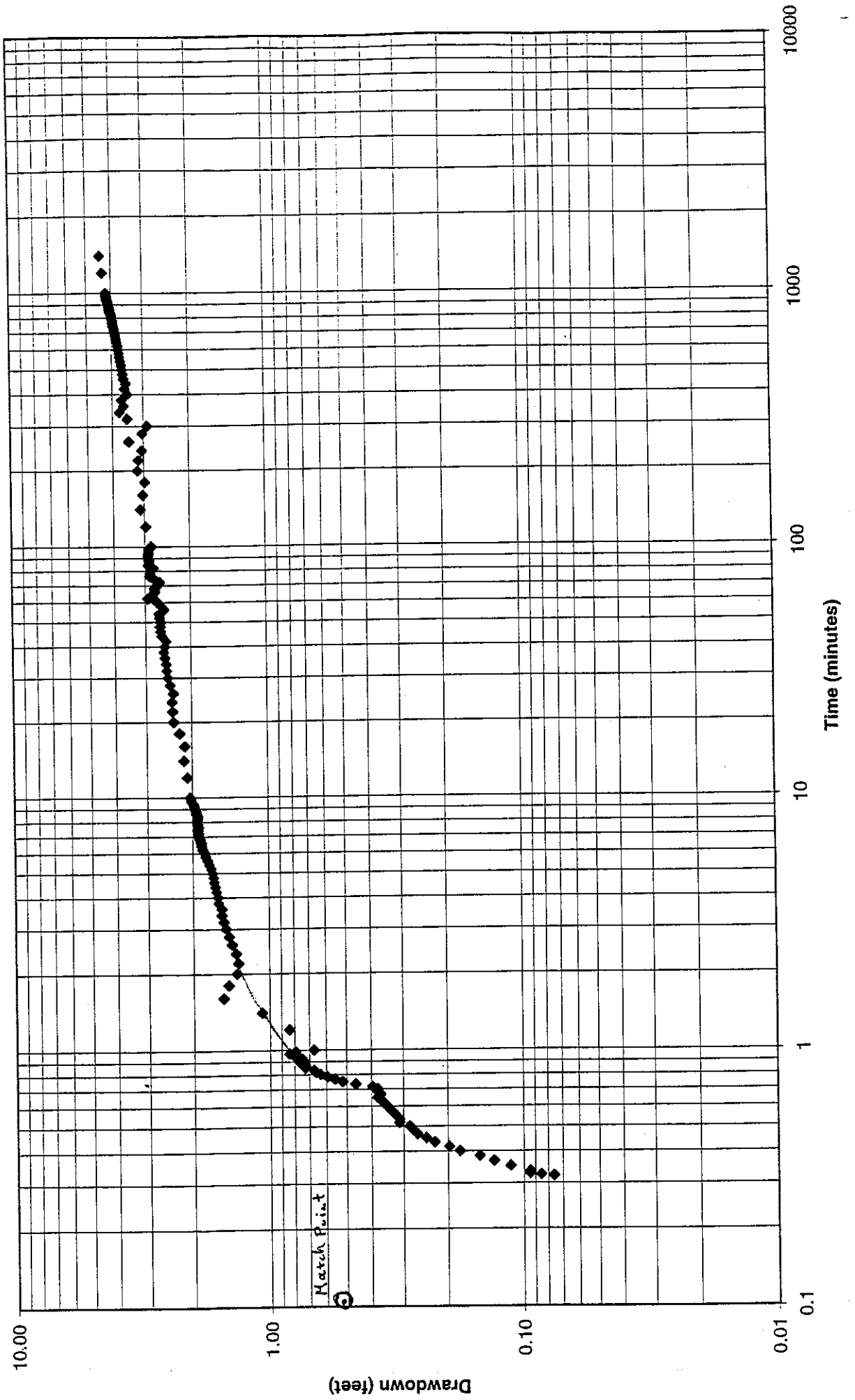
$$T = \frac{114.6 Q}{s} (1) = \frac{(114.6)(1000)}{0.53} = 216,226 \text{ gpd/ft}$$

$$S = \frac{Ttu}{2693 r^2} = \frac{(216,226)(0.1)(1)}{2693 (275)^2} = 1.06 \times 10^{-4}$$

No leakage observed from Type-Curve Match.

Average of methods: Transmissivity $275,000$ gpd/ft Storativity 7.95×10^{-5}

Drawdown vs. Time at MW-1



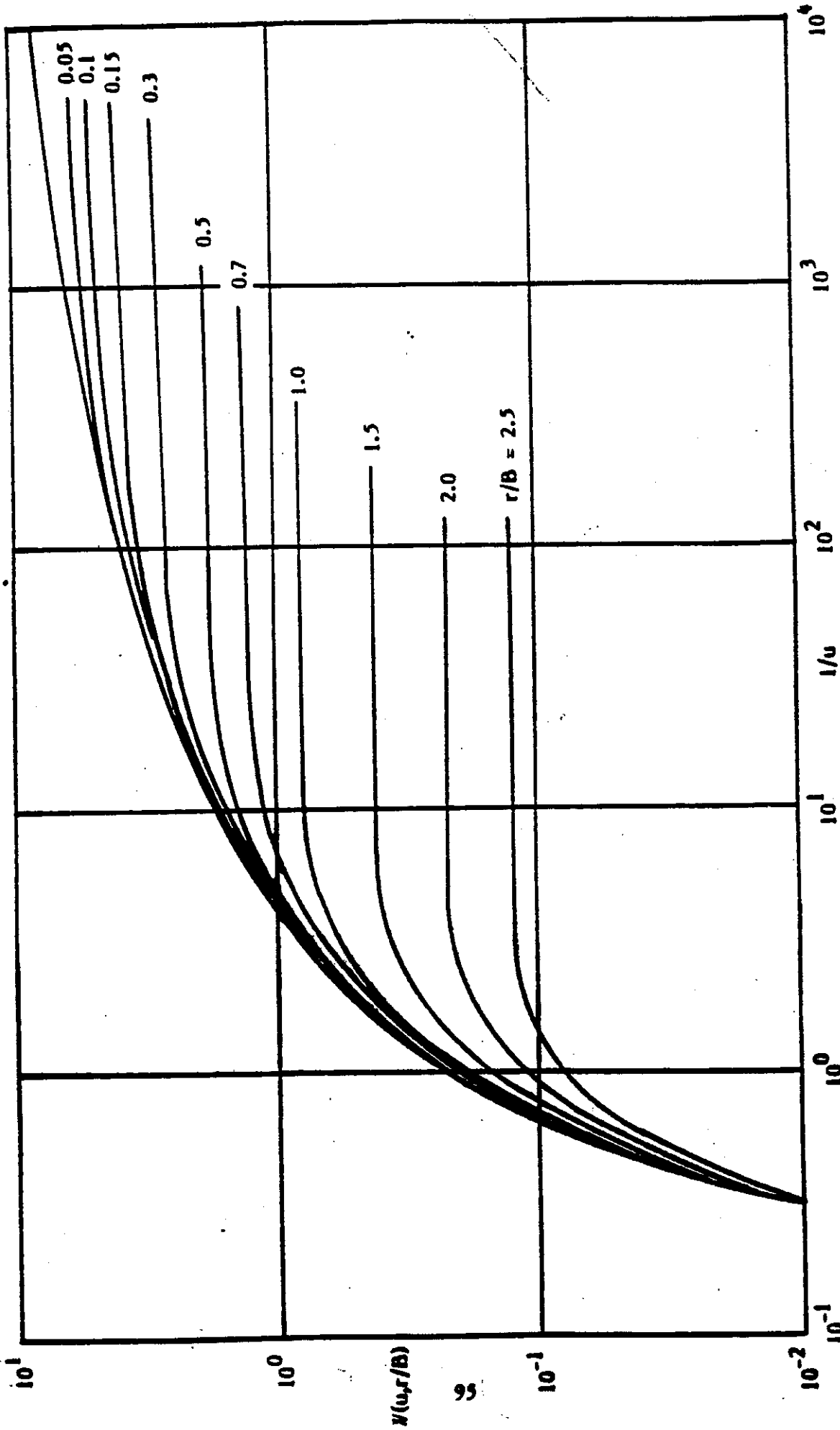


Plate 4. Model 3 time-drawdown type curves.



SUBJECT BROWARD COUNTY ASR DEMONSTRATION PROJECT BY M. SCHILLING DATE 11-21-96

STEP PUMPING TEST ON ASR-4 WELL

SHEET NO. 1 OF 3

PROJECT NO. 103715-A0-30

Time	TOTAL Time (min)	DTW (FT) REF. PAD LEVEL	DRAWDOWN (FT)	PUMPING RATE (GPM)	HEAD PRESSURE (PSI)	COMMENTS
0955	-	+21.0'	STATIC HEAD			TRANSDUCER IS SET AT 71.0 FEET BELOW PAD LEVEL.
1000	0			1050		START STEP TEST
1001	1	+10.0'	+11.0'		12	NOTE: VALVE IS 7/8 TH CLOSE
1002	2	+9.5'	11.5		12	IN ORDER TO KEEP FLOWRATE
1003	3	+9.5	11.5		12	AT 1050, THIS HEAD PRESSURE
1004	4	+9.67	11.33		12	IS AFFECTED.
1005	5	+9.75	11.25	1050		NOTE: TURBINE PUMP SET AT
1007	7	+9.83	11.17		12	100 FEET BELOW PAD LEVEL
1009	9	+10.0	11.0			
1011	11	+10.0	11.0	1050	12	
1013	13	+10.0	11.0			
1015	15	+10.0	11.0	1050	12	
1020	20	+9.92	11.08	1050	12	
1025	25	+9.83	11.17	1050	12	
1030	30	+9.75	11.25	1050	12	
1035	35	+9.67	11.33	1050	12	
1040	40	+9.67	11.33	1050	12	
1045	45	+9.58	11.42	1050	12	
1100	60	+9.58	11.42	1050	12	
1115	75	+9.5	11.5	1050	12	
1130	90	+9.5	11.5	1050	12	
1145	105	+9.5	11.5	1050	12	
1200	120	+9.42	11.58	1050	12	CHANGE PUMP RATE TO 1800 GPM
1202	122	-7.68	28.68	1900		
1203	123	-8.18	29.18	1800		
1204	124	-8.18	29.18	1800	9	NOTE: VALVE IS FULLY OPEN
1205	125	-8.68	29.68	1800		THIS HEAD PRESSURE IS
1207	127	-9.68	29.68	1800		UNAFFECTED.
1209	129	-8.88	29.88			
1211	131	-8.88	29.88	1800		



SUBJECT Broward County ASR Demonstration Project

BY M. Schilling DATE 11-21-96

STEP Purp. Test on ASR-1 Well

SHEET NO. 2 OF 3

PROJECT NO. 103715 AP. 30

TIME	TOTAL TIME (min)	DTW (FT) REF PAD LEVEL	DRAWDOWN (FT)	PUMPING RATE (GPM)	HEAD PRESSURE (PSI)	COMMENTS
1213	133	-8.93	29.93			
1215	135	-8.08	29.08		9	
1220	140	-8.08	29.08	1825	9	
1225	145	-8.13	29.13	1825	9	
1230	150	-8.28	29.28	1825	9	
1235	155	-8.38	29.38	1825	9	
1240	160	-8.38	29.38	1825	9	
1245	165	-8.38	29.38	1825	9	
1300	180	-8.38	29.38	1825	9	
1315	195	-8.48	29.48	1825	9	
1330	210	-8.58	29.58	1825	9	
1345	225	-8.68	29.68	1850	9	NOTE: PUMP RATE IS INCREASED WITHOUT ANY EXTERNAL CHANGE
1400	240	-8.78	29.78	1850	9	CHANGE PUMP RATE TO 3000
1402	242	-38.63	59.63	2950	15.5	
1405	245	-39.18	60.18	2975	12.5	NOTE: DTW IS DIFFICULT TO READ WITH THE WATER LEVEL INDICATOR DUE TO WETNESS ON PROBE WHEN NEXT TO PUMP COLUMN
1407	247	-42.28 -39.28	63.48		12	
1408	248	-42.48 -39.48	63.48			
1409	249	-43.08	64.08	2975	12	
1411	251	-43.08	64.08	2975	12	
1413	253	-43.13	64.13	3000+	12	NOTE: ADJUSTED PUMP RATE
1415	255	-42.98	63.98	3000+	12	BACK TO 2950 GPM
1420	260	-42.98	63.98	2950	12	
1425	265	-36.58	57.68	2950	12	
1430	270	-36.58	57.68	2950	12	
1435	275	-36.68	57.68	2950	12	
1440	280	-36.68	57.68	2950	12	
1445	285	-36.68	57.68	2950	12	
1500	300	-36.73	57.73	2975	11	
1515	315	-36.93	57.93	3000	11	
1530	330	-36.93	57.93	3000	11	



SUBJECT BROWARD COUNTY ASR DEMONSTRATION PROJECT BY M. SCHILLING DATE 11-26-96

24-HOUR CONSTANT RATE PUMP TEST
ON ASR-4 WELL

SHEET NO. 1 OF 1

PROJECT NO. 103715. A0.30

TIME	DTW	DRAWDOWN	HEAD PRESSURE	PUMPING RATE	COMMENTS
0800	+21.5'				TRANSDUCER SET AT SAME LEVEL AS IN STEP 1 STATIC WATER LEVEL
0805				= 1000	START 24-HR PUMPING TEST
0809	+11.5'	10.0'		999.95	FLOW RATE STABILIZED
0825	+11.8'	9.7'	17	1000	
0905	+11.4'	10.1'	17	995	
1005	+11.0'	10.5'	17	795	
1105	+10.82'	10.58'	17	995	NOTE: TRANSDUCER ^{IN} FOR ASR WELL IS GIVING ERRATIC READINGS
1205	+10.5'	11.0	17	1000	
1305	+10.33'	11.17	17	1000	
1405	+10.16'	11.34	16	1000	
1430	+10.0	11.50	16	1000	NOTE: CONTRACTOR CHECKED LEVEL OF MILLION GALLON STORAGE TANK. EMP
1505	+10.0	11.50	16	1000	SPACE BELOW TOP OF TANK = 10' 4"
1605	+10.0	11.50	16	1000	
1610			16	1000	NOTE: LEVEL IN STORAGE TANK IS NOW 10' BELOW TOP OF TANK.
1705	+10.0	11.50	16	1000	
1805	+10.0	11.34	16	1000	
1905	+10.0	11.34	16	1000	
2005	+10.0	11.34	16	1000	
2105	+10.0	11.50	16	1000	CUT BACK FLOW INTO WET WELL & LET CATCH UP.
2205	+10.0	11.34	16	1000	
2305	+10.0	11.50	16	1000	
0005	+10.0	11.50	16	1000	tank level 6' below top of tank
0105	+10.0	11.50	16	1000	
0205	+9.83'	11.67	16	1000	
0305	+9.83'	11.67	16	1000	tank level 4' - Had to stop flow down in wet well
0405	+9.83'	11.67	16	1000	
0605	+9.41'	12.09	16	1000	tank level at 2'
0605	-9.41'	12.09	16	1000	
0705	+9.25'	12.25	16	1000	
0805	+9.16'	12.34	16	1000	STOP PUMP. START RECOVERY
0810	+9.16'	1.75	-	-	
0820	20.5'	1.00	-	-	

APPENDIX J

Background Water Quality Data

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Primary Organics - Volatiles (524)		
Vinyl chloride, ug/l		<0.50
Benzene, ug/l		<0.50
Carbon tetrachloride, ug/l		<0.50
1,2-Dichloroethane, ug/l		<0.50
Trichloroethylene, ug/l		<0.50
1,4-Dichlorobenzene, ug/l		<0.50
1,1-Dichloroethene, ug/l		<0.50
1,1,1-Trichloroethane, ug/l		<0.50
cis-1,2-Dichloroethene, ug/l		<0.50
1,2-Dichloropropane, ug/l		<0.50
Ethylbenzene, ug/l		<0.50
Chlorobenzene, ug/l		<0.50
1,2-Dichlorobenzene, ug/l		<0.50
Styrene, ug/l		<0.50
Tetrachloroethene, ug/l		<0.50
Toluene, ug/l		4.4
trans-1,2-Dichloroethene, ug/l		<0.50
Xylenes, ug/l		<0.50
Methylene chloride (Dichloromethane), ug/l		<1.0
1,2,4-Trichlorobenzene, ug/l		<0.50
1,1,2-Trichloroethane, ug/l		<0.50
Date Analyzed		12.17.96
Method Number		EPA 524.2
Dilution factor		1

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Primary Organics - Trihalomethanes (524.2)		
Bromoform, ug/l		<0.50
Chloroform, ug/l		<0.50
Dichlorobromomethane, ug/l		<0.50
Dibromochloromethane, ug/l		<0.50
Total Trihalomethanes, ug/l		<0.50
Date Analyzed		12.17.96
Method Number		EPA 524

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Group II Unregulated Purgeables		
Bromobenzene, ug/l		<0.50
Bromodichloromethane, ug/l		<0.50
Bromoform, ug/l		<0.50
Bromomethane, ug/l		<0.50
Chloroethane, ug/l		<0.50
Chloroform, ug/l		<0.50
Chloromethane, ug/l		<0.50
Dibromochloromethane, ug/l		<0.50
Dichlorodifluoromethane, ug/l		<0.50
P-Chlorotoluene, ug/l		<0.50
Dibromomethane, ug/l		<0.50
1,1-Dichloroethane, ug/l		<0.50
cis-1,3-Dichloropropene, ug/l		<0.50
trans-1,3-Dichloropropene, ug/l		<0.50
1,3-Dichloropropylene, ug/l		<0.50
1,3-Dichloropropane, ug/l		<0.50
2,2 Dichloropropane, ug/l		<0.50
Trichlorofluoromethane, ug/l		<0.50
1,2,3-Trichloropropane, ug/l		<0.50
1,3-Dichlorobenzene, ug/l		<0.50
1,1,1,2-Tetrachloroethane, ug/l		<0.50
1,1,2,2-Tetrachloroethane, ug/l		<0.50
Methyl-tert-butyl ether (MTBE), ug/l		<0.50
1,1-Dichloropropene, ug/l		<0.50
O-Chlorotoluene, ug/l		<0.50
Date Analyzed		12.17.96
Method Number		EPA 524.2
Dilution factor		1

SL SAVANNAH LABORATORIES

& ENVIRONMENTAL SERVICES. INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
 Received: 03 DEC 96
 Reported: 09 JAN 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 212170225

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER	72759-1	
Microextractables (504)		
1,2-Dibromoethane (EDB) , ug/l	<0.020	
1,2-Dibromo-3-chloropropane, ug/l	<0.020	
Date Extracted	12.17.96	
Date Analyzed	12.17.96	
Method Number	EPA 504	
Primary Organics - Pesticides (507)		
Alachlor, ug/l	<1.0	
Atrazine, ug/l	<1.0	
Simazine, ug/l	<1.0	
Date Extracted	12.05.96	
Date Analyzed	12.17.96	
Method Number	EPA 507	
Group I Unregulated Pesticides (507)		
Butachlor, ug/l	<1.0	
Metolachlor, ug/l	<1.0	
Metribuzin, ug/l	<1.0	
Date Extracted	12.05.96	
Date Analyzed	12.17.96	
Method Number	EPA 507	

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Primary Organics - Pesticides (508)		
alpha-Chlordane, ug/l		<0.20*F65
Gamma Chlordane, ug/l		<0.20*F65
Endrin, ug/l		<0.40*F65
Heptachlor, ug/l		<0.20*F65
Heptachlor epoxide, ug/l		<0.40*F65
Lindane (g-BHC), ug/l		<0.20*F65
Methoxychlor, ug/l		<0.50
Toxaphene, ug/l		<1.0
Aroclor-1016, ug/l		<10*F65
Aroclor-1221, ug/l		<10*F65
Aroclor-1232, ug/l		<10*F65
Aroclor-1242, ug/l		<10*F65
Aroclor-1248, ug/l		<10*F65
Aroclor-1254, ug/l		<10*F65
Aroclor-1260, ug/l		<0.50
Date Extracted		12.04.96
Date Analyzed		12.10.96
Method Number		EPA 508
Group I Unregulated Pesticides (508)		
Aldrin, ug/l		<0.20*F65
Dieldrin, ug/l		<0.40*F65
Date Extracted		12.04.96
Date Analyzed		12.10.96
Method Number		EPA 508

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
 Received: 03 DEC 96
 Reported: 09 JAN 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 212170225

REPORT OF RESULTS

Page 6

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Primary Organics - Herbicides (515.1)		
2,4-D, ug/l		<0.50
Dalapon, ug/l		<10
Dinoseb, ug/l		<0.50
Pentachlorophenol, ug/l		<1.0
Picloram, ug/l		<0.50
2,4,5-TP Silvex, ug/l		<0.50
Date Extracted		12.09.96
Date Analyzed		12.11.96
Method Number		EPA 515.1
Group I Unregulated Herbicides (515.1)		
Dicamba, ug/l		<0.50
Date Extracted		12.09.96
Date Analyzed		12.11.96
Method Number		EPA 515.1
Primary Organics - BN (525.2)		
Benzo(a)pyrene, ug/l		<0.20
Bis(2-ethyl hexyl)adipate, ug/l		<2.0
bis(2-Ethylhexyl) phthalate, ug/l		<2.0
Hexachlorobenzene, ug/l		<1.0
Hexachlorocyclopentadiene, ug/l		<1.0
Date Extracted		12.05.96
Date Analyzed		12.11.96
Method Number		EPA 525.2

SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
 Received: 03 DEC 96
 Reported: 09 JAN 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 212170225

REPORT OF RESULTS

Page 7

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Group III Unregulated Acid Extractables		
2-Chlorophenol, ug/l		<10
2-Methyl-4,6-dinitrophenol, ug/l		<50
Phenol, ug/l		<10
2,4,6-Trichlorophenol, ug/l		<10
Date Extracted		12.04.96
Date Analyzed		12.09.96
Method Number		EPA 625
Group III Unregulated BN Extractables		
Butylbenzylphthalate, ug/l		<10
Di-n-butylphthalate, ug/l		<10
Diethylphthalate, ug/l		<10
Dimethylphthalate, ug/l		<10
2,4-Dinitrotoluene, ug/l		<10
Di-n-octylphthalate, ug/l		<10
Isophorone, ug/l		<10
Date Extracted		12.04.96
Date Analyzed		12.09.96
Method Number		EPA 625
Primary Organics - Carbamates (531.1)		
Carbofuran, ug/l		<1.0
Oxamyl, ug/l		<1.0
Date Analyzed		12.11.96
Method Number		EPA 531.1

LOG NO: D6-72759
 Received: 03 DEC 96
 Reported: 09 JAN 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 212170225

REPORT OF RESULTS

Page 8

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER	72759-1	
Group I Unregulated Carbamates (531.1)		
Aldicarb, ug/l		<0.50
Aldicarb Sulfone, ug/l		<0.50
Aldicarb Sulfoxide, ug/l		<0.50
Carbaryl, ug/l		<1.0
3-Hydroxycarbofuran, ug/l		<1.0
Methomyl, ug/l		<1.0
Date Analyzed		12.11.96
Method Number		EPA 531.1
Primary Organics - Glyphosate (547)		
Glyphosate, ug/l		<150
Date Analyzed		12.11.96
Method Number		EPA 547
Primary Organics - Endothall (548.1)		
Endothall, ug/l		<10
Date Extracted		12.06.96
Date Analyzed		12.09.96
Method Number		EPA 548.1
Primary Organics - Diquat (549.1)		
Diquat, ug/l		<1.0
Date Analyzed		12.10.96
Method Number		EPA 549.1

LOG NO: D6-72759
 Received: 03 DEC 96
 Reported: 09 JAN 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 212170225

REPORT OF RESULTS

Page 9

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Primary ICP Metals (200.7)		
Barium, mg/l		<0.010
Beryllium, mg/l		<0.00040
Cadmium, mg/l		<0.0050
Chromium, mg/l		<0.010
Nickel, mg/l		<0.040
Sodium (200.7), mg/l		970
Date Analyzed		12.26.96
Method Number		EPA 200.7
Antimony (200.7)		
Antimony, mg/l		<0.0060
Date Analyzed		12.26.96
Method Number		EPA 200.7
Arsenic (206.2)		
Arsenic, mg/l		<0.010
Date Analyzed		12.06.96
Method Number		EPA 206.2
Lead (239.2)		
Lead, mg/l		<0.0050
Date Analyzed		12.06.96
Method Number		EPA 239.2
Mercury (245.1)		
Mercury, mg/l		<0.00020
Date Analyzed		12.04.96
Method Number		EPA 245.1

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 10

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Selenium (270.2)		
Selenium, mg/l		<0.0020
Date Analyzed		12.09.96
Method Number		EPA 279.2
Thallium (279.2)		
Thallium, mg/l		<0.0020
Date Analyzed		12.09.96
Method Number		EPA 279.2
Coliform, Total (SM 9222B)		
Coliform (MF), Total, col/100ml		<1
Date Analyzed		12.04.96
Method Number		SM 9222B
Cyanide, Total		
Cyanide, Total , mg/l		<0.010
Date Analyzed		12.06.96
Method Number		EPA 335.2
Fluoride (340.2)		
Fluoride, mg/l		1.1
Date Analyzed		12.03.96
Method Number		EPA 340.2
Nitrogen, Nitrate		
Nitrate-N, mg/l		<0.050
Date Analyzed		12.04.96
Method Number		EPA 353.3
Nitrogen, Nitrite		
Nitrite-N, mg/l		<0.050
Date Analyzed		12.04.96
Method Number		EPA 353.3

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 11

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Nitrogen, Nitrate + Nitrite		
Nitrate + Nitrite-N, mg/l		<0.050
Date Analyzed		12.04.96
Method Number		EPA 353.3
Turbidity		
Turbidity, NTU		16
Date Analyzed		12.04.96
Method Number		EPA 180.1
Secondary Metals (200.7)		
Aluminum, mg/l		<0.20
Copper, mg/l		<0.025
Iron, mg/l		0.082
Manganese, mg/l		<0.010
Silver, mg/l		<0.010
Zinc, mg/l		0.050
Date Analyzed		12.26.96
Method Number		EPA 200.7
Chloride		
Chloride, mg/l		1900
Date Analyzed		12.09.96
Method Number		EPA 325.3
Color		
Color, c.u.		5.0
Date Analyzed		12.03.96
Method Number		EPA 110.2

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225
Page 12

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Odor		
Odor, t.o.n.		16
Date Analyzed		12.12.96
Method Number		EPA 140.1
pH		
pH , units		7.5
Date Analyzed		12.05.96
Method Number		EPA 150.1
Solids, Total Dissolved (160.1)		
Solids, Total Dissolved, mg/l		3200
Date Analyzed		12.06.96
Method Number		EPA 160.2
Sulfate as SO4		
Sulfate as SO4, mg/l		380
Date Analyzed		12.10.96
Method Number		EPA 375.4
Surfactants (MBAS)		
Surfactants (MBAS), mg/l		<0.10
Date Analyzed		12.05.96
Method Number		SM 5540C
Biochemical Oxygen Demand (5-Day) (405.1)		
Biochemical Oxygen Demand (5 Day), mg/l		<2.0
Date Analyzed		12.05.96
Method Number		EPA 405.1
Nitrogen, Ammonia		
Nitrogen, Ammonia, mg/l		0.98
Date Analyzed		12.11.96
Method Number		EPA 350.3

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225
Page 13

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759-1	ASR-1	12-03-96/1135
PARAMETER		72759-1
Kjeldahl Nitrogen as N, Total (EPA 351.2)		
Kjeldahl Nitrogen-N, mg/l		0.93
Date Analyzed		12.10.96
Method Number		EPA 351.2
Phosphorus, Total (365.4)		
Phosphorus, Total (365.4), mg/l		<0.10
Date Analyzed		12.09.96
Method Number		EPA 365.4
Asbestos in Water (TEM), mg/l		*F71
2,3,7,8-TCDD (1613), ug/l		*F71

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 14

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Primary Organics - Volatiles (524)				
Vinyl chloride, ug/l	<0.50	114 %	5.8 %	0.50
Benzene, ug/l	<0.50	100 %	1.4 %	0.50
Carbon tetrachloride, ug/l	<0.50	104 %	8.7 %	0.50
1,2-Dichloroethane, ug/l	<0.50	98 %	1.8 %	0.50
Trichloroethylene, ug/l	<0.50	102 %	6.4 %	0.50
1,4-Dichlorobenzene, ug/l	<0.50	90 %	0.10 %	0.50
1,1-Dichloroethene, ug/l	<0.50	112 %	4.3 %	0.50
1,1,1-Trichloroethane, ug/l	<0.50	100 %	2.6 %	0.50
cis-1,2-Dichloroethene, ug/l	<0.50	97 %	2.8 %	0.50
1,2-Dichloropropane, ug/l	<0.50	93 %	3.9 %	0.50
Ethylbenzene, ug/l	<0.50	100 %	2.7 %	0.50
Chlorobenzene, ug/l	<0.50	96 %	4.0 %	0.50
1,2-Dichlorobenzene, ug/l	<0.50	94 %	2.6 %	0.50
Styrene, ug/l	<0.50	98 %	6.0 %	0.50
Tetrachloroethene, ug/l	<0.50	105 %	0.30 %	0.50
Toluene, ug/l	<0.50	98 %	2.4 %	0.50
trans-1,2-Dichloroethene, ug/l	<0.50	96 %	3.8 %	0.50
Xylenes, ug/l	<0.50	96 %	4.2 %	0.50
Methylene chloride (Dichloromethane), ug/l	<1.0	102 %	0.30 %	1.0
1,2,4-Trichlorobenzene, ug/l	<0.50	110 %	4.0 %	0.50
1,1,2-Trichloroethane, ug/l	<0.50	102 %	3.0 %	0.50
Date Analyzed	12.17.96	---	---	---
Method Number	EPA 524.2	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
 Received: 03 DEC 96
 Reported: 09 JAN 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 212170225

REPORT OF RESULTS

Page 15

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
 72759-3 Accuracy - % Recovery (Mean)
 72759-4 Precision - Relative % Difference
 72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Primary Organics - Trihalomethanes (524.2)				
Bromoform, ug/l	<0.50	---	---	0.50
Chloroform, ug/l	<0.50	---	---	---
Dichlorobromomethane, ug/l	<0.50	---	---	---
Dibromochloromethane, ug/l	<0.50	---	---	---
Total Trihalomethanes, ug/l	<0.50	---	---	---
Date Analyzed	12.17.96	---	---	---
Method Number	EPA 524	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 16

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Group II Unregulated Purgeables				
Bromobenzene, ug/l	<0.50	102 %	1.4 %	0.50
Bromodichloromethane, ug/l	<0.50	106 %	6.8 %	0.50
Bromoform, ug/l	<0.50	107 %	2.0 %	0.50
Bromomethane, ug/l	<0.50	106 %	3.6 %	0.50
Chloroethane, ug/l	<0.50	116 %	7.5 %	0.50
Chloroform, ug/l	<0.50	97 %	2.0 %	0.50
Chloromethane, ug/l	<0.50	96 %	8.8 %	0.50
Dibromochloromethane, ug/l	<0.50	101 %	5.9 %	0.50
Dichlorodifluoromethane, ug/l	<0.50	78 %	6.2 %	0.50
P-Chlorotoluene, ug/l	<0.50	94 %	1.7 %	0.50
Dibromomethane, ug/l	<0.50	98 %	3.7 %	0.50
1,1-Dichloroethane, ug/l	<0.50	100 %	2.8 %	0.50
cis-1,3-Dichloropropene, ug/l	<0.50	114 %	3.6 %	0.50
trans-1,3-Dichloropropene, ug/l	<0.50	115 %	5.2 %	0.50
1,3-Dichloropropylene, ug/l	<0.50	---	---	0.50
1,3-Dichloropropane, ug/l	<0.50	102 %	1.9 %	0.50
2,2 Dichloropropane, ug/l	<0.50	102 %	6.7 %	0.50
Trichlorofluoromethane, ug/l	<0.50	129 %	0.4 %	0.50
1,2,3-Trichloropropane, ug/l	<0.50	93 %	8.4 %	0.50
1,3-Dichlorobenzene, ug/l	<0.50	93 %	2.1 %	0.50
1,1,1,2-Tetrachloroethane, ug/l	<0.50	100 %	1.0 %	0.50
1,1,2,2-Tetrachloroethane, ug/l	<0.50	94 %	3.4 %	0.50
Methyl-tert-butyl ether (MTBE), ug/l	<0.50	98 %	1.8 %	0.50
1,1-Dichloropropene, ug/l	<0.50	102 %	3.4 %	0.50
O-Chlorotoluene, ug/l	<0.50	---	3.8 %	0.50
Date Analyzed	12.17.96	---	---	---
Method Number	EPA 524.2	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 17

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Microextractables (504)				
1,2-Dibromoethane (EDB) , ug/l	<0.020	96 %	3.1 %	0.020
1,2-Dibromo-3-chloropropane, ug/l	<0.020	84 %	8.3 %	0.020
Date Extracted	12.17.96	---	---	---
Date Analyzed	12.17.96	---	---	---
Method Number	EPA 504	---	---	---
Primary Organics - Pesticides (507)				
Alachlor, ug/l	<1.0	91 %	6.4 %	1.0
Atrazine, ug/l	<1.0	88 %	1.0 %	1.0
Simazine, ug/l	<1.0	95 %	15 %	1.0
Date Extracted	12.05.96	---	---	---
Date Analyzed	12.17.96	---	---	---
Method Number	EPA 507	---	---	---
Group I Unregulated Pesticides (507)				
Butachlor, ug/l	<1.0	82 %	12 %	1.0
Metolachlor, ug/l	<1.0	85 %	6.7 %	1.0
Metribuzin, ug/l	<1.0	94 %	3.3 %	1.0
Date Extracted	12.05.96	---	---	---
Date Analyzed	12.17.96	---	---	---
Method Number	EPA 507	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 18

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Primary Organics - Pesticides (508)				
alpha-Chlordane, ug/l	<0.010	---	---	0.010
Gamma Chlordane, ug/l	<0.010	---	---	0.010
Endrin, ug/l	<0.020	97 %	0 %	0.020
Heptachlor, ug/l	<0.010	73 %	8.2 %	0.010
Heptachlor epoxide, ug/l	<0.020	---	---	0.020
Lindane (g-BHC), ug/l	<0.010	83 %	4.8 %	0.010
Methoxychlor, ug/l	<0.50	---	---	0.50
Toxaphene, ug/l	<1.0	---	---	1.0
Aroclor-1016, ug/l	<0.50	---	---	0.50
Aroclor-1221, ug/l	<0.50	---	---	0.50
Aroclor-1232, ug/l	<0.50	---	---	0.50
Aroclor-1242, ug/l	<0.50	---	---	0.50
Aroclor-1248, ug/l	<0.50	---	---	0.50
Aroclor-1254, ug/l	<0.50	---	---	0.50
Aroclor-1260, ug/l	<0.50	---	---	0.50
Date Extracted	12.04.96	---	---	---
Date Analyzed	12.10.96	---	---	---
Method Number	EPA 508	---	---	---
Group I Unregulated Pesticides (508)				
Aldrin, ug/l	<0.010	75 %*F82	8.0 %	0.010
Dieldrin, ug/l	<0.020	95 %*F82	0 %	0.020
Date Extracted	12.04.96	---	---	---
Date Analyzed	12.10.96	---	---	---
Method Number	EPA 508	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 19

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Primary Organics - Herbicides (515.1)				
2,4-D, ug/l	<0.50	83 %	21 %	0.50
Dalapon, ug/l	<10	107 %	11 %	10
Dinoseb, ug/l	<0.50	53 %	20 %	0.50
Pentachlorophenol, ug/l	<1.0	93 %	25 %	1.0
Picloram, ug/l	<0.50	104 %	7.1 %	0.50
2,4,5-TP Silvex, ug/l	<0.50	106 %	11 %	0.50
Date Extracted	12.09.96	---	---	---
Date Analyzed	12.11.96	---	---	---
Method Number	EPA 515.1	---	---	---
Group I Unregulated Herbicides (515.1)				
Dicamba, ug/l	<0.50	94 %	14 %	0.50
Date Extracted	12.09.96	---	---	---
Date Analyzed	12.19.96	---	---	---
Method Number	EPA 515.1	---	---	---
Primary Organics - BN (525.2)				
Benzo(a)pyrene, ug/l	<0.20	85 %	4.7 %	0.20
Bis(2-ethyl hexyl)adipate, ug/l	<2.0	94 %	1.1 %	2.0
bis(2-Ethylhexyl) phthalate, ug/l	<2.0	95 %	4.2 %	2.0
Hexachlorobenzene, ug/l	<1.0	85 %	2.4 %	1.0
Hexachlorocyclopentadiene, ug/l	<1.0	74 %	4.0 %	1.0
Date Extracted	12.05.96	---	---	---
Date Analyzed	12.11.96	---	---	---
Method Number	EPA 525.2	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 20

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Group III Unregulated Acid Extractables				
2-Chlorophenol, ug/l	<10	67 %	0 %	10
2-Methyl-4,6-dinitrophenol, ug/l	<50	---	---	50
Phenol, ug/l	<10	66 %	7.5 %	10
1,4,6-Trichlorophenol, ug/l	<10	---	---	10
Date Extracted	12.04.96	---	---	---
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 625	---	---	---
Group III Unregulated BN Extractables				
Butylbenzylphthalate, ug/l	<10	---	---	10
Di-n-butylphthalate, ug/l	<10	---	---	10
Diethylphthalate, ug/l	<10	---	---	10
Dimethylphthalate, ug/l	<10	---	---	10
2,4-Dinitrotoluene, ug/l	<10	76 %	17 %	10
Di-n-octylphthalate, ug/l	<10	---	---	10
Isophorone, ug/l	<10	---	---	10
Date Extracted	12.04.96	---	---	---
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 625	---	---	---
Primary Organics - Carbamates (531.1)				
Carbofuran, ug/l	<1.0	92 %	0 %	1.0
Oxamyl, ug/l	<1.0	96 %	2.1 %	1.0
Date Analyzed	12.11.96	---	---	---
Method Number	EPA 531.1	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 21

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Group I Unregulated Carbamates (531.1)				
Aldicarb, ug/l	<0.50	96 %	2.1 %	0.50
Aldicarb Sulfone, ug/l	<0.50	---	---	0.50
Aldicarb Sulfoxide, ug/l	<0.50	---	---	0.50
Carbaryl, ug/l	<1.0	---	---	1.0
3-Hydroxycarbofuran, ug/l	<1.0	---	---	1.0
Methomyl, ug/l	<1.0	---	---	1.0
Date Analyzed	12.11.96	---	---	---
Method Number	EPA 531.1	---	---	---
Primary Organics - Glyphosate (547)				
Glyphosate, ug/l	<150	108 %	10 %	150
Date Analyzed	12.11.96	---	---	---
Method Number	EPA 547	---	---	---
Primary Organics - Endothall (548.1)				
Endothall, ug/l	<10	72 %	4.1 %	10
Date Extracted	12.06.96	---	---	---
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 548.1	---	---	---
Primary Organics - Diquat (549.1)				
Diquat, ug/l	<1.0	46 %	20 %	1.0
Date Analyzed	12.10.96	---	---	---
Method Number	EPA 549.1	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.A0 (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 22

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Primary ICP Metals (200.7)				
Barium, mg/l	<0.010	96 %	3.1 %	0.010
Beryllium, mg/l	<0.0040	98 %	3.1 %	0.0040
Cadmium, mg/l	<0.0050	92 %	1.1 %	0.0050
Chromium, mg/l	<0.010	96 %	3.1 %	0.010
Nickel, mg/l	<0.040	90 %	3.3 %	0.040
Sodium (200.7), mg/l	<0.50	108 %	16 %	0.50
Date Analyzed	12.26.96	---	---	---
Method Number	EPA 200.7	---	---	---
Antimony (200.7)				
Antimony, mg/l	<0.0060	94 %	3.2 %	0.0060
Date Analyzed	12.26.96	---	---	---
Method Number	EPA 200.7	---	---	---
Arsenic (206.2)				
Arsenic, mg/l	<0.010	80 %	2.5 %	0.010
Date Analyzed	12.06.96	---	---	---
Method Number	EPA 206.2	---	---	---
Lead (239.2)				
Lead, mg/l	<0.0050	103 %	5.8 %	0.0050
Date Analyzed	12.06.96	---	---	---
Method Number	EPA 239.2	---	---	---
Mercury (245.1)				
Mercury, mg/l	<0.00020	96 %	1.0 %	0.00020
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 245.1	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225
Page 23

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Selenium (270.2)				
Selenium, mg/l	<0.0050	106 %*F75	2.8 %	0.0050
Date Analyzed	12.05.96	---	---	---
Method Number	EPA 270.2	---	---	---
Thallium (279.2)				
Thallium, mg/l	<0.0020	80 %	1.2 %	0.0020
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 279.2	---	---	---
Cyanide, Total				
Cyanide, Total , mg/l	<0.010	96 %	17 %	0.010
Date Analyzed	12.06.96	---	---	---
Method Number	EPA 335.2	---	---	---
Fluoride (340.2)				
Fluoride, mg/l	<0.20	100 %	5.0 %	0.20
Date Analyzed	12.03.96	---	---	---
Method Number	EPA 340.2	---	---	---
Nitrogen, Nitrate				
Nitrate-N, mg/l	<0.050	110 %	28 %	0.050
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 353.3	---	---	---
Nitrogen, Nitrite				
Nitrite-N, mg/l	<0.050	95 %	4.2 %	0.050
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 353.3	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 224370226

REPORT OF RESULTS

Page 24

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Nitrogen, Nitrate + Nitrite				
Nitrate + Nitrite-N, mg/l	<0.050	110 %	28 %	0.050
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 353.3	---	---	---
Secondary Metals (200.7)				
Aluminum, mg/l	<0.20	100 %*F75	3.0 %	0.20
Copper, mg/l	<0.025	94 %	3.2 %	0.025
Iron, mg/l	<0.050	100 %	6.0 %	0.050
Manganese, mg/l	<0.010	90 %	3.3 %	0.010
Silver, mg/l	<0.010	93 %	4.3 %	0.010
Zinc, mg/l	<0.020	88 %	3.4 %	0.020
Date Analyzed	12.26.96	---	---	---
Method Number	EPA 200.7	---	---	---
Chloride				
Chloride, mg/l	<1.0	102 %	3.0 %	1.0
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 325.3	---	---	---
Sulfate as SO4				
Sulfate as SO4, mg/l	<5.0	104 %	1.9 %	5.0
Date Analyzed	12.10.96	---	---	---
Method Number	EPA 375.4	---	---	---
Surfactants (MBAS)				
Surfactants (MBAS), mg/l	<0.10	99 %	24 %	0.10
Date Analyzed	12.05.96	---	---	---
Method Number	SM 5540C	---	---	---

LOG NO: D6-72759
 Received: 03 DEC 96
 Reported: 09 JAN 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 224370226

REPORT OF RESULTS

Page 25

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
 72759-3 Accuracy - % Recovery (Mean)
 72759-4 Precision - Relative % Difference
 72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Biochemical Oxygen Demand (5-Day) (405.1)				
Biochemical Oxygen Demand (5 Day), mg/l	<2.0	100 %	10 %	2.0
Date Analyzed	12.05.96	---	---	---
Method Number	EPA 405.1	---	---	---
Nitrogen, Ammonia				
Nitrogen, Ammonia, mg/l	<0.050	95 %	2.1 %	0.050
Date Analyzed	12.11.96	---	---	---
Method Number	EPA 350.3	---	---	---
Kjeldahl Nitrogen as N, Total (EPA 351.2)				
Kjeldahl Nitrogen-N, mg/l	<0.20	108 %	1.9 %	0.20
Date Analyzed	12.10.96	---	---	---
Method Number	EPA 351.2	---	---	---
Phosphorus, Total (365.4)				
Phosphorus, Total (365.4), mg/l	<0.10	84 %	14 %	0.10
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 365.4	---	---	---

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 224370226

REPORT OF RESULTS

Page 26

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER 72759-2 72759-3 72759-4 72759-5

SL Environmental HRS Cert. #E86221 and SL Drinking Water HRS Cert. #86371.
Method References: EPA 40 CFR Part 136, EPA 600/4-88-039, EPA 600/4-79-020 and
Standard Methods for the Examination of Water and Wastewater.
*F65 = Elevated detection limits were reported due to sample matrix
interference which required sample or extract dilution.

*F71 = Subcontracted results are attached to this report.

*F75 = Matrix spike recoveries were outside advisory limits possibly due to
matrix interference present in the sample; therefore, recovery of the
laboratory control standard analyzed concurrently with the sample batch has
been reported.

*F82 = Insufficient sample volume was available to perform a batch-specific
matrix spike. However, an LCS analyzed with the sample batch met control
criteria.


Marianne J. Walker, Project Manager

Final Page Of Report

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225

REPORT OF RESULTS

Page 22

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Primary ICP Metals (200.7)				
Barium, mg/l	<0.010	96 %	3.1 %	0.010
Beryllium, mg/l	<0.0040	98 %	3.1 %	0.0040
Cadmium, mg/l	<0.0050	92 %	1.1 %	0.0050
Chromium, mg/l	<0.010	96 %	3.1 %	0.010
Nickel, mg/l	<0.040	90 %	3.3 %	0.040
Sodium (200.7), mg/l	<0.50	108 %	16 %	0.50
Date Analyzed	12.26.96	---	---	---
Method Number	EPA 200.7	---	---	---
Antimony (200.7)				
Antimony, mg/l	<0.0060	94 %	3.2 %	0.0060
Date Analyzed	12.26.96	---	---	---
Method Number	EPA 200.7	---	---	---
Arsenic (206.2)				
Arsenic, mg/l	<0.010	80 %	2.5 %	0.010
Date Analyzed	12.06.96	---	---	---
Method Number	EPA 206.2	---	---	---
Lead (239.2)				
Lead, mg/l	<0.0050	103 %	5.8 %	0.0050
Date Analyzed	12.06.96	---	---	---
Method Number	EPA 239.2	---	---	---
Mercury (245.1)				
Mercury, mg/l	<0.00020	96 %	1.0 %	0.00020
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 245.1	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 212170225
Page 23

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Selenium (270.2)				
Selenium, mg/l	<0.0050	106 %*F75	2.8 %	0.0050
Date Analyzed	12.05.96	---	---	---
Method Number	EPA 270.2	---	---	---
Thallium (279.2)				
Thallium, mg/l	<0.0020	80 %	1.2 %	0.0020
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 279.2	---	---	---
Cyanide, Total				
Cyanide, Total , mg/l	<0.010	96 %	17 %	0.010
Date Analyzed	12.06.96	---	---	---
Method Number	EPA 335.2	---	---	---
Fluoride (340.2)				
Fluoride, mg/l	<0.20	100 %	5.0 %	0.20
Date Analyzed	12.03.96	---	---	---
Method Number	EPA 340.2	---	---	---
Nitrogen, Nitrate				
Nitrate-N, mg/l	<0.050	110 %	28 %	0.050
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 353.3	---	---	---
Nitrogen, Nitrite				
Nitrite-N, mg/l	<0.050	95 %	4.2 %	0.050
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 353.3	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 224370226
Page 24

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Nitrogen, Nitrate + Nitrite				
Nitrate + Nitrite-N, mg/l	<0.050	110 %	28 %	0.050
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 353.3	---	---	---
Secondary Metals (200.7)				
Aluminum, mg/l	<0.20	100 %*F75	3.0 %	0.20
Copper, mg/l	<0.025	94 %	3.2 %	0.025
Iron, mg/l	<0.050	100 %	6.0 %	0.050
Manganese, mg/l	<0.010	90 %	3.3 %	0.010
Silver, mg/l	<0.010	93 %	4.3 %	0.010
Zinc, mg/l	<0.020	88 %	3.4 %	0.020
Date Analyzed	12.26.96	---	---	---
Method Number	EPA 200.7	---	---	---
Chloride				
Chloride, mg/l	<1.0	102 %	3.0 %	1.0
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 325.3	---	---	---
Sulfate as SO4				
Sulfate as SO4, mg/l	<5.0	104 %	1.9 %	5.0
Date Analyzed	12.10.96	---	---	---
Method Number	EPA 375.4	---	---	---
Surfactants (MBAS)				
Surfactants (MBAS), mg/l	<0.10	99 %	24 %	0.10
Date Analyzed	12.05.96	---	---	---
Method Number	SM 5540C	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759
Received: 03 DEC 96
Reported: 09 JAN 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 224370226

REPORT OF RESULTS

Page 25

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759-2 Lab Blank
72759-3 Accuracy - % Recovery (Mean)
72759-4 Precision - Relative % Difference
72759-5 Detection Limit

PARAMETER	72759-2	72759-3	72759-4	72759-5
Biochemical Oxygen Demand (5-Day) (405.1)				
Biochemical Oxygen Demand (5 Day), mg/l	<2.0	100 %	10 %	2.0
Date Analyzed	12.05.96	---	---	---
Method Number	EPA 405.1	---	---	---
Nitrogen, Ammonia				
Nitrogen, Ammonia, mg/l	<0.050	95 %	2.1 %	0.050
Date Analyzed	12.11.96	---	---	---
Method Number	EPA 350.3	---	---	---
Kjeldahl Nitrogen as N, Total (EPA 351.2)				
Kjeldahl Nitrogen-N, mg/l	<0.20	108 %	1.9 %	0.20
Date Analyzed	12.10.96	---	---	---
Method Number	EPA 351.2	---	---	---
Phosphorus, Total (365.4)				
Phosphorus, Total (365.4), mg/l	<0.10	84 %	14 %	0.10
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 365.4	---	---	---

MICRO ANALYTICAL LABORATORIES, INC.
 3618 NW 97th Blvd.
 Gainesville, FL 32606
 (904)332-1701

TEM ASBESTOS ANALYSIS REPORT FOR WATER

MAL LOG#:	15575-1		
Client:	Savannah Lab	Vol. Analyzed:	0.025 liter
Client Ref:	D672783	Filter Diameter:	25 mm PC
Sample ID:	ASR-1	Filter Area:	2.30E+08 sq. microns
Sample Received:	12/10/96	Grids Examined:	2
Sample Filtered:	12/10/96	Average Opening Area:	10000 sq. microns
Sample Analyzed:	12/24/96	# of Grid Openings:	8
Type Analysis:	Water	Total Area Examined:	80000 sq. microns
Magnification:	12000X		
Microscopist:	<u>ND. [Signature]</u>		
Reviewed by:	<u>[Signature]</u>		

	Number of Structures ≥ 10 microns	Concentration (MFL) ≥ 10 microns
Chrysotile Morphology (CM):	0	0.00
Chrysotile Diffraction (CD):	0	0.00
Chrysotile Quantified EDS (CQ):	0	0.00
Chrysotile Quant. EDS & Diff. (CDQ):	0	0.00
Amphibole Diffraction (AD):	0	0.00
Amphibole Diff. & Qual. EDS (ADX):	0	0.00
Amphibole Diff. & Quant. EDS (ADQ):	0	0.00
Amphibole ZA Diff. & Quant. EDS (AZQ):	0	0.00

* Detection Limit: 0.1 (MFL) Millions of Fibers/Liter

Asbestos Best Estimate (Fibers >10 microns): 0.00 (MFL) Millions of Fibers/Liter

Confidence Limits: +/- 1.65 (MFL) Millions of Fibers/Liter

*The Detection Limit is calculated on the probability of analyzing one asbestos fiber or structure in the total area examined. 0.0 Display = Below Detection Limit

Preparation and Analysis: Micro Analytical Laboratories, Inc. SOP-007; SOP-009.
 Taken from: EPA-600/4-83-043

The results of this test pertain only to the sample designated in this report and may not be reproduced in full and with permission of this laboratory. Nancy Dehgan, Laboratory Manager

NIST Certification: #1151
 State of Florida Certification: # 82436

LOG NO: D6-72759A
Received: 03 DEC 96
Reported: 14 DEC 96

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 124970122

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
72759A-1	ASR-1	12-03-96/1135
PARAMETER	72759A-1	
Gross Alpha (EPA 900.0)		
Gross Alpha, pCi/l	25+/-38	
Date Analyzed	12.10.96	
Method Number	EPA 900.0	
Radium 226 (EPA 903.1)		
Radium 226, pCi/L	3.6+/-0.11	
Date Analyzed	12.12.96	
Method Number	EPA 903.1	
Radium 228 (EPA 904.0)		
Radium 228, pCi/l	<2.0	
Date Analyzed	12.12.96	
Method Number	EPA 904.0	

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D6-72759A
Received: 03 DEC 96
Reported: 14 DEC 96

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 124970122

REPORT OF RESULTS

Page 2

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

72759A-2 Lab Blank
72759A-3 Accuracy - % Recovery (Mean)
72759A-4 Precision - Relative % Difference
72759A-5 Detection Limit

PARAMETER	72759A-2	72759A-3	72759A-4	72759A-5
Gross Alpha (EPA 900.0)				
Gross Alpha, pCi/l	<3.0	100 %	24 %	3.0
Date Analyzed	12.09.96	---	---	---
Method Number	EPA 900.0	---	---	---
Radium 226 (EPA 903.1)				
Radium 226, pCi/L	<0.60	94 %	30 %	0.60
Date Analyzed	12.04.96	---	---	---
Method Number	EPA 903.1	---	---	---
Radium 228 (EPA 904.0)				
Radium 228, pCi/l	<2.0	113 %	19 %	2.0
Date Analyzed	12.10.96	---	---	---
Method Number	EPA 904.0	---	---	---


Marianne J. Walker Project Manager

Final Page Of Report

CASE NARRATIVE

**Analysis of Samples for the Presence of
2,3,7,8-Tetrachlorinated Dibenzo-*p*-Dioxin by
High-Resolution Chromatography / High-Resolution Mass Spectrometry**

Method 1613A (10/90)

Date: January 7, 1997
Client ID: Savannah Laboratories, Inc.
P.O. Number:
TLI Project Number: 39939

This report should only be reproduced in full. Any reproduction of this report requires permission from Triangle Laboratories, Inc.

Rev. 06/02/95

Triangle Laboratories, Inc.
801 Capitola Drive
Durham, NC 27713-4411
919-544-5729
P.O. Box 13485
Research Triangle Park, NC 27709-3485
Fax # 919-544-5491

Overview

One water sample was received from Savannah Laboratories, Inc. in good condition December 10, 1996 at 6.0 ° C and stored in a refrigerator at 4°C. The chain-of-custody did not indicate if the sample was preserved prior to shipment. The sample and associated QC samples were extracted using a distillation procedure and analyzed according to procedures described in EPA Method 1613A (October 1990) and in the Triangle Laboratories Data User's Manual (Rev. 1/93-VDE-3-AH-2/93). Any particular difficulties encountered during the sample handling by Triangle Laboratories will be discussed in the QC Remarks section below. Results reported relate only to the items tested.

Quality Control Samples

A laboratory method blank and an ongoing precision and recovery (OPR) sample are included with each batch of samples. A batch of samples may include samples from one or more TLI projects.

Quality Control Remarks

This analytical data has been released after being subjected to a series of inspections. General deviations from acceptable QC requirements are identified below. Comments on the effect of these deviations upon the validity and reliability of the results can be obtained from TLI's Data User's Manual. Specific QC issues associated with this particular project are:

Sample receipt: Additional sample volume was received in good condition on December 11, 1996 at 6.0 ° C and was stored in a refrigerator at 4°C.

Sample Preparation Laboratory: None

Mass Spectrometry: None

Data Review: None

General Comments: Any analytes detected in the TLI Blank are at levels equal to or less than the Target Detection Limit. This level of contamination is acceptable as per Method 1613A.

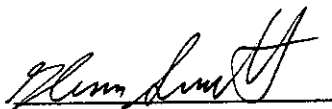
The detection limits in some samples may be above the Target Detection Limit due to Method 1613A reporting format which requires that GC peaks which do not meet QC criteria for ion-abundance ratio be reported in the detection limit.

By our interpretation, the analytical data in this project are valid based on the guidelines of Method 1613A and the Triangle Laboratories' Method 1613 Data User's Manual. Any specific QC concerns or problems have been discussed in the QC Remarks section of this case narrative with emphasis on their effect on the data. Should Savannah Laboratories, Inc. have any questions or comments regarding this data package, please feel free to contact our Project Scientist, Mary McDonald, at 919/544-5729 ext. 269.

For Triangle Laboratories, Inc.,

Report Preparation

Quality Control



Glenn S. Smith
Report Preparation Chemist

Deborah E. Hage
Report Preparation Chemist

The total number of pages in this data package is: 52.

TRIANGLE LABORATORIES, INC.

LIST OF CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

American Association for Laboratory Accreditation. Expires July 31, 1997. Certificate Number 0226-31. Accreditation for technical competence in Environmental Testing. (Including Waste Water, Sol/Haz Waste, Pulp/Paper, and Air Matrices) Parameters are ACX/TOX, Volatiles, Pesticides, PCS's, BNA's, and Dioxin/Furan. Method 1613 for Drinking Water.

State of Alabama, Department of Environmental Management. Expires December 31, 1997. Laboratory I.D. # 40950. Dioxin in drinking water.

State of Alaska, Department of Environmental Conservation. Expires December 21, 1997. Certificate number OS-30397. Dioxin in drinking water.

State of Arizona, Department of Health Services. Expires May 26, 1997. Certificate #AZ0423. Drinking Water for Dioxin, Dioxin in WW and Sol/Haz Waste.

State of Arkansas, Department of Pollution Control and Ecology. Expires February 14, 1997. Primary No. 94-06497. Pulp/paper, soil, water, and Hazardous Waste for Dioxin/Furan; AOX/TOX.

State of California, Department of Health Services. Expires August 31, 1997. Certificate #1922. Selected Metals in Waste Water, Volatiles, Semi-volatiles, and Dioxin/furan in WW and Sol/Haz Waste. Dioxin in drinking water.

State of Connecticut, Department of Health Services. Expires September 30, 1997. Registration # PH-0117. Dioxin in drinking water.

Delaware Health and Social Services. Expires December 31, 1996. Certificate #NC 140. Dioxin in drinking water.

Florida Department of Health and Rehabilitative Services. Expires June 30, 1997. Dioxin in DW. Drinking Water ID HRS# 87424. Metals, Extractable Organics (GC/MS), Pesticides/PCB's (GC) and Volatiles (GC/MS) in Environmental Samples. Environmental water ID HRS# E87411.

Hawaii Department of Health. Expires March 1, 1997. Dioxin in drinking water. "Accepted" status for regulatory purposes.

Idaho Department of Health and Welfare. Expires November 30, 1997. Dioxin in drinking water.

State of Kansas, Department of Health and Environment. Expires January 31, 1997. Environmental Analyses/Non potable Water and Solid and Hazardous Waste. Method 1613 for drinking water. ID #'s - Drinking water and/or pollution control - E-215. Solid or Hazardous Waste - E-1209.

Commonwealth of Kentucky, Department for Environmental Protection. Expires December 31, 1996. ID#90060. Dioxin in drinking water.

Maryland Department of Health and Mental Hygiene. Expires September 30, 1997. Certification #235. Drinking water by Method 1613A.

State of Michigan, Department of Public Health. Expires March 31, 1997. Drinking water by Method 1613.

Montana Department of Health and Environmental Services. Expires December 31, 1996. Dioxin in drinking water.

State of New Jersey, Department of Environmental Protection and Energy. Extended by state. Temporary certificate until June 30, 1997 or sooner. ID #67851. BNAs and Volatiles. Dioxin in drinking water.

State of New Mexico, Environment Department. Expires July 31, 1997. Dioxin in drinking water.

New York State Department of Health. Expires March 31, 1997. ID #11026. Environmental Analyses of non-potable Water, Solid and Hazardous Waste. Method 1613 in DW.

State of North Carolina, Department of Environment Health and Natural Resources Expires December 31, 1996. Certificate # 37751. Dioxin in drinking water.

State of North Carolina, Department of Environment, Health, and Natural Resources, Division of Environmental Management. Expires December 31, 1997. Certificate # 485. Metals, pesticides & PCBs, semi-volatiles and volatiles; TCLP.

North Dakota State Department of Health and Consolidated Laboratories. Expires December 31, 1996. Certificate # R-076. Effective October 4, 1993. Dioxin in drinking water.

Oklahoma Department of Environmental Quality. Expires May 31, 1997. Laboratory #9612. Dioxin by 1613A, 8290 and 8280.

State of South Carolina, Department of Health and Environmental Control. Expires April 1, 1997. Certificate number #99040001 (drinking water). Expires August 31, 1997. Certificate number #99040002 (other parameters). Dioxin/Furans, BNA, Volatiles, and PCBs/pesticides under Clean Water Act, 2,3,7,8-TCDD for Drinking Water, and Organic extractables for Solid and Hazardous Waste.

State of Tennessee, Department of Environment and Conservation. Expires February 5, 1999. ID #02992. Method 1613 Drinking water only.

U.S. Department of Agriculture Soil Permit. Expires September 30, 2001. Permit No. S-3790 Revised. Under the authority of the Federal Plant Pest Act, permission is granted to receive foreign soil samples for use in laboratory analysis.

U.S. Army Corps of Engineers. Expires November 30, 1997. Validated to perform methods 8280 & 8290 for Lockbourne Landfill Site Investigation, Defense Distribution Depot Projects, and assorted projects for the USACE North Pacific Division Laboratory.

U.S. EPA Region V. Expires November 14, 1999. Dioxin in drinking water.

U.S. EPA Region VIII, for the State of Wyoming. Expires November 13, 1997. Dioxin in drinking water.

State of Utah, Department of Health. Expires December 31, 1997. Certificate Number E-166. Certification for the following parameters: Semi-Volatiles and Volatiles under RCRA; Volatiles under Clean Water Act; Dioxin/furans by Method 8280; Drinking water for Dioxin by Method 1613; Metals including Mercury and Microwave Digestion.

Commonwealth of Virginia, Department of General Services, Division of Consolidated Laboratory Services. Expires June 30, 1997. ID # 00341. Dioxin in drinking water.

State of Washington, Department of Ecology. Expires September 11, 1997. Lab Accreditation Number C067. Scope of Accreditation applies to water analyses for Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans, BNA Extr (Semivolatile) Organics and Purgeable (Volatile) Organics.

State of Washington, Department of Health. Expires April 30, 1997. Dioxin in drinking water.

State of West Virginia, Department of Health. Expires December 31, 1996. Certificate No. 9923(C). Dioxin in drinking water.

State of Wisconsin, Department of Natural Resources. Expires June 30, 1997. Laboratory ID Number 999869530. Certification for the following categories of Organics: Purgeable, Base/Neutral, Acid, PCBs, and Dioxin.

Expires November 14, 1999. Laboratory ID 999869530. Dioxin in drinking water.

PHARMACEUTICAL

Drug Enforcement Agency (DEA). Expires November 30, 1997. Registration number RT01195835. Controlled substance registration for schedules 1,2,3,3N,4,5.

N.C. Department of Human Resources. Expires October 31, 1997. Registration number NC-PT 0000 0031. North Carolina controlled substances registration. Application submitted for renewal.

Food & Drug Administration (FDA) Registration. Expires July 1997. ID #'s 001500 1053481. Annual registration of drug establishment. Annual registration of drug establishment.

OTHER

Clinical Laboratory Improvement Amendments (CLIA) Registration. Expires May 30, 1997. ID # 34D0705123. Department of Health & Human Services, Health Care Financing Administration.

U.S. EPA Large Quantity Hazardous Waste Generator. No expiration date. EPA ID #NCD982156879. Permit indicates that the laboratory is a large generator of hazardous waste.

North Carolina Radioactive Materials License. Expires April 30 1998. License No. 032-0954-1. License authorizes the licensee to receive, acquire, own, possess, transfer, import and use such radioactive materials as designated.

North Carolina General License for Radiation Protection. No. expiration date. License No. 032-875-OG. The general license applies only to radioactive material contained in devices which have been manufactured and labeled in accordance with specific requirements.

Savannah Laboratories, Inc.

TLI Project: 39939
 (ent Sample: ASR-1

1613A TCDD Analysis (DB-5)
 Analysis File: P970067

Client Project: D672759	Date Received: 12/10/96	Spike File: SP161F2S
Sample Matrix: AQUEOUS	Date Extracted: 12/16/96	ICal: PF51276
TLI ID: 149-78-1	Date Analyzed: 01/07/97	ConCal: P970064
Sample Size: 1.000 L	Dilution Factor: n/a	% Moisture: 100.0
Dry Weight: n/a	Blank File: P970066	% Lipid: n/a
GC Column: DB-5	Analyst: DL	% Solids: 0.0

Analytes	Conc. (pg/L)	DL	Ratio	RT	Flags
2,3,7,8-TCDD	ND	2.8			—

Internal Standard	Conc. (pg/L)	% Recovery	QC Limits	Ratio	RT	Flags
¹³ C ₁₂ -2,3,7,8-TCDD	1680	83.8	25%-150%	0.81	33:20	—

Surrogate Standard (Type C)	Conc. (pg/L)	% Recovery	QC Limits	Ratio	RT	Flags
³⁷ Cl ₄ -2,3,7,8-TCDD	166	83.1	25%-150%		33:21	—

Recovery Standard	Ratio	RT	Flags
¹³ C ₁₂ -1,2,3,4-TCDD	0.81	33:07	—

Data Reviewer: *Glen Smith* 01/07/97

InitialDate...

Data Review By: _____ / _____ / _____ Calculated Noise Area: 0.54

Sample No. 1 Listing of P970067B.dbf
01/07/97 Matched GC Peaks / Ratio / Ret. Time

Compound/
M_Z.... QC.Log Omit Why ..RT. OK Ratio Total.Area... Area.Peak.1.. Area.Peak.2.. Rel.RT Compound.Name.. ID.. Flags.

		0.65-0.89				0.915-1.038			
TCDD									
320-322	DC NL	0:00	RO	1.13	0.32			0.000	
	DC WL	29:19		0.86	0.26			0.380	
	DC WL	29:39	RO	3.50	0.27			0.890	
	DC WL	29:51	RO	0.24	0.21			0.896	
	DC WL	30:12	RO	2.25	0.13			0.906	
	DC WL	30:16	RO	0.14	0.16			0.908	
	DC WL	30:20		0.89	0.17			0.910	
	DC WL	30:25	RO	1.18	0.37			0.913	
	DC SN	30:40	RO	1.27	0.25			0.920	
	DC SN	31:08		0.79	0.25			0.934	
	DC SN	31:10	RO	0.44	0.13			0.935	
	DC SN	31:20	RO	1.80	0.14			0.940	
	DC SN	31:25	RO	1.33	0.21			0.943	
	DC SN	31:38		0.80	0.09			0.949	
	DC SN	31:43	RO	0.43	0.10			0.952	
	DC SN	32:18	RO	0.60	0.08			0.969	
	DC SN	32:32	RO	2.63	0.58			0.976	
	DC SN	32:54	RO	1.13	0.17			0.987	
	DC SN	33:09		0.74	0.33			0.995	
	DC SN	33:15	RO	3.60	0.23			0.998	
	DC SN	33:21	RO	0.55	0.17			1.001	2378-TCDD AN
	DC SN	33:35	RO	0.50	0.12			1.008	
	DC SN	34:07	RO	1.00	0.10			1.024	
	DC SN	34:12	RO	3.00	0.32			1.026	
	DC SN	34:25		0.79	0.25			1.033	
	DC SN	34:34	RO	1.67	0.08			1.037	
	DC WH	34:48	RO	0.27	0.19			1.044	
	DC WH	35:32	RO	0.44	0.13			1.066	
	DC WH	35:37	RO	1.38	0.19			1.069	
	DC WH	35:43	RO	2.00	0.15			1.072	
320-322		0 Peaks				0.00			
		0.940-1.060							
37C1-TCDD									
328	DC NL	0:00			0.18			0.000	
	DC WL	29:13			0.16			0.879	
	DC WL	29:56			0.12			0.898	
	DC WL	30:04			0.04			0.902	
	DC WL	30:08			0.05			0.904	
	DC WL	30:14			0.41			0.907	
	DC WL	30:19			0.30			0.910	
	DC WL	30:26			0.02			0.913	
	DC WL	30:26			0.03			0.913	
	DC WL	30:30			0.20			0.915	
	DC WL	30:33			0.06			0.917	
	DC WL	30:53			0.06			0.927	
	DC WL	31:07			0.08			0.934	

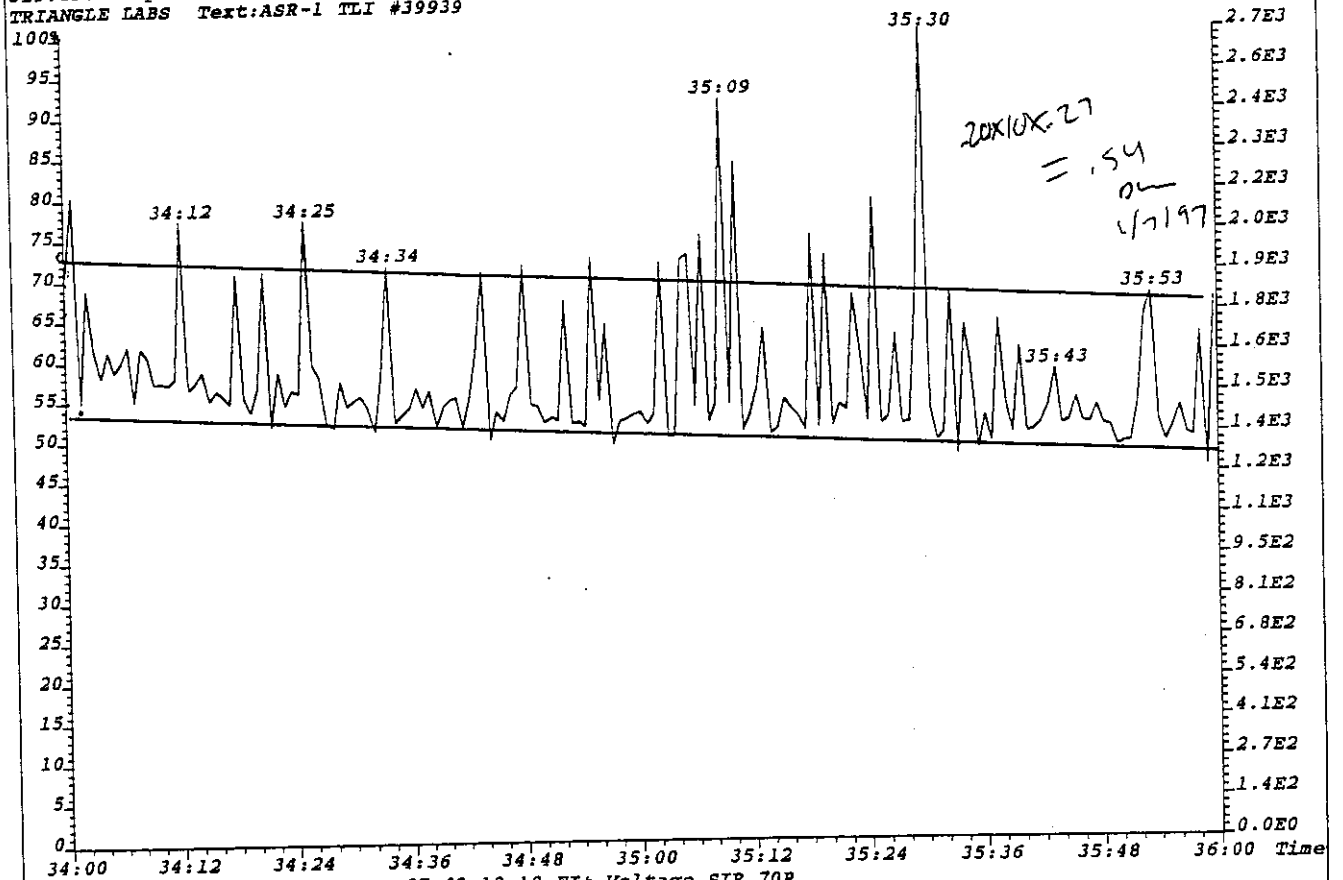
Compound/ Z....	QC.Log	Omit	Why	..RT.	OK	Ratio	Total.Area...	Area.Peak.1..	Area.Peak.2..	Rel.RT	Compound.Name..	ID..	Flags.
	DC	WL		31:07			0.08			0.934			
	DC	WL		31:14			0.09			0.937			
	DC	SN		31:23			0.13			0.942			
	DC	SN		31:28			0.07			0.944			
	DC	SN		31:35			0.10			0.948			
	DC	SN		31:39			0.03			0.950			
	DC	SN		31:39			0.02			0.950			
	DC	SN		31:45			0.19			0.953			
	DC	SN		31:48			0.14			0.954			
	DC	SN		31:52			0.24			0.956			
	DC	SN		31:59			0.04			0.960			
	DC	SN		32:02			0.07			0.961			
	DC	SN		32:10			0.12			0.965			
	DC	SN		32:10			0.04			0.965			
	DC	SN		32:15			0.08			0.968			
	DC	SN		32:23			0.33			0.972			
	DC	SN		32:24			0.07			0.972			
	DC	SN		32:31			0.14			0.976			
	DC	SN		32:43			0.05			0.982			
	DC	SN		32:46			0.14			0.983			
	DC	SN		32:54			0.08			0.987			
	DC	SN		33:07			0.08			0.994			
	DC	SN		33:11			0.08			0.996			
				33:21			73.86	73.86		1.001	37C1-TCDD	SUR1	
	DC	SN		33:34			0.49			1.007			
	DC	SN		33:40			0.13			1.010			
	DC	SN		33:44			0.35			1.012			
	DC	SN		33:49			0.21			1.015			
	DC	SN		33:54			0.29			1.017			
	DC	SN		34:04			0.16			1.022			
	DC	SN		34:05			0.09			1.023			
	DC	SN		34:12			0.23			1.026			
	DC	SN		34:16			0.04			1.028			
	DC	SN		34:34			0.08			1.037			
	DC	SN		34:38			0.26			1.039			
	DC	SN		34:47			0.36			1.044			
	DC	SN		34:51			0.09			1.046			
	DC	SN		34:55			0.23			1.048			
	DC	SN		35:00			0.06			1.050			
	DC	SN		35:10			0.06			1.055			
	DC	WH		35:24			0.12			1.062			
	DC	WH		35:30			0.10			1.065			
	DC	WH		35:32			0.07			1.066			
	DC	WH		35:35			0.05			1.068			
	DC	WH		35:36			0.05			1.068			
	DC	WH		35:44			0.24			1.072			
	DC	WH		35:51			0.10			1.076			
	DC	WH		35:59			0.04			1.080			
328				1 Peak			73.86						
13C12-TCDD							0.65-0.89			0.940-1.060			
332-334	DC	NL		0:00	RO	2.21	2.34			0.000			

Compound/ M_2	QC.Log	Omit	Why	..RT.	OK	Ratio	Total.Area...	Area.Peak.1..	Area.Peak.2..	Rel..RT	Compound.Name..	ID..	Flags.
				32:04	RO	0.60	2.66	1.00	1.86	0.962			
				33:07		0.81	803.84	359.51	444.33	0.994	13C12-1234-TCDD	RS1	
				33:20		0.81	739.28	331.14	408.14	1.000	13C12-2378-TCDD	IS1	
				33:33	RO	0.44	5.56	1.71	3.85	1.007			
				33:44	RO	1.05	13.93	7.12	6.81	1.012			
				33:47	RO	1.35	1.76	1.01	0.75	1.014			
	DC	SN		33:58		0.81	1.32			1.019			
332-334				6 Peaks			1,567.03						

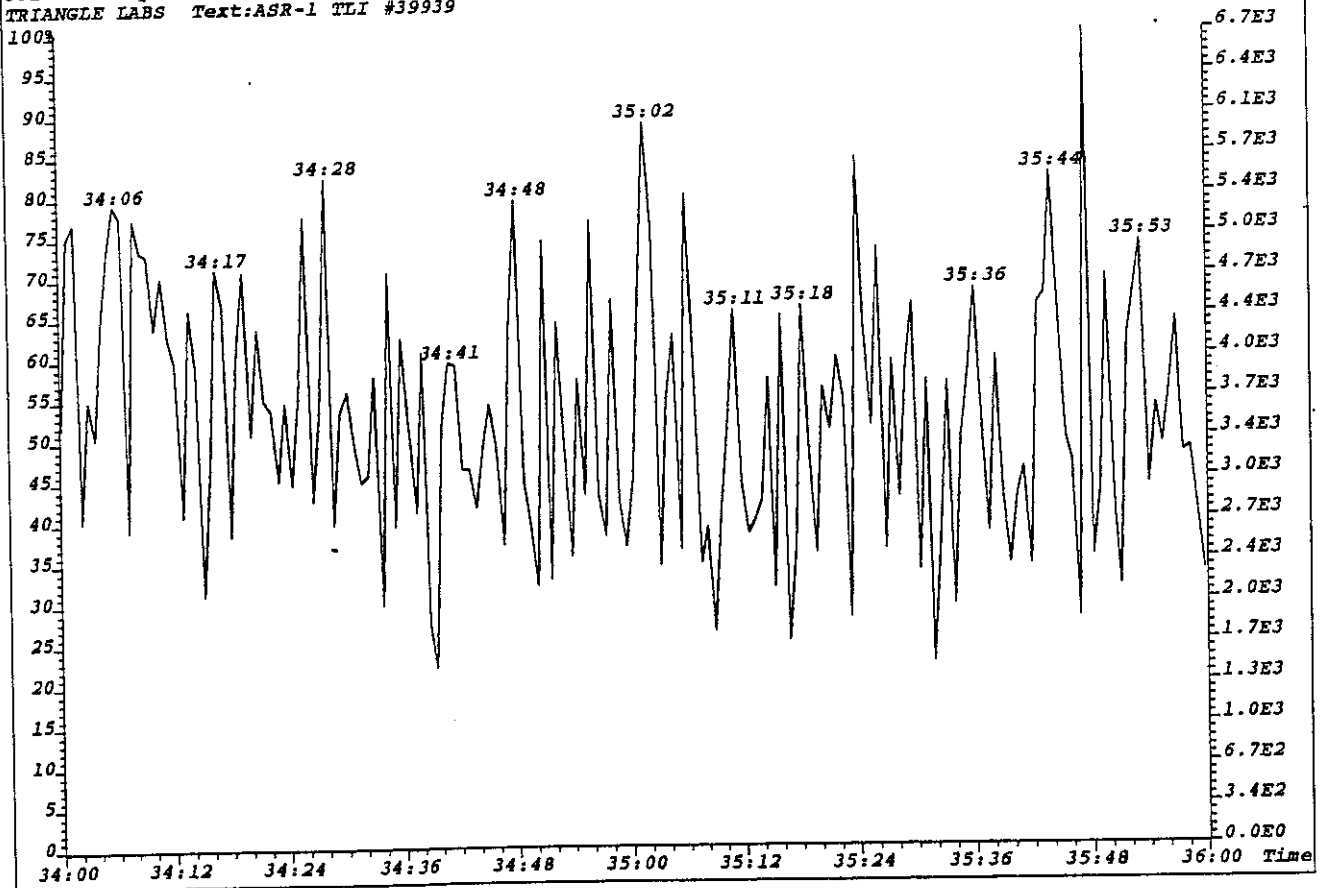
Column Description.....	"Why" Code	Description.....	QC Log Desc.....
M_2 -Nominal Ion Mass(es)	WL	Below Retention Time Window	A-Peak Added
..RT. -Retention Time (mm:ss)	WH	Above Retention Time Window	K-Peak Kept
Rat.1 -Ratio of M/M+2 Ions	SN	Below Signal to Noise Level	D-Peak Deleted
OK -RO=Ratio Outside Limits	<M	Below Method Detection Limit	T-Time Changed
Rel..RT-Relative Retention Time	NL	Channel Specific Noise Level	M-Peak Area Changed
			N-Name Changed
			E-Ether Interference

*** End of Report ***

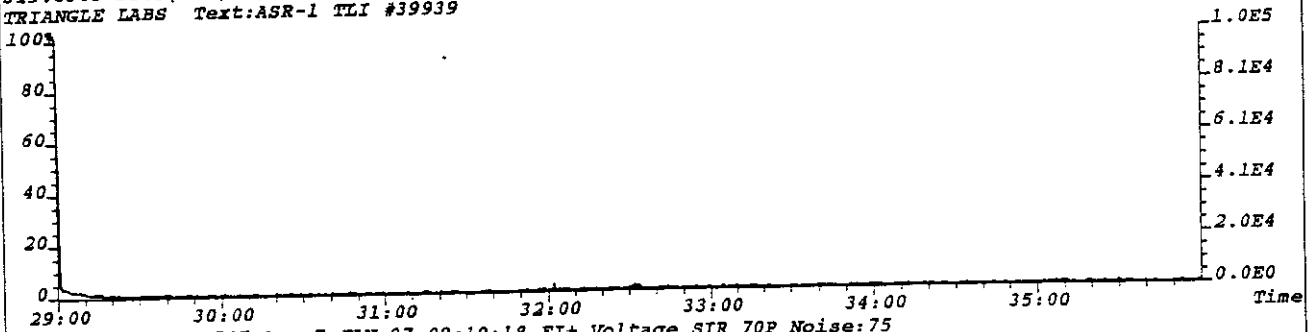
File: P970067 #1-587 Acq: 7-JAN-97 09:10:18 EI+ Voltage SIR 70P
319.8965 Exp: DB5
TRIANGLE LABS Text: ASR-1 TLI #39939



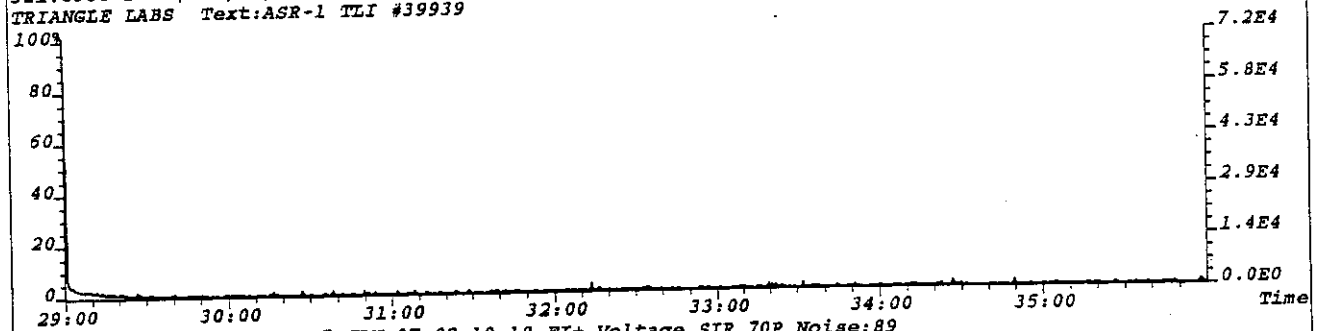
File: P970067 #1-587 Acq: 7-JAN-97 09:10:18 EI+ Voltage SIR 70P
331.9368 Exp: DB5
TRIANGLE LABS Text: ASR-1 TLI #39939



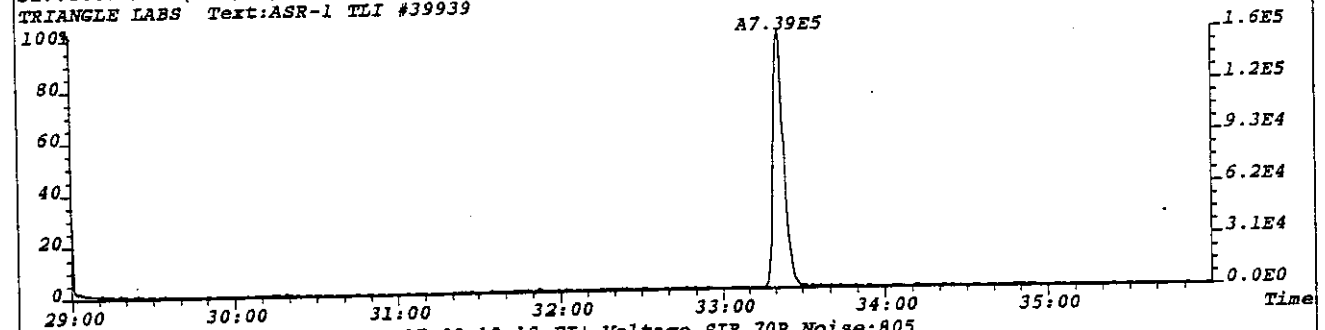
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P Noise:87
319.8965 BSUB(256,30,-3.0) PKD(5,3,1,0.10%,348.0,0.00%,F,F) Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



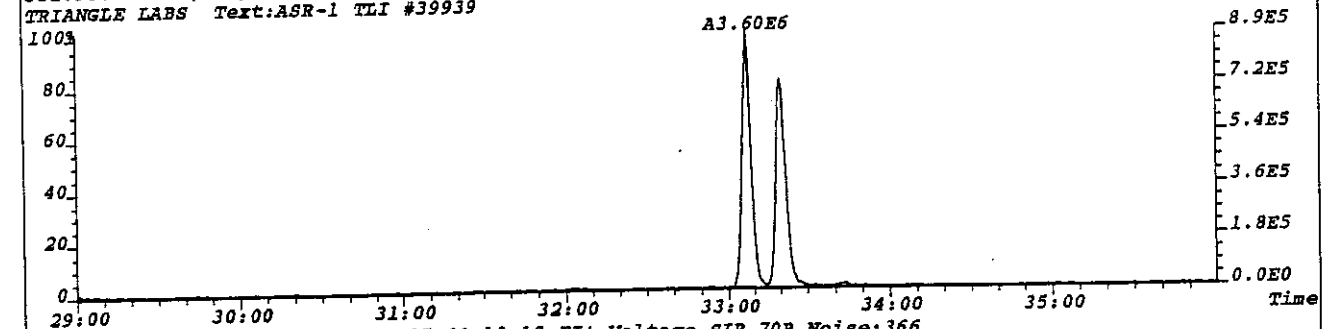
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P Noise:75
321.8936 BSUB(256,30,-3.0) PKD(5,3,1,0.10%,300.0,0.00%,F,F) Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



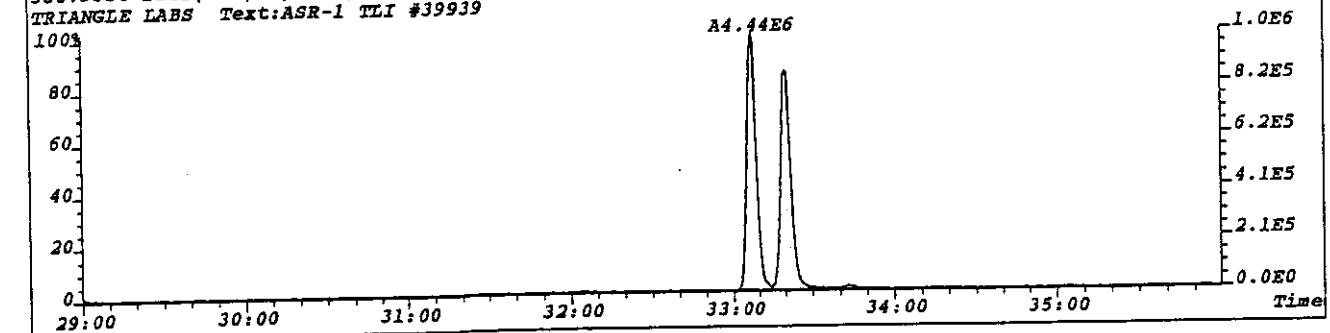
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P Noise:89
327.8847 BSUB(256,30,-3.0) PKD(5,3,1,0.10%,356.0,0.00%,F,F) Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



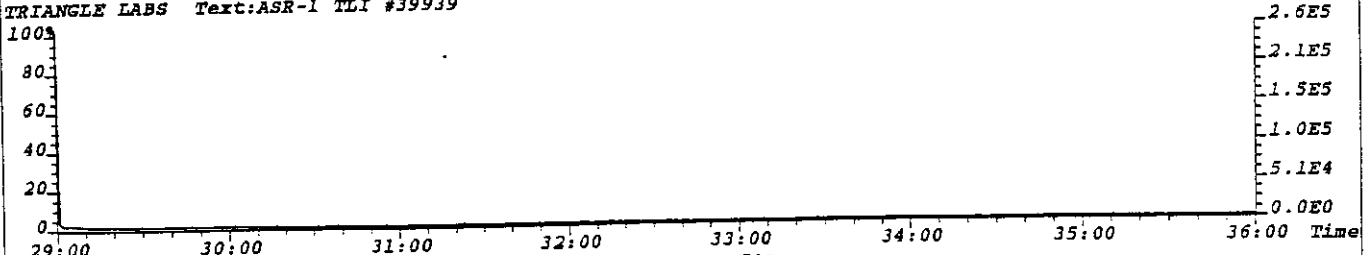
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P Noise:805
331.9368 BSUB(256,30,-3.0) PKD(5,3,1,0.10%,3220.0,0.00%,F,F) Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



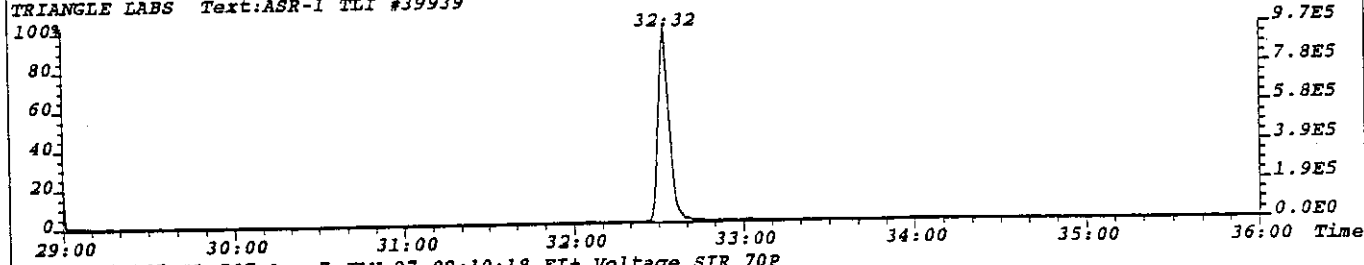
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P Noise:366
333.9338 BSUB(256,30,-3.0) PKD(5,3,1,0.10%,1464.0,0.00%,F,F) Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



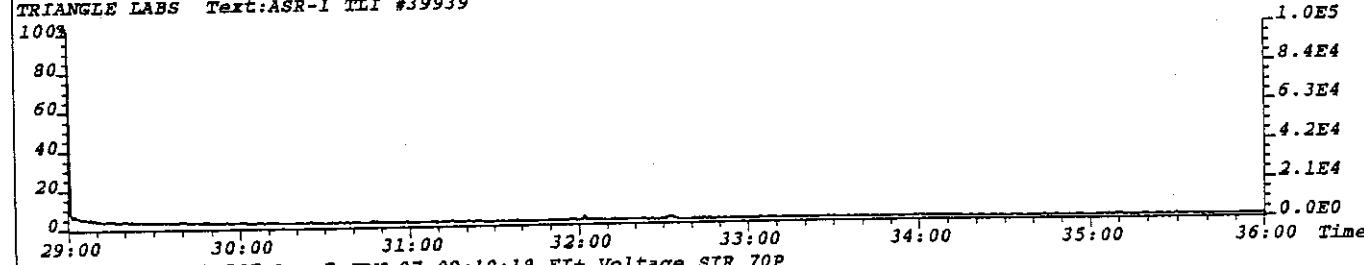
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P
303.9016 Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



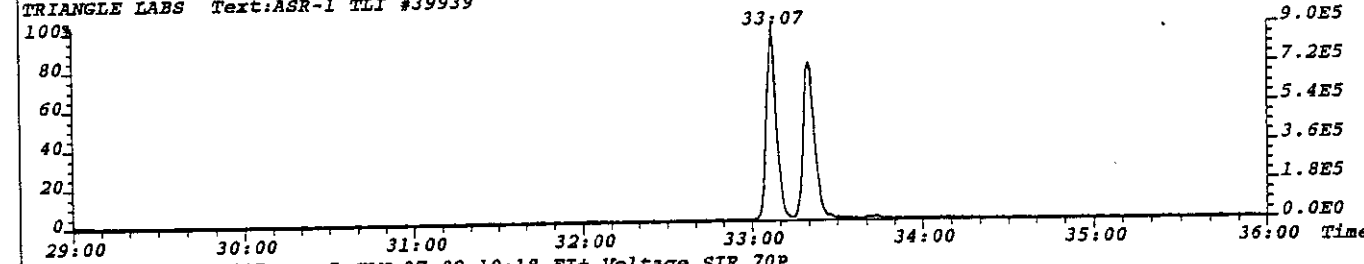
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P
315.9419 Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



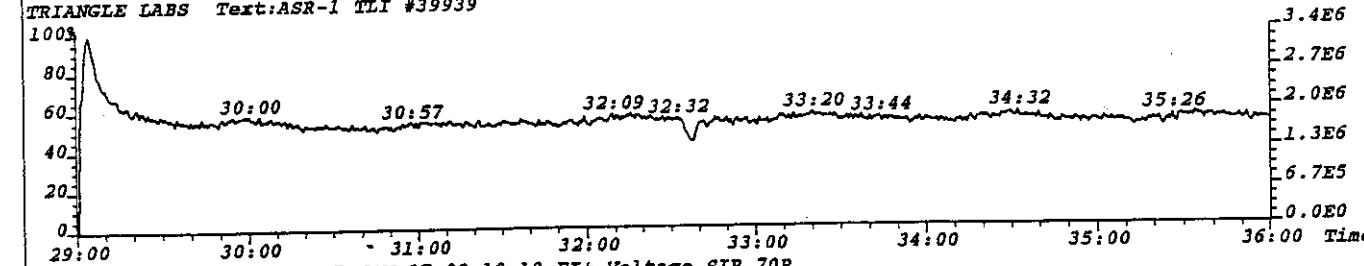
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P
319.8965 Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



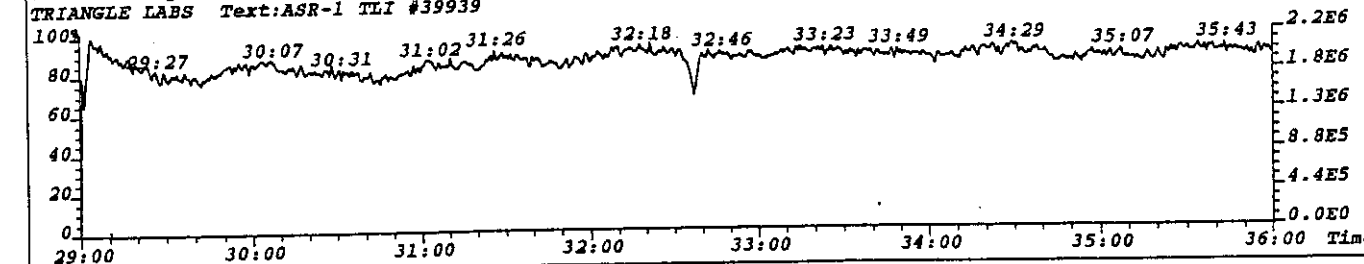
File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P
331.9368 Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P
292.9825 Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



File:P970067 #1-587 Acq:7-JAN-97 09:10:18 EI+ Voltage SIR 70P
330.9792 Exp:DB5
TRIANGLE LABS Text:ASR-1 TLI #39939



Ref. mass 292.9825 Peak top
Height .37 volts Span 200 ppm

System file name D85
Data file name A:P970067
Resolution 10000
Group number 1
Ionization mode EI+
Switching VOLTAGE
Ref. masses 292.9825, 330.9761
A 292.9825 J 330.9732
B 303.9016 K 331.9368
C 305.8987 L 333.9338
D 315.9419 M 375.8364
E 317.9389
F 319.8965
G 321.8336
H 327.8847
I 330.9792

Channel I 330.9732 Peak top
Height .28 volts Span 200 ppm

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

102 LaRoche Avenue, Savannah, GA 31404
 Phone: (912) 354-7858 Fax: (912) 352-0165
 2846 Industrial Plaza Drive, Tallahassee, FL 32301
 Phone: (904) 878-3994 Fax: (904) 878-9504
 414 SW 12th Avenue, Deerfield Beach, FL 33442
 Phone: (305) 421-7400 Fax: (305) 421-2584
 900 Lakeside Drive, Mobile, AL 36693
 Phone: (205) 666-6633 Fax: (205) 666-6696
 6712 Benjamin Road, Suite 100, Tampa, FL 33634
 Phone: (813) 885-7427 Fax: (813) 885-7049
 100 Alpha Drive, Suite 110, Destrehan, LA 70047
 Phone: (504) 764-1100 Fax: (504) 725-1163

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PROJECT REFERENCE		PROJECT NO.	P.O. NUMBER	PAGE / OF 2	
PROJECT LOC. (State)		SAMPLER(S) NAME	PHONE	REQUIRED ANALYSES	
FL	Mark Schmiling		954-467-1266	<input type="checkbox"/> BS (ASBESTOS) <input type="checkbox"/> MEAS (METHANOL) <input type="checkbox"/> CHLORIDE (METHANOL) <input type="checkbox"/> METALS (METHANOL) <input type="checkbox"/> SEMI-VOLATILES (METHANOL) <input type="checkbox"/> VOLATILES (METHANOL) <input type="checkbox"/> PESTICIDES (METHANOL) <input type="checkbox"/> PAH'S (METHANOL) <input type="checkbox"/> PCB'S (METHANOL) <input type="checkbox"/> HCL (METHANOL)	
CLIENT NAME		CLIENT PROJECT MANAGER	DATE DUE:		
C/O M HILL		PETER KWIAKOWSKI			
CLIENT ADDRESS (CITY, STATE, ZIP)		STANDARD REPORT DELIVERY <input checked="" type="checkbox"/>			
380 FAIRMONT DR, STE 350		EXPEDITED REPORT DELIVERY (surcharge) <input type="checkbox"/>			
DEERFIELD BEACH, FL 33441		REMARKS			
SAMPLE DATE	SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED		
12-3-96 1135		BSB-1	3	3	1
12-3-96		TRAP BLANK	3	3	1
MATRIX TYPE			RELINQUISHED BY: (SIGNATURE)		
AQUEOUS (WATER)			DATE 12-3-96 1235		
SOLID OR SEMI-SOLID			RECEIVED BY: (SIGNATURE)		
MONOQUEOUS LIQUID (oil, solvent, etc)			DATE 12-3-96 1235		
AIR			RECEIVED BY: (SIGNATURE)		
RECEIVED FOR LABORATORY BY: (SIGNATURE)			DATE 12/3/96 1235		
RECEIVED BY: (SIGNATURE)			RECEIVED BY: (SIGNATURE)		
DATE 12/3/96 1730			DATE		
TIME 1730			TIME		

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE) DATE 12/3/96 1235

CUSTODY SEAL NO. YES NO

SL LOG NO. 1072789

LABORATORY REMARKS:

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Phone: (912) 354-7858 Fax: (912) 352-0165
 Phone: (904) 878-3994 Fax: (904) 878-9504
 Phone: (305) 421-7400 Fax: (305) 421-2584
 Phone: (205) 666-6633 Fax: (205) 666-6696
 Phone: (813) 885-7427 Fax: (813) 885-7049
 Phone: (504) 764-1100 Fax: (504) 725-1163

102 LaRoche Avenue, Savannah, GA 31404
 2846 Industrial Plaza Drive, Tallahassee, FL 32301
 414 SW 12th Avenue, Deerfield Beach, FL 33442
 900 Lakeside Drive, Mobile, AL 36693
 6712 Benjamin Road, Suite 100, Tampa, FL 33634
 100 Alpha Drive, Suite 110, Drestrehan, LA 70047

PROJECT REFERENCE: **BRAUN'S COUNTY NOR** PROJECT NO.: **103715.A0** P.O. NUMBER: **954-926-9008** PAGE 2 OF 2

PROJECT LOC. (State): **FL** SAMPLER(S) NAME: **MARK SCHILLING** PHONE: **954-926-9008** FAX: **954-698-6010**

CLIENT NAME: **CH2M HILL** CLIENT PROJECT MANAGER: **PETER KOZINTKOWSKI**

CLIENT ADDRESS (CITY, STATE, ZIP): **800 FAIRMONT DRIVE, STE 350, DEERFIELD BEACH, FL 33441**

SAMPLE DATE	TIME	SL NO.	SAMPLE IDENTIFICATION	MATRIX TYPE		REQUIRED ANALYSES	REMARKS
				MOISTURE	OTHER		
12-3-96	1135		ASR-1	2	3	TOTAL (CONTAMINANTS) GROSS (RADIO) DICKIN (S) CHELATING (S) NITRATES (S) TRICHL (S) EXTRA	STANDARD REPORT DELIVERY <input checked="" type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) <input type="checkbox"/> Date Due:
				1	1		
				1	1		
				3	1		

RELINQUISHED BY: (SIGNATURE) *M. P. C. Schilling* DATE: 12-3-96 TIME: 1235

RECEIVED BY: (SIGNATURE) *M. P. C. Schilling* DATE: 11/20/96 TIME: 1730

RELINQUISHED BY: (SIGNATURE) _____ DATE: _____ TIME: _____

RECEIVED BY: (SIGNATURE) _____ DATE: _____ TIME: _____

LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE) *Robert A. Kelly* DATE: 12/13/96 TIME: 1255

RECEIVED BY: (SIGNATURE) *Robert A. Kelly* DATE: 12/13/96 TIME: 1255

SL LOG NO.: **2072759**

LABORATORY REMARKS:

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 133570424

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER	50529-1	
Primary Organics - Volatiles (524)		
Vinyl chloride, ug/l		<0.50
Benzene, ug/l		<0.50
Carbon tetrachloride, ug/l		<0.50
1,2-Dichloroethane, ug/l		<0.50
Trichloroethylene, ug/l		<0.50
1,4-Dichlorobenzene, ug/l		<0.50
1,1-Dichloroethene, ug/l		<0.50
1,1,1-Trichloroethane, ug/l		<0.50
cis-1,2-Dichloroethene, ug/l		<0.50
1,2-Dichloropropane, ug/l		<0.50
Ethylbenzene, ug/l		<0.50
Chlorobenzene, ug/l		<0.50
1,2-Dichlorobenzene, ug/l		<0.50
Styrene, ug/l		<0.50
Tetrachloroethene, ug/l		<0.50
Toluene, ug/l		<0.50
trans-1,2-Dichloroethene, ug/l		<0.50
Xylenes, ug/l		<0.50
Methylene chloride (Dichloromethane), ug/l		<0.50
1,2,4-Trichlorobenzene, ug/l		<0.50
1,1,2-Trichloroethane, ug/l		<0.50
Date Analyzed		03.19.97
Method Number		EPA 524

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

4 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER		50529-1
Primary Organics - Trihalomethanes (524.2)		
Bromoform, ug/l		<0.50
Chloroform, ug/l		<0.50
Dichlorobromomethane, ug/l		<0.50
Dibromochloromethane, ug/l		<0.50
Total Trihalomethanes, ug/l		<0.50
Date Analyzed		03.19.97
Method Number		EPA 524

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 134070424

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER		50529-1
Group II Unregulated Purgeables		
Bromobenzene, ug/l		<0.50
Bromodichloromethane, ug/l		<0.50
Bromoform, ug/l		<0.50
Bromomethane, ug/l		<0.50
Chloroethane, ug/l		<0.50
Chloroform, ug/l		<0.50
Chloromethane, ug/l		<0.50
Dibromochloromethane, ug/l		<0.50
Dichlorodifluoromethane, ug/l		<0.50
P-Chlorotoluene, ug/l		<0.50
Dibromomethane, ug/l		<0.50
1,1-Dichloroethane, ug/l		<0.50
cis-1,3-Dichloropropene, ug/l		<0.50
trans-1,3-Dichloropropene, ug/l		<0.50
1,3-Dichloropropylene, ug/l		<0.50
1,3-Dichloropropane, ug/l		<0.50
2,2 Dichloropropane, ug/l		<0.50
Trichlorofluoromethane, ug/l		<0.50
1,2,3-Trichloropropane, ug/l		<0.50
1,3-Dichlorobenzene, ug/l		<0.50
1,1,1,2-Tetrachloroethane, ug/l		<0.50
1,1,2,2-Tetrachloroethane, ug/l		<0.50
Methyl-tert-butyl ether (MTBE), ug/l		<0.50
1,1-Dichloropropene, ug/l		<0.50
O-Chlorotoluene, ug/l		<0.50
Date Analyzed		03.19.97
Method Number		EPA 524

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER		50529-1
Microextractables (504)		
1,2-Dibromoethane (EDB) , ug/l		<0.020
1,2-Dibromo-3-chloropropane, ug/l		<0.020
Date Extracted		03.14.97
Date Analyzed		03.14.97
Method Number		EPA 504
Primary Organics - Pesticides (507)		
Alachlor, ug/l		<1.0
Atrazine, ug/l		<1.0
Simazine, ug/l		<1.0
Date Extracted		03.18.97
Date Analyzed		03.19.97
Method Number		EPA 507
Group I Unregulated Pesticides (507)		
Butachlor, ug/l		<1.0
Metolachlor, ug/l		<1.0
Metribuzin, ug/l		<1.0
Date Extracted		03.18.97
Date Analyzed		03.19.97
Method Number		EPA 507

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER		50529-1
Chlorinated Pesticides (508)		
Aldrin, ug/l		<0.010
Chlordane, ug/l		<0.10
Dieldrin, ug/l		<0.020
Endrin, ug/l		<0.020
Heptachlor, ug/l		<0.010
Heptachlor epoxide, ug/l		<0.020
Hexachlorobenzene, ug/l		<0.050
Hexachlorocyclopentadiene, ug/l		<0.050
gamma-BHC (Lindane), ug/l		<0.010
Methoxychlor, ug/l		<0.50
Propachlor, ug/l		<1.0
Toxaphene, ug/l		<1.0
PCB-1016, ug/l		<0.50
PCB-1221, ug/l		<0.50
PCB-1232, ug/l		<0.50
PCB-1242, ug/l		<0.50
PCB-1248, ug/l		<0.50
PCB-1254, ug/l		<0.50
PCB-1260, ug/l		<0.50
Date Extracted		03.18.97
Date Analyzed		03.21.97
Method Number		EPA 508

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424
Page 6

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER		50529-1
Group I Unregulated Pesticides (508)		
Aldrin, ug/l		<0.010
Dieldrin, ug/l		<0.020
Propachlor, ug/l		<1.0
Date Extracted		03.18.97
Date Analyzed		03.21.97
Method Number		EPA 508
Primary Organics - Herbicides (515.1)		
2,4-D, ug/l		<0.50
Dalapon, ug/l		<10
Dinoseb, ug/l		<0.50
Pentachlorophenol, ug/l		<1.0
Picloram, ug/l		<0.50
2,4,5-TP Silvex, ug/l		<0.50
Date Extracted		03.17.97
Date Analyzed		03.24.97
Method Number		EPA 515.1
Group I Unregulated Herbicides (515.1)		
Dicamba, ug/l		<0.50
Date Extracted		03.17.97
Date Analyzed		03.24.97
Method Number		EPA 515.1

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424
Page 7

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER		50529-1
Primary Organics - BN (525.2)		
Benzo(a)pyrene, ug/l		<0.20
Bis(2-ethyl hexyl)adipate, ug/l		<2.0
bis(2-Ethylhexyl) phthalate, ug/l		<2.0
Hexachlorobenzene, ug/l		<1.0
Hexachlorocyclopentadiene, ug/l		<1.0
Date Extracted		03.18.97
Date Analyzed		03.20.97
Method Number		EPA 525.2
Group III Unregulated Acid Extractables		
2-Chlorophenol, ug/l		<10
2-Methyl-4,6-dinitrophenol, ug/l		<50
Phenol, ug/l		<10
2,4,6-Trichlorophenol, ug/l		<10
Date Extracted		03.12.97
Date Analyzed		03.17.97
Method Number		EPA 625
Group III Unregulated BN Extractables		
Butylbenzylphthalate, ug/l		<10
Di-n-butylphthalate, ug/l		<10
Diethylphthalate, ug/l		<10
Dimethylphthalate, ug/l		<10
2,4-Dinitrotoluene, ug/l		<10
Di-n-octylphthalate, ug/l		<10
Isophorone, ug/l		<10
Date Extracted		03.12.97
Date Analyzed		03.17.97
Method Number		EPA 625

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 8

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER		50529-1
Primary Organics - Carbamates (531.1)		
Carbofuran, ug/l		<1.0
Oxamyl, ug/l		<1.0
Date Analyzed		03.19.97
Method Number		EPA 531.1
Group I Unregulated Carbamates (531.1)		
Aldicarb, ug/l		<0.50
Aldicarb Sulfone, ug/l		<0.50
Aldicarb Sulfoxide, ug/l		<0.50
Carbaryl, ug/l		<1.0
3-Hydroxycarbofuran, ug/l		<1.0
Methomyl, ug/l		<1.0
Date Analyzed		03.19.97
Method Number		EPA 531.1
Primary Organics - Glyphosate (547)		
Glyphosate, ug/l		<150
Date Analyzed		03.21.97
Method Number		EPA 547
Primary Organics - Endothall (548.1)		
Endothall, ug/l		<10
Date Extracted		03.19.97
Date Analyzed		03.21.97
Method Number		EPA 548.1
Primary Organics - Diquat (549.1)		
Diquat, ug/l		<1.0
Date Extracted		03.12.97
Date Analyzed		03.13.97
Method Number		EPA 549.1

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 101570529

REPORT OF RESULTS

Page 9

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER	50529-1	
Primary ICP Metals (200.7)		
Barium, mg/l		<0.010
Beryllium, mg/l		<0.0040
Cadmium, mg/l		<0.0050
Chromium, mg/l		<0.010
Nickel, mg/l		<0.040
Sodium (200.7), mg/l		1100
Date Analyzed		03.20.97
Method Number		EPA 200.7
Antimony (SM 3113B)		
Antimony, mg/l		<0.0050
Date Analyzed		03.24.97
Method Number		SM 3113B
Arsenic (SM 3113B)		
Arsenic, mg/l		<0.010
Date Analyzed		03.21.97
Method Number		SM 3113B
Lead (SM 3113B)		
Lead, mg/l		<0.0050
Date Analyzed		03.17.97
Method Number		SM 3113B
Mercury (245.1)		
Mercury, mg/l		<0.00020
Date Analyzed		03.14.97
Method Number		EPA 245.1

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 125270424

REPORT OF RESULTS

Page 10

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER	50529-1	
Selenium (3113B)		
Selenium, mg/l	0.035*F4	
Date Analyzed	03.24.97	
Method Number	SM 3113B	
Thallium (279.2)		
Thallium, mg/l	<0.0020	
Date Analyzed	03.18.97	
Method Number	EPA 279.2	
Coliform, Total (SM 9222B)		
Coliform (MF), Total, col/100ml	720	
Date Analyzed	03.12.97	
Method Number	SM 9222B	
Cyanide, Total (EPA 335.2)		
Cyanide (EPA 335.2), mg/l	<0.010	
Date Analyzed	03.20.97	
Method Number	EPA 335.2	
Fluoride (EPA 340.2)		
Fluoride, mg/l	1.1	
Date Analyzed	03.14.97	
Method Number	EPA 340.2	
Nitrogen, Nitrate		
Nitrate-N, mg/l	<0.050	
Date Analyzed	03.12.97	
Method Number	EPA 353.3	
Nitrogen, Nitrite		
Nitrite-N, mg/l	<0.050	
Date Analyzed	03.12.97	
Method Number	EPA 353.3	

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 11

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER	50529-1	
Nitrogen, Nitrate + Nitrite		
Nitrate + Nitrite-N, mg/l	<0.050	
Date Analyzed	03.12.97	
Method Number	EPA 353.3	
Turbidity		
Turbidity, NTU	0.59	
Date Analyzed	03.13.97	
Method Number	EPA 180.1	
Secondary Metals (200.7)		
Aluminum, mg/l	<0.20	
Copper, mg/l	<0.025	
Iron, mg/l	<0.050	
Manganese, mg/l	<0.010	
Silver, mg/l	<0.010	
Zinc, mg/l	<0.020	
Date Analyzed	03.20.97	
Method Number	EPA 200.7	
Chloride (EPA 325.2)		
Chloride, mg/l	1900	
Date Analyzed	03.26.97	
Method Number	EPA 325.2	
Color		
Color, c.u.	10	
Date Analyzed	03.13.97	
Method Number	EPA 110.2	

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 134070424

REPORT OF RESULTS

Page 12

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER	50529-1	
Odor		
Odor, t.o.n.	16	
Date Analyzed	03.13.97	
Method Number	EPA 140.1	
pH		
pH , units	7.5	
Date Analyzed	03.13.97	
Method Number	EPA 150.1	
Solids, Total Dissolved (160.1)		
Solids, Total Dissolved, mg/l	2600	
Date Analyzed	03.13.97	
Method Number	EPA 160.1	
Sulfate as SO4 (EPA 375.3)		
Sulfate, mg/l	460	
Date Analyzed	03.24.97	
Method Number	EPA 375.2	
Surfactants (MBAS)		
Surfactants (MBAS), mg/l	0.18*F73	
Date Analyzed	03.13.97	
Method Number	SM 5540C	
Biochemical Oxygen Demand (5-Day) (405.1)		
Biochemical Oxygen Demand (5 Day), mg/l	<2.0	
Date Analyzed	03.13.97	
Method Number	EPA 405.1	
Chemical Oxygen Demand (410.1)		
Chemical Oxygen Demand, mg/l	60	
Date Analyzed	03.22.97	
Method Number	EPA 410.1	

SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 134070424

REPORT OF RESULTS

Page 13

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529-1	MW-1	03-12-97/1335
PARAMETER	50529-1	
Ammonia Nitrogen as N (EPA 350.1)		
Ammonia-N, mg/l		0.58
Date Analyzed		03.18.97
Method Number		EPA 350.1
Kjeldahl Nitrogen as N, Total (EPA 351.2)		
Kjeldahl Nitrogen-N, mg/l		0.72
Date Analyzed		03.18.97
Method Number		EPA 351.2
Phosphorus as P		
Phosphorus, Total, mg/l		<0.10
Date Analyzed		03.18.97
Method Number		EPA 365.4
Asbestos in Water (TEM), MFL		0.00
2,3,7,8-TCDD (1613), ug/l		*F71

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 14

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
50529-3 Accuracy - % Recovery (Mean)
50529-4 Precision - Relative % Difference
50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Primary Organics - Volatiles (524)				
Vinyl chloride, ug/l	<0.50	110 %	7.0 %	0.50
Benzene, ug/l	<0.50	103 %	0.5 %	0.50
Carbon tetrachloride, ug/l	<0.50	95 %	0.8 %	0.50
1,2-Dichloroethane, ug/l	<0.50	80 %	0.8 %	0.50
Trichloroethylene, ug/l	<0.50	95 %	0.3 %	0.50
1,4-Dichlorobenzene, ug/l	<0.50	90 %	2.3 %	0.50
1,1-Dichloroethene, ug/l	<0.50	102 %	4.8 %	0.50
1,1,1-Trichloroethane, ug/l	<0.50	100 %	0 %	0.50
cis-1,2-Dichloroethene, ug/l	<0.50	93 %	0.5 %	0.50
1,2-Dichloropropane, ug/l	<0.50	83 %	2.0 %	0.50
Ethylbenzene, ug/l	<0.50	98 %	0.3 %	0.50
Chlorobenzene, ug/l	<0.50	98 %	0.6 %	0.50
1,2-Dichlorobenzene, ug/l	<0.50	92 %	2.1 %	0.50
Styrene, ug/l	<0.50	92 %	2.0 %	0.50
Tetrachloroethene, ug/l	<0.50	104 %	1.7 %	0.50
Toluene, ug/l	<0.50	100 %	1.1 %	0.50
trans-1,2-Dichloroethene, ug/l	<0.50	96 %	0.1 %	0.50
Xylenes, ug/l	<0.50	100 %	0.9 %	0.50
Methylene chloride (Dichloromethane), ug/l	<0.50	101 %	0.5 %	0.50
1,2,4-Trichlorobenzene, ug/l	<0.50	94 %	1.2 %	0.50
1,1,2-Trichloroethane, ug/l	<0.50	82 %	6.3 %	0.50
Date Analyzed	03.19.97	---	---	---
Method Number	EPA 524	---	---	---

SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

4 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 125270424

REPORT OF RESULTS

Page 15

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

 50529-2 Lab Blank
 50529-3 Accuracy - % Recovery (Mean)
 50529-4 Precision - Relative % Difference
 50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5

Primary Organics - Trihalomethanes (524.2)				
Bromoform, ug/l	<0.50	80 %	5.3 %	0.50
Chloroform, ug/l	<0.50	96 %	3.0 %	0.50
Dichlorobromomethane, ug/l	<0.50	88 %	8.2 %	0.50
Dibromochloromethane, ug/l	<0.50	80 %	10 %	0.50
Total Trihalomethanes, ug/l	<0.50	---	---	0.50
Date Analyzed	03.19.97	---	---	---
Method Number	EPA 524	---	---	---

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 16

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
50529-3 Accuracy - % Recovery (Mean)
50529-4 Precision - Relative % Difference
50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Group II Unregulated Purgeables				
Bromobenzene, ug/l	<0.50	92 %	7.0 %	0.50
Bromodichloromethane, ug/l	<0.50	88 %	8.2 %	0.50
Bromoform, ug/l	<0.50	80 %	5.3 %	0.50
Bromomethane, ug/l	<0.50	106 %	5.1 %	0.50
Chloroethane, ug/l	<0.50	98 %	11 %	0.50
Chloroform, ug/l	<0.50	96 %	3.0 %	0.50
Chloromethane, ug/l	<0.50	112 %	12 %	0.50
Dibromochloromethane, ug/l	<0.50	80 %	10 %	0.50
Dichlorodifluoromethane, ug/l	<0.50	128 %	5.9 %	0.50
P-Chlorotoluene, ug/l	<0.50	96 %	0.1 %	0.50
Dibromomethane, ug/l	<0.50	92 %	12 %	0.50
1,1-Dichloroethane, ug/l	<0.50	100 %	1.8 %	0.50
cis-1,3-Dichloropropene, ug/l	<0.50	96 %	13 %	0.50
trans-1,3-Dichloropropene, ug/l	<0.50	98 %	8.6 %	0.50
1,3-Dichloropropylene, ug/l	<0.50	---	---	0.50
1,3-Dichloropropane, ug/l	<0.50	82 %	5.5 %	0.50
2,2 Dichloropropane, ug/l	<0.50	102 %	0.2 %	0.50
Trichlorofluoromethane, ug/l	<0.50	101 %	1.6 %	0.50
1,2,3-Trichloropropane, ug/l	<0.50	82 %	12 %	0.50
1,3-Dichlorobenzene, ug/l	<0.50	94 %	1.2 %	0.50
1,1,1,2-Tetrachloroethane, ug/l	<0.50	81 %	9.9 %	0.50
1,1,2,2-Tetrachloroethane, ug/l	<0.50	81 %	7.0 %	0.50
Methyl-tert-butyl ether (MTBE), ug/l	<0.50	78 %	9.1 %	0.50
1,1-Dichloropropene, ug/l	<0.50	93 %	0.3 %	0.50
O-Chlorotoluene, ug/l	<0.50	100 %	0.8 %	0.50
Date Analyzed	03.19.97	---	---	---
Method Number	EPA 524	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 17

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
50529-3 Accuracy - % Recovery (Mean)
50529-4 Precision - Relative % Difference
50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Microextractables (504)				
1,2-Dibromoethane (EDB) , ug/l	<0.020	112 %	4.5 %	0.020
1,2-Dibromo-3-chloropropane, ug/l	<0.020	114 %	6.2 %	0.020
Date Extracted	03.14.97	---	---	---
Date Analyzed	03.14.97	---	---	---
Method Number	EPA 504	---	---	---
Primary Organics - Pesticides (507)				
Alachlor, ug/l	<1.0	80 %	7.5 %	1.0
Atrazine, ug/l	<1.0	87 %	11 %	1.0
Simazine, ug/l	<1.0	94 %	5.4 %	1.0
Date Extracted	03.18.97	---	---	---
Date Analyzed	03.19.97	---	---	---
Method Number	EPA 507	---	---	---
Group I Unregulated Pesticides (507)				
Butachlor, ug/l	<1.0	71 %	5.6 %	1.0
Metolachlor, ug/l	<1.0	72 %	7.8 %	1.0
Metribuzin, ug/l	<1.0	80 %	10 %	1.0
Date Extracted	03.18.97	---	---	---
Date Analyzed	03.19.97	---	---	---
Method Number	EPA 507	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 18

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
50529-3 Accuracy - % Recovery (Mean)
50529-4 Precision - Relative % Difference
50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Chlorinated Pesticides (508)				
Aldrin, ug/l	<0.010	85 %	2.4 %	0.010
Chlordane, ug/l	<0.10	---	---	0.10
Dieldrin, ug/l	<0.020	82 %	2.4 %	0.020
Endrin, ug/l	<0.020	98 %	3.0 %	0.020
Heptachlor, ug/l	<0.010	87 %	2.3 %	0.010
Heptachlor epoxide, ug/l	<0.020	91 %	2.2 %	0.020
Hexachlorobenzene, ug/l	<0.050	54 %	1.9 %	0.050
Hexachlorocyclopentadiene, ug/l	<0.050	30 %	3.4 %	0.050
gamma-BHC (Lindane), ug/l	<0.010	85 %	4.7 %	0.010
Methoxychlor, ug/l	<0.50	88 %	5.7 %	0.50
Propachlor, ug/l	<1.0	91 %	2.2 %	1.0
Toxaphene, ug/l	<1.0	---	---	1.0
PCB-1016, ug/l	<0.50	---	---	0.50
PCB-1221, ug/l	<0.50	---	---	0.50
PCB-1232, ug/l	<0.50	---	---	0.50
PCB-1242, ug/l	<0.50	---	---	0.50
PCB-1248, ug/l	<0.50	---	---	0.50
PCB-1254, ug/l	<0.50	---	---	0.50
PCB-1260, ug/l	<0.50	---	---	0.50
Date Extracted	03.18.97	---	---	---
Date Analyzed	03.20.97	---	---	---
Method Number	EPA 508	---	---	---

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 125270424

REPORT OF RESULTS

Page 19

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
 50529-3 Accuracy - % Recovery (Mean)
 50529-4 Precision - Relative % Difference
 50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Group I Unregulated Pesticides (508)				
Aldrin, ug/l	<0.010	85 %	2.4 %	0.010
Dieldrin, ug/l	<0.020	82 %	2.4 %	0.020
Propachlor, ug/l	<1.0	91 %	2.2 %	1.0
Date Extracted	03.18.97	---	---	---
Date Analyzed	03.20.97	---	---	---
Method Number	EPA 508	---	---	---
Primary Organics - Herbicides (515.1)				
2,4-D, ug/l	<0.50	92 %	22 %	0.50
Dalapon, ug/l	<10	54 %	11 %	10
Dinoseb, ug/l	<0.50	82 %	8.1 %	0.50
Pentachlorophenol, ug/l	<1.0	102 %	10 %	1.0
Picloram, ug/l	<0.50	46 %	9.2 %	0.50
2,4,5-TP Silvex, ug/l	<0.50	100 %	18 %	0.50
Date Extracted	03.17.97	---	---	---
Date Analyzed	03.24.97	---	---	---
Method Number	EPA 515.1	---	---	---
Group I Unregulated Herbicides (515.1)				
Dicamba, ug/l	<0.50	92 %	14 %	0.50
Date Extracted	03.17.97	---	---	---
Date Analyzed	03.24.97	---	---	---
Method Number	EPA 515.1	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 20

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
50529-3 Accuracy - % Recovery (Mean)
50529-4 Precision - Relative % Difference
50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Primary Organics - BN (525.2)				
Benzo(a)pyrene, ug/l	<0.20	88 %	15 %	0.20
Bis(2-ethyl hexyl)adipate, ug/l	<2.0	92 %	9.8 %	2.0
bis(2-Ethylhexyl) phthalate, ug/l	<2.0	93 %	11 %	2.0
Hexachlorobenzene, ug/l	<1.0	83 %	17 %	1.0
Hexachlorocyclopentadiene, ug/l	<1.0	74 %	12 %	1.0
Date Extracted	03.18.97	---	---	---
Date Analyzed	03.20.97	---	---	---
Method Number	EPA 525.2	---	---	---
Group III Unregulated Acid Extractables				
2-Chlorophenol, ug/l	<10	78 %	1.3 %	10
2-Methyl-4,6-dinitrophenol, ug/l	<50	---	---	50
Phenol, ug/l	<10	71 %	8.4 %	10
2,4,6-Trichlorophenol, ug/l	<10	---	---	10
Date Extracted	03.12.97	---	---	---
Date Analyzed	03.17.97	---	---	---
Method Number	EPA 625	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 21

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
50529-3 Accuracy - % Recovery (Mean)
50529-4 Precision - Relative % Difference
50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Group III Unregulated BN Extractables				
Butylbenzylphthalate, ug/l	<10	---	---	10
Di-n-butylphthalate, ug/l	<10	---	---	10
Diethylphthalate, ug/l	<10	---	---	10
Dimethylphthalate, ug/l	<10	---	---	10
2,4-Dinitrotoluene, ug/l	<10	90 %	3.3 %	10
Di-n-octylphthalate, ug/l	<10	---	---	10
Isophorone, ug/l	<10	---	---	10
Date Extracted	03.12.97	---	---	---
Date Analyzed	03.17.97	---	---	---
Method Number	EPA 625	---	---	---
Primary Organics - Carbamates (531.1)				
Carbofuran, ug/l	<1.0	88 %	3.4 %	1.0
Oxamyl, ug/l	<1.0	92 %	3.3 %	1.0
Date Analyzed	03.19.97	---	---	---
Method Number	EPA 531.1	---	---	---
Group I Unregulated Carbamates (531.1)				
Aldicarb, ug/l	<0.50	92 %	3.3 %	0.50
Aldicarb Sulfone, ug/l	<0.50	---	---	0.50
Aldicarb Sulfoxide, ug/l	<0.50	---	---	0.50
Carbaryl, ug/l	<1.0	---	---	1.0
3-Hydroxycarbofuran, ug/l	<1.0	---	---	1.0
Methomyl, ug/l	<1.0	---	---	1.0
Date Analyzed	03.19.97	---	---	---
Method Number	EPA 531.1	---	---	---

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 125270424
 Page 22

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
 50529-3 Accuracy - % Recovery (Mean)
 50529-4 Precision - Relative % Difference
 50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Primary Organics - Glyphosate (547)				
Glyphosate, ug/l	<150	108 %	8.3 %	150
Date Analyzed	03.21.97	---	---	---
Method Number	EPA 547	---	---	---
Primary Organics - Endothall (548.1)				
Endothall, ug/l	<10	51 %	12 %	10
Date Extracted	03.19.97	---	---	---
Date Analyzed	03.21.97	---	---	---
Method Number	EPA 548.1	---	---	---
Primary Organics - Diquat (549.1)				
Diquat, ug/l	<1.0	71 %	1.4 %	1.0
Date Extracted	03.12.97	---	---	---
Date Analyzed	03.13.97	---	---	---
Method Number	EPA 549.1	---	---	---
Primary ICP Metals (200.7)				
Barium, mg/l	<0.010	96 %	0 %	0.010
Beryllium, mg/l	<0.0040	96 %	1.0 %	0.0040
Cadmium, mg/l	<0.0050	94 %	1.1 %	0.0050
Chromium, mg/l	<0.010	96 %	0 %	0.010
Nickel, mg/l	<0.040	94 %	1.1 %	0.040
Sodium (200.7), mg/l	<0.50	92 %*F81	3.2 %	0.50
Date Analyzed	03.20.97	---	---	---
Method Number	EPA 200.7	---	---	---

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 125270424
 Page 23

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
 50529-3 Accuracy - % Recovery (Mean)
 50529-4 Precision - Relative % Difference
 50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Antimony (SM 3113B)				
Antimony, mg/l	<0.0050	118 %*F75	0.84 %	0.0050
Date Analyzed	03.24.97	---	---	---
Method Number	SM 3113B	---	---	---
Arsenic (SM 3113B)				
Arsenic, mg/l	<0.010	107 %*F75	5.6 %	0.010
Date Analyzed	03.21.97	---	---	---
Method Number	SM 3113B	---	---	---
Lead (SM 3113B)				
Lead, mg/l	<0.0050	113 %	0 %	0.0050
Date Analyzed	03.14.97	---	---	---
Method Number	SM 3113B	---	---	---
Mercury (245.1)				
Mercury, mg/l	<0.00020	108 %	0.92 %	0.00020
Date Analyzed	03.14.97	---	---	---
Method Number	EPA 245.1	---	---	---
Selenium (3113B)				
Selenium, mg/l	<0.0050	106 %*F75	0.95 %	0.0050
Date Analyzed	03.24.97	---	---	---
Method Number	SM 3113B	---	---	---
Thallium (279.2)				
Thallium, mg/l	<0.0020	82 %	1.2 %	0.0020
Date Analyzed	03.18.97	---	---	---
Method Number	EPA 279.2	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 125270424

REPORT OF RESULTS

Page 24

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
50529-3 Accuracy - % Recovery (Mean)
50529-4 Precision - Relative % Difference
50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Cyanide, Total (EPA 335.2)				
Cyanide (EPA 335.2), mg/l	<0.010	104 %	2.9 %	0.010
Date Analyzed	03.20.97	---	---	---
Method Number	EPA 335.2	---	---	---
Fluoride (EPA 340.2)				
Fluoride, mg/l	<0.20	103 %	0 %	2.0
Date Analyzed	03.14.97	---	---	---
Method Number	EPA 340.2	---	---	---
Nitrogen, Nitrate				
Nitrate-N, mg/l	<0.050	98 %*F75	7.1 %	0.050
Date Analyzed	03.12.97	---	---	---
Method Number	EPA 353.3	---	---	---
Nitrogen, Nitrite				
Nitrite-N, mg/l	<0.050	88 %*F75	1.1 %	0.050
Date Analyzed	03.12.97	---	---	---
Method Number	EPA 353.3	---	---	---
Nitrogen, Nitrate + Nitrite				
Nitrate + Nitrite-N, mg/l	<0.050	98 %*F75	7.1 %	0.050
Date Analyzed	03.12.97	---	---	---
Method Number	EPA 353.3	---	---	---

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 125270424
 Page 25

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

LOG NO	SAMPLE DESCRIPTION	50529-2	50529-3	50529-4	50529-5
50529-2	Lab Blank				
50529-3	Accuracy - % Recovery (Mean)				
50529-4	Precision - Relative % Difference				
50529-5	Detection Limit				
PARAMETER		50529-2	50529-3	50529-4	50529-5
Secondary Metals (200.7)					
Aluminum, mg/l		<0.20	109 %	7.3 %	0.20
Copper, mg/l		<0.025	94 %	1.1 %	0.025
Iron, mg/l		<0.050	98 %	1.0 %	0.050
Manganese, mg/l		<0.010	94 %	1.1 %	0.010
Silver, mg/l		<0.010	92 %	0 %	0.010
Zinc, mg/l		<0.020	94 %	0 %	0.020
Date Analyzed		03.20.97	---	---	---
Method Number		EPA 200.7	---	---	---
Chloride (EPA 325.2)					
Chloride, mg/l		<1.0	97 %	20 %	1.0
Date Analyzed		03.26.97	---	---	---
Method Number		EPA 325.2	---	---	---
Sulfate as SO4 (EPA 375.3)					
Sulfate, mg/l		<1.0	106 %	0.94 %	1.0
Date Analyzed		03.24.97	---	---	---
Method Number		EPA 375.3	---	---	---
Surfactants (MBAS)					
Surfactants (MBAS), mg/l		<0.10	86 %	22 %	0.10
Date Analyzed		03.13.97	---	---	---
Method Number		SM 5540C	---	---	---
Biochemical Oxygen Demand (5-Day) (405.1)					
Biochemical Oxygen Demand (5 Day), mg/l		<2.0	82 %	2.4 %	2.0
Date Analyzed		03.13.97	---	---	---
Method Number		EPA 405.1	---	---	---

LOG NO: D7-50529
 Received: 12 MAR 97
 Reported: 18 APR 97

Mr. Pete Kwiatkowski
 CH2M Hill
 800 Fairway Dr. Suite 350
 Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
 Sampled By: Mark Schilling
 Code: 125270424

REPORT OF RESULTS

Page 26

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
 50529-3 Accuracy - % Recovery (Mean)
 50529-4 Precision - Relative % Difference
 50529-5 Detection Limit

PARAMETER	50529-2	50529-3	50529-4	50529-5
Chemical Oxygen Demand (410.1)				
Chemical Oxygen Demand, mg/l	<20	98 %*F75	0 %	20
Date Analyzed	03.22.97	---	---	---
Method Number	EPA 410.1	---	---	---
Ammonia Nitrogen as N (EPA 350.1)				
Ammonia-N, mg/l	<0.030	95 %	1.1 %	0.030
Date Analyzed	03.18.97	---	---	---
Method Number	EPA 350.1	---	---	---
Kjeldahl Nitrogen as N, Total (EPA 351.2)				
Kjeldahl Nitrogen-N, mg/l	<0.20	102 %	8.8 %	0.20
Date Analyzed	03.18.97	---	---	---
Method Number	EPA 351.2	---	---	---
Phosphorus as P				
Phosphorus, Total, mg/l	<0.10	95 %	0 %	0.10
Date Analyzed	03.18.97	---	---	---
Method Number	EPA 365.4	---	---	---

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529
Received: 12 MAR 97
Reported: 18 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 134070424
Page 27

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529-2 Lab Blank
50529-3 Accuracy - % Recovery (Mean)
50529-4 Precision - Relative % Difference
50529-5 Detection Limit

PARAMETER 50529-2 50529-3 50529-4 50529-5

SL Environmental HRS Cert. #E86221 and SL Drinking Water HRS Cert. #86371.

Method References: EPA 40 CFR Part 136, EPA 600/4-88-039, EPA 600/4-79-020 and Standard Methods for the Examination of Water and Wastewater.

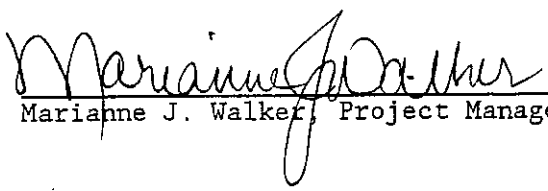
*F4 = The reported value was determined by the method of standard additions (MSA).

*F71 = Subcontracted results attached.

*F73 = Matrix spike recoveries were outside advisory limits due to matrix interference present in the sample.

*F75 = Matrix spike recoveries were outside advisory limits possibly due to matrix interference present in the sample; therefore, recovery of the laboratory control standard analyzed concurrently with the sample batch has been reported.

*F81 = Matrix spike recoveries were outside advisory limits due to abundance of target analytes present in the sample; therefore, laboratory control standards analyzed concurrently with the sample batch have been reported.


Marianne J. Walker, Project Manager

Final Page Of Report

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529A
Received: 12 MAR 97
Reported: 22 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 135070424

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
50529A-1	MW-1	03-12-97/1335
PARAMETER	50529A-1	
Gross Alpha (EPA 900.0)		
Gross Alpha, pCi/l	13+/-43	
Date Extracted	03.26.97	
Date Analyzed	03.27.97	
Method Number	EPA 900.0	
Radium 226 (EPA 903.1)		
Radium 226, pCi/L	3.3+/-0.11	
Prep or Extraction Date	03.26.97	
Date Analyzed	04.04.97	
Method Number	EPA 903.1	
Radium 228 (EPA 904.0)		
Radium 228, pCi/l	<1.0+/- .43	
Prep or Extraction Date	04.07.97	
Date Analyzed	04.08.97	
Method Number	EPA 904.0	

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D7-50529A
Received: 12 MAR 97
Reported: 22 APR 97

Mr. Pete Kwiatkowski
CH2M Hill
800 Fairway Dr. Suite 350
Deerfield Beach, FL 33441

Project: #103715.AO (Broward County ASR)
Sampled By: Mark Schilling
Code: 135070424

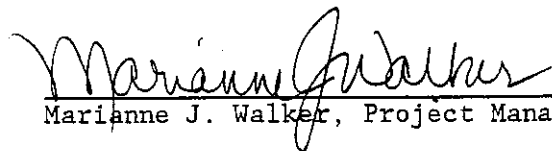
REPORT OF RESULTS

Page 2

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

50529A-2 Lab Blank
50529A-3 Accuracy - % Recovery (Mean)
50529A-4 Precision - Relative % Difference
50529A-5 Detection Limit

PARAMETER	50529A-2	50529A-3	50529A-4	50529A-5
Gross Alpha (EPA 900.0)				
Gross Alpha, pCi/l	<3.0	129 %	13 %	3.0
Date Extracted	03.21.97	---	---	---
Date Analyzed	03.24.97	---	---	---
Method Number	EPA 900.0	---	---	---
Radium 226 (EPA 903.1)				
Radium 226, pCi/L	<0.60	79 %	20 %	0.60
Prep or Extraction Date	03.26.97	---	---	---
Date Analyzed	04.03.97	---	---	---
Method Number	EPA 903.1	---	---	---
Radium 228 (EPA 904.0)				
Radium 228, pCi/l	<1.0	74 %	37 %	1.0
Prep or Extraction Date	04.07.97	---	---	---
Date Analyzed	04.07.97	---	---	---
Method Number	EPA 904.0	---	---	---


Marianne J. Walker, Project Manager

Final Page Of Report

TRIANGLE LABS

SAMPLE
DATA

Triangle Laboratories, Inc.
801 Capitola Drive
Durham, NC 27713-4411
919-544-5729

P.O. Box 13485
Research Triangle Park, NC 27709-3485
Fax # 919-544-5491

TRIANGLE LABORATORIES OF RTP, INC.
 Sample Result Summary for Project 41064
 1613A TCDD Analysis (DB-5)

Page 1
 03/28/97

Sample File ID	W087701	W087702	W087703	W087704
Sample ID	OPR Water	TLI Water Blank	MW-1	RC8
Units	pg/L	pg/L	pg/L	pg/L
Extraction Date	03/19/97	03/19/97	03/19/97	03/19/97
Analysis Date	03/28/97	03/28/97	03/28/97	03/28/97
Instrument	W	W	W	W
Matrix	AQUEOUS	AQUEOUS	AQUEOUS	AQUEOUS
Extraction Type	sp/soxh	sp/soxh	sp/soxh	sp/soxh
=====				
Analytes				
2378-TCDD	209	< 5.0	< 5.0	< 5.0
Other Standards Percent Recovery Summary (% Rec)				
37C1-TCDD	68.4	73.8	74.8	71.5
Internal Standards Percent Recovery Summary (% Rec)				
13C12-2378-TCDD	66.5	66.3	74.0	66.2

TRIANGLE LABORATORIES OF RTP, INC.
Sample Result Summary for Project 41064
1613A TCDD Analysis (DB-5)

Page 2
03/28/97

```
=====
Data File          W088001          W088002
Sample ID         RO9             RO10

Units             pg/L             pg/L
Extraction Date  03/19/97        03/19/97
Analysis Date    03/28/97        03/28/97
Instrument        W                W
Matrix           AQUEOUS         AQUEOUS
Extraction Type  sp/soxh        sp/soxh
=====
```

```
Analytes
2378-TCDD        < 5.0           < 5.0
```

```
Other Standards Percent Recovery Summary (% Rec)
37C1-TCDD        67.9            65.9
```

```
Internal Standards Percent Recovery Summary (% Rec)
13C12-2378-TCDD 62.4            56.0
=====
```

(Concentration of GC peaks out of theoretical isotopic abundance ratio range expressed as a detection limit).
Minimum levels are reported for non-detected GC peaks.
***** = INTERFERENCE

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES. INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

REMIT TO: P.O. Box 13548, Savannah, Georgia 31416-0548

Project: #103715.AO (Broward County ASR)

Ms. Anne Murray
Montgomery Watson
1776 N. Pine Island Rd. Suite 200
Plantation, FL 33322

Invoice No: D70860

Invoice Date: 18 APR 1997

Terms: Net 30 Days
Federal Tax ID NO: 58-1485724
CODE: MW-PLANT\$-D-90MW

LOG NO: D750529

INVOICE

ITEM	QTY	SAMPLE IDENTIFICATION	ANALYSIS	UNIT PRICE	PRICE/SAMP	TOTAL
1	1	MW-1	Primary Organics - Volatiles (524) Primary Organics - Trihalomethanes (524.2) Group II Unregulated Purgeables Microextractables (504) Primary Organics - Pesticides (507) Group I Unregulated Pesticides (507) Chlorinated Pesticides (508) Group I Unregulated Pesticides (508) Primary Organics - Herbicides (515.1) Group I Unregulated Herbicides (515.1) Primary Organics - BN (525.2) Group III Unregulated Acid Extractables Group III Unregulated BN Extractables Primary Organics - Carbamates (531.1) Group I Unregulated Carbamates (531.1) Primary Organics - Glyphosate (547)	\$1,764.00	\$2,578.40	2,578.40

INVOICE CONTINUED ON PAGE 2

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

PAGE: 2

REMIT TO: P.O. Box 13548, Savannah, Georgia 31416-0548

Project: #103715.AO (Broward County ASR)

Ms. Anne Murray
Montgomery Watson
1776 N. Pine Island Rd. Suite 200
Plantation, FL 33322

Invoice No: D70860

Invoice Date: 18 APR 1997

Terms: Net 30 Days
Federal Tax ID NO: 58-1485724
CODE: MW-PLANTS-D-90MW

LOG NO: D750529

INVOICE

ITEM	QTY	SAMPLE IDENTIFICATION	ANALYSIS	UNIT PRICE	PRICE/SAMP	TOTAL
			Primary Organics -			
			Endothall (548.1)			
			Primary Organics -			
			Diquat (549.1)			
			Primary ICP Metals			
			(200.7)			
			Antimony (SM 3113B)			
			Arsenic (SM 3113B)			
			Lead (SM 3113B)			
			Mercury (245.1)			
			Selenium (3113B)			
			Thallium (279.2)			
			Coliform, Total (SM			
			9222B)			
			Cyanide, Total (EPA			
			335.2)			
			Fluoride (EPA 340.2)			
			Nitrogen, Nitrate			
			Nitrogen, Nitrite			
			Nitrogen, Nitrate +			
			Nitrite			
			Turbidity			
			Secondary Metals (200.7)			
			Chloride (EPA 325.2)			
			Color			
			Odor			
			pH			
			Solids, Total Dissolved			
			(160.1)			
			Sulfate as SO4 (EPA			
			375.3)			

INVOICE CONTINUED ON PAGE 3

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

PAGE: 3

REMIT TO: P.O. Box 13548, Savannah, Georgia 31416-0548

Project: #103715.A0 (Broward County ASR)

Ms. Anne Murray
Montgomery Watson
1776 N. Pine Island Rd. Suite 200
Plantation, FL 33322

Invoice No: D70860

Invoice Date: 18 APR 1997

Terms: Net 30 Days
Federal Tax ID NO: 58-1485724
CODE: MW-PLANT\$-D-90MW

LOG NO: D750529

INVOICE

<u>ITEM</u>	<u>QTY</u>	<u>SAMPLE IDENTIFICATION</u>	<u>ANALYSIS</u>	<u>UNIT PRICE</u>	<u>PRICE/SAMP</u>	<u>TOTAL</u>
			Surfactants (MBAS)			
			Biochemical Oxygen Demand (5-Day) (405.1)	\$22.00		
			Chemical Oxygen Demand (410.1)	\$17.60		
			Ammonia Nitrogen as N (EPA 350.1)	\$13.20		
			Total Kjeldahl Nitrogen - N (EPA 351)	\$30.80		
			Phosphorus as P	\$30.80		
			Asbestos in Water (TEM)	\$250.00		
			2,3,7,8-TCDD (1613)	\$450.00		

INVOICE CONTINUED ON PAGE 4

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

PAGE: 4

REMIT TO: P.O. Box 13548, Savannah, Georgia 31416-0548

Project: #103715.AO (Broward County ASR)

Ms. Anne Murray
Montgomery Watson
1776 N. Pine Island Rd. Suite 200
Plantation, FL 33322

Invoice No: D70860

Invoice Date: 18 APR 1997

Terms: Net 30 Days
Federal Tax ID NO: 58-1485724
CODE: MW-PLANT\$-D-90MW

LOG NO: D750529

INVOICE

ITEM	QTY	SAMPLE IDENTIFICATION	ANALYSIS	UNIT PRICE	PRICE/SAMP	TOTAL
2	4	Lab Blank Accuracy - % Recovery (Mean) Precision - Relative % Difference Detection Limit	Primary Organics - Volatiles (524) Primary Organics - Trihalomethanes (524.2) Group II Unregulated Purgeables Microextractables (504) Primary Organics - Pesticides (507) Group I Unregulated Pesticides (507) Chlorinated Pesticides (508) Group I Unregulated Pesticides (508) Primary Organics - Herbicides (515.1) Group I Unregulated Herbicides (515.1) Primary Organics - BN (525.2) Group III Unregulated Acid Extractables Group III Unregulated BN Extractables Primary Organics - Carbamates (531.1) Group I Unregulated Carbamates (531.1) Primary Organics - Glyphosate (547)			

INVOICE CONTINUED ON PAGE 5

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

PAGE: 5

REMIT TO: P.O. Box 13548, Savannah, Georgia 31416-0548

Project: #103715.AO (Broward County ASR)

Ms. Anne Murray
Montgomery Watson
1776 N. Pine Island Rd. Suite 200
Plantation, FL 33322

Invoice No: D70860

Invoice Date: 18 APR 1997

Terms: Net 30 Days
Federal Tax ID NO: 58-1485724
CODE: MW-PLANT\$-D-90MW

LOG NO: D750529

INVOICE

ITEM	QTY	SAMPLE IDENTIFICATION	ANALYSIS	UNIT PRICE	PRICE/SAMP	TOTAL
			Primary Organics -			
			Endothall (548.1)			
			Primary Organics -			
			Diquat (549.1)			
			Primary ICP Metals			
			(200.7)			
			Antimony (SM 3113B)			
			Arsenic (SM 3113B)			
			Lead (SM 3113B)			
			Mercury (245.1)			
			Selenium (3113B)			
			Thallium (279.2)			
			Cyanide, Total (EPA			
			335.2)			
			Fluoride (EPA 340.2)			
			Nitrogen, Nitrate			
			Nitrogen, Nitrite			
			Nitrogen, Nitrate +			
			Nitrite			
			Secondary Metals (200.7)			
			Chloride (EPA 325.2)			
			Sulfate as SO4 (EPA			
			375.3)			
			Surfactants (MBAS)			
			Biochemical Oxygen			
			Demand (5-Day) (405.1)			
			Chemical Oxygen Demand			
			(410.1)			
			Ammonia Nitrogen as N			
			(EPA 350.1)			
			Total Kjeldahl Nitrogen			

INVOICE CONTINUED ON PAGE 6

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

PAGE: 6

REMIT TO: P.O. Box 13548, Savannah, Georgia 31416-0548

Project: #103715.AO (Broward County ASR)

Ms. Anne Murray
Montgomery Watson
1776 N. Pine Island Rd. Suite 200
Plantation, FL 33322

Invoice No: D70860

Invoice Date: 18 APR 1997

Terms: Net 30 Days
Federal Tax ID NO: 58-1485724
CODE: MW-PLANT\$-D-90MW

LOG NO: D750529

INVOICE

<u>ITEM</u>	<u>QTY</u>	<u>SAMPLE IDENTIFICATION</u>	<u>ANALYSIS</u>	<u>UNIT PRICE</u>	<u>PRICE/SAMP</u>	<u>TOTAL</u>
			- N (EPA 351) Phosphorus as P			
TOTAL						\$2,578.40

INVOICE NOTE: Prices as per quote DQ60260

REPORTED TO: Mr. Pete Kwiatkowski
For Proper Credit, please show INVOICE NUMBER on your remittance.
After 30 days, service charges of 1.5% per 30 days will be applied to unpaid balance.

CUSTOMER PHONE: 954/426-4008

SL SAVANNAH LABORATORIES
 & ENVIRONMENTAL SERVICES, INC.

114 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

REMIT TO: P.O. Box 13548, Savannah, Georgia 31416-0548

Project: #103715.AO (Broward County ASR)

Ms. Anne Murray
 Montgomery Watson
 1776 N. Pine Island Rd. Suite 200
 Plantation, FL 33322

Invoice No: D70894

Invoice Date: 24 APR 1997

Terms: Net 30 Days
 Federal Tax ID NO: 58-1485724
 CODE: MW-PLANTŞ-D-90MW

LOG NO: D750529A

INVOICE

ITEM	QTY	SAMPLE IDENTIFICATION	ANALYSIS	UNIT PRICE	PRICE/SAMP	TOTAL
1	1	MW-1	Gross Alpha (EPA 900.0) Radium 226 (EPA 903.1) Radium 228 (EPA 904.0)	\$166.50	\$166.50	166.50
2	4	Lab Blank Accuracy - % Recovery (Mean) Precision - Relative % Difference Detection Limit	Gross Alpha (EPA 900.0) Radium 226 (EPA 903.1) Radium 228 (EPA 904.0)			
TOTAL						\$166.50

REPORTED TO: Mr. Pete Kwiatkowski
 For Proper Credit, please show INVOICE NUMBER on your remittance.
 After 30 days, service charges of 1.5% per 30 days will be applied to unpaid balance.

CUSTOMER PHONE: 954/426-4008

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

14 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

REMIT TO: P.O. Box 13548, Savannah, Georgia 31416-0548

Project: #103715.A0 (Broward County ASR)

Ms. Anne Murray
Montgomery Watson
1776 N. Pine Island Rd. Suite 200
Plantation, FL 33322

Invoice No: D70894

Invoice Date: 24 APR 1997

Terms: Net 30 Days
Federal Tax ID NO: 58-1485724
CODE: MW-PLANTS-D-90MW

LOG NO: D750529A

INVOICE

ITEM	QTY	SAMPLE IDENTIFICATION	ANALYSIS	UNIT PRICE	PRICE/SAMP	TOTAL
1	1	MW-1	Gross Alpha (EPA 900.0) Radium 226 (EPA 903.1) Radium 228 (EPA 904.0)	\$166.50	\$166.50	166.50
2	4	Lab Blank Accuracy - % Recovery (Mean) Precision - Relative % Difference Detection Limit	Gross Alpha (EPA 900.0) Radium 226 (EPA 903.1) Radium 228 (EPA 904.0)			
TOTAL						\$166.50

REPORTED TO: Mr. Pete Kwiatkowski

CUSTOMER PHONE: 954/426-4008

For Proper Credit, please show INVOICE NUMBER on your remittance.

After 30 days, service charges of 1.5% per 30 days will be applied to unpaid balance.

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Phone: (912) 354-7858
 Phone: (904) 878-3994
 Phone: (305) 421-7400
 Phone: (205) 666-6633
 Phone: (813) 885-7427
 Phone: (504) 764-1100

Phone: (912) 354-7858
 Phone: (904) 878-3994
 Phone: (305) 421-7400
 Phone: (205) 666-6633
 Phone: (813) 885-7427
 Phone: (504) 764-1100

Fax: (904) 878-3994
 Fax: (305) 421-2584
 Fax: (205) 666-6696
 Fax: (813) 885-7049
 Fax: (504) 725-1163

PROJECT REFERENCE: BROWARD COUNTY ASR 103715.A06
 PROJECT LOC. (State): FL MARK SCHILLING
 CLIENT NAME: PETER KWIATKOWSKI
 CLIENT ADDRESS (CITY, STATE, ZIP): 800 FAIRWAY DR, STE 350 DEERFIELD BEACH, FL 33441
 PROJECT NO.: 103715.A06
 P.O. NUMBER:
 PHONE: 954-426-4008
 FAX: 954-698-6010
 CLIENT PROJECT MANAGER: PETER KWIATKOWSKI

SAMPLE DATE	SL NO.	SAMPLE IDENTIFICATION	MATRIX TYPE	REQUIRED ANALYSES										REMARKS						
				EPA 524	EPA 507	EPA 508	EPA 515	EPA 525	EPA 531	EPA 547	EPA 548	NONAQUEOUS LIQUID (oil, solvent, etc)	AQUEOUS (WATER) SOLID OR SEMI SOLID		AIR					
3-12-97	1335	MW-1	HCL																	

STANDARD REPORT DELIVERY EXPEDITED REPORT DELIVERY (surcharge)

DATE Due:

RELINQUISHED BY: (SIGNATURE) DATE TIME RELINQUISHED BY: (SIGNATURE) DATE TIME

RECEIVED BY: (SIGNATURE) DATE TIME RECEIVED BY: (SIGNATURE) DATE TIME

RECEIVED FOR LABORATORY BY: (SIGNATURE) DATE TIME
 RECEIVED BY: (SIGNATURE) DATE TIME

LABORATORY SEAL NO. D750589

LABORATORY REMARKS:

RECEIVED FOR LABORATORY BY: (SIGNATURE) DATE TIME
 RECEIVED BY: (SIGNATURE) DATE TIME

ORIGINAL

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-9504
 414 SW 12th Avenue, Deerfield Beach, FL 33442 Phone: (305) 421-7400 Fax: (305) 421-2584
 900 Lakeside Drive, Mobile, AL 36693 Phone: (205) 666-6633 Fax: (205) 666-6696
 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
 100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

PROJECT REFERENCE
 PROJECT NO. 103715-AP
 PROJECT LOC. (State) BROWARD COUNTY ASR
 SAMPLER(S) NAME
 CLIENT NAME FL MARK SCHILLING
 CLIENT PROJECT MANAGER
 CLIENT ADDRESS (CITY, STATE, ZIP) PETER KWIATKOWSKI
 800 FAIRWAY DR, STE 350
 DEERFIELD BEACH, FL 33441

REQUIRED ANALYSES
 MATRIX TYPE
 ASBESTOS
 DIOXIN (1613)
 GROSS α
 RADIUM 226
 RADIUM 228
 EXTRA
 HNO₃/HNO₂/HNO₃ INTERFERATE
 SODIUM
 STANDARD REPORT DELIVERY
 EXPEDITED REPORT DELIVERY (surcharge)
 Date Due:

SAMPLE DATE	SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED				REMARKS
			ASBESTOS	DIOXIN (1613)	GROSS α	RADIUM 226	
3-12-97/1325		MW-1	1	4	1	4	

RELINQUISHED BY: (SIGNATURE) [Signature] DATE 3/10/97 TIME 12:30
RECEIVED BY: (SIGNATURE) [Signature] DATE 3/11/97 TIME 8:00
RELINQUISHED BY: (SIGNATURE) [Signature] DATE 3-12-97 TIME 14:40
RECEIVED BY: (SIGNATURE) [Signature] DATE

LABORATORY USE ONLY
 RECEIVED FOR LABORATORY BY: (SIGNATURE) [Signature] DATE 3/12/97 TIME 14:40
 CUSTODY SEAL NO. [] YES [] NO
 SL LOG NO. D750529
 LABORATORY REMARKS:

APPENDIX K

Casing Pressure Test Data

CASING PRESSURE TEST

Project: BCOES ASR Demonstration Project
Well: Class V ASR Well (16-inch Diameter)
Driller: Diversified Drilling Corp. (Joe Schmidt)
Date: 1-Nov-96
Casing Depth: 995 feet bpl
Witnessed By: Mark Silverman, P.G./FDEP/West Palm Beach
 Peter Kwiatkowski, P.G./CH2M HILL
Remarks: Cement plug at base of casing
Gauge: Ashcroft 200-psi gauge; 0.5 psi increments
Results: 4.81% PASSED

Time	Elapsed Time (min)	Pressure (psi)	Differential Pressure (psi)	Comments
9:13 AM	0	150.75	0.00	Start test
9:18 AM	5	150.10	0.65	
9:23 AM	10	149.50	1.25	
9:28 AM	15	148.75	2.00	
9:33 AM	20	148.25	2.50	
9:38 AM	25	147.75	3.00	
9:43 AM	30	147.00	3.75	
9:48 AM	35	146.50	4.25	
9:53 AM	40	146.00	4.75	
9:58 AM	45	145.25	5.50	
10:03 AM	50	144.75	6.00	
10:08 AM	55	144.25	6.50	
10:13 AM	60	143.50	7.25	End test.
10:14 AM		143	0	Bleed off pressure
10:15 AM		108	1 gallon	
10:15 AM		77	1 gallon	
10:16 AM		44	1 gallon	
10:16 AM		12.5	1 gallon	
10:17 AM		0	0.3 gallon	4.3 gailons total

APPENDIX L

Pressure Gauge Calibration Certificate



**DIVERSIFIED
DRILLING
CORPORATION**

**LETTER OF
TRANSMITTAL**

Job No.

960701

Date

9/6/96

P.O. BOX 290699 · Tampa, Florida 33687-0699

TO PETER KWIATKOWSKI
CH2M HILL, INC.

RE PRESSURE TEST GAUGE
CERTIFICATION

WE ARE FORWARDING TO YOU:

- Estimates
- Plans
- Shop Drawings
- Copy of letter
- Proposals
- Prints
- Samples
- Change order
- Reports
- Under separate cover via: _____
- Specifications
- _____

NO. OF COPIES	DRAWING NO.	LAST DATED	CODE	DESCRIPTION
1		9/5/95		GAUGE CERTIFICATION

THESE ARE TRANSMITTED

- For approval
- For your use
- As requested
- For review and comment
- Resubmit _____ Copies for review
- Submit _____ copies for distribution
- Return _____ corrected prints
- _____
- No exceptions taken (NE)
- Make corrections noted (MCN)
- Amend and resubmit. (AR)

PLEASE NOTE: _____

CC: WELL FILE

DIVERSIFIED DRILLING CORPORATION

Per STUART C. ANDERSON



Epperson & Company

5202 Shadowlawn
P.O. Box 11535
Tampa, FL 33680

Tampa 813—626-6125
Polk Co. 813—682-1258
Wats 1-800—282-0651
Fax # 813—626-8806

TO WHOM IT MAY CONCERN,

THIS IS TO CERTIFY THE FOLLOWING, GAUGE

TYPE Ashcroft Test Gauge 4 1/2" 0-200 psi # 1211

IS ACCURATE TO 0.25 OF 1.00 PERCENT,

TESTED ON OUR DEADWEIGHT TESTER #38443, TRACEABLE

TO THE NATIONAL BUREAU OF STANDARDS.

EPPERSON & COMPANY

BY W. Wacker

DATE 9-5-96

IND

APPENDIX M

Video Survey Summary and Video Tape

TUL
TUL

RECORD OF UNDERWATER TV SURVEY

Client: Broward County Office of Environmental Services
Project: ASR Demonstration Project
Well: Class V ASR Well (16-inch Diameter)
Survey By: Deep Venture Inc. (Jim Hayden)
Survey Date: 3-Dec-96
Total Depth: 1,189 feet
Witnessed By: Mark Schilling/CH2M HILL
Reviewed By: Peter Kwiatkowski, P.G./CH2M HILL
Remarks: Camera zeroed at wellhead flange, 14 inches above pad level.

Depth (feet bpl)	Observations
32	Tubing Joint
72	Tubing Joint
116	Tubing Joint
158	Tubing Joint
200	Tubing Joint
242	Tubing Joint
283	Tubing Joint
325	Tubing Joint
367	Tubing Joint
409	Tubing Joint
450	Tubing Joint
492	Tubing Joint
535	Tubing Joint
576	Tubing Joint
618	Tubing Joint
660	Tubing Joint
702	Tubing Joint
744	Tubing Joint
785	Tubing Joint
827	Tubing Joint
869	Tubing Joint
911	Tubing Joint (with cement coating).
953	Tubing Joint (with cement coating).
990	Bottom of 16-inch casing; large washout below base of casing
1011	Centralizer in open hole
1081	Fracture
1095	Rugged borehole with several large fractures
1108	Color change in picture
1160	Cloudier picture
1189	Bottom filled in with loose sand.
1189	END OF SURVEY