Coral Springs Improvement District

Class I Injection Facility No. 41

CONSTRUCTION AND TESTING OF AN INJECTION WELL CORAL SPRINGS IMPROVEMENT DISTRICT BROWARD COUNTY, FLORIDA

UC06-81395

MARCH 1986

PREPARED FOR:

GEE & JENSON ENGINEERS, ARCHITECTS, PLANNERS, INC.
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PREPARED BY:

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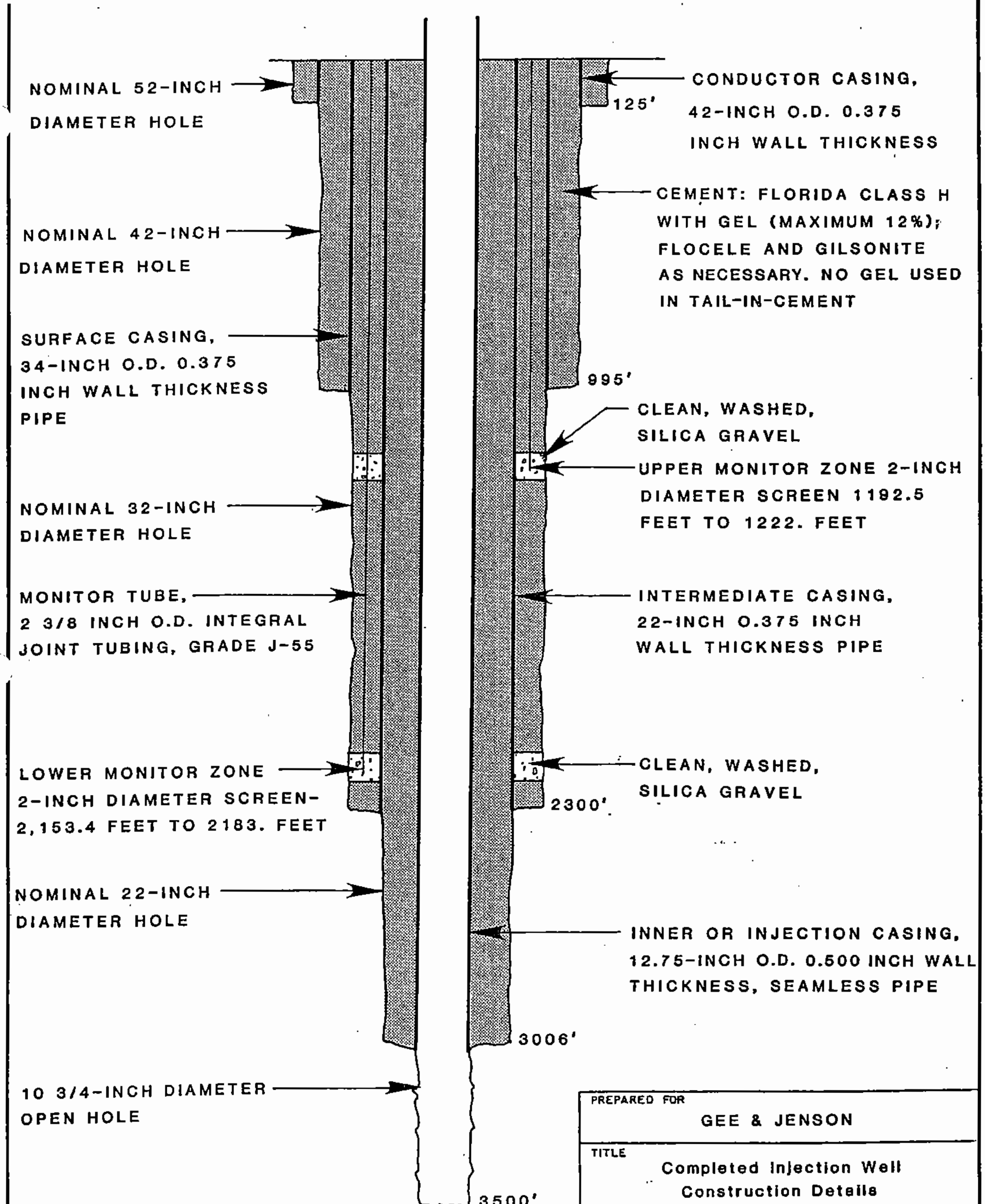

PREPARED FOR

GEE & JENSON

TITLE

Completed Injection Well Construction Details Coral Springs Improvement District

COMPILED BY L. SIMS	Geraghty & Miller, Inc.	DATE JUNE 1985
DRAWN BY Y. DIMICK	Palm Beach Gardens, Florida	REVISED
CHECKED BY J.WHEATLEY	SCALE NONE	FIGURE 1

P234CS3

CONSTRUCTION AND TESTING OF INJECTION WELL SYSTEM #2 CORAL SPRINGS IMPROVEMENT DISTRICT WASTEWATER TREATMENT PLANT

OCTOBER 1990

GERAGHTY & MILLER, INC.
Environmental Services

RECEIVED
OCT 22 1990
Dept. of Environmental Reg.
West Palm Beach

CONSTRUCTION AND TESTING OF INJECTION WELL SYSTEM #2 CORAL SPRINGS IMPROVEMENT DISTRICT WASTEWATER TREATMENT PLANT

October 1990

Prepared for:
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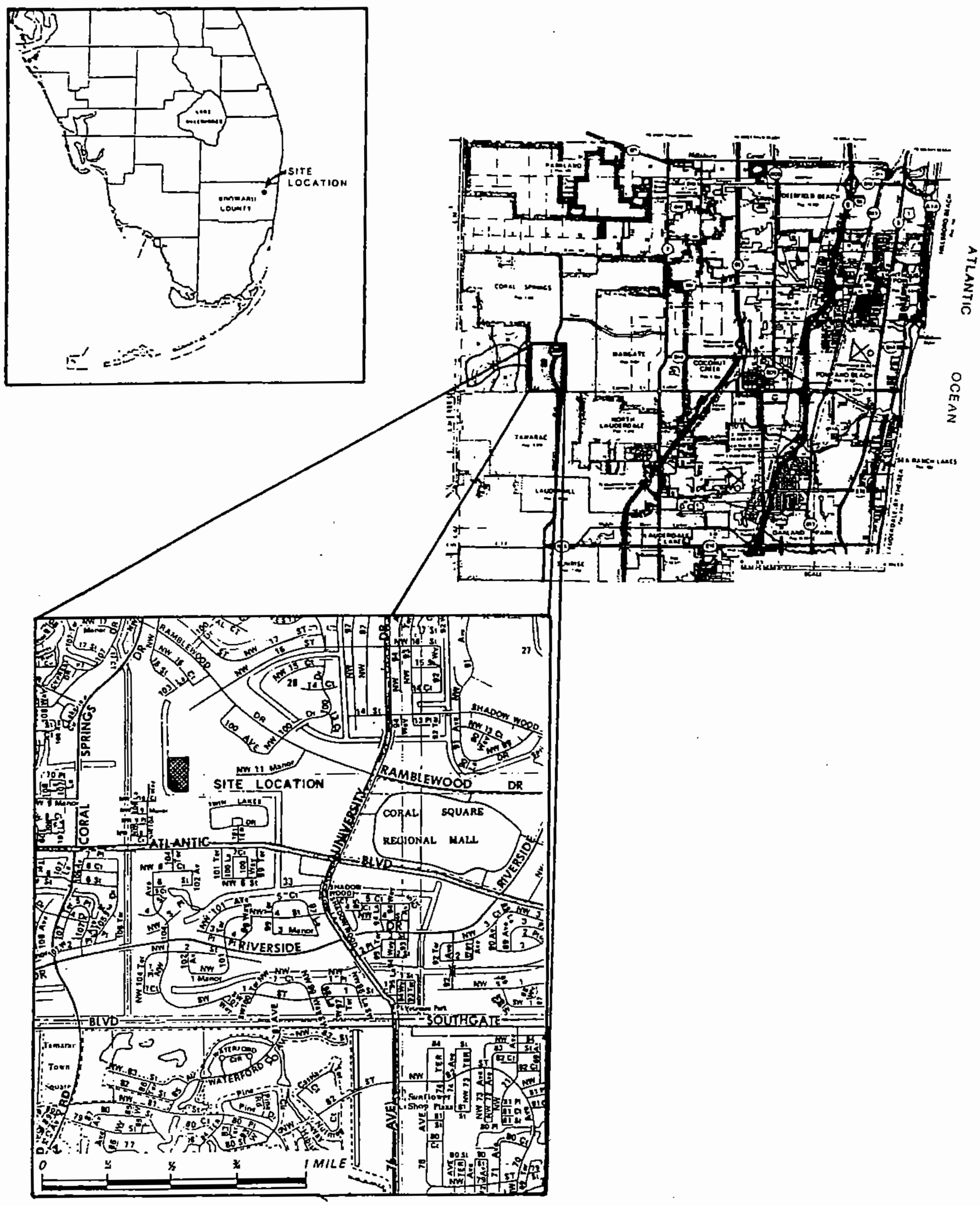
PREPARED BY: S.SCZYMANSKI	JUL 90	SHOWN	GEE & JENSON
PROJECT MGR.: J.WHEATLEY	FILE NO: PF01003		CORAL SPRINGS IMPROVEMENT DISTRICT



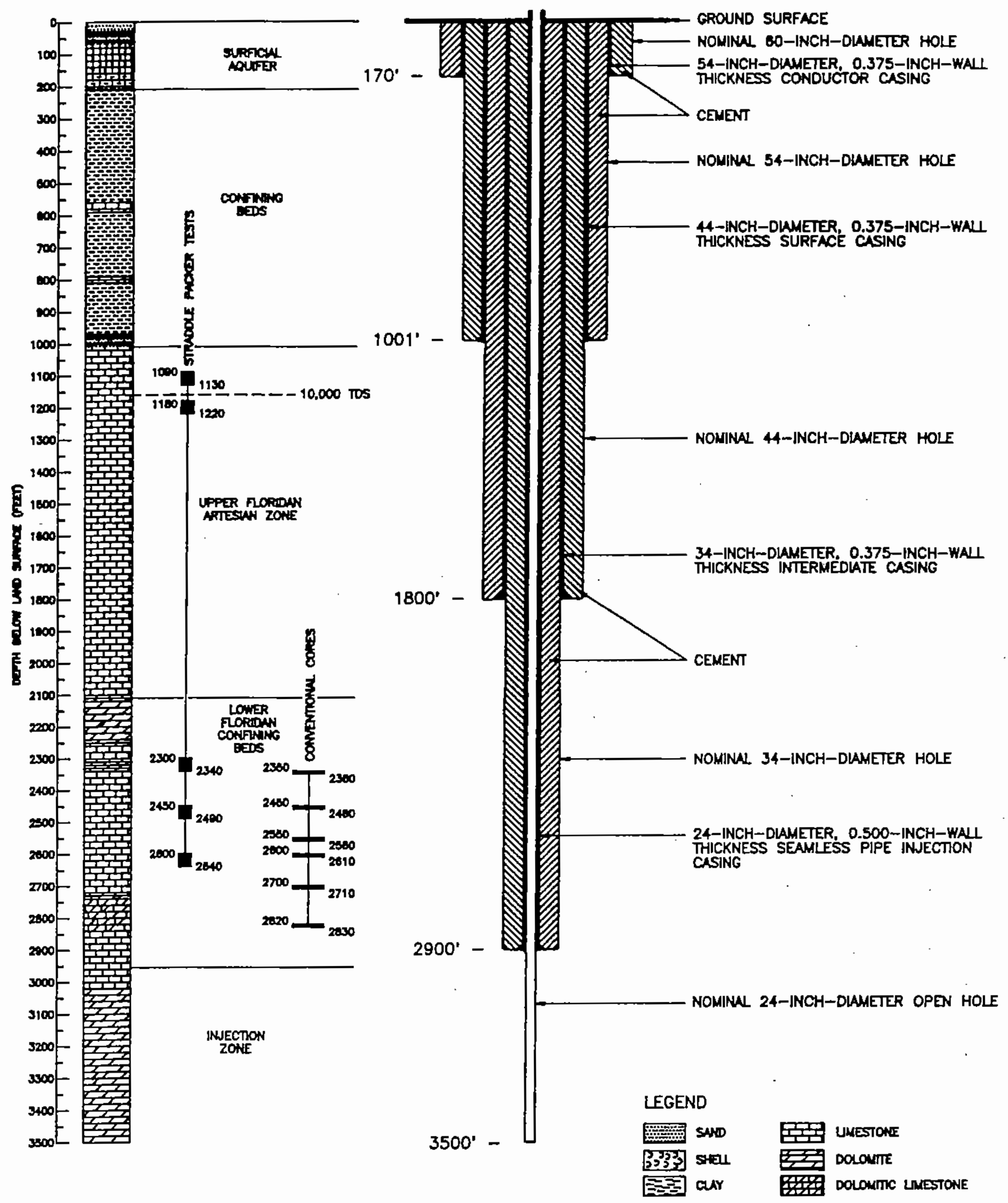
SUBJECT:

SITE LOCATION MAP

FIGURE: 1

& MILLER, INC.
Environmental Services

PREPARED BY: B. OLIVA	FILE NO: PF01003	GEE & JENSON
PROJECT MGR: J. WHEATLEY		CORAL SPRINGS IMPROVEMENT DISTRICT



SUBJECT:

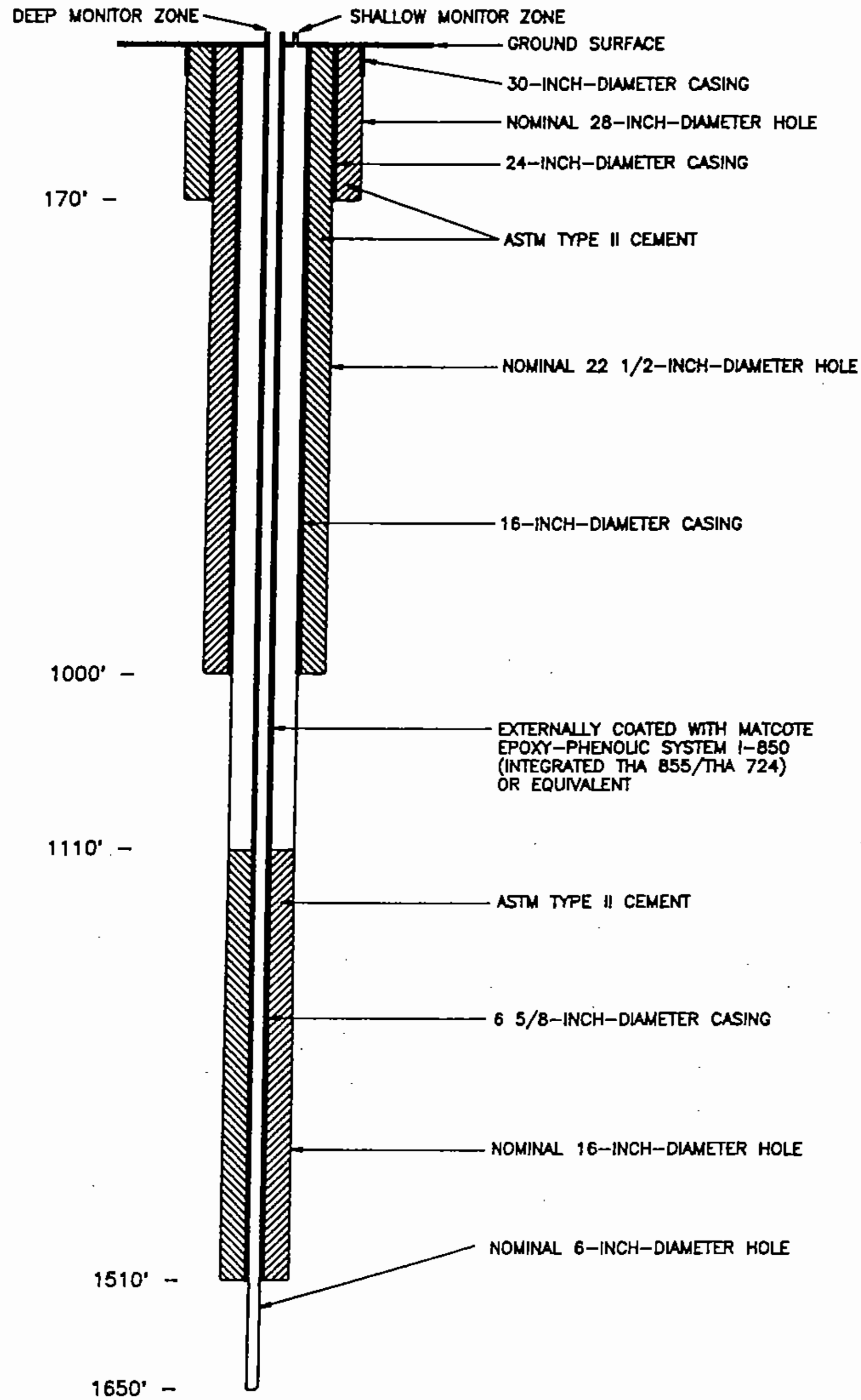
FINAL COMPLETION CONSTRUCTION DETAILS
INJECTION WELL #2

FIGURE 2

& MILLER, INC.
Environmental Services

PREPARED BY: B. OLIVA	JUL 90	NONE
PROJECT MGR.: J. WHEATLEY	FILE NO. PF01003	

GEE & JENSON
CORAL SPRINGS IMPROVEMENT DISTRICT



SUBJECT:

FINAL COMPLETION CONSTRUCTION DETAILS
DUAL MONITOR WELL #2

FIGURE 3

After the injection test, fresh water was pumped into the injection well before surveying with the video camera. The favorable picture quality obtained during the survey provided visual data on the condition of the injection casings and the nature of the injection zone. Video copies have been supplied to those members of the Technical Advisory Committee requesting the information.

A Radioactive Tracer Survey (RTS) was conducted after the video survey. Five logging events were conducted which consisted of moving a logging tool with gamma-ray detectors through an interval where a known amount of the radioactive isotope Iodine 131 was released. These tests, detailed later in this report, were performed to ensure the mechanical integrity of the injection well. A copy of the original log is included in Appendix C.

WELL DRILLING AND CONSTRUCTION

In July 1989, Youngquist Brothers constructed the drilling pad for IW-2 and for the deep monitor well. In August 1989, drilling commenced on IW-2 and the deep monitor well.

Injection Well #2

Construction of the injection well began in August 1989 with the drilling of a nominal 70-inch-diameter hole to a depth of 50 feet using the mud-rotary method of drilling. Pit casing (62-inch-diameter) was installed to a depth of 50 feet and cemented in place using ASTM Type II neat cement. Next, a nominal 60-inch-diameter hole was drilled to a depth of 170 feet. A string of 54-inch-diameter conductor casing then was installed and cemented to a depth of 170 feet using ASTM Type II cement with 12-percent bentonite.

Following the cementing of the conductor casing, a temperature log was conducted. A 52-inch-diameter pilot hole then was drilled to 1001 feet. A caliper/gamma-ray log was conducted prior to setting and cementing 44-inch-diameter surface casing at 1000 feet using ASTM Type II cement with 12-percent bentonite. Temperature logs were conducted after each stage of cementing.

After cementing of the 44-inch-diameter surface casing, the drilling method was changed from mud-rotary to reverse-air. A 12-1/4-inch-diameter pilot hole was drilled to 1800 feet, and geophysical logging (dual-induction, temperature, natural gamma-ray, borehole-compensated sonic/VDL, and X-Y caliper) was conducted. Straddle-packer testing was conducted over the intervals from 1090 to 1130 feet and 1180 to 1220 feet. Upon completion of the testing program in the pilot hole, the hole was reamed out to a nominal 44-inch diameter down to a depth of 1800 feet. Following the reaming of the hole, a gamma ray/X-Y caliper log was conducted. Subsequently, a 34-inch-diameter intermediate casing string was set at 1800 feet. Cementing of the 34-inch-diameter casing required six stages.

After the 34-inch-casing was cemented in place, drilling of the 12-1/4-inch-diameter pilot hole continued to a depth of 3000 feet. During drilling of the 12-1/4-inch-diameter pilot hole, six 4-inch-diameter cores were taken from the following intervals: 2350 to 2360 feet, 2450 to 2460 feet, 2850 to 2560 feet, 2600 to 2610 feet, 2700 to 2710 feet, and 2820 to 2830. The results of the laboratory analysis of the cores are presented in Table 2. Upon completion of the pilot hole, a suite of geophysical logs was conducted. Three straddle-packer tests were performed over the intervals from 2300 to 2340 feet, 2450 to 2490 feet, and 2600 to 2640 feet. Next, the hole was reamed to a nominal diameter of 34 inches, and 24-inch-diameter injection casing was installed to a depth of 2900 feet. Cementing of the 24-inch-diameter casing required ten stages and a total cement volume of 8360 cubic feet. Temperature logs were recorded after every stage, and a cement bond log was conducted on the entire length of the casing after the cement job was completed. A copy of the cement bond log appears in Appendix C with other geophysical logs. After the cement bond log was completed, a hydrostatic pressure test was successfully performed. Following the pressure test, the cement plug was drilled out and the injection zone was drilled to the final depth of 3500 feet using a 22-inch-diameter bit. Water samples were taken from the injection zone were taken (see section entitled "Water Quality") and geophysical logs were conducted in the open hole from 2900 to 3510 feet.

The injection test for IW-2 began after a 24-hour pre-injection-test monitoring period; the 24-hour injection test was aborted after three hours due to a lack of supply water. After the injection test, a 12-hour post-injection monitoring was conducted for 12 hours. A TV survey and a radioactive tracer survey completed the testing of the well.

Review of the cementing records, pressure-test results, injection-test data, and radioactive tracer survey indicates that the injection casing is properly cemented and that isolation between the injection horizon and overlying sources of drinking water has been achieved.

The conductor, surface, and intermediate casings were all 0.375-inch-wall API Grade B pipe. The final injection casing was 24-inch-diameter Grade B pipe with a 0.500-inch wall thickness. Copies of the mill certificates are found in Appendix G. Complete construction details are shown on Figure 2.

Dual-Zone Monitor Well

The monitor well construction began with the drilling of a nominal 35-inch-diameter hole to 20 feet, followed by setting and cementing 30-inch-diameter casing. A nominal 28-inch-diameter hole then was drilled to a depth of 170 feet, followed by setting and cementing 24-inch-diameter casing at 170 feet using ASTM Type II neat cement and ASTM Type II cement with 12-percent bentonite. Following cementing, a temperature log was conducted. A nominal 22-1/2-inch-diameter hole was drilled to 1007 feet. During the drilling, inclination surveys were conducted every 60 feet. A gamma ray/caliper log was then conducted, and 16-inch-diameter casing was installed at a depth of 1000 feet. The casing was cemented in place in two stages using ASTM Type II cement. Temperature logs were conducted after each cementing stage. A cement bond log was run on the 16-inch-diameter casing from 1000 feet to surface, and a hydrostatic pressure test was successfully completed. After the pressure test, a nominal 16-inch-diameter hole was drilled to 1510 feet, and a caliper/gamma-ray log was conducted in the open hole.

The final 6-5/8-inch-diameter coated casing string was installed from 1510 to surface. The casing string was left uncemented from 1100 feet to surface for annular monitoring purposes (the upper monitoring zone). A cement bond log was conducted, and a pressure test was successfully performed on the 6-5/8-inch-diameter casing. Next a nominal 6-inch-diameter hole was drilled from 1500 to 1650 feet to serve as the lower monitoring zone. Both the shallow (1000 to 1100 feet) and deep (1510 to 1650 feet) monitoring zones were disinfected, developed, and sampled. Water samples were analyzed for primary and secondary drinking water standards including EPA Test Methods 608, 624, and 625 (see Appendix D for laboratory results). Construction details of the monitor well are shown on Figure 3.

SUBSURFACE CONDITIONS

Background

The final design of the injection well was based on the information collected during drilling and testing of the pilot holes, and the drilling and testing program was established to provide flexibility in well-completion procedures as dictated by local geologic conditions. Specifications for the program were based and on regional geologic conditions and data from existing injection wells in the area. This section on subsurface conditions is presented at this point in the report so that the reader will obtain a good understanding of local geologic conditions and the rationale for the final design of the well.

Geologic Setting

A well-defined, areally-extensive sequence of carbonate sediments is present at the CSID site and throughout the area. The geologic units found during the construction of the well satisfied the requirements of Chapter 17-28 FAC. The injection zone is capable of receiving the required volume of effluent (15 million gallons per day, maximum injection rate), and disposal of the effluent into this zone should not result in contamination of any Underground Source of Drinking Water (USDW). A brief description of the various geologic units follows.