PRELIMINARY CONTAMINATION ASSESSMENT REPORT

Prepared for

CITY OF DELRAY BEACH

Prepared by

CH2M HILL

SE24708.A8

December 1988

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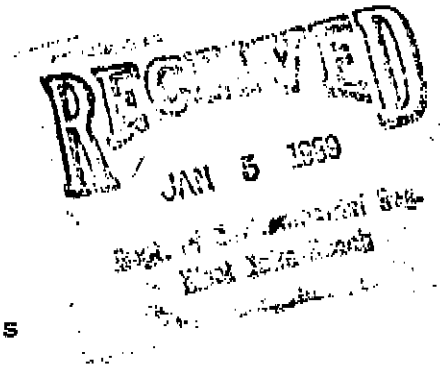

TABLES

FIGURES

Section 1
INTRODUCTION

1.1 BACKGROUND

In July 1987, 3.17 parts per billion (ppb) of the volatile organic chemical tetrachloroethene were detected in the finished water at the City of Delray Beach Water Treatment Plant (WTP). A subsequent analysis of groundwater from the City's production wells revealed that Wells 21, 22, 23 and 24 of the City's 20-Series Well Field had measurable quantities of tetrachloroethene, trichloroethene and cis-1,2-dichloroethene. This incident of production well contamination prompted an investigation of local industries by the Florida Department of Environmental Regulation (FDER).

FDER conducted a hazardous waste inspection of Aero-Dri Corporation on September 30, 1987. The Aero-Dri plant is located approximately 1,000 feet southeast of the contaminated production wells. The Hazardous Waste Inspection Report cited Aero-Dri with 11 violations. As a result, a Warning Notice (No. 50-419-87-HW) was issued on November 12, 1987. Enforcement meetings were held in accordance with the terms of the Warning Notice on November 23, 1987, and December 7, 1987, between FDER, Aero-Dri, their representatives, L&J Enterprises (the property owner), and the Palm Beach County Health Department (PBCHD). A draft Consent Order was given to attorneys representing Aero-Dri and L&J Enterprises at a December 23, 1987, meeting.

Aero-Dri representatives conducted a preliminary investigation by collecting soil samples on October 22, 1987, and groundwater samples on October 30, 1987, at the site. The results of sample analyses were given to the FDER and the PBCHD on November 23, 1987. Contamination of the site resulted in a fine to Aero-Dri, and the requirement to take corrective actions according to FDER guidelines.

The City had been forced to shut down five of the six 20-Series Wells by February 1988 due to high contaminant levels. This created a water shortage of approximately 7 million gallons per day (mgd). The City imposed a moratorium on new water connections and restricted the use of water for irrigation. At the same time, the South Florida Water Management District (SFWMD) ordered the City to reduce its water consumption to 3 mgd in the South Well Field because of the potential for saltwater intrusion.

CH2M HILL was authorized by the City on March 4, 1988, to design and procure an interim treatment system for groundwater from some of the 20-Series wells, alleviating the City's water shortage. CH2M HILL was also authorized to

velop a plan for implementing a full scale treatment sys-
m for long-term, cost effective treatment of the 20-Series
ll Field.

anular activated carbon (GAC) was proposed as a viable
eatment alternative which could be provided on a timely
sis until a full-scale treatment system could be con-
ructed. Other types of treatment systems for flow rates
er 4 mgd were not available within a short time frame.
algon Carbon Corporation agreed to provide two GAC systems
thin 1 week after entering into an agreement with the City
d a third unit 1 week later. Calgon and the City reached
agreement on March 17, 1988, and the first carbon unit
rrived on March 23, 1988. The second unit arrived the fol-
owing day. PBCHD approved the effluent water quality from
oth carbon systems on March 28, 1988 and the City began
sing Wells 22 and 23 that same day. The third carbon unit
t Well 24 was put into operation on April 4, 1988. A fourth
AC unit was eventually installed at Well 25 to meet
ncreasing water demand.

he City authorized CH2M HILL to conduct a preliminary
ontamination assessment on May 27, 1988. This work would
ide information to support the City's legal efforts
gainst Aero-Dri, the alleged source of contamination.

.2 PURPOSE

he preliminary contamination assessment field activities
ere conducted to obtain information confirming a potential
ource of production well contamination, and provide an
nitial estimate of the contaminant plume magnitude. The
esults of the assessment are contained in this report and
nclude:

- Private well inventory
- Geophysical logging
- Soil sampling
- Monitor well installation and surveying
- Groundwater sampling and analysis
- Split groundwater sampling with Aero-Dri consultant

lso included is a previously published result summary of
he water quality sampling program conducted by CH2M HILL on
aw water from 20-Series wells and finished water from the
TP; and results of the groundwater flow modeling performed
y CH2M HILL of the 20-Series and Golf Course Well Fields.

Section 2
SITE DESCRIPTION

2.1 SITE LOCATION

The City of Delray Beach 20-Series Well Field is located in south Palm Beach County between Linton Boulevard and Atlantic Avenue. Figure 2-1 shows the location of the 20-Series Well Field within the City of Delray Beach. The 20-Series Wells are about 400 feet east of I-95 just north and south of S.W. 10th Street. Well 21 is located on the north side of S.W. 8th Street between S.W. 13th and S.W. 14th Avenues. Wells 22, 23 and 24 are located on the east side of S.W. 15th Avenue between S.W. 7th Street and S.W. 10th Street. Well 25 is located about 100 feet south of S.W. 10th Street near a Florida Power and Light (FPL) transformer station. Well 26 is located just east of I-95 near the FPL transformer station. Figure 2-2 shows the locations of the 20-Series Wells. Table 2-1 summarizes construction data provided by the City on the 20-Series Wells.

Aero-Dri is located on S.W. 10th Street, about 1,000 feet east and southeast of the production wells. The area chosen for this study extends from Poinsettia Drive on the southeast to S.W. 16th Avenue on the west. Poinsettia Drive is southeast of Aero-Dri and S.W. 16th Avenue is west of the 20-Series Well Field.

2.2 PREVIOUS INVESTIGATIONS

Aero-Dri conducted a preliminary investigation in the immediate vicinity of the suspected spill site (Dames and Moore, 1987). Two monitor wells were installed on October 22, 1987 to collect groundwater samples. These wells were installed at the southwest corner of the Aero-Dri building in the area of the suspected spill. The screen intervals for the wells were set at depths of 20 to 25 feet for MW-1 and 40 to 45 feet for MW-2. Four soil samples at approximately 5-foot intervals were collected during the installation of the wells.

Groundwater and soil from the two monitor wells were analyzed using EPA Methods 601 (purgeable halocarbons) and 602 (purgeable hydrocarbons). The Method 601 analysis showed elevated levels of tetrachloroethene in the range of 26 parts per billion (ppb) in soil taken from a depth of 15 feet at MW-1, to 585,000 ppb in soil taken from near the surface at MW-2. A more detailed summary of the available soil analysis is given in Table 2-2.

Tetrachloroethene levels in groundwater were 5,600 ppb in MW-1 and 531,500 ppb in MW-2. In addition, 450 ppb and 430 ppb trichloroethene were measured in groundwater from

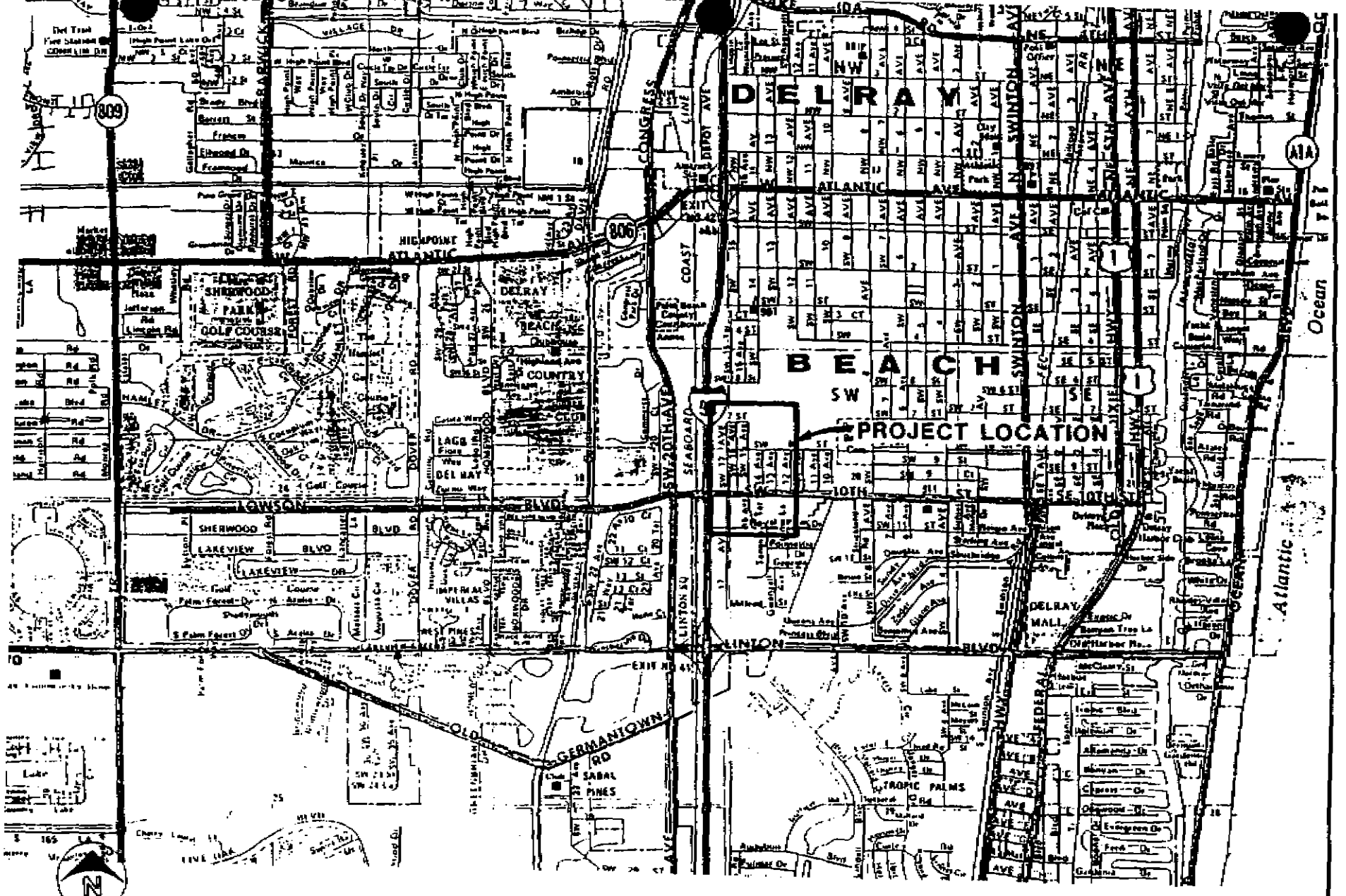

FIGURE 2-1
PROJECT LOCATION

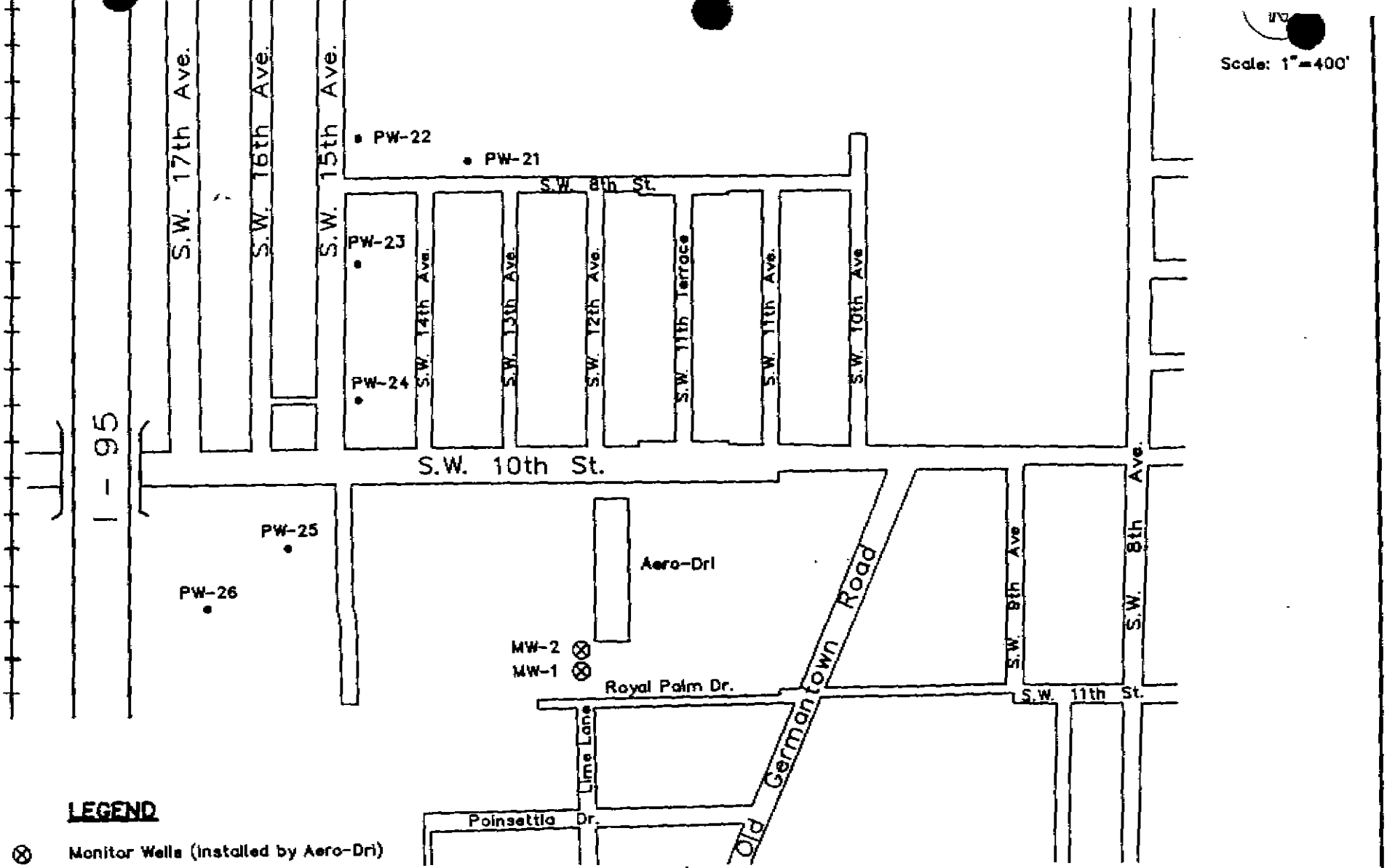

FIGURE 2-2
LOCATION OF 20-SERIES WELLS

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Table 2-1
CONSTRUCTION DATA, 20-SERIES WELLS

Well Number	Diameter (inches)	Approximate Cased Interval (feet)	Approximate Screened Interval (feet)	Rated Capacity (gpm)
21	12	0-110	110-150	900
22	12	0-110	110-150	1,000
23	12	0-100	100-140	1,000
24	12	0-110	110-150	1,000
25	12	0-110	110-150	1,000
26	12	0-110	110-150	1,000

Table 2-2
SUMMARY OF PERTINENT SOIL SAMPLE ANALYSES
FROM THE AERO-DRI SITE

	Concentration (ppb) Soil Depth (feet)			
	Surface	5	10	15
MW-1				
Benzene	<0.1	5	<0.1	<0.1
Ethylbenzene	<0.1	4	11	1
Toluene	<0.1	8	7	12
o-Xylene	<0.1	11	35	3
m-Xylene	<0.1	11	32	4
p-Xylene	<0.1	<0.1	<0.1	<0.2
Chloroform	6,900	<250	<250	<250
Trichloroethene	<250	<250	<250	<250
Tetrachloroethene	4,030	4,469	2,274	26
MW-2				
Benzene	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	<0.1	18	<0.1	<0.1
Toluene	<0.1	6	<0.1	<0.1
o-Xylene	<0.1	66	<0.1	<0.1
m-Xylene	<0.1	30	<0.1	<0.1
p-Xylene	<0.1	42	<0.1	<0.1
Chloroform	<250	<250	<250	<250
Trichloroethene	<250	<250	<250	<250
Tetrachloroethene	585,000	480	408,000	4,600

Source: Compiled from Preliminary Contamination Assessment Report, Perchloroethylene Spill, Aero-Dri Corporation Site, Dames & Moore, December 21, 1987.

MW-1 and MW-2, respectively. Table 2-3 summarizes the groundwater sample data for MW-1 and MW-2 located on the Aero-Dri property.

The Method 602 analysis indicated the presence of benzene, ethylbenzene, toluene, and xylene in soil samples from MW-1 and MW-2. Each of these compounds except toluene were also detected in the groundwater. At MW-1, as much as 5 ppb benzene, 11 ppb ethylbenzene, 12 ppb toluene, 35 ppb o-xylene and 32 ppb m-xylene were found in the soil column. Similar concentrations were detected in soil from MW-2 for some parameters. In the groundwater, 17 ppb ethylbenzene and 1 ppb o-xylene were measured in MW-1, while 14 ppb ethylbenzene, 12 ppb benzene, 4 ppb o-xylene, 6 ppb m-xylene and 3 ppb p-xylene were detected in MW-2. The presence of these compounds typically indicates contamination by petroleum products.

CH2M HILL conducted a water quality sampling program for the City between February and June 1988 (CH2M HILL, August 1988). Finished water samples from the City WTP were analyzed for SDWA parameters by EPA Method 524.2. The results of this study plus a summary of analytical results for 20-Series well samples are contained in Appendix A.

2.3 LOCAL HYDROGEOLOGY

The well fields in Delray Beach withdraw groundwater from the unconfined surficial aquifer. Most of the production wells are constructed to a total depth of 130 to 150 feet below land surface (bls). The production interval of these wells extends from approximately 100 feet bls to the total depth of the wells.

The geology of the surficial aquifer in the vicinity of Delray Beach is composed of the Pamlico Sand and Anastasia Formations. Lithologic logs from two wells in the Golf Course Well Field (under construction) show fine to medium sand to approximately 70 feet bls. Calcareous sandstone with shell fragments are found below the sand layers to approximately 200 feet bls. The bottom of the surficial aquifer is bounded by layers of clay and silt beds.

Pumping tests conducted by other City consultants on the Golf Course Well Field indicated that the portion of the aquifer tapped by the production wells responds as an unconfined aquifer. No laterally-persistent confining layers appear to be present above 200 feet bls.

Water levels in the surficial aquifer range from 8 feet above the national geodetic vertical datum (NGVD) of 1929 to less than zero feet NGVD near the City's North and South Well Fields. The direction of regional groundwater flow appears to be towards the east-southeast (Land, et al.,

Table 2-3
SUMMARY OF PERTINENT GROUNDWATER SAMPLE ANALYSIS
FROM THE AERO-DRI SITE
(OCTOBER 30, 1987)

Compound	Concentration (ppb) MW-1	MW-2
Benzene	<0.1	12
Ethylbenzene	17	14
Toluene	<0.1	<0.1
o-Xylene	1	4
m-Xylene	<0.1	6
p-Xylene	<0.1	3
Trichloroethene	450	430
Tetrachloroethene	5,600	531,500

Source: Compiled from Preliminary Contamination Assessment Report, Perchloroethylene Spill, Aero-Dri Corporation Site, Dames & Moore, December 21, 1987.

1973), but canals and pumping well fields tend to alter and intercept the flow patterns. The primary source of recharge to the aquifer is rainfall, however, some of the recharge is provided through canal leakage, particularly near the pumping well fields.

Section 3
FIELD INVESTIGATIONS

WELL INVENTORY

results of a private well inventory were obtained from PBCHD. This study showed that private wells are located h of S.W. 10th Street along Old Germantown Road and Poinia Drive. This area is south-southwest of the Aero-Dri erty and suspected spill site. Nine private wells were led by PBCHD and analyzed for purgeable organics by EPA iod 624. The approximate locations of these wells are n in Figure 3-1. None of the contaminants detected at Aero-Dri site were observed in these samples. The anaical results of these samples are contained in Appendix B.

City of Delray Beach currently operates three well lds, the North, South, and 20-Series Wells. A fourth l field is currently under construction. These well lds are shown in Figure 3-2. The North and South Well lds are located along Swinton Avenue, from N.E. 8th eet to S.E. 10th Street. These two well fields consist 17 production wells with a combined capacity of approxiy 13 mgd. The City, however, has been limited on its ng from some of these wells by the SFWMD because of ltwater intrusion problems. Some of the wells are out of rvice due to mechanical problems. Well 16 from the South ll Field is the closest to Aero-Dri. It is located proximately 4,000 feet east of Aero-Dri.

e Golf Course Well Field is currently under construction the Delray Beach Municipal Golf Course, which is located st of Interstate 95 and the 20-Series Well Field. This ll field will consist of seven wells located between Atlanc Avenue and Lowson Boulevard. The Golf Course Well Field ll have a permitted capacity of 7.5 mgd and is scheduled be in operation by early 1989. The closest of these wells Aero-Dri is 8W which is about 2,600 feet west of Aero-Dri.

2 GEOPHYSICAL LOGGING

nitor wells were installed as part of the preliminary ntamination assessment. During the drilling of the monitor lls, geophysical logging was conducted to help describe e stratigraphic conditions. Two logs were run, the natural mma ray and the single point electric. The natural gamma y log detects the presence of clay and silt while the sine point electric log yields qualitative changes in sediment rmeability throughout the geologic profile.

e upper sediment layers (strata) in the study area consist inly of unconsolidated sand and shell. Deeper strata may

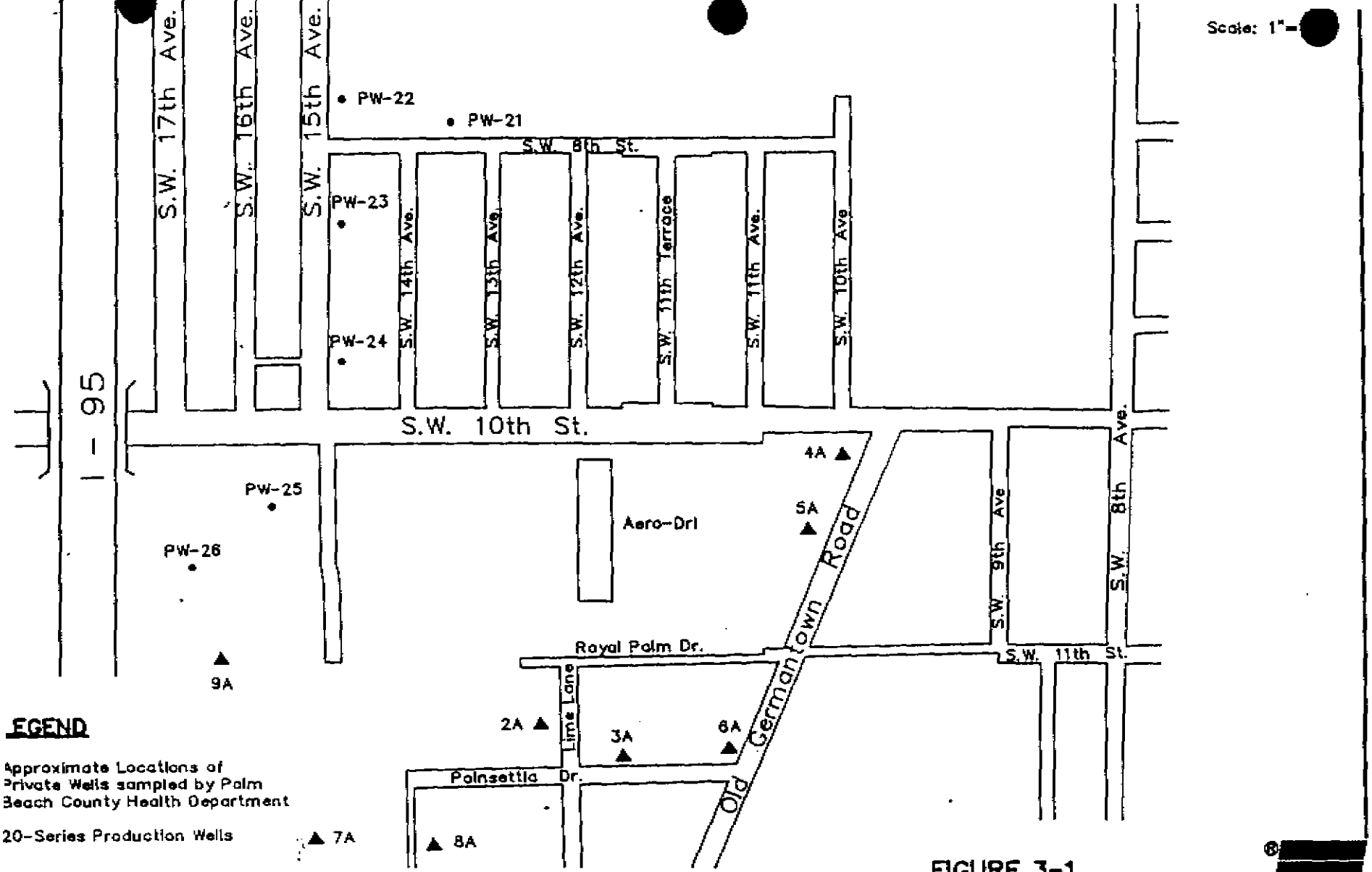
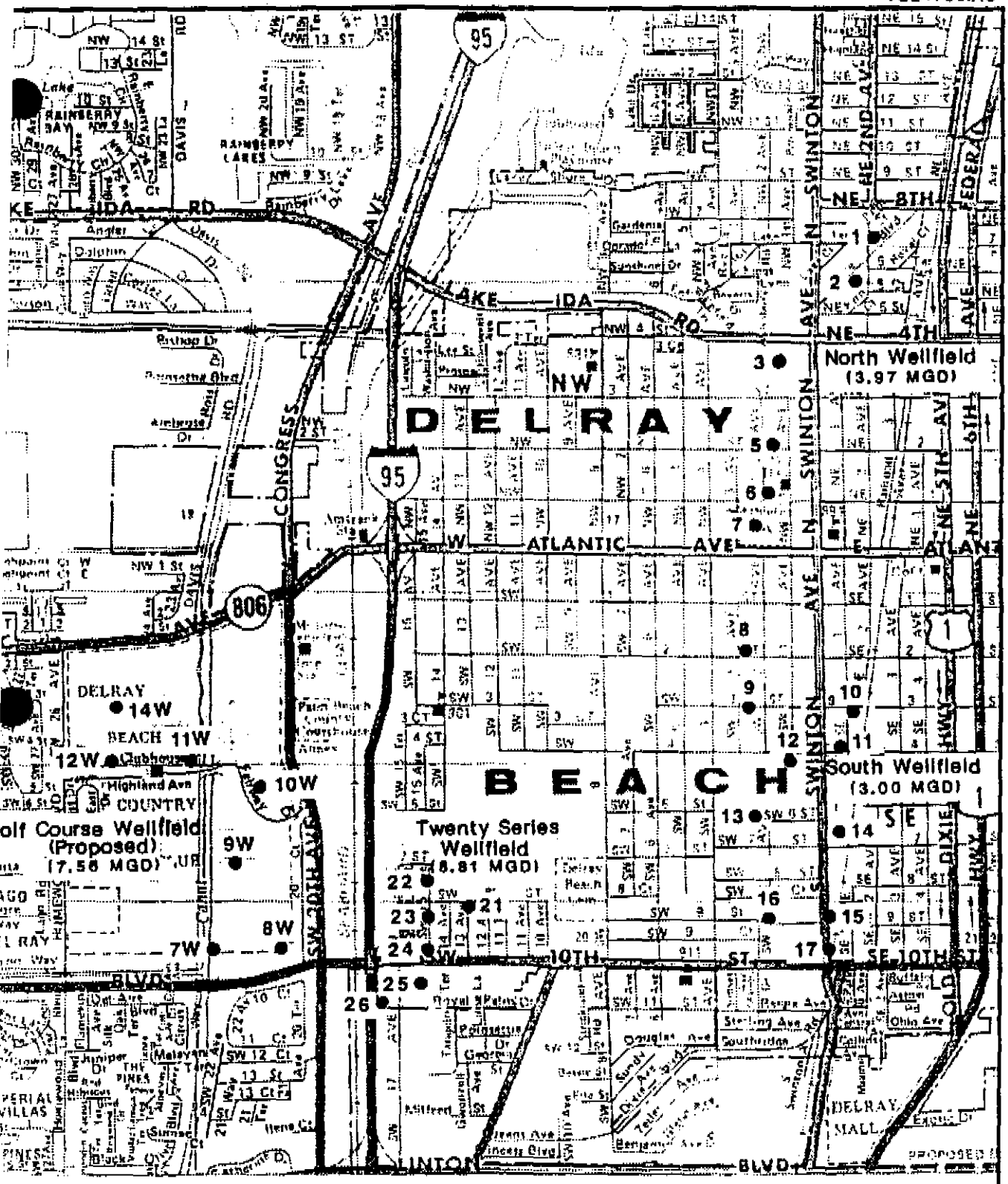


FIGURE 3-1
PRIVATE WELL LOCATIONS

.DWG



N

1/4 1/2

Scale in Miles

LEGEND

- ● CITY OF DELRAY BEACH PRODUCTION WELLS

(3.97) REPRESENTS TOTAL PERMITTED YIELD FROM WELLFIELD

FIGURE 3-2

LOCATION OF CITY OF DELRAY BEACH'S

CH2MHILL

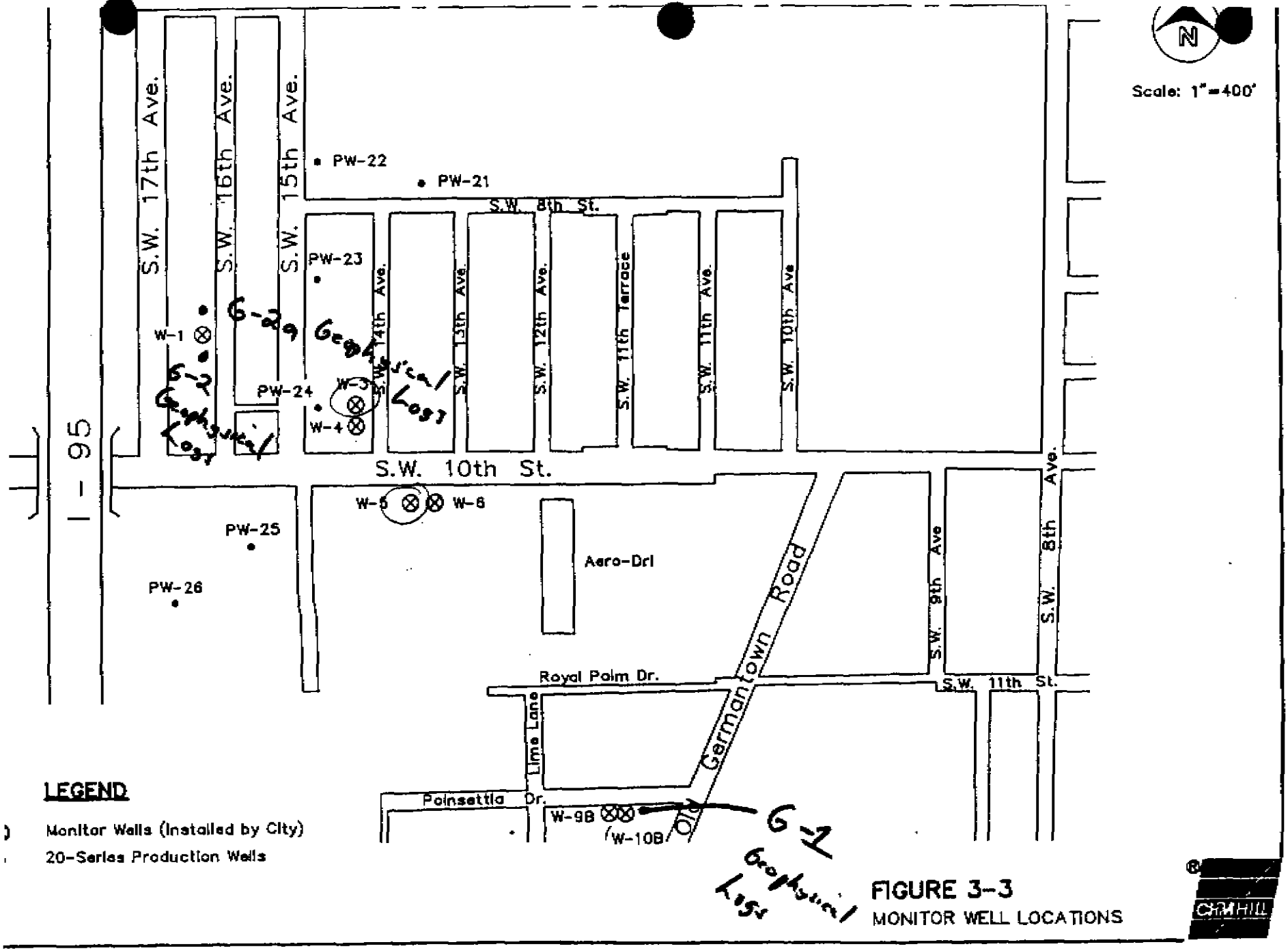


FIGURE 3-3
MONITOR WELL LOCATIONS

CH2MHILL

DWG

tain less permeable confining layers, characterized by presence of silts and clays. These confining layers may retard vertical movement of water and contaminants. These layers can be identified with geophysical logs. The purpose of the logging was to assist in establishing appropriate screen intervals for the monitor wells and to identify potential confining layers which would affect the migration of contamination.

Geophysical logging was conducted on two test boreholes located near monitor well W-1 and monitor wells W-9B and W-10B (Figure 3-3). Borehole G-1, located near W-9B and W-10B, was drilled to a depth of 202 feet and logged to a depth of 199 feet. Difficulties occurred during construction of test borehole G-2, which was located near W-1. This borehole was therefore abandoned and replaced with G-2a. G-2a was drilled to 205 feet and logged to 202 feet. The gamma ray and electric logs are presented in Appendix C.

Based on the drill cutting analysis and the geophysical logs, a slight formation change was encountered between depths of 105 and 135 feet. This change represents a transformation from the fine-grained sands of the upper 100 feet of the surficial aquifer to the coarser-grained sandstone and shell of the production zone of the well field (approximately 100 to 150 feet bls). No confining layers were detected, therefore, a direct connection exists between the upper sands and the deeper, more permeable production zone within the study area. Chemicals disposed of at the land surface would appear to have no geological impediment for migrating through the upper sediments to the more permeable production zone.

3.3 MONITOR WELL INSTALLATION

Seven monitor wells were proposed in the Preliminary Contamination Assessment Plan (PCAP) (CH2M HILL, May 1988), however, only seven of the proposed wells were actually installed. Two of the proposed monitor wells (W-7 and W-8) were to be located just west of the Aero-Dri property. Consultants for Aero-Dri had installed monitor wells near this location; therefore, W-7 and W-8 were eliminated from the plan to avoid duplicating Aero-Dri's efforts.

Two monitor wells (W-1 and W-2) were to be placed west of the 20-Series Well Field. These wells were anticipated to be background wells screened from 150 to 160 feet and 190 to 200 feet, respectively. These monitor wells were to be constructed using surface casing to prevent transporting contamination downward to the deeper parts of the aquifer should contamination be present in the upper sediment. Unexpected subsurface conditions at this location, however, would have made the installation of the deeper monitor well cost prohibitive using this approach. It was determined, therefore,

that only one monitor well would be installed in this location. Geophysical logs were used to aid in locating the well screen in a highly transmissive zone near the 150-foot depth. This approach would help insure that the monitor well was located in the most likely path which contaminants would be transported.

Monitor wells W-9 and W-10 shown in Figure 3-1 of the PCAP were proposed to be located at the corner of Poinsetta Drive and Old Germantown Road. These two monitor wells were actually installed about 200 feet west of this intersection. The revised locations have been designated W-9B and W-10B in this report. The proposed screen depths of these two monitor wells were 60 to 70 feet and 100 to 110 feet, respectively. Information obtained after the PCAP was published indicated that Aero-Dri consultants were installing monitor wells south and southeast of the suspected spill site on the Aero-Dri property. The screen depths for their wells ranged from 40 to 90 feet. It was decided, therefore, that W-9B and W-10B should be deeper than was proposed to compliment the information obtained from the Aero-Dri monitor wells and present a more complete assessment of the vertical profile. The screen depths for W-9B and W-10B were increased to depths of 140 to 150 feet and 120 to 130 feet, respectively.

The monitor wells were installed by the mud rotary drilling technique. The wells were constructed with 2-inch Schedule 40 PVC casing and screen. The completion diagrams for the seven monitor wells are given in Appendix D. Table 3-1 summarizes the construction details for these monitor wells.

3.4 SOIL SAMPLING

Soil samples were collected during installation of two monitor wells. Soil from the first boring (B-1) was taken during the installation of monitor well W-5 and soil from the second boring (B-2) was obtained during the installation of monitor well W-3 (Figure 3-3). Two samples were obtained at each boring. The first sample was collected at 12 to 14 feet bls while the second was collected at 14 to 16 feet bls. The samples were analyzed for volatile organic compounds (VOCs) and total organic carbon (TOC). The TOC measurements will be used in subsequent discussions regarding contaminant fate and transport.

No VOCs were detected in soil samples from this shallow depth. The TOC of the soils ranged from 126 mg/kg of soil to 253 mg/kg of soil. The results of these analysis are contained in Appendix E.

Table 3-1
MONITOR WELL CONSTRUCTION DATA

Well No.	Diameter (inches)	Estimated Cased Interval (feet)	Screened Interval (feet)	Gravel Pack Interval (feet)	Bentonite Seal (feet)	Cement Interval (feet)
W-1	2	0-145	145-155	140-155	1	0-139
W-3	2	0-110	110-120	105-120	1	0-104
W-4	2	0-140	140-150	135-150	1	0-134
W-5	2	0-90	90-100	85-100	1	0-84
W-6	2	0-130	130-140	125-140	1	0-124
W-9B	2	0-140	140-150	135-150	1	0-134
W-10B	2	0-120	120-130	115-130	1	0-114

Table 3-2
SAMPLE CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Sample Parameter	Container[a]	Preservation Technique[b,c]	Maximum Holding Time[d]
Metals [except Chromium (VI) and Mercury]	P,G	HNO_3 to pH <2	6 months
Chromium (VI)	P,G	Cool to 4°C	24 hours
Mercury	P,G	HNO_3 to pH <2	28 days
Purgeable Halocarbons[f]	G, Teflon-lined septum	Cool to 4°C	14 days
Purgeable Aromatics[f]	G, Teflon-lined septum	Cool to 4°C HCl to pH <2[g]	14 days
Base/Neutral Extractables[f]	G, Teflon-lined septum	Cool to 4°C	7 days until extraction, 40 days after extraction
Acid Extractables[f]	G, Teflon-lined septum	Cool to 4°C	7 days until extraction, 40 days after extraction
Pesticides[h]	G, Teflon-lined cap	Cool to 4°C pH 5-9[i]	7 days until extraction, 40 days after extraction
CN^-	P,G	Cool to 4°C, NaOH to pH >12	14 days[e]
EDB	G, Teflon-lined septum	Cool to 4°C	14 days

[a]Polyethylene (P) or Glass (G).

[b]Sample preservation should be performed immediately upon sample collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

[c]When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table 6-1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); nitric acid (NHO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

[d]Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if data on file show that the specific types of samples under study are stable for the longer time, and has received a variance from the U.S. EPA Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show that this is necessary to maintain sample stability.

[e]Maximum holding time is 24 hours when sulfide is present. Optionally all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

Table 3-2
(Continued)

[f]Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

[g]Sample receiving no pH adjustment must be analyzed within seven days of sampling.

[h]When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for seven days before extraction and for forty days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote e (re: the requirement for thiosulfate reduction of residual chlorine).

[i]For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

Tetrachloroethene and trichloroethene were detected in water samples from Monitor Wells W-3, W-4, W-5, and W-6. These four wells are located between the suspected spill site and the 20-Series Wells. Tetrachloroethene and trichloroethene were not detected in W-1 or in W-9B and W-10B. Monitor Well W-1 is located west of the 20-Series Well Field, whereas W-9B and W-10B are located south-southeast of Aero-Dri. These results are summarized in Table 3-3. Appendix F contains the laboratory analysis for the groundwater samples collected from the monitor wells installed for this study.

None of the pesticides contained in EPA Method 608 were detected in the samples from Monitor Wells W-3 and W-5. Priority pollutant metals were also not detected in these wells.

Benzene, toluene, ethylbenzene, and xylene were detected in the October 30, 1987, samples from MW-1 and MW-2 at the Aero-Dri site. None of these compounds were detected in the offsite monitor wells.

3.7 SPLIT SAMPLING

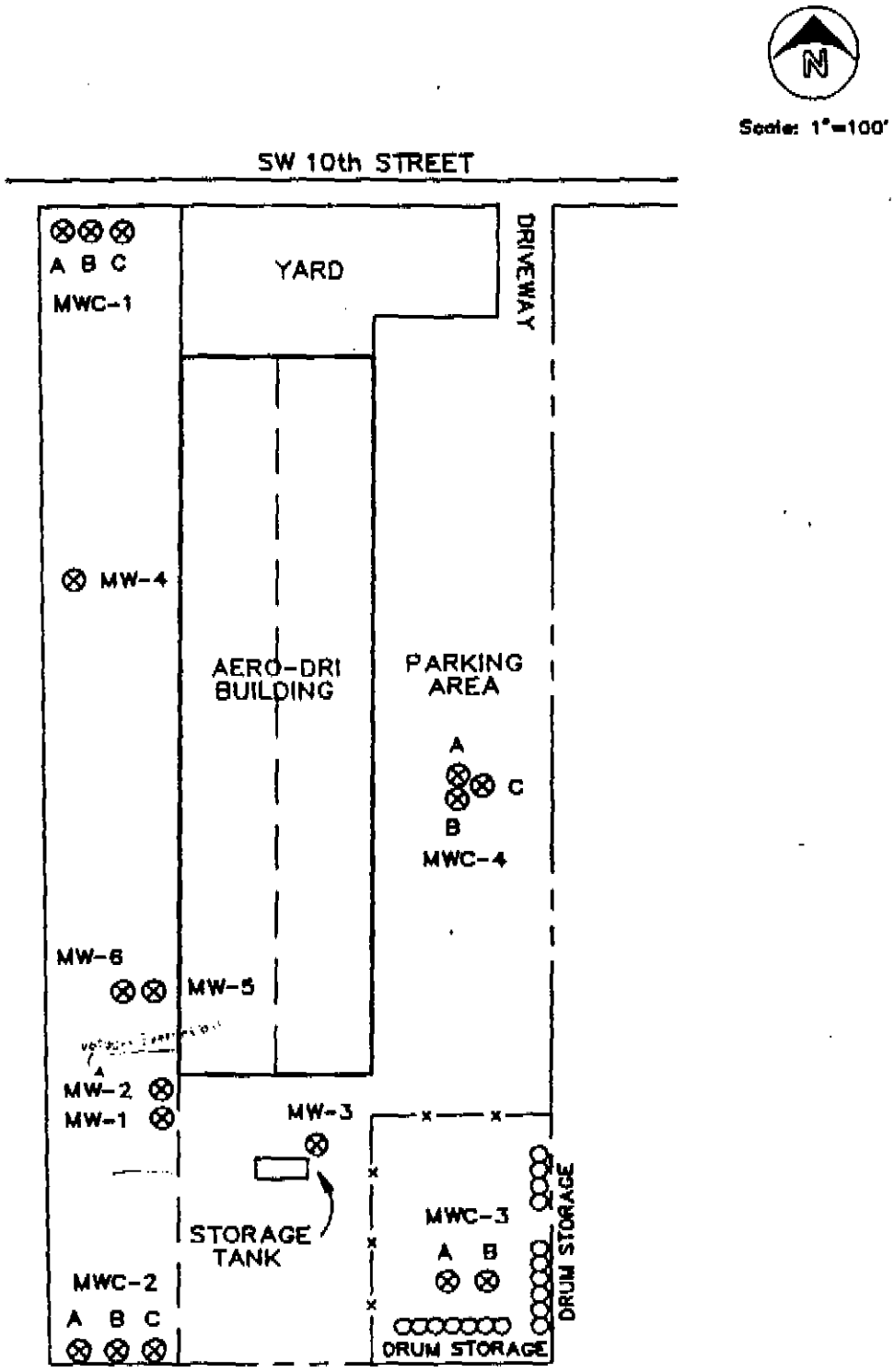
At the direction of the City, CH2M HILL obtained samples from monitor wells installed by consultants for Aero-Dri. Two such split sampling events occurred. The first was on May 25, 1988 and the second was on August 4, 1988. During the first split sampling activity, 14 monitor wells located on the Aero-Dri site plus Production Wells 22, 23, 24, and 25 were sampled. Seven additional monitor wells were installed after the first split sampling event. Four of these additional monitor wells were off the Aero-Dri property. Figure 3-4 shows the location of the on-site monitor wells and Figure 3-5 shows the location of off-site monitor wells installed by Aero-Dri's consultant.

All samples collected during the May 25, 1988 split sampling were analyzed by EPA Methods 601 and 602. In addition, the sample from MW-2 was analyzed for base neutral and acid extractable compounds (EPA Method 625) and priority pollutant metals. The highest contamination was detected in samples from MW-1 and MW-2. These samples contained 15,000 ppb and 53,000 ppb tetrachloroethene, respectively. In general, contamination was detected in monitor wells located west and northwest of the Aero-Dri building. Contamination was not detected in samples from monitor wells located south, southeast and east of the Aero-Dri building. No significant levels of base neutral, acid extractable or priority pollutant metals were detected in the sample taken from MW-2. Table 3-4 summarizes the tetrachloroethene and trichloroethene concentrations for this sampling event. Appendix G contains the laboratory analysis for the May 25, 1988, split sampling event.

Table 3-3
SUMMARY OF PERTINENT GROUNDWATER ANALYSIS

Well No.	Concentration (ppb) Tetrachloroethene	Trichloroethene
W-1	BMDL	BMDL
W-3	1,200	60
W-4	47	3.2
W-5	250	87
W-6	650	13
W-9B	BMDL	BMDL
W-10B	BMDL	BMDL

Note: BMDL = Below Method Detection Limit



LEGEND

⊗ MONITOR WELL (Installed by Aero-Dri)

FIGURE 3-4

MONITOR WELL LOCATIONS ON

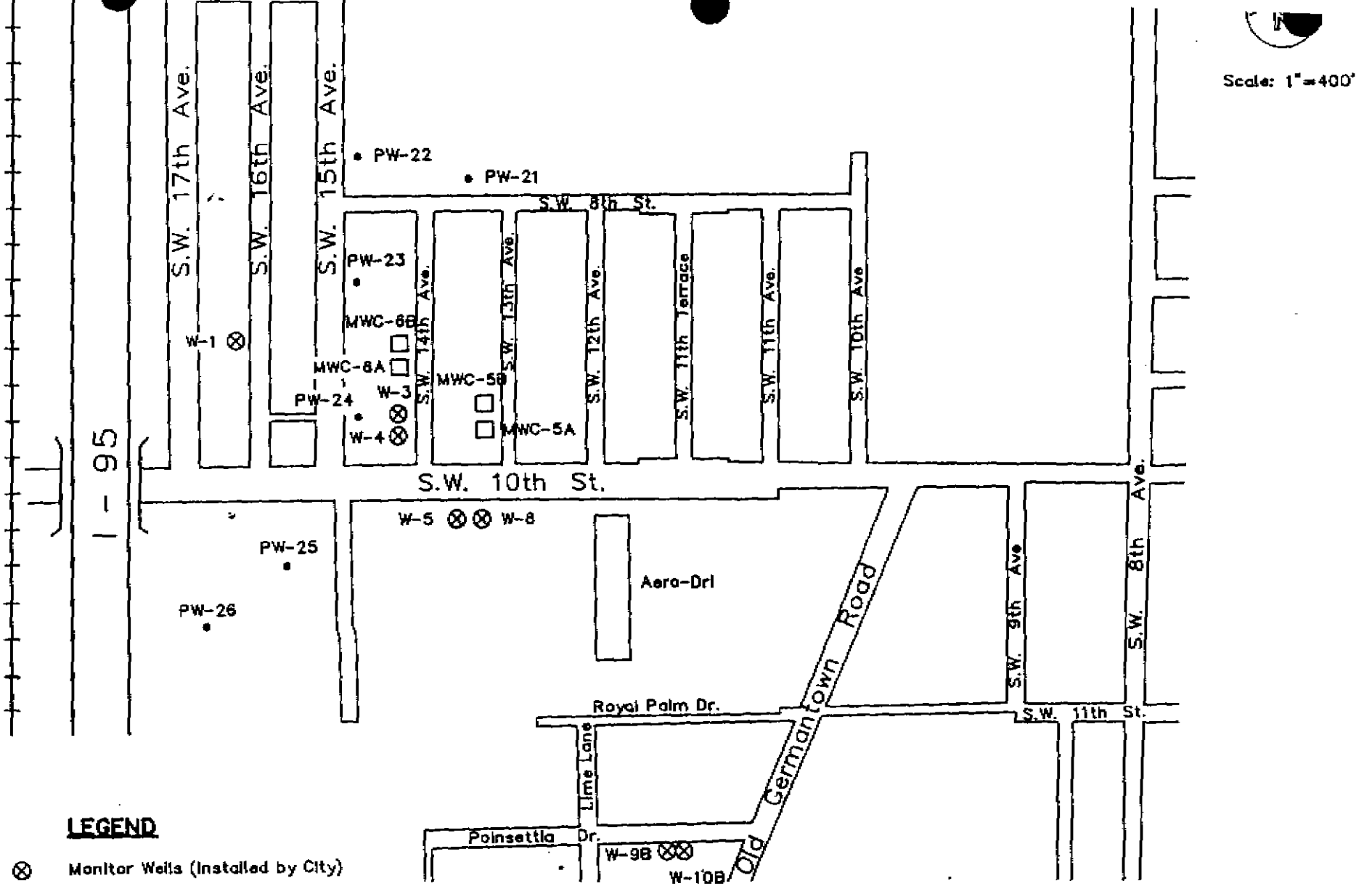


FIGURE 3-5
LOCATION OF MONITOR WELLS
INSTALLED BY AERO-DRI

CH2MHILL

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Table 3-4
SUMMARY OF PERTINENT GROUNDWATER ANALYSIS FOR
SPLIT SAMPLES OBTAINED FROM AERO-DRI CONSULTANT

	Concentration, (ppb)			
	Tetrachloroethene		Trichloroethene	
Well No.	5/25/88	8/4/88	5/25/88	8/4/88
MW-1	15,000	3,700	450	96
MW-2	53,000	63,000	<5,000	<5,000
MW-3	220	29	220	29
MW-4	NI	BMDL	NI	BMDL
MW-5	NI	24	NI	BMDL
MW-6	NI	2,800	NI	<100
MWC1-A	4,100	2,900	<1,000	<100
MWC1-B	1,800	1,100	22	<100
MWC1-C	1.6	BMDL	BMDL	BMDL
MWC2-A	BMDL	BMDL	BMDL	BMDL
MWC2-B	BMDL	1.7	BMDL	BMDL
MWC2-C	BMDL	BMDL	BMDL	BMDL
MWC3-A	BMDL	BMDL	BMDL	BMDL
MWC3-B	BMDL	BMDL	BMDL	BMDL
MWC4-A	BMDL	3.0	BMDL	BMDL
MWC4-B	BMDL	4.1	BMDL	1.2
MWC4-C	BMDL	7.4	BMDL	1.1
MWC-5A	NI	1,300	NI	<100
MWC-5B	NI	310	NI	<10
MWC-6A	NI	560	NI	<10
MWC-6B	NI	7.3	NI	BMDL
PW-22	BMDL	BMDL	1.2	BMDL
PW-23	21	28	BMDL	4.6
PW-24	190	480	22	77
PW-25	BMDL	360	BMDL	39
PW-26	NA	BMDL	NA	BMDL

Note: NI = Well not installed at the time of sampling
BMDL = Below Method Detection Limit
NA = Not Analyzed

Table 3-4
SUMMARY OF PERTINENT GROUNDWATER ANALYSIS FOR
SPLIT SAMPLES OBTAINED FROM AERO-DRI CONSULTANT

	Concentration, (ppb)			
	Tetrachloroethene		Trichloroethene	
Well No.	5/25/88	8/4/88	5/25/88	8/4/88
MW-1	15,000	3,700	450	96
MW-2	53,000	63,000	<5,000	<5,000
MW-3	220	29	220	29
MW-4	NI	BMDL	NI	BMDL
MW-5	NI	24	NI	BMDL
MW-6	NI	2,800	NI	<100
MWC1-A	4,100	2,900	<1,000	<100
MWC1-B	1,800	1,100	22	<100
MWC1-C	1.6	BMDL	BMDL	BMDL
MWC2-A	BMDL	BMDL	BMDL	BMDL
MWC2-B	BMDL	1.7	BMDL	BMDL
MWC2-C	BMDL	BMDL	BMDL	BMDL
MWC3-A	BMDL	BMDL	BMDL	BMDL
MWC3-B	BMDL	BMDL	BMDL	BMDL
MWC4-A	BMDL	3.0	BMDL	BMDL
MWC4-B	BMDL	4.1	BMDL	1.2
MWC4-C	BMDL	7.4	BMDL	1.1
MWC-5A	NI	1,300	NI	<100
MWC-5B	NI	310	NI	<10
MWC-6A	NI	560	NI	<10
MWC-6B	NI	7.3	NI	BMDL
PW-22	BMDL	BMDL	1.2	BMDL
PW-23	21	28	BMDL	4.6
PW-24	190	480	22	77
PW-25	BMDL	360	BMDL	39
PW-26	NA	BMDL	NA	BMDL

Note: NI = Well not installed at the time of sampling
BMDL = Below Method Detection Limit
NA = Not Analyzed

Samples collected on the August 4, 1988 split sampling activity were analyzed only by EPA Method 601 and 602. The highest contamination was measured in MW-1 and MW-2. The concentration of tetrachloroethene in these samples were 3,700 ppb and 63,000 ppb, respectively. High concentrations of tetrachloroethene were also detected in monitor wells located west and northwest of the Aero-Dri building. Low levels of tetrachloroethene were also detected in three monitor wells east of the Aero-Dri building. Monitor wells installed off-site by Aero-Dri's consultant were also sampled during this split sampling event. The results of these analyses for tetrachloroethene and trichloroethene are summarized in Table 3-4. Appendix H contains the laboratory analysis for the August 4, 1988 split sampling event.

3.8 FATE AND TRANSPORT OF CONTAMINANTS

The factors which control the movement of contaminants in the subsurface primarily include hydrodynamic, abiotic, and biotic processes. Each of these processes include parameters which promote or retard contaminant transport rates. The magnitude of each of the transport processes and consequently the contribution of each process in influencing the rate of transport is dependent on contaminant and soil/groundwater system characteristics. Hydrodynamic processes include advection and dispersion. Advection is the movement of contaminants at a rate equal to the groundwater flow. Dispersion describes the spreading of a contaminant plume as the groundwater follows a tortuous path through the pore spaces between soil particles. The contaminant concentration is diluted during the dispersion process.

Abiotic processes describe the nonbiological interactions between the contaminant and the subsurface environment. These processes include adsorption/desorption, ion exchange, solution/precipitation, oxidation/reduction, and acid-base reactions. The most important of these interactions in cases involving organic compounds is typically adsorption/desorption.

Adsorption of organic chemicals in soil has been estimated from physical and chemical properties of the aquifer and the contaminant (Karickhoff, Brown and Scott, 1979). The sand fraction was much less efficient in adsorption studies than was the silt and clay fractions. The effectiveness of adsorption in retarding the movement of organic compounds in the subsurface can be estimated using the soil organic fraction content and the contaminant octanol/water partition coefficient. The following will discuss adsorption as a mechanism for retarding the migration of tetrachloroethene in soil at the 20-Series Well Field.

Organics present in soil at a level not exceeding 60 to 70 percent of their aqueous solubility follows a linear adsorption isotherm. This relationship is given as follows:

$$X = K_p C \qquad (3.8a)$$

where:

X = sorbate concentration on the sediment (ppb)

K_p = partition coefficient (dimensionless)

C = equilibrium sorbate concentration in solution (ppb)

The aqueous solubility of tetrachloroethene is approximately 200,000 ppb. All samples collected during this study contained tetrachloroethene concentrations less than 60 percent of the solubility. Therefore, Equation 3.8a should be valid for this study. The term sorbate refers to the organic chemical of interest. The partition coefficient, K_p, is a measure of the affinity of the individual compound for a particular aquifer material. K_p may therefore have a different value for each organic compound and soil system. K_p however, has been shown to be related to the organic content of the soil. This relationship is given as follows:

$$K_p = (K_{oc})(oc)/(1 \times 10^6) \qquad (3.8b)$$

where:

K_{oc} = organic carbon partition coefficient (dimensionless)

oc = organic carbon content of soil (mg/kg soil)

The organic carbon partition coefficient, K_{oc}, is a measure of the tendency for an organic compound to partition between water and organic matter in soils. The K_{oc} can be estimated from the octanol/water partition coefficient, K_{ow}. The K_{ow} is an experimentally determined parameter which is dependent on the organic compound's physical properties. The relationship between K_{ow} and K_{oc} given by Karickhoff, et al. (1979) is given below:

$$\log K_{oc} = \log K_{ow} - 0.21 \qquad (3.8c)$$

where:

K_{ow} = octanol/water partition coefficient (dimensionless)

Using these relationships with the primary contaminant in the 20-Series Well Field, tetrachloroethene, a preliminary estimate of the adsorption characteristics in mitigating the movement of tetrachloroethene from a spill source can be

determined. The log octanol/water partition for tetrachloroethene is 2.60 (Canter, Knox, and Fairchild, 1987). Substituting this value into equation 3.8c above yields a $\log K_{oc}$ of 2.39 (K_{oc} = 245). The mean organic carbon content of the four soil borings was 180 milligrams (mg) organic carbon per kilogram (kg) of soil. Substituting the values of K_{oc} and organic carbon into equation 3.8b yields a K_p equal to 0.044. In the soil system at 20-Series Well Field, therefore, only about 4 percent of the tetrachloroethene would be expected to adsorb to the aquifer material while the remainder would flow with the groundwater.

Biological processes can also affect the fate of organic compounds in the subsurface environment. At the Aero-Dri site, tetrachloroethene and trichloroethene were detected in the groundwater. Analysis of water from the production wells indicate the presence of cis-1,2,-dichloroethene and trans-1,2,-dichloroethene in addition to tetrachloroethene and trichloroethene. The two dichloroethene isomers have been shown to be degradation products of tetrachloroethene and trichloroethene in other studies (Wood, Russell and Payan, 1981; and Wilson, Smith and Rees, 1986). The presence of cis-1,2,-dichloroethene and trans-1,2,-dichloroethene in the 20-Series Well Field samples are likely the result of biological degradation of tetrachloroethene and trichloroethene.

CH2M HILL conducted an evaluation of the groundwater flow in the vicinity of the 20-Series Well Field (CH2M HILL, September 1988). The results of this study are contained in Appendix I. The results of this groundwater flow modeling simulation indicated that the zone of influence of the 20-Series Well Field included the Aero-Dri property and the suspected spill site. Chemicals spilled at the site would therefore be drawn to the production wells with the groundwater flow particularly since no silty or clayey layers were detected during the monitor well drilling which would retard the movement of contaminants into the transmissive production zone. Figure 3-6 shows the simulated steady state groundwater contours and Figure 3-7 shows the associated groundwater flow lines from the modeling study. The actual pumping scenario varies depending on the operation of the WTP. The actual pumping scenario also influences the movement of the contaminant plume. For example, if Well 24 was shut down, the contamination would be expected to be drawn toward Wells 25 and 23. This simulation assumed Wells 21, 22, 23, 24, and 25 were pumping. Actual groundwater elevations may vary from the simulated values depending on among other things the City pumping schedule.

Depth-to-water measurements were collected at the time the monitor wells were sampled. By using the casing elevation determined during the site survey, the water level elevations in each monitor well could be determined (Table 3-5). The water level elevations showed that the groundwater flows

Table 3-5
WATER LEVEL MEASUREMENTS
(SEPTEMBER 1, 1988)

Well No.	Casing Elevation (feet NGVD)	Depth-to-Water (feet)	Water Elevation (feet NGVD)
W-1	14.60	17.14	-2.54
W-3	12.92	16.85	-3.93
W-4	12.55	16.63	-4.08
W-5	14.04	15.85	-1.81
W-6	14.45	16.57	-2.02
W-9B	15.78	14.42	1.36
W-10B	15.91	14.38	1.53

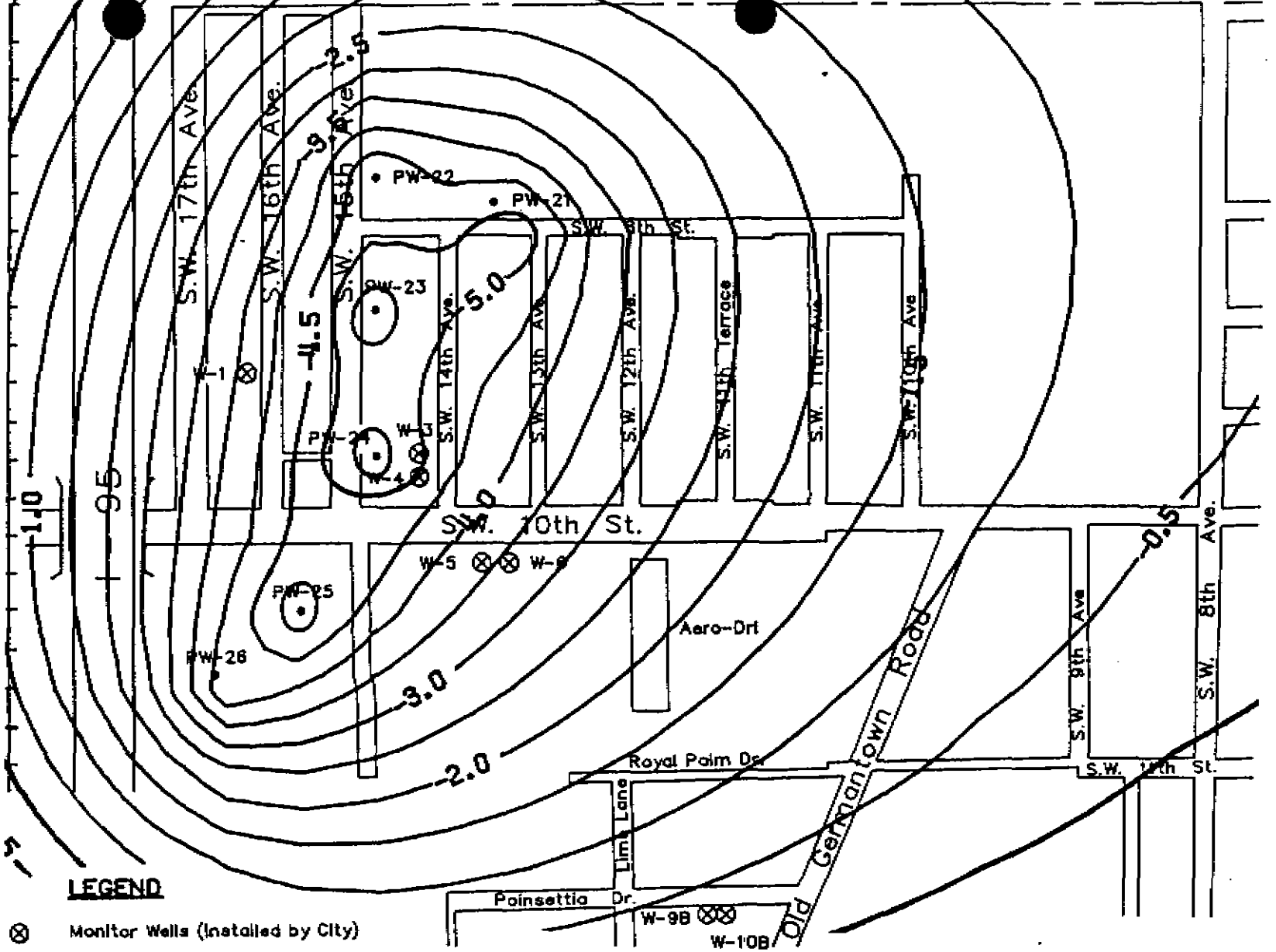

FIGURE 3-6

SIMULATED STEADY STATE
GROUND WATER LEVEL CONTOURS

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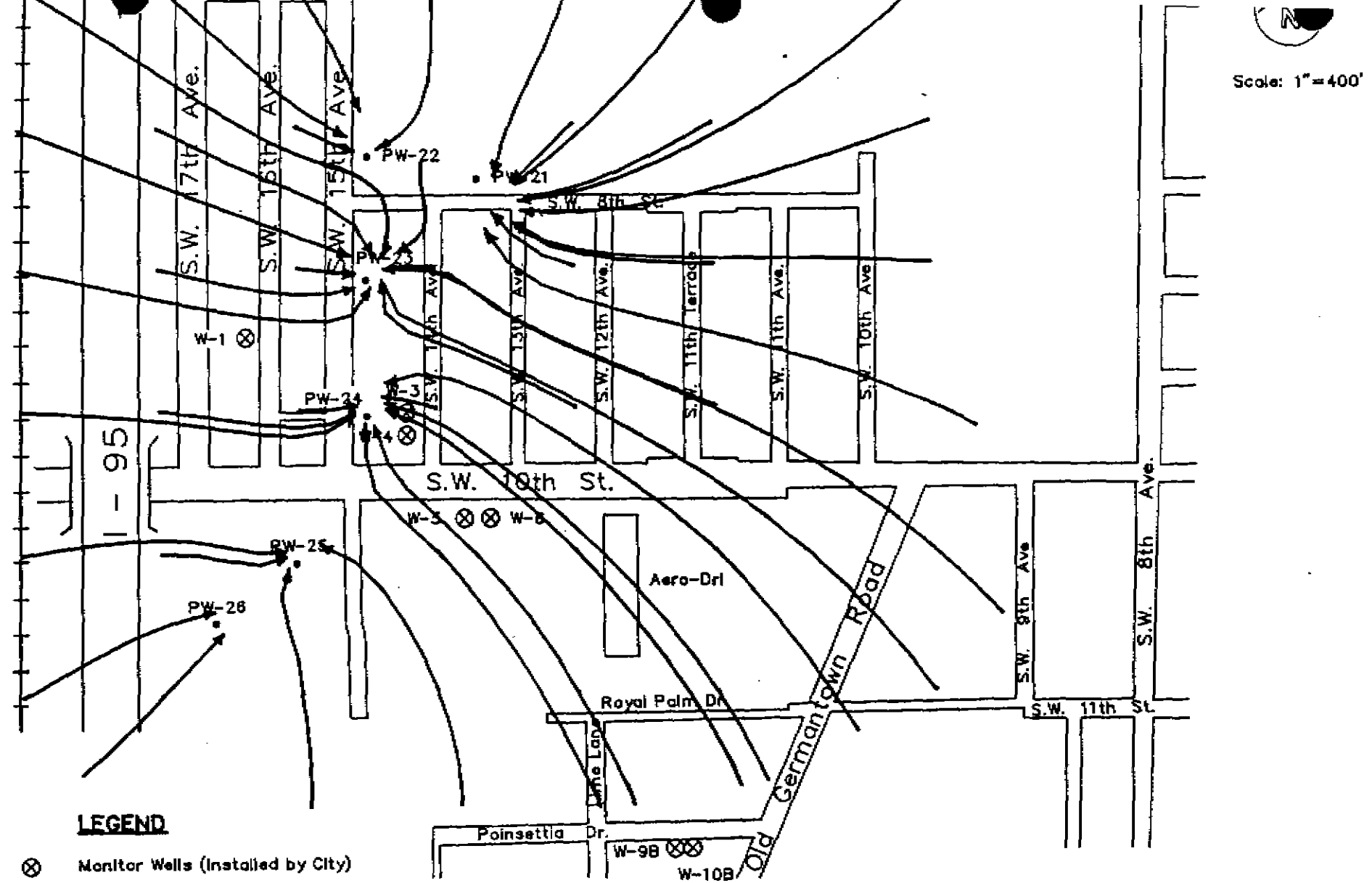

LEGEND

- ⊗ Monitor Wells (Installed by City)
- • 20-Series Production Wells
- —→ Simulated Ground Water Movement

FIGURE 3-7

SIMULATED STEADY STATE GROUND WATER FLOW LINES

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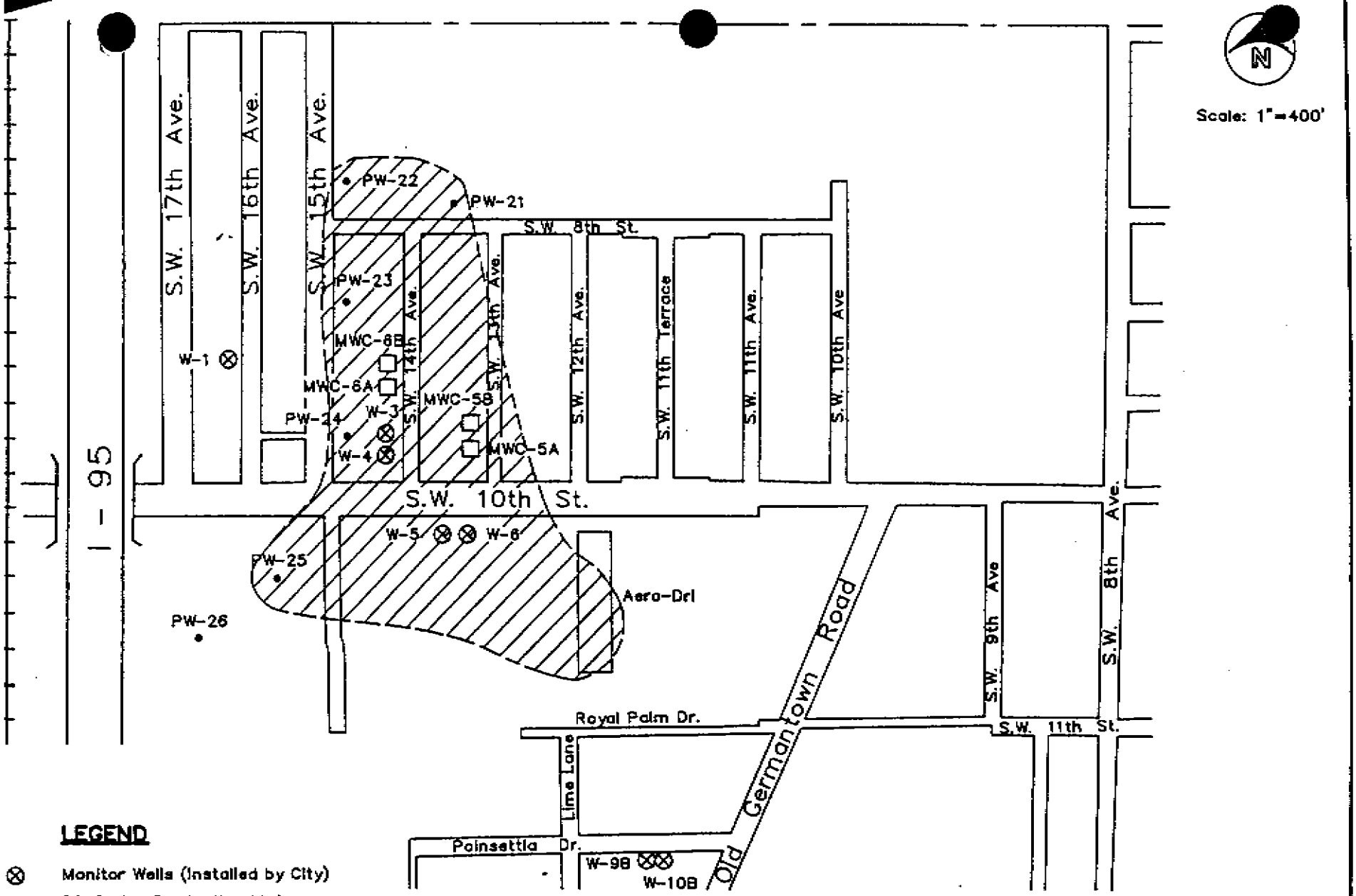
west-northwest from W-9B and W-10B to W-3 and W-4. In addition, groundwater flows east from W-1. These data indicated that the pumping from the 20-Series Well Field controls the flow of groundwater between and including the suspected spill site. The actual water level measurements were slightly less than the simulated steady state groundwater levels. However, the direction of groundwater flow as indicated by the actual water level measurements agreed with the simulated groundwater modeling results. The groundwater flow modeling results plus the monitor well and production well analytical results were used to develop the estimated location of the contaminant plume (Figure 3-8).



LEGEND

- ⊗ Monitor Wells (Installed by City)
- • 20-Series Production Wells
- □ Monitor Wells (Installed by Aero-Dri)
- ▨ Inferred Contaminant Plume Boundary

NOTE:

Inferred Plume Boundary based on historical monitor well & production well data. Plume boundary may vary over time depending on production well pumping schedule.

FIGURE 3-8

APPROXIMATE CONTAMINANT PLUME BOUNDARY

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Section 4
SUMMARY AND CONCLUSIONS

The summary and conclusions listed below are made based on the information presented in this study:

1. Geophysical logs indicated that soils in the vicinity of the 20-Series Well Field contained fine-grained sands in the upper 100 feet of the surficial aquifer and coarser-grained, more-permeable sandstone and shell between 100 and 200 feet. No confining layers were detected that would significantly impede the migration of contamination along the vertical soil profile.

2. Groundwater analysis from monitor wells installed in the vicinity of the 20-Series Well Field indicated that contamination was present between Well 24 and the Aero-Dri property. Contamination was not detected in monitor wells southeast of the Aero-Dri property or in the monitor well west of Well 24. Private wells sampled by PBCHD that are located south-southeast of the suspected spill site were not contaminated with compounds detected at the Aero-Dri site.

3. Samples obtained during two split sampling events indicated that severe contamination existed on the Aero-Dri site. The contamination appeared to be limited to areas west and northwest of the Aero-Dri building.

4. Based on an estimate of the contamination fate and transport aspects, adsorption of tetrachloroethene is minimal in the soil at the 20-Series Well Field. Tetrachloroethene, therefore, remains in solution and may migrate with the flow of groundwater. A previous study conducted by CH2M HILL that simulated groundwater flow indicates that the influence zone of the 20-Series Well Field includes the Aero-Dri property. Water level measurements taken from the monitor wells confirmed the results of the computer simulation model. Tetrachloroethene contamination at the Aero-Dri site, therefore, would migrate to the 20-Series Wells.

Section 5
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Appendix A
Results of the Water Quality Sampling Program for the 20-Series Well Field

TECHNICAL MEMORANDUM

CH2M HILL

PREPARED BY: CH2M HILL SOUTHEAST, INC.

DATE: August 9, 1988

SUBJECT: Sampling and Analysis of Raw Water from the 20-Series Well Field and Finished Water from the Water Treatment Plant

PROJECT: SEF24708.A2.98

INTRODUCTION

CH2M HILL performed water quality sampling and analysis of raw water from the 20-Series Well Field and finished water from the water treatment plant (WTP) during the period of February 26 to June 17, 1988. This technical memorandum describes the sampling activities and analytical results of this task.

On February 23, 1988, a meeting was held between the City of Delray Beach, Florida Department of Environmental Regulation (FDER), Palm Beach County Health Department (PBCHD), and South Florida Water Management District (SFWMD). FDER requested that the City analyze water samples from the 20-Series Well Field and the water treatment plant using a proposed a "500-Series" method of analysis. The 500-Series analytical methods are recognized under EPA's Safe Drinking Water Act (SDWA), amended in 1986. EPA Method 524.2 is one of the SDWA-accepted analytical methods utilizing purge and trap cappillary column gas chromotography and mass spectrometry.

On February 25, 1988, the City requested that CH2M HILL begin sampling the 20-Series wells and finished water from the WTP. The 20-Series wells and finished water samples were collected and shipped the following day to CH2M HILL's laboratory in Montgomery, Alabama, where they were analyzed by EPA Method 524.2. Four months of bi-weekly sampling and analysis have been completed since then.

SAMPLING PROTOCOL

Groundwater and finished water sampling, handling, and analysis are conducted according to the procedures specified in the CH2M HILL Quality Assurance Project Plan (QAPP) for the City of Delray Beach. The QAPP was prepared and submitted to FDER in April 1988.

Sample bottles and containers were prepared according to procedures outlined in Standard Operating Procedures for the Handling and Collection of Groundwater and Surface Water Samples (FDER, 1981). Borosilicate glass bottles were washed with Alconox detergent followed by a liberal tap water and deionized water rinse.

Groundwater samples were collected by the following procedure:

1. Each well was purged prior to sample collection.

2. Once the specific conductance, pH, and temperature had stabilized, the purging was completed. A three- to five-well volume purge was usually adequate.

3. Samples collected for VOC measurement were completely filled to eliminate air bubbles within the bottle.

The number of field quality control samples was approximately 15 percent of the total number of field samples collected. Field quality control samples consisted of:

- Travel blanks
- Equipment blanks
- Blind duplicate samples
- Blind blanks
- Blind spikes
- Preservation blanks

A description of the required types of containers, preservation techniques, and holding times for handling the environmental samples after collection and prior to analyses is presented in the October 26, 1984, issue of the Federal Register (49 FR 43260, Table II). The information applicable to this project is listed in Table 6-1 of the QAPP. CH2M HILL field personnel labeled the appropriate sample containers indicating the parameter to be analyzed and other information necessary for effective sample tracking. They also added the necessary preservative to each sample vial prior to sampling. Groundwater samples were stored in containers and preserved according to guidelines outlined in the October 26, 1984, Federal Register (49 FR 43260, Table II).

When samples were shipped by common carrier, they were prepared for shipment in accordance with U.S. Department of Transportation hazardous materials regulations (49 CFR Part 172). All samples were individually wrapped in bubble-pack and placed in a cooler with ice packs. Chain-of-custody procedures for sample shipment as described in Section 7 of the QAPP were followed. The maximum holding times presented in Table 6-1 of the QAPP were considered when shipping samples to the laboratory.

DATA COLLECTION AND ANALYSIS

In accordance with the above sampling protocol, CH2M HILL has collected samples from the City's 20-Series Well Field and the WTP for 4 months. The sampling and analysis that have been completed to date are described below.

February 26, 1988--CH2M HILL collected raw water samples from each of the 20-Series wells and from the finished water at the WTP. Samples were analyzed using EPA Method 524.2.

March 4, 1988--CH2M HILL received analytical results from the laboratory via telephone conversation. CH2M HILL relayed information to the City of Delray Beach.

March 7, 1988--CH2M HILL received written analytical results of water quality sampling that was conducted on February 26, 1988. Copies of the analytical results are included in Appendix A.

March 11, 1988--CH2M HILL collected raw water samples from each of the 20-Series wells and from the finished water at the WTP. Samples were analyzed using EPA Method 524.2.

March 14, 1988--Lou DeVillon/FDER, after meeting with the City of Delray Beach, called CH2M HILL and suggested that only the finished water at the WTP be analyzed with the EPA 524.2 Method. CH2M HILL concurred and agreed to continue biweekly sample collection of the City's finished water.

March 24, 1988--CH2M HILL collected samples from the finished water at the WTP and from the seven golf course wells. EPA Method 524.2 was used to analyze the finished water, and EPA Methods 601 and 602 were selected for the golf course wells samples.

April 6, 1988--CH2M HILL received analytical results of water quality sampling conducted on March 11, 1988. Copies of the analytical results are included in Appendix A.

April 8, 1988--CH2M HILL collected a water quality sample of the finished water from the WTP and submitted the sample to CH2M HILL's laboratory for EPA Method 524.2 analysis.

April 20, 1988--CH2M HILL received analytical results of water quality sampling that was conducted on March 24, 1988. Copies of the analytical results are included in Appendix A.

April 22, 1988--CH2M HILL collected samples of raw water from PW-24 in the 20-Series well field and from PW-12W from the Golf Course well field, and finished water from the WTP. PW-12W was resampled and analyzed as per the City's request. A raw water sample from PW-24 was analyzed for pesticides, PCB's using EPA Method 608, and for volatile organic compounds using EPA Method 601. A raw water sample from PW-12W was reanalyzed for EPA Method 601/602 compounds, and finished water sample from the WTP was analyzed using EPA Method 524.2.

May 6, 1988--CH2M HILL collected samples from PW-24 and the WTP. Raw water from PW-24 was analyzed for ethylene dibromide (EDB), acid compounds, base/neutral compounds, pesticides, PCBs, and EPA Methods 601 and 602 compounds to aid in determining possible treatment alternatives for the well field. Finished water from the WTP was analyzed for EPA Method 524.2 compounds.

May 12, 1988--CH2M HILL received analytical results of water quality sampling that was conducted on April 8, 1988. Copies of the analytical results are included in Appendix A.

May 20, 1988--CH2M HILL collected a finished water sample from the WTP and submitted the sample for analysis using EPA Method 524.2.

May 25-26, 1988--CH2M HILL, at the request of the City, split samples with Aero-Dri's consultant, Dames and Moore, from PW-22, PW-23, PW-24, PW-25, and from 13 of their onsite monitor wells. All samples were analyzed for EPA Method 601 and 602 compounds, and one sample from one of the monitor wells was analyzed by EPA Methods 625 (Base Neutral) and 624 (Volatile Organic Compounds), and for priority pollutant metals.

May 31, 1988--CH2M HILL collected a raw water sample from PW-24 to determine the presence of mercury. This analysis was performed after it was made known by Aero-Dri's consultant that mercury was present on the site.

June 1, 1988--CH2M HILL received analytical results of water quality sampling that was conducted on April 22, 1988. The analytical results are included in Appendix A.

June 3, 1988--CH2M HILL collected a finished water sample from the WTP for EPA Method 524.2 analysis.

June 6, 1988--CH2M HILL received analytical results of water quality sampling that was conducted on May 6, 1988. The analytical results are included in Appendix A.

June 13, 1988--CH2M HILL received analytical results of water quality sampling that was conducted on May 20, 1988. The analytical results are included in Appendix A.

June 17, 1988--CH2M HILL collected a finished water sample from the WTP for EPA Method 524.2 analysis.

June 20, 1988--CH2M HILL received analytical results of water quality sampling that was conducted on May 25 and 26, 1988. The analytical results are included in Appendix A.

June 24, 1988--CH2M HILL received analytical results of water quality sampling that was conducted on June 3, 1988. The analytical results are included in Appendix A.

July 6, 1988--CH2M HILL received analytical results of water quality sampling that was conducted on May 31 and June 17, 1988. The analytical results are included in Appendix A.

RESULTS AND CONCLUSIONS

CH2M HILL has compiled a summary of the water quality analytical results from the 20-Series Well Field. The summary is included in Appendix B. In addition to the above-mentioned analytical results, results from Broward Testing's Laboratory weekly sampling activities have been included.

CH2M HILL has completed the work items as outlined in Task 2 of Addendum 1, and compiled the water quality results from the 20-Series Well Field and water treatment plant into a data base format. We intend to continue to maintain this data base for additional project sample results.

TWENTY SERIES WELL FIELD
PRODUCTION WELL 21

SAMPLING DATE:		08/22/87	8/28/87	9/21/87	09/25/87	10/03/87	10/30/87	12/05/87	01/25/88	02/26/88	03/11/88	05/07/88
ANALYTICAL LABORATORY:		BROWARD	TECH	BROWARD	MCGINNES	BROWARD	BROWARD	BROWARD	BROWARD	CH2M HILL	CH2M HILL	CH2M HILL
PARAMETER	MCL											
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	24
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.9	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	140
TETRACHLOROETHENE	3.0	35	3.6	35	0.05	29	58.7	64.8	30.3	22	2.9	110
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	57
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	<1.0	0.5	0.51	0.51	<1.0	<1.0	<1.0	1.3	5	<1.0	14
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY SERI[illegible]ELL FIELD
PRODUCTION WELL 21

SAMPLING DATE:		08/22/87	8/28/87	9/21/87	9/25/87	10/3/87	10/30/87	12/5/87	1/25/88	2/26/88	3/11/88	5/7/88	7/31/88
ANALYTICAL LABORATORY:		BROWARD	BROWARD	BROWARD	MCGINNES	BROWARD	BROWARD	BROWARD	BROWARD	CH2M HILL	CH2M HILL	CH2M HILL	BROWARD
PARAMETER	MCL												
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.6
BROMOMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.1
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	24	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	5.9	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	0.65	0.65	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	140	<1.0
TETRACHLOROETHENE	3.0	35	3.6	35	0.05	29	58.7	64.8	30.3	22	2.9	110	<1.0
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	57	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	<1.0	0.5	0.51	0.51	<1.0	<1.0	<1.0	1.3	5	<1.0	14	<1.0
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY SERIES WELL FIELD
PRODUCTION WELL 22

SAMPLING DATE:		08/22/87	8/28/87	10/03/87	10/30/87	12/03/87	01/25/88	2/1/88	2/7/88	2/16/88	2/23/88	02/26/88	2/28/88	03/11/88
ANALYTICAL LABORATORY:		BROWARD	TECH	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	CH2M HILL	BROWARD	CH2M HILL
PARAMETER	MCL													
BROMODICHLOROMETHANE	NE	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
BROMOFORM	NE	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
BROMOMETHANE	NE	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CARBON TETRACHLORIDE	3.0	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CHLOROBENZENE	NE	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CHLOROETHANE	NE	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	NA
CHLOROFORM	NE	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CHLOROMETHANE	NE	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
DIBROMOCHLOROMETHANE	NE	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
1,2-DICHLOROBENZENE	NE	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<0.5
1,3-DICHLOROBENZENE	NE	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<0.5
1,4-DICHLOROBENZENE	NE	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<0.5
DICHLORODIFLUOROMETHANE	NE	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<0.5
1,1-DICHLOROETHANE	NE	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
1,2-DICHLOROETHANE	3.0	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
1,1-DICHLOROETHENE	7.0	<1.0	<0.05	1.53	1.69	1.08	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CIS-1,2-DICHLOROETHENE	NE	4.83	NA	8.45	4.95	3.72	3.46	NA	3.05	2.31	2.49	NA	NA	5
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<0.05	2.07	3.41	2.35	1.8	<1.0	3.33	<1.0	1.62	<5.0	<1.0	1.9
1,2-DICHLOROPROPANE	NE	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	NA
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.27	<1.0	<5.0	<1.0	NA
METHYLENE CHLORIDE	NE	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	0.3
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
TETRACHLOROETHENE	3.0	24.9	<0.05	<1.0	<1.0	<1.0	6.56	6.82	7.16	12.7	12.11	19	<1.0	<0.5
1,1,1-TRICHLOROETHANE	200.0	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
1,1,2-TRICHLOROETHANE	NE	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
TRICHLOROETHENE	3.0	6.02	1.6	2.41	2.67	2.65	3.37	<1.0	3.29	2.68	2.57	3.3	<1.0	2.2
TRICHLOROFLUOROMETHANE	NE	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
VINYL CHLORIDE	1.0	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
VINYL CHLORIDE	1.0	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0		<5.0	<1.0	<0.5

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED
NS = NOT SAMPLED

IWE[redacted]ERIES WELL FIELD
PRO[redacted]ON WELL 22

SAMPLING DATE:		4/05/88	4/10/88	4/17/88	4/23/88	05/07/88	5/08/88	5/31/88	6/5/88	6/12/88	6/19/88	6/26/88	7/10/88
ANALYTICAL LABORATORY:		BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD
PARAMETER	MCL												
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	2.97	5.88	3.32	4.23	4.19	2.79	2.66	<1.0	2.95	3.63	3.17	3.22
TRANS-1,2-DICHLOROETHENE	NE	3.04	1.02	<1.0	1.97	3.04	2.58	2.23	1.85	1.77	2.16	3.59	5.38
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	2.14	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TETRACHLOROETHENE	3.0	3.31	1.99	1.1	<1.0	<1.0	<1.0	<1.0	1.17	<1.0	<1.0	<1.0	<1.0
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	1.99	6.07	1.91	1.27	2.22	1.74	1.75	2.31	1.49	1.74	1.85	3.42
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0		<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED
NS = NOT SAMPLED

TWENTY SE[illegible] WELL FIELD
PRODUCTION WELL 22

SAMPLING DATE: / ANALYTICAL LABORATORY:		7/31/88 BROWARD	8/7/88 BROWARD	8/15/88 BROWARD	8/21/88 BROWARD	8/28/88 BROWARD	9/3/88 BROWARD	9/10/88 BROWARD	9/24/88 BROWARD
PARAMETER	MCL								
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
BROMOMETHANE	NE	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	3.55	2.13	3.59	1.22	<1.0
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	2.64	3.54	2.30	<1.0	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TETRACHLOROETHENE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	2.21	<1.0	<1.0	<1.0	<1.0	2.84	2.65	<1.0
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY SERIES WELL FIELD
PRODUCTION WELL 23

PARAMETER	MCL	SAMPLING DATE:	08/22/87	8/28/87	9/21/87	09/25/87	10/[illegible]/87	10/30/87	12/05/87	12/09/87	12/11/87	12/14/87	01/25/88	02/2[illegible]	03/11/88
		ANALYTICAL LABORATORY:	BROWARD	TECH	BROWARD	MCGINNES	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	CH2M HILL	CH2M HILL
BROMODICHLOROMETHANE	NE		<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
BROMOFORM	NE		<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
BROMOMETHANE	NE		<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CARBON TETRACHLORIDE	3.0		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CHLOROBENZENE	NE		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CHLOROETHANE	NE		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
2-CHLOROETHYLVINYL ETHER	NE		<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	NA
CHLOROFORM	NE		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CHLOROMETHANE	NE		<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
DIBROMOCHLOROMETHANE	NE		<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,2-DICHLOROBENZENE	NE		<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<0.5
1,3-DICHLOROBENZENE	NE		<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<0.5
1,4-DICHLOROBENZENE	NE		<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<0.5
DICHLORODIFLUOROMETHANE	NE		<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<0.5
1,1-DICHLOROETHANE	NE		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,2-DICHLOROETHANE	3.0		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,1-DICHLOROETHENE	7.0		<1.0	<0.05	<1.0	<0.05	<1.0	1.44	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CIS-1,2-DICHLOROETHENE	NE		2.59	NA	<1.0	NA	NA	NA	NA	<1.0	NA	NA	NA	NA	<0.5
TRANS-1,2-DICHLOROETHENE	NE		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,2-DICHLOROPROPANE	NE		<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CIS-1,3-DICHLOROPROPENE	NE		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	NA
TRANS-1,3-DICHLOROPROPENE	NE		<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	NA
METHYLENE CHLORIDE	NE		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	11
1,1,2,2-TETRACHLOROETHANE	NE		<1.0	<0.02	1.75	1.75	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
TETRACHLOROETHENE	3.0		12.1	2.5	12.1	<0.05	8.99	1.2	16.85	12.5	1.47	1	12.4	43	1.5
1,1,1-TRICHLOROETHANE	200.0		<1.0	5.5	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,1,2-TRICHLOROETHANE	NE		<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
TRICHLOROETHENE	3.0		1.61	1.6	1.44	1.44	<1.0	<1.0	<1.0	0.4	<1.0	<1.0	1.59	3.7	0.6
TRICHLOROFLUOROMETHANE	NE		<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
VINYL CHLORIDE	1.0		<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY [illegible]IES WELL FIELD
PRODU[illegible] WELL 23

SAMPLING DATE:		4/05/88	4/10/88	4/17/88	4/23/88	5/08/88	5/16/88	5/22/88	5/31/88	6/5/88	6/12/88	6/19/88	6/26/88	7/10/88
ANALYTICAL LABORATORY:		BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD
PARAMETER	MCL													
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CARBON TETRACHLORIDE	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	NA	NA	NA	NA	<1.0	<1.0	<1.0	2.06	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	1.93	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TETRACHLOROETHENE	3.0	66.7	79	56.8	44.2	25	24.5	15.9	66.7	15.4	13.4	11.2	1.39	15
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	1.96	2.07	1.86	2.03	1.97	2.08	2.58	14	2.82	2.81	2.91	<1.0	3.6
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY SERI[illegible]LL FIELD
PRODUCTION WELL 23

SAMPLING DATE:		BROWARD 7/31/88	BROWARD 8/7/88	BROWARD 8/15/88	BROWARD 8/21/88	BROWARD 8/28/88	BROWARD 9/3/88	BROWARD 9/10/88	BROWARD 9/24/88
ANALYTICAL LABORATORY:									
PARAMETER	MCL								
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
BROMOMETHANE	NE	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TETRACHLOROETHENE	3.0	24.8	20.8	11.6	12.2	11.7	4.56	7.59	3.78
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	4.58	4.60	3.17	4.89	5.17	5.80	6.63	5.30
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY [redacted]ES WELL FIELD
PRODUCT[redacted]4

SAMPLING DATE:		08/22/87	8/28/87	9/21/87	09/25/87	10/03/87	10/30/87	12/05/87	12/09/87	12/11/87	12/14/87	01/25/88	02/26/88	03/11/88
ANALYTICAL LABORATORY:		BROWARD	TECH	BROWARD	MCGINNES	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	CH2M HILL	CH2M HILL
PARAMETER	MCL													
BROMODICHLOROMETHANE	NE	<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
BROMOFORM	NE	<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
BROMOMETHANE	NE	<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CARBON TETRACHLORIDE	3.0	<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CHLOROBENZENE	NE	<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CHLOROETHANE	NE	<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	NA
CHLOROFORM	NE	<1.0	<0.05	<1.0	5.12	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CHLOROMETHANE	NE	<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
DIBROMOCHLOROMETHANE	NE	<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,2-DICHLOROBENZENE	NE	<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<0.5
1,3-DICHLOROBENZENE	NE	<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<0.5
1,4-DICHLOROBENZENE	NE	<1.0	<0.02	<1.0	<0.02	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<0.5
DICHLORODIFLUOROMETHANE	NE	<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<0.5
1,1-DICHLOROETHANE	NE	<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,2-DICHLOROETHANE	3.0	<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,1-DICHLOROETHENE	7.0	<1.0	<0.05	<1.0	<0.05	<1.0	1.35	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CIS-1,2-DICHLOROETHENE	NE	23.8	NA	<1.0	NA	26.9	NA	19.2	22.7	2.89	NA	NA	NA	8
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,2-DICHLOROPROPANE	NE	<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<0.05	<1.0	<0.05	<1.0	25.8	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	NA
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	NA
METHYLENE CHLORIDE	NE	<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	11
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	2.1	0.67	0.67	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
TETRACHLOROETHENE	3.0	51	10	99.6	<0.05	99.6	87.6	57.6	43.6	12.77	5.15	6.19	130	65
1,1,1-TRICHLOROETHANE	200.0	<1.0	4.4	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
1,1,2-TRICHLOROETHANE	NE	<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5
TRICHLOROETHENE	3.0	11.8	3.1	1.83	1.83	30.1	16.8	16.8	9.67	2.06	<1.0	1	20	13
TRICHLOROFLUOROMETHANE	NE	<1.0	<0.01	<1.0	<0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	2.3
VINYL CHLORIDE	1.0	<1.0	<0.05	<1.0	<0.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY SERIES WELL FIELD
PRODUCTION 24

SAMPLING DATE:		4/05/88	4/10/88	4/17/88	4/23/88	05/07/88	5/06/88	5/16/88	5/22/88	6/5/88	6/12/88	6/19/88	6/26/88	7/10/88
ANALYTICAL LABORATORY:		BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD
PARAMETER	MCL													
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	22.9	32.7	27.9	26.8	27.1	22.6	21.4	19.6	33	<1.0	43.1	56.7	37.5
TRANS-1,2-DICHLOROETHENE	NE	3.12	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TETRACHLOROETHENE	3.0	110	163	149	155	132	114	174	168	136	15.5	261	366	239
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	52.7	<1.0	<1.0
TRICHLOROETHENE	3.0	29.9	40.3	30.8	29.4	33.2	26.3	36.6	25.9	28.1	3.18	<1.0	56.3	49.9
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY SE[redacted] WELL FIELD
PRODUCTION WELL 24

SAMPLING DATE:		BROWARD 7/31/88	BROWARD 8/7/88	BROWARD 8/15/88	BROWARD 8/21/88	BROWARD 8/28/88	BROWARD 9/3/88	BROWARD 9/10/88	BROWARD 9/24/88
ANALYTICAL LABORATORY:									
PARAMETER	MCL								
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
BROMOMETHANE	NE	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	30.97	<1.0	78.4	62.8	65.6	43	41.9	22.5
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TETRACHLOROETHENE	3.0	63.8	237	221	669	692	445	451	470
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	15.6	52.9	87.9	103	93.9	80.5	81.6	60.0
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY SERIES [redacted]L FIELD
PRODUTION WE[redacted]

SAMPLING DATE: / ANALYTICAL LABORATORY:		06/22/87 BROWARD	1/10/88 BROWARD	1/17/88 BROWARD	01/25/88 BROWARD	02/26/88 CH2M HILL	03/11/88 CH2M HILL	5/08/88 BROWARD	5/16/88 BROWARD	5/22/88 BROWARD	6/5/88 BROWARD	6/12/88 BROWARD	6/19/88 BROWARD	6/26/88 BROWARD	7/10/8 BROWA
PARAMETER	MCL														
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
BROMOFORM	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
BROMOMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<10.0	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	NA	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	NA	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	NA	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	NA	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
1,2-DICHLOROETHANE	5.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
cis-1,2-DICHLOROETHENE	NE	<1.0	NA	NA	NA	NA	1.3	<1.0	<1.0	<1.0	<1.0	<1.0	3.63	<1.0	14.
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	2.16	<1.0	<1.
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
cis-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	0.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
TETRACHLOROETHENE	5.0	<1.0	<1.0	<1.0	20.8	11	17	1.07	<1.0	<1.0	1.17	<1.0	9.65	16.4	190
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
TRICHLOROETHENE	5.0	<1.0	<1.0	<1.0	6.64	ERR	3.1	<1.0	<1.0	<1.0	2.31	<1.0	<1.0	<1.0	20.
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<5.0	2.2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<0.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY SER[illegible]WELL FIELD
PRODUCTION WELL 25

SAMPLING DATE: / ANALYTICAL LABORATORY: / PARAMETER	MCL	BROWARD 7/31/88	BROWARD 8/7/88	BROWARD 8/15/88	BROWARD 8/21/88	BROWARD 8/28/88	BROWARD 9/3/88	BROWARD 9/10/88	BROWARD 9/24/88
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
BROMOMETHANE	NE	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	40.3	21.2	<1.0	<1.0	<1.0	<1.0	<1.0	1.17
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	56.5	<1.0
TETRACHLOROETHENE	3.0	291	186	131	65.3	68.7	95.4	<1.0	112
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	43.3	19.4	2.19	<1.0	<1.0	<1.0	<1.0	2.73
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY [illegible]ES WELL FIELD
PRODUCT[illegible]WELL 26

SAMPLING DATE:		08/22/87	12/28/87	1/02/88	1/10/88	1/17/88	01/25/88	2/1/88	2/7/88	2/16/88	2/21/88	02/26/88	2/28/88	03/11/88
ANALYTICAL LABORATORY:		BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	CH2M HILL	BROWARD	CH2M HILL
PARAMETER	MCL													
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
BROMOFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
BROMOMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	NA
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<0.5
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<0.5
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<0.5
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	NA	<1.0	<0.5
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CIS-1,2-DICHLOROETHENE	NE	<1.0	NA	NA	NA	NA	NA	NA	<1.0	NA	NA	NA	5.71	<0.5
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	5.36	<0.5
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	NA
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	NA
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	2.8
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
TETRACHLOROETHENE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	1.5
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
TRICHLOROETHENE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	1.91	<0.5
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<5.0	<1.0	<0.5

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY [redacted]S WELL FIELD
PRODUCTI[redacted]ELL 26

SAMPLING DATE:		3/14/88	3/20/88	3/27/88	4/05/88	4/10/88	4/17/88	4/23/88	5/08/88	5/16/88	5/22/88	5/31/88	6/5/88	6/12/88
ANALYTICAL LABORATORY:		BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD
PARAMETER	MCL													
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
BROMOMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	NA	NA	NA	NA	NA	NA	NA	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.85	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TETRACHLOROETHENE	3.0	2.21	2.25	2.87	2.45	2.62	1.56	1.87	<1.0	<1.0	2.19	<1.0	2.05	<1.0
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TWENTY [illegible]RIES WELL FIELD
PRODUC[illegible] WELL 26

SAMPLING DATE:		6/19/88	6/26/88	7/10/88
ANALYTICAL LABORATORY:		BROWARD	BROWARD	BROWARD
PARAMETER	MCL			
BROMODICHLOROMETHANE	NE	<1.0	<1.0	<1.0
BROMOFORM	NE	<1.0	<1.0	<1.0
BROMOMETHANE	NE	<1.0	<1.0	<1.0
CARBON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0
CHLOROBENZENE	NE	<1.0	<1.0	<1.0
CHLOROETHANE	NE	<1.0	<1.0	<1.0
2-CHLOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0
CHLOROFORM	NE	<1.0	<1.0	<1.0
CHLOROMETHANE	NE	<1.0	<1.0	<1.0
DIBROMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0
1,2-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0
1,3-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0
1,4-DICHLOROBENZENE	NE	<1.0	<1.0	<1.0
DICHLORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0
1,1-DICHLOROETHANE	NE	<1.0	<1.0	<1.0
1,2-DICHLOROETHANE	3.0	<1.0	<1.0	<1.0
1,1-DICHLOROETHENE	7.0	<1.0	<1.0	<1.0
CIS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0
TRANS-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0
1,2-DICHLOROPROPANE	NE	<1.0	<1.0	<1.0
CIS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0
TRANS-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0
METHYLENE CHLORIDE	NE	<1.0	<1.0	<1.0
1,1,2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0
TETRACHLOROETHENE	3.0	<1.0	<1.0	<1.0
1,1,1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0
1,1,2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0
TRICHLOROETHENE	3.0	<1.0	<1.0	<1.0
TRICHLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0
VINYL CHLORIDE	1.0	<1.0	<1.0	<1.0

NOTES: UNITS = UG/L OR PPB
EPA METHOD = 601
NA = NOT ANALYZED
NE = NOT ESTABLISHED
NS = NOT SAMPLED

TY SERIES WE[redacted]ELD
UCTION WELL [redacted]

LING DATE:		6/19/88	6/26/88	7/10/88	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD	BROWARD
YTICAL LABORATORY:		BROWARD	BROWARD	BROWARD	7/31/88	8/7/88	8/21/88	8/28/88	9/3/88	9/10/88	9/24/88
METER	MCL										
DICHLOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
OFORM	NE	<1.0	<1.0	<1.0	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
OMETHANE	NE	<1.0	<1.0	<1.0	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
ON TETRACHLORIDE	3.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
ROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
ROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
LOROETHYLVINYL ETHER	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
ROFORM	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
ROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
OMOCHLOROMETHANE	NE	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLOROBENZENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
LORODIFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLOROETHANE	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLOROETHENE	7.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
S-1,2-DICHLOROETHENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
DICHLOROPROPANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
S-1,3-DICHLOROPROPENE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
YLENE CHLORIDE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2,2-TETRACHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
ACHLOROETHENE	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1-TRICHLOROETHANE	200.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2-TRICHLOROETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HLOROETHENE	5.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
HLOROFLUOROMETHANE	NE	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
L CHLORIDE	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

S: UNITS = UG/L OR PPB
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NA = NOT ANALYZED
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NS = NOT SAMPLED

Appendix B
Analytical Results
Private Well Samples Obtained from the Palm Beach County Health Department

3 DHHS LAB SVCS REPORT LAB # 87-12-228

IVED: 12/30/87 Results by Sample

LE ID MR. RUBY PRADO/TREAT FRACTION 02A TEST CODE PURGE NAME PURGEABLES

Date & Time Collected 12/29/87 09:30:00 Category 43 3

PURGEABLES BY EPA 624

ANALYST CC DATE INJECTED 01/04/88 VERIFIED BY SAA

#	CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESUL
V	107-02-8	acrolein	BDL	38V	100-41-4	ethylbenzene	BDL
V	107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
V	71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
V	56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
V	108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	BDL
V	107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	BDL
V	71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
V	75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
V	79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	BDL
V	79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
V	75-00-3	chloroethane	BDL	86V	108-88-3	toluene	
V	110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	BDL
V	67-66-3	chloroform	BDL	88V	75-01-4	vinyl chloride	BDL
V	75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
V	156-60-5	1,2-trans-dichloroethylene	BDL		78-93-3	2-butanone	NS
V	78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
V	10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
	10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
					100-42-5	styrene	BDL
					108-05-4	vinyl acetate	NS
					1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

: 4 DHRS LAB SVCS REPORT LAB # 87-12-228

:IVED: 12/30/87 Results by Sample

'LE ID UNITED CRANE/TREATED FRACTION 03A TEST CODE PURGE NAME PURGEABLES

Date & Time Collected 12/29/87 09:50:00 Category 43 3

PURGEABLES BY EPA 624

ANALYST CC DATE INJECTED 01/04/88 VERIFIED BY SAA

#	CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESUL
V	107-02-8	acrolein	BDL	38V	100-41-4	ethylbenzene	BDL
V	107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
V	71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
V	56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
V	108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	BDL
V	107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	BDL
V	71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
V	75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
V	79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	BDL
V	79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
V	75-00-3	chloroethane	BDL	86V	108-88-3	toluene	BDL
V	110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	BDL
V	67-66-3	chloroform	BDL	88V	75-01-4	vinyl chloride	BDL
V	75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
V	156-60-5	1,2-trans-dichloroethylene	BDL		78-93-3	2-butanone	NS
V	78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
V	10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
	10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
					100-42-5	styrene	BDL
					108-05-4	vinyl acetate	NS
					1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

E 5 DHRS LAB SVCS REPORT LAB # 87-12-228

EIVED: 12/30/87 Results by Sample

PLE ID DORALIS GROCERY/TREATED FRACTION Q4A TEST CODE PURGE NAME PURGEABLES

Date & Time Collected 12/29/87 10:10:00 Category 43 3

PURGEABLES BY EPA 624

ANALYST CC DATE INJECTED 01/04/88 VERIFIED BY SAA

#	CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESULT
2V	107-02-8	acrolein	BDL	38V	100-41-4	ethylbenzene	BDL
3V	107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
4V	71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
5V	56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
7V	108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	BDL
0V	107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	BDL
1V	71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
3V	75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
4V	79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	BDL
5V	79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
6V	75-00-3	chloroethane	BDL	86V	108-88-3	toluene	
9V	110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	BDL
3V	67-66-3	chloroform	BDL	88V	75-01-4	vinyl chloride	BDL
9V	75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
0V	156-60-5	1,2-trans-dichloroethylene	BDL		78-93-3	2-butanone	NS
2V	78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
3V	10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
	10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
					100-42-5	styrene	BDL
					108-05-4	vinyl acetate	NS
					1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

IVED: [redacted]90/87 Results by [redacted]mple

LE ID ROGERS FRACTION 05A TEST CODE PURGE NAME PURGEABLES

Date & Time Collected 12/29/87 10:25:00 Category 43 3

PURGEABLES BY EPA 624

ANALYST [redacted] CC DATE INJECTED 01/04/88 VERIFIED BY SAA

#	CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESULT
[redacted]V	107-02-8	acrolein	BDL	33V	100-41-4	ethylbenzene	BDL
[redacted]V	107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
[redacted]V	71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
[redacted]V	56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
[redacted]V	108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	BDL
[redacted]V	107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	BDL
[redacted]V	71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
[redacted]V	75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
[redacted]V	79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	BDL
[redacted]V	79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
[redacted]V	75-00-3	chloroethane	BDL	86V	108-88-3	toluene	[redacted]
[redacted]V	110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	[redacted]
[redacted]V	67-66-3	chloroform	T	88V	75-01-4	vinyl chloride	BDL
[redacted]V	75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
[redacted]V	156-60-5	1,2-trans-dichloroethylene	BDL		78-93-3	2-butanone	NS
[redacted]V	78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
[redacted]V	10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
	10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
					100-42-5	styrene	BDL
					108-05-4	vinyl acetate	NS
					1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

E 7 DHRS LAB SVCS REPORT LAB # 87-12-228

EIVED: 30/87 Results by Sample

PLE ID RESIDENCE FRACTION 06A TEST CODE PURGE NAME PURGEABLES

Date & Time Collected 12/29/87 10:35:00 Category 43 3

PURGEABLES BY EPA 624

ANALYST RS DATE INJECTED 01/05/88 VERIFIED BY SAA

#	CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESULT
2V	107-02-8	acrolein	BDL	38V	100-41-4	ethylbenzene	BDL
3V	107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
1V	71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
5V	56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
7V	108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	BDL
0V	107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	BDL
1V	71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
3V	75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
4V	79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	BDL
6V	79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
9V	75-00-3	chloroethane	BDL	86V	108-88-3	[illegible]	
7V	110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	BDL
0V	67-66-3	chloroform	BDL	88V	75-01-4	vinyl chloride	BDL
7V	75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
0V	156-60-5	1,2-trans-dichloroethylene	BDL		78-93-3	2-butanone	NS
2V	78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
8V	10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
	10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
					100-42-5	styrene	BDL
					108-05-4	vinyl acetate	NS
					1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

VED: 12[redacted]/87 Results by S[redacted]le

E ID LINTON CENTRE/TREATED FRACTION 07A TEST CODE PURGE NAME PURGEABLES

Date & Time Collected 12/29/87 10:45:00 Category 43 3

PURGEABLES BY EPA 624

ANALYST [redacted]RS DATE INJECTED 01/05/88 VERIFIED BY SAA

CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESUL
107-02-8	acrolein	BDL	38V	100-41-4	ethylbenzene	BDL
107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	BDL
107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	BDL
71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	BDL
79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
75-00-3	chloroethane	BDL	86V	108-88-3	toluene	[illegible]
110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	BDL
67-66-3	chloroform	BDL	88V	75-01-4	vinyl chloride	BDL
75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
156-60-5	1,2-trans-dichloroethylene	BDL		78-93-3	2-butanone	NS
78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
				100-42-5	styrene	BDL
				108-05-4	vinyl acetate	NS
				1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

EIVED: [redacted]30/87 Results by [redacted]mple

PLE ID ORKIN CHEMICAL/RAW FRACTION OBA TEST CODE PURGE NAME PURGEABLES

Date & Time Collected 12/29/87 11:05:00 Category 43 3

PURGEABLES BY EPA 624

ANALYST RS DATE INJECTED 01/05/88 VERIFIED BY SAA

#	CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESULT
2V	107-02-8	acrolein	BDL	38V	100-41-4	ethylbenzene	BDL
3V	107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
4V	71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
6V	56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
7V	108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	BDL
10V	107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	BDL
11V	71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
13V	75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
14V	79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	BDL
15V	79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
16V	75-00-3	chloroethane	BDL	86V	108-38-3	toluene	-
19V	110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	BDL
23V	67-66-3	chloroform	BDL	88V	75-01-4	vinyl chloride	BDL
29V	75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
30V	156-60-5	1,2-trans-dichloroethylene	BDL		78-93-3	2-butanone	NS
32V	78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
33V	10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
	10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
					100-42-5	styrene	BDL
					108-05-4	vinyl acetate	NS
					1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

EIVED: [redacted]30/87 Results by [redacted]mple

PLE ID PARK TEN WAREHOUSES/RAW FRACTION 09A TEST CODE PURGE NAME PURGEABLES
Date & Time Collected 12/29/87 11:05:00 Category 43 3

PURGEABLES BY EPA 624

ANALYST [redacted]RS DATE INJECTED 01/05/38 VERIFIED BY SAA

#	CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESUL
2V	107-02-8	acrolein	BDL	38V	100-41-4	ethylbenzene	BDL
3V	107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
4V	71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
5V	56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
7V	108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	BDL
0V	107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	BDL
1V	71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
3V	75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
4V	79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	BDL
5V	79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
6V	75-00-3	chloroethane	BDL	86V	108-88-3	toluene	
9V	110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	BDL
3V	67-66-3	chloroform	BDL	88V	75-01-4	vinyl chloride	BDL
9V	75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
0V	156-60-5	1,2-trans-dichloroethylene	BDL		78-93-3	2-butanone	NS
2V	78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
3V	10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
	10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
					100-42-5	styrene	BDL
					108-05-4	vinyl acetate	NS
					1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

EIVED: 30/87 Results by mple

PLE ID SECURITY STORAGE FRACTION 10A TEST CODE PURGE NAME PURGEABLES

Date & Time Collected 12/29/87 Category 42 3

PURGEABLES BY EPA 624

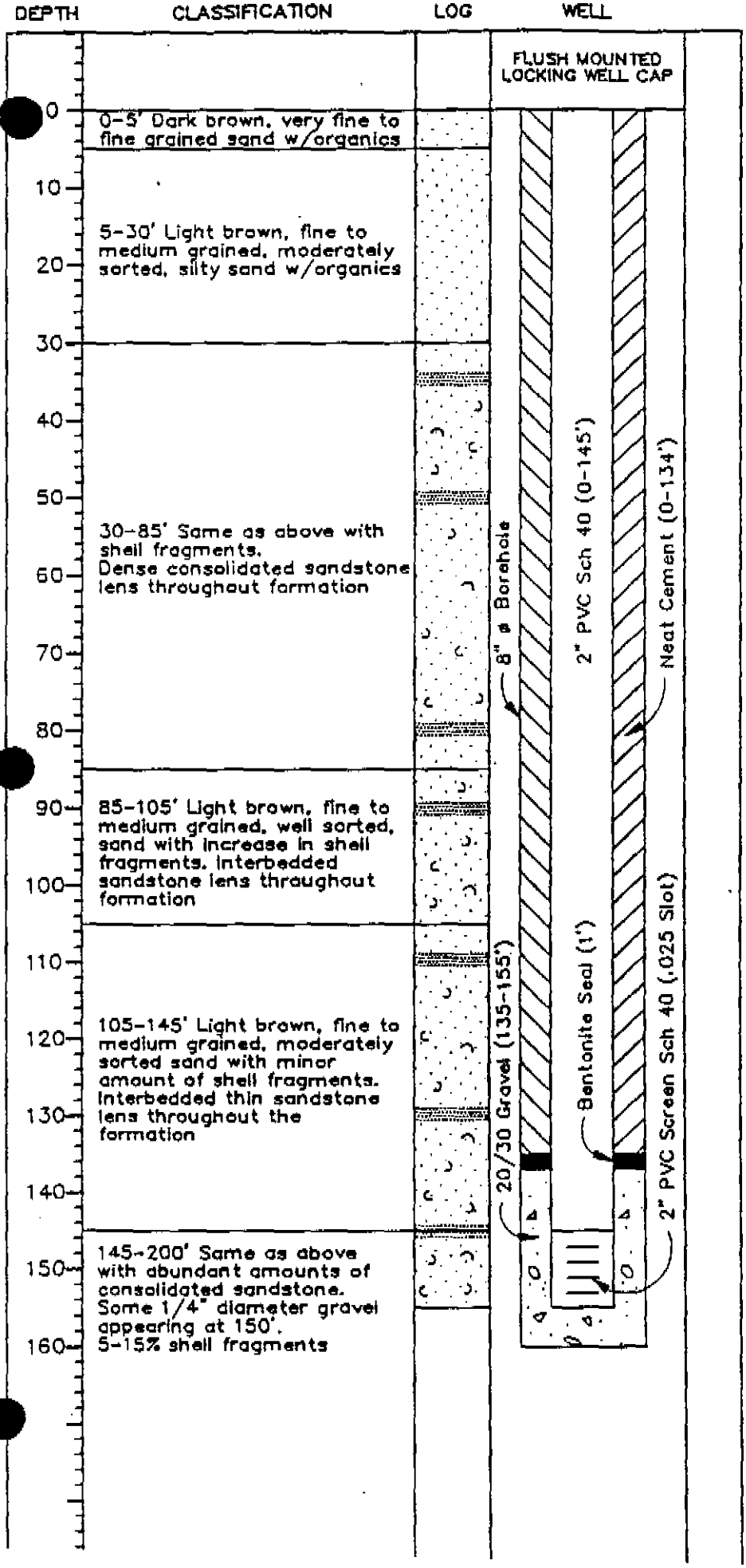
ANALYST RS DATE INJECTED 01/05/88 VERIFIED BY SAA

#	CAS #	COMPOUND	RESULT	PP #	CAS #	COMPOUND	RESULT
2V	107-02-8	acrolein	BDL	38V	100-41-4	ethylbenzene	BDL
3V	107-13-1	acrylonitrile	BDL	44V	75-09-2	methylene chloride	BDL
4V	71-43-2	benzene	BDL	45V	74-87-3	methyl chloride	BDL
5V	56-23-5	carbon tetrachloride	BDL	46V	74-83-9	methyl bromide	BDL
7V	108-90-7	chlorobenzene	BDL	47V	75-25-2	bromoform	T
0V	107-06-2	1,2-dichloroethane	BDL	48V	75-27-4	dichlorobromomethane	17.3
1V	71-55-6	1,1,1-trichloroethane	BDL	49V	75-69-4	trichlorofluoromethane	BDL
3V	75-34-3	1,1-dichloroethane	BDL	50V	75-71-8	dichlorodifluoromethane	BDL
4V	79-00-5	1,1,2-trichloroethane	BDL	51V	124-48-1	chlorodibromomethane	6.70
5V	79-34-5	1,1,2,2-tetrachloroethane	BDL	85V	127-18-4	tetrachloroethylene	BDL
6V	75-00-3	chloroethane	BDL	86V	108-88-3	toluene	-
9V	110-75-8	2-chloroethylvinyl ether	BDL	87V	79-01-6	trichloroethylene	BDL
3V	67-66-3	chloroform	43.8	88V	75-01-4	vinyl chloride	BDL
9V	75-35-4	1,1-dichloroethylene	BDL		67-64-1	acetone	NS
0V	156-60-5	1,2-trans-dichloroethylene	T		78-93-3	2-butanone	NS
2V	78-87-5	1,2-dichloropropane	BDL		75-15-0	carbondisulfide	NS
3V	10061-02-6	trans-1,3-dichloropropene	BDL		519-78-6	2-hexanone	NS
	10061-02-05	cis-1,3-dichloropropene	BDL		108-10-1	4-methyl-2-pentanone	NS
					100-42-5	styrene	BDL
					108-05-4	vinyl acetate	NS
					1330-20-7	total xylenes	BDL

ALL RESULTS REPORTED IN ug/L
BDL = BELOW DETECTION LEVEL
T = TRACE DETECTED BUT NOT QUANTITATED
NS = COMPOUND NOT SCREENED

Appendix C
Geophysical Logs

Appendix D
Monitor Well Completion Diagrams



WELL DRILLING REPORT

PROJECT No. SE24708.A8

WELL: W-1

LOCATION: West side of SW 16th Ave., ± 800' North of SW 10th St. and SW 16th Ave. Intersection

COUNTY: Palm Beach STATE: Fl.

GROUND ELEVATION: ___

DIAMETER: 2"

DEPTH: 155'

STATIC WATER LEVEL: 17.14' DTW

DATE: 8/22/88

CASING: 2" PVC Trilloc

SCREEN: 2" PVC Sch 40 (.025 Slot)

CONSTRUCTION: Mud Rotary

DRILLER: Groundwater Protection Inc.

DATE FINISHED: 8/22/88

PUMPING TEST

SPECIFIC YIELD ___gpm/ft @ ___ gpm

WATER ANALYSIS (ppm)

TDS ___

TOTAL HARDNESS ___

M.O. ALKALINITY ___

CHLORIDE Cl ___

IRON Fe ___

SULFATE SO_4 ___

COLOR (APHA) ___

CALCIUM ___

COMMENTS: ___

COMPILED BY: Lisa Rainger

DATE: 8/22/88

WELL DRILLING REPORT

CH2M HILL

PROJECT No. SE24708.A8

WELL: W-3

LOCATION: West side of SW 14th Ave. ±80' North of SW 10th St. and SW 14th Ave. intersection

COUNTY: Palm Beach STATE: Fl.

GROUND ELEVATION: ____

DIAMETER: 2"

DEPTH: 120'

STATIC WATER LEVEL: 16.85' DTW

DATE: 8/1/88

CASING: 2" PVC Triloc

SCREEN: 2" PVC Sch 40 (.025 Slot)

CONSTRUCTION: Mud Rotary

DRILLER: Groundwater Protection Inc.

DATE FINISHED: 8/1/88

PUMPING TEST

SPECIFIC YIELD ____ gpm/ft @ ____ gpm

WATER ANALYSIS (ppm)

TDS ____

TOTAL HARDNESS ____

M.O. ALKALINITY ____

CHLORIDE Cl ____

IRON Fe ____

SULFATE SO_4 ____

COLOR (APHA) ____

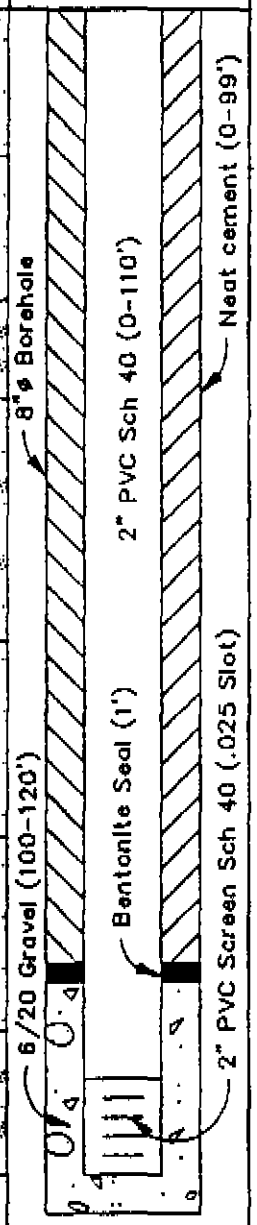
CALCIUM ____

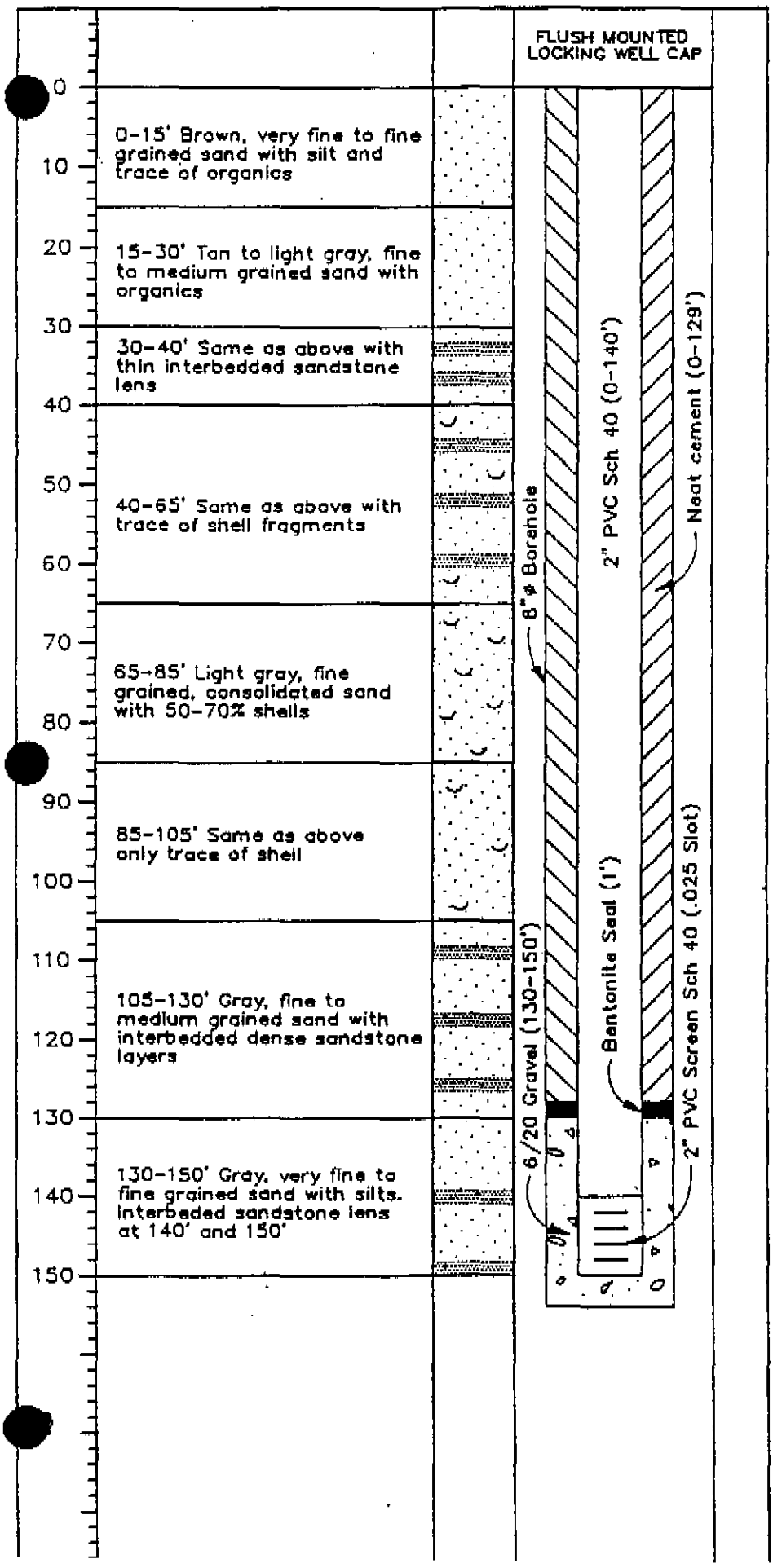
COMMENTS: ____

COMPILED BY: Doug VanNote

DATE: 8/1/88

DEPTH	CLASSIFICATION	LOG	WELL
0			FLUSH MOUNTED LOCKING WELL CAP
10	0-15' Brown, very fine to fine grained sand with silt and trace of organics		
20	15-30' Tan to light gray, fine to medium grained sand with organics		
30	30-40' Same as above with thin interbedded sandstone lens		
40			
50	40-65' Same as above with trace of shell fragments		
60			
70	65-85' Light gray, fine grained, consolidated sands with 50-70% shell		
80			
90	85-105' Same as above only trace of shell		
100			
110	105-120' Gray, fine to medium grained sand with interbedded dense sandstone layers		
120			
130			





WELL DRILLING REPORT

PROJECT No. SE24708.A8

WELL: W-4

LOCATION: West side of SW 14th Ave. ±80' North of SW 10th St. and SW 14th Ave. intersection

COUNTY: Palm Beach STATE: Fl.

GROUND ELEVATION: _____

DIAMETER: 2"

DEPTH: 150'

STATIC WATER LEVEL: 16.63' DTW

DATE: 8/2/88

CASING: 2" PVC Trilog

SCREEN: 2" PVC

CONSTRUCTION: Mud Rotary

DRILLER: Groundwater Protection Inc.

DATE FINISHED: 8/2/88

PUMPING TEST

SPECIFIC YIELD ___ gpm/ft @ ___ gpm

WATER ANALYSIS (ppm)

TDS _____

TOTAL HARDNESS * _____

M.O. ALKALINITY * _____

CHLORIDE Cl _____

IRON Fe _____

SULFATE SO_4 _____

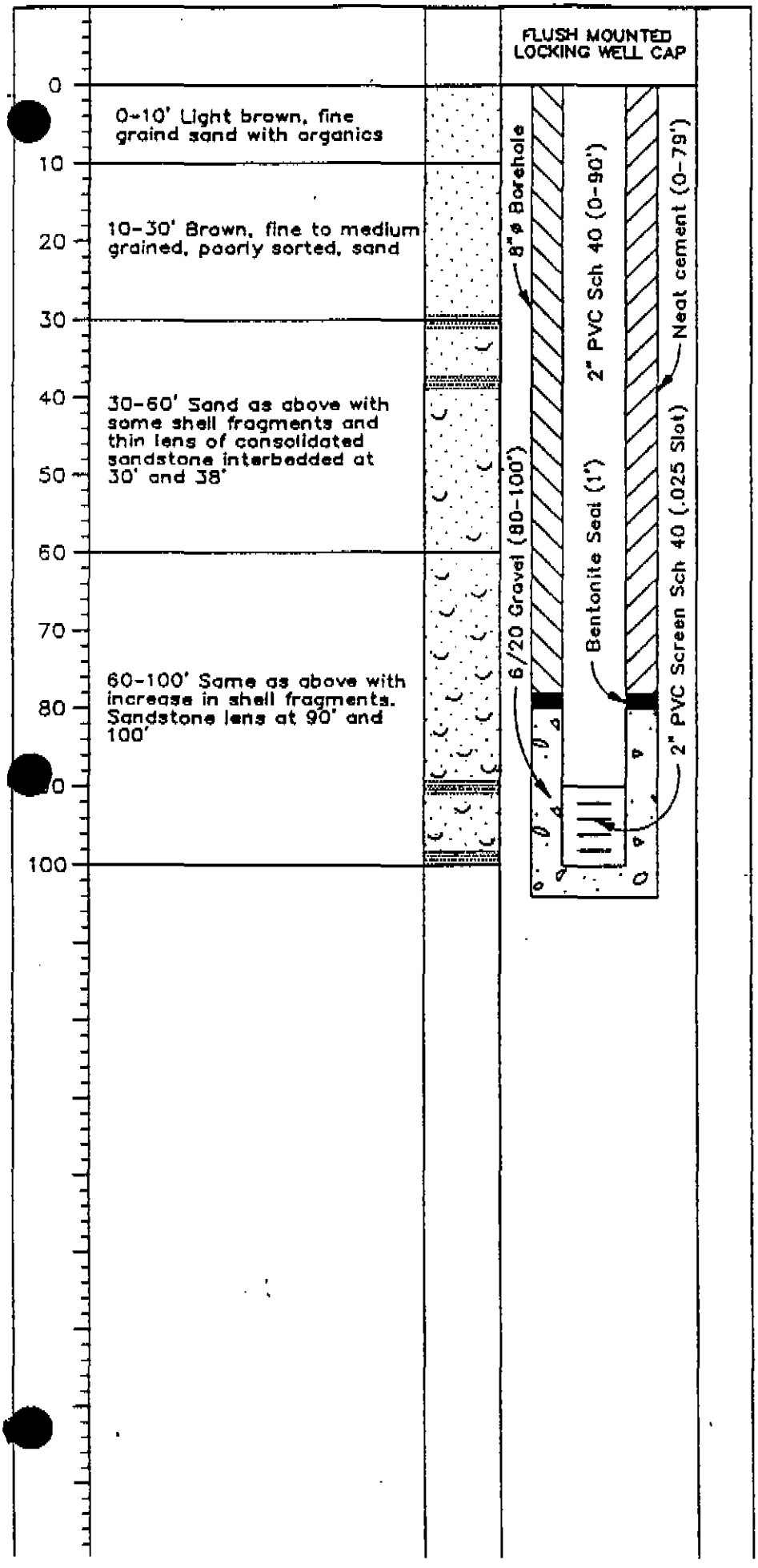
COLOR (APHA) _____

CALCIUM * _____

COMMENTS: _____

COMPILED BY: Doug VanNote

DATE: 8/2/88



WELL DRILLING REPORT

PROJECT No. SE24708.A8

WELL: W-5

LOCATION: Southside of SW 10th between SW 13th Ave. and SW 14th Ave.

COUNTY: Palm Beach STATE: Fl.

GROUND ELEVATION: _____

DIAMETER: 2"

DEPTH: 100'

STATIC WATER LEVEL: 15.85' DTW

DATE: 8/3/88

CASING: 2" PVC Trilac

SCREEN: 2" PVC Sch 40 (.025 Slot)

CONSTRUCTION: Mud Rotary

DRILLER: Groundwater Protection Inc.

DATE FINISHED: 8/3/88

PUMPING TEST

SPECIFIC YIELD ____gpm/ft @ ____ gpm

WATER ANALYSIS (ppm)

TDS _____

TOTAL HARDNESS* _____

M.O. ALKALINITY* _____

CHLORIDE Cl _____

IRON Fe _____

SULFATE SO_4 _____

COLOR (APHA) _____

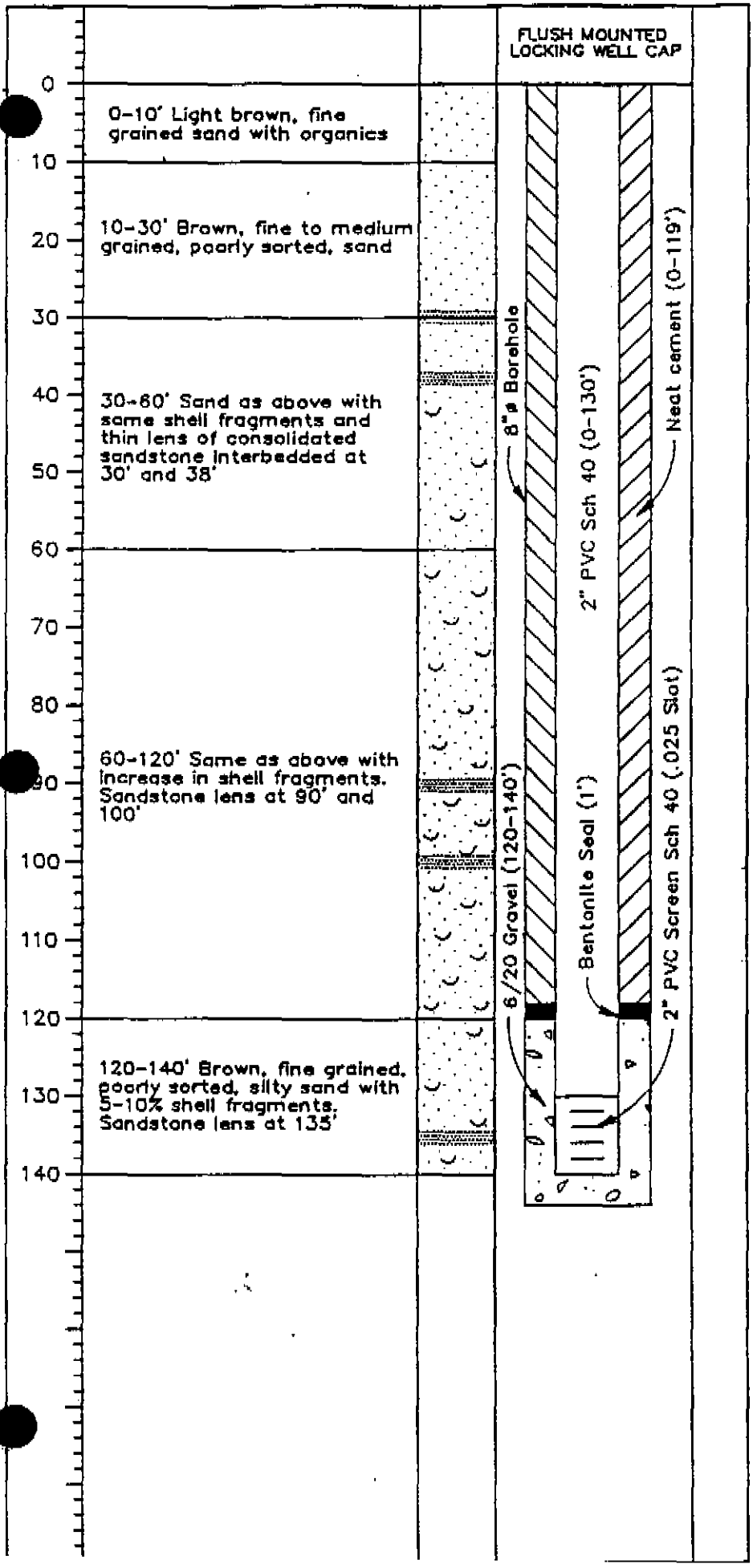
CALCIUM* _____

COMMENTS: _____

COMPILED BY: Doug VanNote

DATE: 8/3/88

* AS $CaCO_3$



WELL DRILLING REPORT

PROJECT No. SE24708.A8

WELL: W-6

LOCATION: South side of SW 10th between SW 13th Ave. and SW 14th Ave.

COUNTY: Palm Beach STATE: Fl.

GROUND ELEVATION: _____

DIAMETER: 2"

DEPTH: 140'

STATIC WATER LEVEL: 16.57' DTW

DATE: 8/4/88

CASING: 2" PVC Triloc

SCREEN: 2" PVC Sch 40 (.025 Slot)

CONSTRUCTION: Mud Rotary

DRILLER: Groundwater Protection Inc.

DATE FINISHED: 8/4/88

PUMPING TEST

SPECIFIC YIELD ____ gpm/ft @ ____ gpm

WATER ANALYSIS (ppm)

TDS _____

TOTAL HARDNESS * _____

M.O. ALKALINITY * _____

CHLORIDE Cl _____

IRON Fe _____

SULFATE SO_4 _____

COLOR (APHA) _____

CALCIUM * _____

COMMENTS: _____

COMPILED BY: Lisa Rainger

DATE: 8/4/88

* AS $CaCO_3$

WELL DRILLING REPORT

PROJECT No. SE24708.A8

WELL: W-98

LOCATION: South side of Poinsettia Dr. ±800' West of Old Germantown Rd. and Poinsettia Dr. intersection

COUNTY: Palm Beach STATE: Fl.

GROUND ELEVATION: _____

DIAMETER: 2"

DEPTH: 133'

STATIC WATER LEVEL: 14.42' DTW

DATE: 7/27/88

CASING: 2" PVC Trilac

SCREEN: 2" PVC Sch 40 (.025 Slot)

CONSTRUCTION: Mud Rotary

DRILLER: Groundwater Protection Inc.

DATE FINISHED: 7/27/88

PUMPING TEST

SPECIFIC YIELD ___ gpm/ft @ ___ gpm

WATER ANALYSIS (ppm)

TDS _____

TOTAL HARDNESS _____

M.O. ALKALINITY _____

CHLORIDE Cl _____

IRON Fe _____

SULFATE SO_4 _____

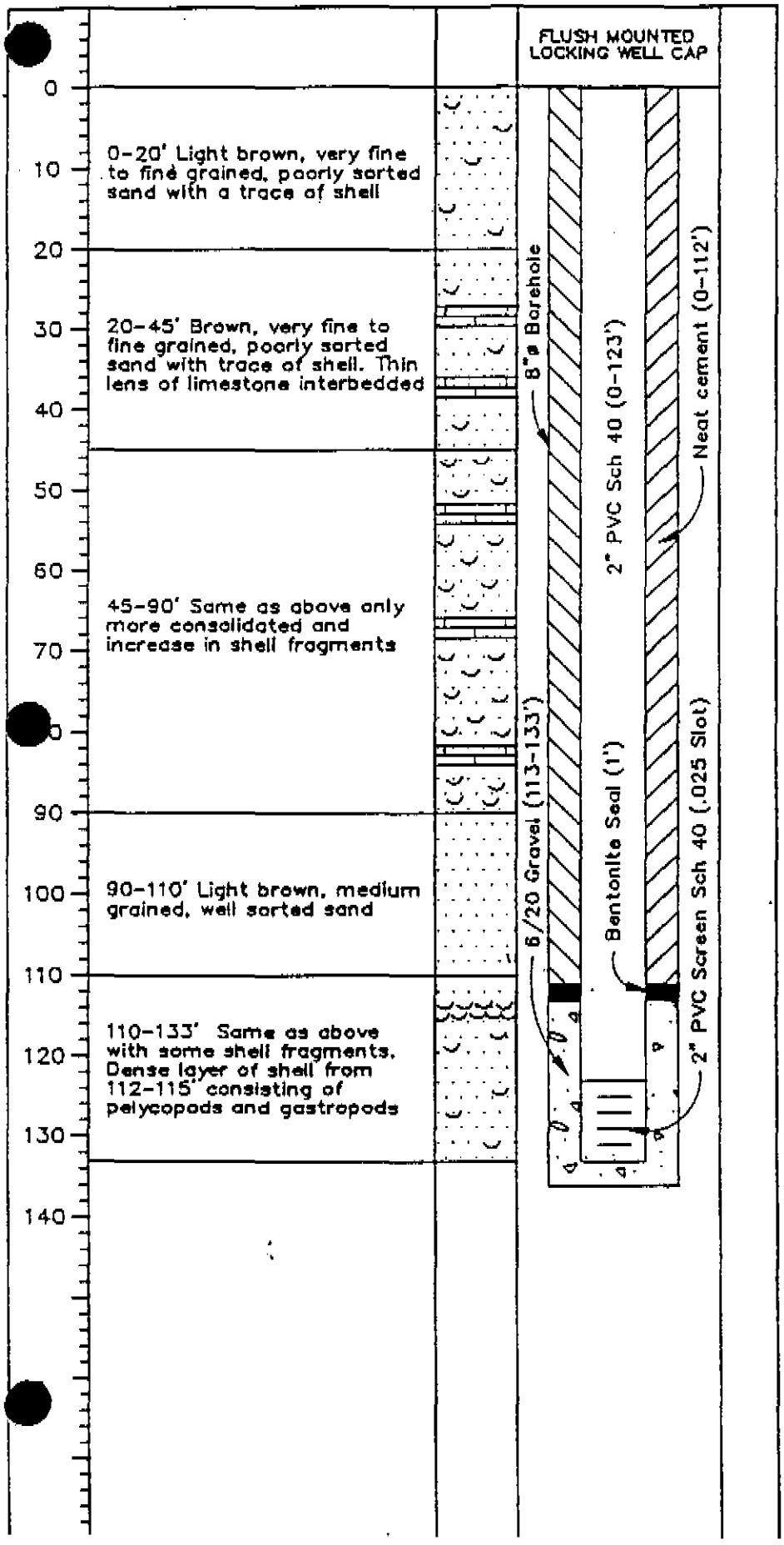
COLOR (APHA) _____

CALCIUM _____

COMMENTS: _____

COMPILED BY: Tim Sharp

DATE: 7/27/88



WELL DRILLING REPORT

CH2MHILL

PROJECT No. SE24708.A8

WELL: W-10B

LOCATION: South side of Poinsettia Dr. ±800' West of Old Germantown Rd. and Poinsettia Dr. intersection

COUNTY: Palm Beach STATE: Fl.

GROUND ELEVATION: _____

DIAMETER: 2"

DEPTH: 152'

STATIC WATER LEVEL: 14.38' DTW

DATE: 7/28/88

CASING: 2" PVC Trilac

SCREEN: 2" PVC Sch 40 (.025 Slot)

CONSTRUCTION: Mud Rotary

DRILLER: Groundwater Protection Inc.

DATE FINISHED: 7/28/88

PUMPING TEST

SPECIFIC YIELD ___ gpm/ft @ ___ gpm

WATER ANALYSIS (ppm)

TDS _____

TOTAL HARDNESS _____

M.O. ALKALINITY _____

CHLORIDE Cl _____

IRON Fe _____

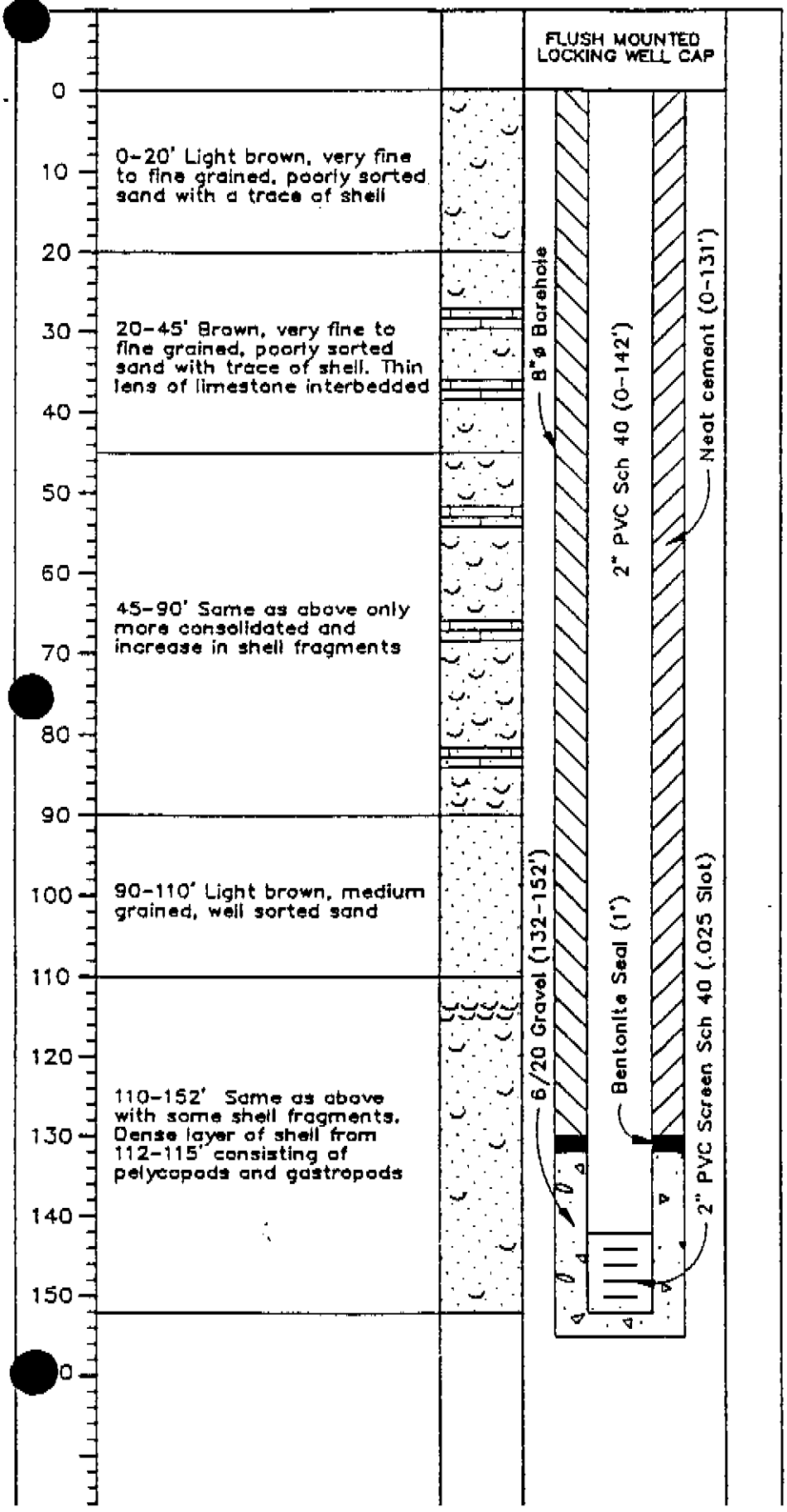
SULFATE SO4 _____

COLOR (APHA) _____

CALCIUM _____

COMMENTS: _____

COMPILED BY: Lisa Rainger



Appendix E
VOC and TOC Analyses of Soil

Engineers
Planners
Economists
Scientists

REPORT OF ANALYSIS

Florida Certification: 82112; E82124

AAA057
07/29/88

Sample Nos: 56081 - 56084

City of Delray	CH2M Hill
Attention: Tim Sharp Address: DFB Copies to: Lisa Rainger/DFB	Project No: SEF24708.A8 Received: 07/22/88 Reported: 07/29/88
Collected: 07/19/88 by Lisa Rainger Type: soil	

SAMPLE NUMBER	56081	56082	56083	56084
SAMPLE DESCRIPTIONS	B-1 12'-14' 12:00	B-2 14'- 16' 13:30	B-1 14'- 16' 12:30	B-2 12'- 14' 13:00
GENERAL ORGANICS				
TOC - Solid	197	126	145	253
SOLIDS				
% Solids	90	86	86	87

NOTE: VALUES ARE MG/KG, DRY WEIGHT.

Respectfully submitted,

Thomas C. Eisenhiser, Laboratory Manager

n/r = not requested
NOTE: This report contains test data and no interpretation is intended or implied.

Engineers
Planners
Economists
Scientists

REPORT OF ANALYSIS

Florida Certification: 82112; E82124

Sample Nos: 56081 - 56084

City of Delray	CH2M Hill
Attention: Tim Sharp Address: DFB Copies to: Lisa Rainger/DFB	Project No: SEF24708.A8 Received: 07/22/88 Reported: 07/29/88

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Type: soil

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SAMPLE DESCRIPTIONS	B-1 12'-14' 12:00	B-2 14'- 16' 13:30	B-1 14'- 16' 12:30	B-2 12'- 14' 13:00
GENERAL ORGANICS				
TOC - Solid	197	126	145	253
SOLIDS				
% Solids	90	86	86	87

NOTE: VALUES ARE MG/KG, DRY WEIGHT.

Respectfully submitted,

Thomas C. Eisenhiser

Thomas C. Eisenhiser, Laboratory Manager

n/r = not requested
NOTE: This report contains test data and no interpretation is intended or implied.

CH2M HILL ENVIRONMENTAL LABORATORY
2218 RAILROAD AVENUE
REDDING, CA 96001 916-243-5831

EPORT TO: CH2M HILL/GNV
SEF20647.EO
TTENTION: DON HASH
MPLE DESCRIPTION: SOIL-CITY OF DELRAY
TE OF SAMPLE: 7-19-88

REFERENCE NUMBER: 20619
PAGE 17 OF 19
DATE: 8-3-88
PHONE:
SAMPLED BY: LISA RAINGER
DATE RECEIVED: 7-23-88

ST METHODS: EPA-601-8010
TRACTION METHOD: EPA 5030

CONSTITUENT	56082 B-2 (14'-16')	56083 B-1 (14'-16')
loromethane	<0.1	<0.1
omomethane	<0.1	<0.1
chlorodifluoromethane	<0.1	<0.1
nyl chloride	<0.1	<0.1
loroethane	<0.1	<0.1
thylene chloride	<0.5	<0.5
ichlorofluoromethane	<0.1	<0.1
1-Dichloroethene	<0.1	<0.1
1-Dichloroethane	<0.1	<0.1
[redacted]-1,2-Dichloroethene	<0.1	<0.1
loroform	<0.1	<0.1
2-Dichloroethane	<0.1	<0.1
1,1-Trichloroethane	<0.1	<0.1
rbon Tetrachloride	<0.1	<0.1
omodichloromethane	<0.1	<0.1
2-Dichloropropane	<0.1	<0.1
s-1,3-Dichloropropene	<0.1	<0.1
ichloroethene	<0.1	<0.1
bromochloromethane	<0.1	<0.1
1,2-Trichloroethane	<0.1	<0.1
ans-1,3-Dichloropropene	<0.1	<0.1
omoform	<0.1	<0.1
1,2,2-Tetrachloroethane	<0.1	<0.1
trachloroethene	<0.1	<0.1
lorobenzene	<0.1	<0.1
3-Dichlorobenzene	<0.1	<0.1
2-Dichlorobenzene	<0.1	<0.1
4-Dichlorobenzene	<0.1	<0.1
te Analyzed	7-30-88	7-30-88

MMENTS: Results in milligrams per kilogram.
2-Chloroethylvinyl ether not analyzed
e information shown on this sheet is test data only and
[redacted]lysis or interpretation is intended or implied.

ALYST: Gregory A. Jones APPROVED BY: J. Stanley

CH2M HILL ENVIRONMENTAL LABORATORY
2218 RAILROAD AVENUE
REDDING, CA 96001 916-243-5831

EPORT TO: CH2M HILL/GNV
SEF24708.A8

REFERENCE NUMBER: 20619
PAGE 18 OF 19
DATE: 8-3-88
PHONE:

TTENTION: DON HASH
AMPLE DESCRIPTION: SOIL-CITY OF DELRAY
ATE OF SAMPLE: 7-19-88

SAMPLED BY: LISA RAINGER
DATE RECEIVED: 7-23-88

EST METHODS: EPA-602-8020
XTRACTION METHOD: EPA 5030

CONSTITUENT	56082 B-2 (14'16')	56083 B-1 (14'16')
enzene	<0.1	<0.1
oluene	<0.1	<0.1
thyl benzene	<0.1	<0.1
ylene	<0.1	<0.1
hlorobenzene	<0.1	<0.1
,4-Dichlorobenzene	<0.1	<0.1
,3-Dichlorobenzene	<0.1	<0.1
Dichlorobenzene	<0.1	<0.1
ate Analyzed	7-30-88	7-30-88

COMMENTS: Results are in milligrams per kilogram.

he information shown on this sheet is test data only and
o interpretation is intended or implied.

NALYST: Gregory A. Jones APPROVED: J. B. Hawley

Appendix F
Analytical Results
Preliminary Contamination Assessment Monitor Wells

CH2M HILL ENVIRONMENTAL LABORATORIES
7201 N.W. 11th Place, P.O. Box 1647
Gainesville, Florida 32602
904/377-2442
State of Florida Certification No.: 82112, E82124

Sample Nos. 57455-57462
Number of Samples: 8
Date Completed: 09/12/88
Date Reported: 09/16/88

REPORT OF ANALYSIS

Client: City of Delray
Attention: Mark Morris, Dawn Sanders
Address: CH2M HILL Deerfield Beach Office

Project No. SEF24708.A8.00
Received: 09/03/88

Description of Sample: Water
Collected on 09/01/88 by Greg Ford
Samples were iced and chemically preserved

EPA Method 601	#57455 Travel Blank (ppb)	#57456 Bailer Blank (ppb)	#57457 Duplicate (ppb)	#57458 W-10B+ (ppb)
Chloromethane	BMDL	BMDL	<10	BMDL
Bromomethane	BMDL	BMDL	<10	BMDL
Vinyl Chloride	BMDL	BMDL	<10	BMDL
Chloroethane	BMDL	BMDL	<10	BMDL
Dichloromethane	BMDL	BMDL	<10	BMDL
1,1-Dichloroethene	BMDL	BMDL	<10	BMDL
1,1-Dichloroethane	BMDL	BMDL	<10	BMDL
Trans-1,2-Dichloroethene	BMDL	BMDL	<10	BMDL
Chloroform	BMDL	BMDL	<10	BMDL
1,2-Dichloroethane	BMDL	BMDL	<10	BMDL
1,1,1-Trichloroethane	BMDL	BMDL	2.7 (F)	BMDL
Carbon Tetrachloride	BMDL	BMDL	<10	BMDL
Dichlorobromomethane	BMDL	BMDL	<10	BMDL
1,2-Dichloropropane and Cis-1,3-Dichloropropene	BMDL	BMDL	<10	BMDL
Trichloroethene	BMDL	BMDL	3.9 (F)	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	BMDL	BMDL	<10	BMDL
Bromoform	BMDL	BMDL	<10	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	BMDL	BMDL	- 94	BMDL

NOTE: (F) Presence indicated but less than stated Method Detection Limit of ppb (Dilution Factor: 1:)
Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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

EPA Method 602	#57455 Travel Blank (ppb)	#57456 Bailer Blank (ppb)	#57457 Duplicate (ppb)	#57458 W-10B+ (ppb)
Tert-Butyl Methyl Ether	BMDL	BMDL	<10	BMDL
Benzene	BMDL	BMDL	<10	BMDL
Toluene	BMDL	BMDL	<10	BMDL
Chlorobenzene	BMDL	BMDL	<10	BMDL
Ethyl Benzene	BMDL	BMDL	<10	BMDL
o-,m- and p-Xylene	BMDL	BMDL	<10	BMDL
1,3-Dichlorobenzene	BMDL	BMDL	<10	BMDL
1,2-Dichlorobenzene	BMDL	BMDL	<10	BMDL
1,4-Dichlorobenzene	BMDL	BMDL	<10	BMDL
Tetrachloroethene (P)	BMDL	BMDL	62	BMDL

NOTE: (P) From Photo Ionization Detector
Method Detection Limit = 1 ppb
unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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

EPA Method 601	#57459 W-9B+ (ppb)	#57460 W-1 (ppb)	#57461 W-4 (ppb)	#57462 W-6 (ppb)
Chloromethane	BMDL	BMDL	BMDL	<10
Bromomethane	BMDL	BMDL	BMDL	<10
Vinyl Chloride	BMDL	BMDL	BMDL	<10
Chloroethane	BMDL	BMDL	BMDL	<10
Dichloromethane	BMDL	BMDL	BMDL	<10
1,1-Dichloroethene	BMDL	BMDL	BMDL	<10
1,1-Dichloroethane	BMDL	BMDL	BMDL	<10
Trans-1,2-Dichloroethene	BMDL	BMDL	BMDL	<10
Chloroform	BMDL	BMDL	BMDL	<10
1,2-Dichloroethane	BMDL	BMDL	BMDL	<10
1,1,1-Trichloroethane	BMDL	BMDL	BMDL	<10
Carbon Tetrachloride	BMDL	BMDL	BMDL	<10
Dichlorobromomethane	BMDL	BMDL	BMDL	<10
1,2-Dichloropropane and Cis-1,3-Dichloropropene	BMDL	BMDL	BMDL	<10
Trichloroethene	BMDL	BMDL	3.2	13
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	BMDL	BMDL	BMDL	<10
Bromoform	BMDL	BMDL	BMDL	<10
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	BMDL	BMDL	63	930
EPA Method 602				
Tert-Butyl Methyl Ether	BMDL	BMDL	BMDL	<10
Benzene	BMDL	BMDL	BMDL	<10
Toluene	BMDL	BMDL	BMDL	<10
Chlorobenzene	BMDL	BMDL	BMDL	<10
Ethyl Benzene	BMDL	BMDL	BMDL	<10
o-,m- and p-Xylene	BMDL	BMDL	BMDL	<10
1,3-Dichlorobenzene	BMDL	BMDL	BMDL	<10
1,2-Dichlorobenzene	BMDL	BMDL	BMDL	<10
1,4-Dichlorobenzene	BMDL	BMDL	BMDL	<10
Tetrachloroethene (P)	BMDL	BMDL	47	650

NOTE: (P) From Photo Ionization Detector
Method Detection Limit = 1 ppb
unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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

Engineers
Planners
Economists
Scientists

ORGANICS ANALYSIS DATA SHEET

:ory Name: CH2M HILL/M&M
aple ID: 11856001
Sample ID: W3 57463 1335

Concentration: LOW
Sample Matrix: WATER
Percent Moisture: ____

Date Extracted: ____
Date Analyzed: 09/15/88
Dilution Factor: 1.0

VOLATILE COMPOUNDS

nber		ug/L		CAS Number		ug/L	
5	Chloromethane	10	U	79-00-5	1,1,2-Trichloroethane	5	U
9	Bromomethane	10	U	71-43-2	Benzene	5	U
4	Vinyl Chloride	10	U	10061-02-6	trans-1,3-Dichloropropene	5	U
3	Chloroethane	10	U	110-75-8	2-Chloroethylvinylether	10	U
2	Methylene Chloride	8	BJ	75-25-2	Bromoform	5	BU
1	Acetone	43		591-78-6	2-Hexanone	10	BU
0	Carbon Disulfide	5	U	108-10-1	4-Methyl-2-Pentanone	10	U
4	Trichlorofluoromethane	5	U	127-18-4	Tetrachloroethene	1200	
4	1,1-Dichloroethene	5	U	79-34-5	1,1,2,2-Tetrachloroethane	10	BU
3	1,1-Dichloroethane	5	U	108-88-3	Toluene	5	U
-0	1,2-Dichloroethene (total)	5	U	108-90-7	Chlorobenzene	5	U
3	Chloroform	5	BU	100-41-4	Ethylbenzene	5	U
-2	1,2-Dichloroethane	5	U	100-42-5	Styrene	5	U
3	2-Butanone	10	U	1330-20-7	Xylenes (total)	5	U
6	1,1,1-Trichloroethane	5	U	541-73-1	1,3-Dichlorobenzene	5	U
5	Carbon Tetrachloride	5	U	106-46-7	1,4-Dichlorobenzene	5	U
-4	Vinyl Acetate	10	U	95-50-1	1,2-Dichlorobenzene	5	U
	Bromodichloromethane	5	U		---		
5	1,2-Dichloropropane	5	U		Toluene-d8 - SS	110	
01-5	cis-1,3-Dichloropropene	5	U		1,4-Bromofluorobenzene - SS	110	
6	Trichloroethene	60			1,2-Dichloroethane-d4 - SS	100	
-1	Dibromochloromethane	5	U				

U Compound analyzed for but not detected.
B Compound was detected in QC blank.
J Reported value less than quantitation limit.
S Surrogate Standard reported as percent recovery.

CH2M HILL Montgomery 2567 Fairlane Drive, P.O. Box 230548, 205.271.1444

Engineers
Planners
Economists
Scientists

atory Name: CH2M HILL/M&M
No: V11856

Sample Number
W3_57463_1335

TENTATIVELY IDENTIFIED COMPOUNDS
(Page 4)

CAS Number	Compound Name	Fraction	Scan Num	Estimated Conc ug/L	
	NOT IDENTIFIED	VOA		70	J

semi-volatile compounds found.

Estimated compound concentration using RF=1.

page 1A for complete definitions of the data
orting qualifiers.

Form I

Engineers
Planners
Economists
Scientists

ORGANICS ANALYSIS DATA SHEET

itory Name: CH2M HILL/MGM
mple ID: 11856002
Sample ID: W5 57464 1500

Concentration: LOW
Sample Matrix: WATER
Percent Moisture: ____

Date Extracted: ____
Date Analyzed: 09/15/88
Dilution Factor: 1.0

VOLATILE COMPOUNDS

mber		ug/L		CAS Number		ug/L	
-3	Chloromethane	10	U	79-00-5	1,1,2-Trichloroethane	5	U
-9	Bromomethane	10	U	71-43-2	Benzene	5	U
-4	Vinyl Chloride	10	U	10061-02-6	trans-1,3-Dichloropropene	5	U
-3	Chloroethane	10	U	110-75-8	2-Chloroethylvinylether	10	U
-2	Methylene Chloride	7	BJ	75-25-2	Bromoform	5	BU
-1	Acetone	27		591-78-6	2-Hexanone	10	BU
-0	Carbon Disulfide	5	U	108-10-1	4-Methyl-2-Pentanone	10	U
-4	Trichlorofluoromethane	5	U	127-18-4	Tetrachloroethene	250	
-4	1,1-Dichloroethene	5	U	79-34-5	1,1,2,2-Tetrachloroethane	10	BU
-3	1,1-Dichloroethane	5	U	108-88-3	Toluene	5	U
-0	1,2-Dichloroethene (total)	5	U	108-90-7	Chlorobenzene	5	U
-3	Chloroform	5	BU	100-41-4	Ethylbenzene	5	U
-2	1,2-Dichloroethane	5	U	100-42-5	Styrene	5	U
-3	2-Butanone	10	U	1330-20-7	Xylenes (total)	5	U
-6	1,1,1-Trichloroethane	5	U	541-73-1	1,3-Dichlorobenzene	5	U
-5	Carbon Tetrachloride	5	U	106-46-7	1,4-Dichlorobenzene	5	U
	Vinyl Acetate	10	U	95-50-1	1,2-Dichlorobenzene	5	U
	Bromodichloromethane	5	U		---		
-5	1,2-Dichloropropane	5	U		Toluene-d8 - SS	110	
-01-5	cis-1,3-Dichloropropene	5	U		1,4-Bromofluorobenzene - SS	110	
-6	Trichloroethene	87			1,2-Dichloroethane-d4 - SS	110	
-1	Dibromochloromethane	5	U				

- Compound analyzed for but not detected.
- Compound was detected in QC blank.
- Reported value less than quantitation limit.
- Surrogate Standard reported as percent recovery.

Form I

Engineers
Planners
Economists
Scientists

Name: CH2M HILL/MGM
V11856

Sample Number
WS_57464_1500

TENTATIVELY IDENTIFIED COMPOUNDS
(Page 4)

CAS Number	Compound Name	Fraction	Scan Num	Estimated Conc ug/L	
	NOT IDENTIFIED	VOA	51		J

mi-volatile compounds found.

timated compound concentration using RF=1.

ge 1A for complete definitions of the data
ing qualifiers.

Form I

Engineers
Planners
Economists
Scientists

ORGANICS ANALYSIS DATA SHEET

ory Name: CH2M HILL/MGM
ile ID: 11856001
Sample ID: WELL 3 57463

Concentration: LOW
Sample Matrix: WATER
Percent Moisture: ____

Date Extracted: 09/08/88
Date Analyzed: 09/13/88
Dilution Factor: 1.0

SEMIVOLATILE COMPOUNDS

ier		ug/L		CAS Number		ug/L	
	N-Nitrosodimethylamine . .	10	U	51-28-5	2,4-Dinitrophenol	50	U
2	Phenol	10	U	100-02-7	4-Nitrophenol	50	U
	Aniline	10	U	132-64-9	Dibenzofuran	10	U
4	bis(2-Chloroethyl)Ether .	10	U	121-14-2	2,4-Dinitrotoluene	10	U
	2-Chlorophenol	10	U	84-66-2	Diethylphthalate	10	U
1	1,3-Dichlorobenzene . . .	10	U	7005-72-3	4-Chlorophenyl-phenylether	10	U
7	1,4-Dichlorobenzene . . .	10	U	86-73-7	Fluorene	10	U
6	Benzyl Alcohol	10	U	100-01-6	4-Nitroaniline	50	U
	1,2-Dichlorobenzene . . .	10	U	534-52-1	4,6-Dinitro-2-methylphenol	50	U
	2-Methylphenol	10	U	86-30-6	N-Nitrosodiphenylamine (1)	10	U
1	bis(2-Chloroisopropyl)Ether	10	U	122-66-7	1,2-Diphenylhydrazine . .	10	U
5	4-Methylphenol	10	U	101-55-3	4-Bromophenyl-phenylether	10	U
	N-Nitroso-Di-n-Propylamine	10	U	118-74-1	Hexachlorobenzene	10	U
	Hexachloroethane	10	U	87-86-5	Pentachlorophenol	10	U
	Nitrobenzene	10	U	85-01-8	Phenanthrene	10	U
	Isophorone	10	U	120-12-7	Anthracene	10	U
	2-Nitrophenol	10	U	84-74-2	Di-n-Butylphthalate . . .	10	U
9	2,4-Dimethylphenol	10	U	206-44-0	Fluoranthene	10	U
	Benzoic Acid	50	U	129-00-0	Pyrene	10	U
1	bis(2-Chloroethoxy)Methane	10	U	85-68-7	Butylbenzylphthalate . . .	10	U
2	2,4-Dichlorophenol	10	U	91-94-1	3,3'-Dichlorobenzidine . .	20	U
1	1,2,4-Trichlorobenzene . .	10	U	56-55-3	Benzo(a)anthracene	10	U
	Naphthalene	10	U	218-01-9	Chrysene	10	U
8	4-Chloroaniline	10	U	117-81-7	bis(2-Ethylhexyl)Phthalate	34	
	Hexachlorobutadiene . . .	10	U	117-84-0	Di-n-octylphthalate . . .	10	U
	4-Chloro-3-methylphenol .	10	U	205-99-2	Benzo(b)fluoranthene . . .	10	U
	2-Methylnaphthalene . . .	10	U	207-08-9	Benzo(k)fluoranthene . . .	10	U
	Hexachlorocyclopentadiene	10	U	50-32-8	Benzo(a)pyrene	10	U
	2,4,6-Trichlorophenol . .	10	U	193-39-5	Indeno(1,2,3-cd)Pyrene . .	10	U
	2,4,5-Trichlorophenol . .	50	U	53-70-3	Dibenz(a,h)Anthracene . .	10	U
	2-Chloronaphthalene . . .	10	U	191-24-2	Benzo(g,h,i)perylene . . .	10	U
	2-Nitroaniline	50	U		----------		
3	Dimethyl Phthalate	10	U		Nitrobenzene-d5 - SS . . .	110	
8	Acenaphthylene	10	U		2-Fluorobiphenyl - SS . .	86	
2	2,6-Dinitrotoluene	10	U		Terphenyl-d14 - SS	110	
	3-Nitroaniline	50	U		Phenol-d5 - SS	65	
	Acenaphthene	10	U		2-Fluorophenol - SS . . .	91	
					2,4,6-Tribromophenol - SS	77	

Cannot be separated from diphenylamine.
Compound analyzed for but not detected.
Compound was detected in QC blank.
Reported value less than quantitation limit.

Engineers
Planners
Economists
Scientists

ORGANICS ANALYSIS DATA SHEET

tory Name: CH2M HILL/M&M
mple ID: 11856002
Sample ID: WELL 5 57464

Concentration: LOW
Sample Matrix: WATER
Percent Moisture: _____

Date Extracted: 09/08/88
Date Analyzed: 09/13/88
Dilution Factor: 1.0

SEMIVOLATILE COMPOUNDS

nber		ug/L		CAS Number		ug/L	
9	N-Nitrosodimethylamine . .	10	U	51-28-5	2,4-Dinitrophenol	50	U
-2	Phenol	10	U	100-02-7	4-Nitrophenol	50	U
3	Aniline	10	U	132-64-9	Dibenzofuran	10	U
-4	bis(2-Chloroethyl)Ether .	10	U	121-14-2	2,4-Dinitrotoluene	10	U
8	2-Chlorophenol	10	U	84-66-2	Diethylphthalate	10	U
-1	1,3-Dichlorobenzene . . .	10	U	7005-72-3	4-Chlorophenyl-phenylether	10	U
-7	1,4-Dichlorobenzene . . .	10	U	86-73-7	Fluorene	10	U
-6	Benzyl Alcohol	10	U	100-01-6	4-Nitroaniline	50	U
1	1,2-Dichlorobenzene . . .	10	U	534-52-1	4,6-Dinitro-2-methylphenol	50	U
7	2-Methylphenol	10	U	86-30-6	N-Nitrosodiphenylamine (1)	10	U
-1	bis(2-Chloroisopropyl)Ether	10	U	122-66-7	1,2-Diphenylhydrazine . .	10	U
-5	4-Methylphenol	10	U	101-55-3	4-Bromophenyl-phenylether	10	U
-7	N-Nitroso-Di-n-Propylamine	10	U	118-74-1	Hexachlorobenzene	10	U
1	Hexachloroethane	10	U	87-86-5	Pentachlorophenol	10	U
3	Nitrobenzene	10	U	85-01-8	Phenanthrene	10	U
1	Isophorone	10	U	120-12-7	Anthracene	10	U
[redacted]	2-Nitrophenol	10	U	84-74-2	Di-n-Butylphthalate . . .	10	U
	2,4-Dimethylphenol	10	U	206-44-0	Fluoranthene	10	U
0	Benzoic Acid	50	U	129-00-0	Pyrene	10	U
-1	bis(2-Chloroethoxy)Methane	10	U	85-68-7	Butylbenzylphthalate . . .	10	U
-2	2,4-Dichlorophenol	10	U	91-94-1	3,3'-Dichlorobenzidine . .	20	U
-1	1,2,4-Trichlorobenzene . .	10	U	56-55-3	Benzo(a)anthracene	10	U
3	Naphthalene	10	U	218-01-9	Chrysene	10	U
-8	4-Chloroaniline	10	U	117-81-7	bis(2-Ethylhexyl)Phthalate	10	U
3	Hexachlorobutadiene . . .	10	U	117-84-0	Di-n-octylphthalate . . .	10	U
7	4-Chloro-3-methylphenol .	10	U	205-99-2	Benzo(b)fluoranthene . . .	10	U
6	2-Methylnaphthalene . . .	10	U	207-08-9	Benzo(k)fluoranthene . . .	10	U
4	Hexachlorocyclopentadiene	10	U	50-32-8	Benzo(a)pyrene	10	U
2	2,4,6-Trichlorophenol . .	10	U	193-39-5	Indeno(1,2,3-cd)Pyrene . .	10	U
4	2,4,5-Trichlorophenol . .	50	U	53-70-3	Dibenz(a,h)Anthracene . .	10	U
7	2-Chloronaphthalene . . .	10	U	191-24-2	Benzo(g,h,i)perylene . . .	10	U
4	2-Nitroaniline	50	U		----------		
-3	Dimethyl Phthalate	10	U		Nitrobenzene-d5 - SS . . .	98	
-8	Acenaphthylene	10	U		2-Fluorobiphenyl - SS . .	81	
-2	2,6-Dinitrotoluene	10	U		Terphenyl-d14 - SS	100	
2	3-Nitroaniline	50	U		Phenol-d5 - SS	71	
9	Acenaphthene	10	U		2-Fluorophenol - SS . . .	89	
					2,4,6-Tribromophenol - SS	75	

- Cannot be separated from diphenylamine.
Compound analyzed for but not detected.
mpound was detected in QC blank.
Reported value less than quantitation limit.
Surrogate Standard reported as percent recovery.

CH2M HILL Montgomery 2567 Fairlane Drive, P.O. Box 230548 205 271 1444

Engineers
Planners
Economists
Scientists

REPORT OF ANALYSIS

Florida Certification: 82112; EB2124

AAA202
10/12/88

Sample Nos: 57463 - 57464

City of Delray	C H 2 M H i l l
Attention: Mark Morris Address: DFB Copies to: Dawn Sanders/DFB	Project No: SEF24708.A8.00 Received: 09/03/88 Reported: 10/12/88
Collected: 09/01/88 by Greg Ford Type: water, grab	

SAMPLE NUMBER	57463	57464
SAMPLE DESCRIPTIONS	Well 83	Well 85
METALS		
Antimony - FU	<0.2	<0.2
Arsenic - FU	<0.005	<0.005
Beryllium - FL	<0.01	<0.01
Cadmium - FL	0.0003	<0.0002
Chromium, Tot - FL	<0.05	<0.05
Copper - FL	<0.02	<0.02
Lead - FL	<0.002	<0.002
Mercury - CV	<0.0002	<0.0002
Nickel - FL	<0.05	<0.05
Selenium	<0.001	<0.001
Silver - FL	<0.02	<0.02
Thallium - FL	<0.5	<0.5
Zinc - FL	0.04	<0.01

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

Respectfully submitted,

Thomas C. Eennniser, Laboratory Manager

n/r = not requested
NOTE: This report contains test data and no interpretation is intended or implied.

904.377.2442

ory Name: CH2M HILL
11856

Sample Number
11856001

ORGANICS ANALYSIS DATA SHEET

PESTICIDE / PCB COMPOUNDS

antration: LOW
Extracted/Prepared: 09/08/88
Analyzed: 09/18/88
/Dil Factor: 1
ent Moisture: (Decanted)

Alumina Cleanup ___ Yes _X_ No
Separatory Funnel Extraction ___ Yes
Continuous Liquid-Liquid Extraction _X_ Yes

Number		UG/L	
84-6	alpha-BHC	0.01	U
85-7	beta-BHC	0.02	U
86-8	delta-BHC	0.01	U
9-9	gamma-BHC (Lindane)	0.01	U
4-8	Heptachlor	0.01	U
00-2	Aldrin	0.01	U
-57-3	Heptachlor Epoxide	0.01	U
98-8	Endosulfan I	0.02	U
[redacted]	Dieldrin	0.02	U
[redacted]	4,4'-DDE	0.02	U
0-8	Endrin	0.02	U
3-65-9	Endosulfan II	0.02	U
4-8	4,4'-DDD	0.02	U
-07-8	Endosulfan Sulfate	0.02	U
9-3	4,4'-DDT	0.02	U
3-5	Methoxychlor	0.04	U
4-70-5	Endrin Ketone	0.02	U
9-03-6	Chlordane	0.1	U
-35-2	Toxaphene	0.5	U
4-11-2	Aroclor-1016	0.8	U
4-28-2	Aroclor-1221	2	U
1-16-5	Aroclor-1232	2	U
9-21-9	Aroclor-1242	0.8	U
2-29-6	Aroclor-1248	0.4	U
7-69-1	Aroclor-1254	0.2	U
6-82-5	Aroclor-1260	0.2	U

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
C - Confirmed by GC/MS.
E - Concentration exceeds instrument calibration range.
D - Secondary dilution result.

tory Name: CH2M HILL
11856

Sample Number
11856002

ORGANICS ANALYSIS DATA SHEET

PESTICIDE / PCB COMPOUNDS

entration: LOW
Extracted/Prepared: 09/08/88
Analyzed: 09/18/88
/Dil Factor: 1
ent Moisture: (Decanted)

Alumina Cleanup ___ Yes _X_ No
Separatory Funnel Extraction ___ Yes
Continuous Liquid-Liquid Extraction _X_ Yes

Number		UG/L	
84-6	alpha-BHC	0.01	U
85-7	beta-BHC	0.02	U
86-8	delta-BHC	0.01	U
9-9	gamma-BHC (Lindane)	0.01	U
4-8	Heptachlor	0.01	U
00-2	Aldrin	0.01	U
-57-3	Heptachlor Epoxide	0.01	U
98-8	Endosulfan I	0.02	U
7-1	Dieldrin	0.02	U
	4,4'-DDE	0.02	U
0-8	Endrin	0.02	U
3-65-9	Endosulfan II	0.02	U
4-8	4,4'-DDD	0.02	U
-07-8	Endosulfan Sulfate	0.02	U
9-3	4,4'-DDT	0.02	U
3-5	Methoxychlor	0.04	U
4-70-5	Endrin Ketone	0.02	U
9-03-6	Chlordane	0.1	U
-35-2	Toxaphene	0.5	U
4-11-2	Aroclor-1016	0.8	U
4-28-2	Aroclor-1221	2	U
1-16-5	Aroclor-1232	2	U
9-21-9	Aroclor-1242	0.8	U
2-29-6	Aroclor-1248	0.4	U
7-69-1	Aroclor-1254	0.2	U
6-82-5	Aroclor-1260	0.2	U

U - Compound analyzed for but not detected.
B - Compound was detected in QC blank.
J - Reported value less than quantitation limit.
C - Confirmed by GC/MS.
E - Concentration exceeds instrument calibration range.
D - Secondary dilution result.

Appendix G
Analytical Results
Split Sampling with Aero-Dri Consultant
May 25, 1988

CH2M HILL ENVIRONMENTAL LABORATORIES
2201 N.W. 11th Place, P.O. Box 1647
Gainesville, Florida 32602
904/377-2442
State of Florida Certification No.: 82112, E82124

Sample Nos. 54398-54419
Number of Samples: 22
Date Completed: 06/13/88
Date Reported: 06/29/88

REPORT OF ANALYSIS

Client: City of Delray
Attention: Bob Wright
Address: CH2M HILL Deerfield Beach Office

Project No. SEF24708.A4
Received: 05/31/88

Description of Sample: Water Samples
Collected on 05/25/88 by Derrik Williams
Samples were iced and chemically preserved

EPA Method 601	#54398 PW-24 (ppb)	#54399 PW-23 (ppb)	#54400 PW-22 (ppb)	#54401 PW-25 (ppb)	#54402 MWC4-A (ppb)	#54403 MWC4-B (ppb)
Chloromethane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Bromomethane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Vinyl Chloride	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Chloroethane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Dichloromethane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
1,1-Dichloroethene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
1,1-Dichloroethane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
trans-1,2-Dichloroethane	40	2.7	11	BMDL	BMDL	BMDL
Chloroform	<10	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichloroethane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
1,1,1-Trichloroethane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Carbon Tetrachloride	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Dichlorobromomethane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichloropropane	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Cis-1,3-Dichloropropene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Trichloroethene	22	BMDL	1.2	BMDL	BMDL	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Bromoform	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	270	20	BMDL	BMDL	BMDL	BMDL

NOTE: Method Detection Limit = 1 ppb
unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Thomas C. Emerson
Laboratory Manager

EPA Method 602	#54398 PW-24 (ppb)	#54399 PW-23 (ppb)	#54400 PW-22 (ppb)	#54401 PW-25 (ppb)	#54402 MWC4-A (ppb)	#54403 MWC4-B (ppb)
Tert-Butyl Methyl Ether	<10	BMDL	BMDL	BMDL	2.2	BMDL
Benzene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Toluene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Chlorobenzene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Ethyl Benzene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
o-,m- and p-Xylene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
1,3-Dichlorobenzene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichlorobenzene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
1,4-Dichlorobenzene	<10	BMDL	BMDL	BMDL	BMDL	BMDL
Tetrachloroethene*	190	21	BMDL	BMDL	BMDL	BMDL

NOTE: *From Photo Ionization Detector
Method Detection Limit = 1 ppb
unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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

EPA Method 601	#54404 MWC4-C (ppb)	#54405 MWC2-A (ppb)	#54406 MWC2-B (ppb)	#54407 MWC2-C (ppb)	#54408 B.B. (ppb)	#54409 Dup #1 (ppb)
Chloromethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Bromomethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Vinyl Chloride	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Chloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Dichloromethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,1-Dichloroethene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,1-Dichloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Trans-1,2-Dichloroethene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Chloroform	8.1	BMDL	BMDL	BMDL	2.1	BMDL
1,2-Dichloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,1,1-Trichloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Carbon Tetrachloride	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Dichlorobromomethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichloropropane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Cis-1,3-Dichloropropene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Trichloroethene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and trans-1,3,-Dichloropropene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Bromoform	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
EPA Method 602						
Tert-Butyl Methyl Ether	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Benzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Toluene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Chlorobenzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Ethyl Benzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
o-,m- and p-Xylene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,3-Dichlorobenzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichlorobenzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,4-Dichlorobenzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Tetrachloroethene*	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL

NOTE: *From Photo Ionization Detector
Method Detection Limit = 1 ppb
unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Thomas C. Emerson
Laboratory Manager

EPA Method 601	#54410 MWC3-A (ppb)	#54411 MWC3-B (ppb)	#54412 MW-3 (ppb)	#54413 MWC1-B (ppb)	#54414 MWC1-A (ppb)
Chloromethane	BMDL	BMDL	<10	<50	<100
Bromomethane	BMDL	BMDL	<10	<50	<100
Vinyl Chloride	BMDL	BMDL	<10	<50	<100
Chloroethane	BMDL	BMDL	<10	<50	<100
Dichloromethane	BMDL	BMDL	<10	<50	<100
1,1-Dichloroethene	BMDL	BMDL	<10	<50	<100
1,1-Dichloroethane	BMDL	BMDL	<10	<50	<100
Trans-1,2-Dichloroethene	BMDL	BMDL	<10	<50	<100
Chloroform	BMDL	BMDL	<10	<50	<100
1,2-Dichloroethane	BMDL	BMDL	<10	<50	<100
1,1,1-Trichloroethane	BMDL	BMDL	<10	<50	<100
Carbon Tetrachloride	BMDL	BMDL	<10	<50	<100
Dichlorobromomethane	BMDL	BMDL	<10	<50	<100
1,2-Dichloropropane	BMDL	BMDL	<10	<50	<100
Cis-1,3-Dichloropropene	BMDL	BMDL	<10	<50	<100
Trichloroethene	BMDL	BMDL	32	22*	<100
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	BMDL	BMDL	<10	<50	<100
Bromoform	BMDL	BMDL	<10	<50	<100
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	BMDL	BMDL	330	2,600	6,300
EPA Method 602					
Tert-Butyl Methyl Ether	BMDL	BMDL	<10	<50	<100
Benzene	BMDL	BMDL	<10	<50	<100
Toluene	BMDL	BMDL	<10	<50	<100
Chlorobenzene	BMDL	BMDL	<10	<50	<100
Ethyl Benzene	BMDL	BMDL	<10	<50	<100
o-,m- and p-Xylene	BMDL	BMDL	<10	<50	<100
1,3-Dichlorobenzene	BMDL	BMDL	<10	<50	<100
1,2-Dichlorobenzene	BMDL	BMDL	<10	<50	<100
1,4-Dichlorobenzene	BMDL	BMDL	<10	<50	<100
Tetrachloroethene**	BMDL	BMDL	220	1,800	4,100

NOTE: *Presence indicated but less than stated Method Detection Limit of 50 ppb (Dilution Factor: 1:50)
**From Photo Ionization Detector
Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Thomas C. Emerson
Laboratory Manager

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

EPA Method 601	#54415 MWC1-C (ppb)	#54416 MW-2 (ppb)	#54417 MW-1 (ppb)	#54418 Dup. (ppb)	#54419 T.B. (ppb)
Chloromethane	BMDL	<5,000	<500	<10	BMDL
Bromomethane	BMDL	<5,000	<500	<10	BMDL
Vinyl Chloride	BMDL	<5,000	<500	<10	BMDL
Chloroethane	BMDL	<5,000	<500	<10	BMDL
Dichloromethane	BMDL	<5,000	<500	<10	BMDL
1,1-Dichloroethene	BMDL	<5,000	<500	<10	BMDL
1,1-Dichloroethane	BMDL	<5,000	<500	<10	BMDL
Trans-1,2-Dichloroethene	BMDL	<5,000	<500	<10	BMDL
Chloroform	1.1	<5,000	<500	<10	BMDL
1,2-Dichloroethane	BMDL	<5,000	<500	<10	BMDL
1,1,1-Trichloroethane	BMDL	<5,000	<500	<10	BMDL
Carbon Tetrachloride	BMDL	<5,000	<500	<10	BMDL
Dichlorobromomethane	BMDL	<5,000	<500	<10	BMDL
1,2-Dichloropropane	BMDL	<5,000	<500	<10	BMDL
Cis-1,3-Dichloropropene	BMDL	<5,000	<500	<10	BMDL
Trichloroethene	BMDL	<5,000	450*	32	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	BMDL	<5,000	<500	<10	BMDL
Bromoform	BMDL	<5,000	<500	<10	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	2.0	62,000	23,000	270	BMDL
EPA Method 602					
Tert-Butyl Methyl Ether	BMDL	<5,000	<500	<10	BMDL
Benzene	BMDL	<5,000	<500	<10	BMDL
Toluene	BMDL	<5,000	<500	<10	BMDL
Chlorobenzene	BMDL	<5,000	<500	<10	BMDL
Ethyl Benzene	BMDL	<5,000	<500	<10	BMDL
o-,m- and p-Xylene	BMDL	<5,000	<500	<10	BMDL
1,3-Dichlorobenzene	BMDL	<5,000	<500	<10	BMDL
1,2-Dichlorobenzene	BMDL	<5,000	<500	<10	BMDL
1,4-Dichlorobenzene	BMDL	<5,000	<500	<10	BMDL
Tetrachloroethene**	1.6	53,000	15,000	210	BMDL

NOTE: *Presence indicated but less than stated Method Detection Limit of 500 ppb (Dilution Factor: 1:500)
**From Photo Ionization Detector
Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Thomas E. Endres
Laboratory Manager

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

ory Name: CH2M HILL/MGM
S11327

| Sample Number |
| 11327001 |

ORGANICS ANALYSIS DATA SHEET
(Page 2)

SEMIVOLATILE COMPOUNDS

ration: LOW
tracted/Prepared: 06/07/88
alyzed: 06/22/88
l Factor: 1.
Moisture: (Decanted)

GPC Cleanup ___ Yes _1_ No
Separatory Funnel Extraction ___ Yes
Continuous Liquid-Liquid Extraction ___ Yes

ber		ug/L		CAS Number		ug/L	
2	Phenol	10	U	99-09-2	3-Nitroaniline	50	U
	Aniline	10	U	83-32-9	Acenaphthene	10	U
4	bis(2-Chloroethyl)Ether	10	U	51-28-5	2,4-Dinitrophenol	50	U
	2-Chlorophenol	10	U	100-02-7	4-Nitrophenol	50	U
	1,3-Dichlorobenzene	10	U	132-64-9	Dibenzofuran	10	U
/	1,4-Dichlorobenzene	10	U	121-14-2	2,4-Dinitrotoluene	10	U
5	Benzyl Alcohol	10	U	84-66-2	Diethyl Phthalate	10	U
	1,2-Dichlorobenzene	10	U	7005-72-3	4-Chlorophenyl-phenylether	10	U
	2-Methylphenol	10	U	86-73-7	Fluorene	10	U
2-9	bis(2-Chloroisopropyl)Ether	10	U	100-10-6	4-Nitroaniline	50	U
3	4-Methylphenol	10	U	534-52-1	4,6-Dinitro-2-Methylphenol	50	U
	N-Nitroso-Di-n-Propylamine	10	U	86-30-6	N-Nitrosodiphenylamine (1)	10	U
	Hexachloroethane	10	U	101-55-3	4-Bromophenyl-phenylether	10	U
	Nitrobenzene	10	U	118-74-1	Hexachlorobenzene	10	U
	Isophorone	10	U	87-86-5	Pentachlorophenol	10	U
5	2-Nitrophenol	10	U	85-01-8	Phenanthrene	10	U
-9	2,4-Dimethylphenol	10	U	120-12-7	Anthracene	10	U
	Benzoic Acid	50	U	84-74-2	Di-n-Butylphthalate	10	U
-1	bis(2-Chloroethoxy)Methane	10	U	206-44-0	Fluoranthene	10	U
-2	2,4-Dichlorophenol	10	U	129-00-0	Pyrene	10	U
-1	1,2,4-Trichlorobenzene	10	U	85-68-7	Butylbenzylphthalate	10	U
5	Naphthalene	2	J	1746-01-6	Tetrachlorodibenzo-p-dioxin	10	U
-8	4-Chloroaniline	10	U	91-94-1	3,3'-Dichlorobenzidine	20	U
	Hexachlorobutadiene	10	U	56-55-3	Benzo(a)Anthracene	10	U
	4-Chloro-3-Methylphenol	10	U	117-81-7	bis(2-Ethylhexyl)Phthalate	140	
	2-Methylnaphthalene	9	J	218-01-9	Chrysene	10	U
3	Hexachlorocyclopentadiene	10	U	117-84-0	Di-n-Octyl Phthalate	10	U
2	2,4,6-Trichlorophenol	10	U	205-99-2	Benzo(b)Fluoranthene	10	U
1	2,4,5-Trichlorophenol	50	U	207-08-9	Benzo(k)Fluoranthene	10	U
7	2-Chloronaphthalene	10	U	50-32-8	Benzo(a)Pyrene	10	U
3	2-Nitroaniline	50	U	193-39-5	Indeno(1,2,3-cd)Pyrene	10	U
-3	Dimethyl Phthalate	10	U	53-70-3	Dibenz(a,h)Anthracene	10	U
-8	Acenaphthylene	10	U	191-24-2	Benzo(g,h,i)Perylene	10	U
-2	2,6-Dinitrotoluene	10	U				

Compound analyzed for but not detected.
mpound was detected in QC blank.
Reported value less than quantitation limit.

CH2M HILL ENVIRONMENTAL LABORATORIES
7201 NW ELEVENTH PLACE
P.O. DRAWER 1647
GAINESVILLE, FLORIDA 32602

STATE OF FLORIDA
CERTIFICATION NUMBERS: 82112; E82124

07/06/88

REPORT OF ANALYSIS

Sample No. 54416

Client: CITY OF DELRAY
Attention: BOB WRIGHT
Address: DFB OFFICE

Project No. SEF24708.A4
Received: 05/31/88

Description of Sample:

WATER
Collected on 05/26/88 by DERRICK WILLIAMS

54416

MW 2

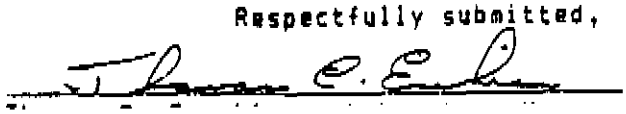
PARAMETER	
METALS	
Antimony	<0.2
Arsenic	<0.002 *
Beryllium	<0.01
Cadmium	0.0005
Chromium, Total	<0.05
Copper	0.025
Lead, Total	0.005
Nickel	<0.05
Selenium	<0.001
Silver	<0.02
Thallium	<0.5
Zinc	<0.01

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

* Analyzed by Method of Standard Addition.

Analyses performed in accordance with methods approved by the USEPA

Respectfully submitted,



Appendix H
Analytical Results
Split Sampling with Aero-Dri Consultant
August 4, 1988

CH2M HILL ENVIRONMENTAL LABORATORIES
201 N.W. 11th Place, P.O. Box 1647
Gainesville, Florida 32602
904/377-2442
State of Florida Certification No.: 82112, E82124

Sample Nos. 56439-56467
Number of Samples: 29
Date Completed: 08/17/88
Date Reported: 8/19/88

REPORT OF ANALYSIS

Client: City of Delray
Attention: Mark Morris, Dawn Sanders
Address: CH2M HILL Deerfield Beach Office

Project No. SEF24708.A9.04
Received: 08/06/88

Description of Sample: Water
Location:
Collected on 08/04/88 by Greg Ford
Samples were iced and chemically preserved

EPA Method 601	#56439 MWC-4A (ppb)	#56440 MWC-4B (ppb)	#56441 MWC-4C (ppb)	#56442 MWC-2C (ppb)	#56443 MWC-2B (ppb)	#56444 MWC-2A (ppb)
Chloromethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Bromomethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Vinyl Chloride	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Chloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Dichloromethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,1-Dichloroethene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,1-Dichloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Trans-1,2-Dichloroethene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Chloroform	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,1,1-Trichloroethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Carbon Tetrachloride	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Dichlorobromomethane	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichloropropane and Cis-1,3-Dichloropropene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Trichloroethene	BMDL	1.2	1.1	BMDL	BMDL	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Bromoform	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	3.3	5.0	8.5	BMDL	1.7	BMDL

NOTE: Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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

EPA Method 602	#56439 MWC-4A (ppb)	#56440 MWC-4B (ppb)	#56441 MWC-4C (ppb)	#56442 MWC-2C (ppb)	#56443 MWC-2B (ppb)	#56444 MWC-2A (ppb)
Tert-Butyl Methyl Ether	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Benzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Toluene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Chlorobenzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Ethyl Benzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
o-,m- and p-Xylene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,3-Dichlorobenzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,2-Dichlorobenzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
1,4-Dichlorobenzene	BMDL	BMDL	BMDL	BMDL	BMDL	BMDL
Tetrachloroethene*	3.0	4.1	7.4	BMDL	1.7	BMDL

NOTE: *From Photo Ionization Detector
Method Detection Limit = 1 ppb
unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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EPA Method 601	#56445 E.B. (ppb)	#56446 MWC-1A (ppb)	#56447 MWC-1B (ppb)	#56448 MWC-1C (ppb)	#56449 MW-3 (ppb)	#56450 MW-4 (ppb)
Chloromethane	BMDL	<100	<100	BMDL	BMDL	BMDL
Bromomethane	BMDL	<100	<100	BMDL	BMDL	BMDL
Vinyl Chloride	BMDL	<100	<100	BMDL	BMDL	BMDL
Chloroethane	BMDL	<100	<100	BMDL	BMDL	BMDL
Dichloromethane	BMDL	<100	<100	BMDL	BMDL	BMDL
1,1-Dichloroethene	BMDL	<100	<100	BMDL	BMDL	BMDL
1,1-Dichloroethane	BMDL	<100	<100	BMDL	BMDL	BMDL
Trans-1,2-Dichloroethene	BMDL	<100	<100	BMDL	9.3*	BMDL
Chloroform	BMDL	<100	<100	1.5	BMDL	1.0
1,2-Dichloroethane	BMDL	<100	<100	BMDL	BMDL	BMDL
1,1,1-Trichloroethane	BMDL	<100	<100	BMDL	BMDL	BMDL
Carbon Tetrachloride	BMDL	<100	<100	BMDL	BMDL	BMDL
Dichlorobromomethane	BMDL	<100	<100	BMDL	BMDL	BMDL
1,2-Dichloropropane and Cis-1,3-Dichloropropene	BMDL	<100	<100	BMDL	BMDL	BMDL
Trichloroethene	BMDL	<100	<100	BMDL	29	BMDL
Dibromochloromethane and 1,2-Trichloroethane and Trans-1,3,-Dichloropropene	BMDL	<100	<100	BMDL	BMDL	BMDL
Bromoform	BMDL	<100	<100	BMDL	BMDL	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	BMDL	3000	1100	BMDL	30	BMDL
EPA Method 602						
Tert-Butyl Methyl Ether	BMDL	<100	<100	BMDL	BMDL	BMDL
Benzene	BMDL	<100	<100	BMDL	BMDL	BMDL
Toluene	BMDL	<100	<100	BMDL	BMDL	BMDL
Chlorobenzene	BMDL	<100	<100	BMDL	BMDL	BMDL
Ethyl Benzene	BMDL	<100	<100	BMDL	BMDL	BMDL
o-,m- and p-Xylene	BMDL	<100	<100	BMDL	BMDL	BMDL
1,3-Dichlorobenzene	BMDL	<100	<100	BMDL	BMDL	BMDL
1,2-Dichlorobenzene	BMDL	<100	<100	BMDL	BMDL	BMDL
1,4-Dichlorobenzene	BMDL	<100	<100	BMDL	BMDL	BMDL
Tetrachloroethene**	BMDL	2900	1100	BMDL	29	BMDL

NOTE: *Data suggests presence of mixed CIS and Trans isomers. Quanitation based on Trans isomers.
**From Photo Ionization Detector
Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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EPA Method 601	#56451 E.B. (ppb)	#56452 MW-1 (ppb)	#56453 MW-2 (ppb)	#56454 MWC-3A (ppb)	#56455 MWC-3B (ppb)	#56456 MW-5 (ppb)
Chloromethane	BMDL	<100	<5000	BMDL	BMDL	BMDL
Bromomethane	BMDL	<100	<5000	BMDL	BMDL	BMDL
Vinyl Chloride	BMDL	<100	<5000	BMDL	BMDL	BMDL
Chloroethane	BMDL	<100	<5000	BMDL	BMDL	BMDL
Dichloromethane	BMDL	<100	<5000	BMDL	BMDL	BMDL
1,1-Dichloroethene	BMDL	<100	<5000	BMDL	BMDL	BMDL
1,1-Dichloroethane	BMDL	<100	<5000	BMDL	BMDL	BMDL
Trans-1,2-Dichloroethene	BMDL	<100	<5000	BMDL	BMDL	BMDL
Chloroform	BMDL	<100	<5000	BMDL	BMDL	BMDL
1,2-Dichloroethane	BMDL	<100	<5000	BMDL	BMDL	BMDL
1,1,1-Trichloroethane	BMDL	<100	<5000	BMDL	BMDL	BMDL
Carbon Tetrachloride	BMDL	<100	<5000	BMDL	BMDL	BMDL
Dichlorobromomethane	BMDL	<100	<5000	BMDL	BMDL	BMDL
1,2-Dichloropropane and Cis-1,3-Dichloropropene	BMDL	<100	<5000	BMDL	BMDL	BMDL
Trichloroethene	BMDL	96*	<5000	BMDL	BMDL	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	BMDL	<100	<5000	BMDL	BMDL	BMDL
Bromoform	BMDL	<100	<5000	BMDL	BMDL	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	BMDL	3900	66,000	BMDL	BMDL	25
EPA Method 602						
Tert-Butyl Methyl Ether	BMDL	<100	<5000	BMDL	BMDL	BMDL
Benzene	BMDL	<100	<5000	BMDL	BMDL	BMDL
Toluene	BMDL	<100	<5000	BMDL	BMDL	12
Chlorobenzene	BMDL	<100	<5000	BMDL	BMDL	BMDL
Ethyl Benzene	BMDL	<100	<5000	BMDL	BMDL	3.7
o-,m- and p-Xylene	BMDL	<100	<5000	BMDL	BMDL	17
1,3-Dichlorobenzene	BMDL	<100	<5000	BMDL	BMDL	BMDL
1,2-Dichlorobenzene	BMDL	<100	<5000	BMDL	BMDL	BMDL
1,4-Dichlorobenzene	BMDL	<100	<5000	BMDL	BMDL	BMDL
Tetrachloroethene**	BMDL	3700	63,000	BMDL	BMDL	24

NOTE: *Presence indicated but less than stated Method Detection Limit of 100 ppb (Dilution Factor: 1:100)
**From Photo Ionization Detector
Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

J. Thomas C. Erwin
Laboratory Manager

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

EPA Method 601	#56457 MW-6 (ppb)	#56458 MWC-5A (ppb)	#56459 MWC-5B (ppb)	#56460 E.B. (ppb)	#56461 PW-25 (ppb)	#56462 PW-22 (ppb)
Chloromethane	<100	<100	<10	BMDL	<10	BMDL
Bromomethane	<100	<100	<10	BMDL	<10	BMDL
Vinyl Chloride	<100	<100	<10	BMDL	<10	BMDL
Chloroethane	<100	<100	<10	BMDL	<10	BMDL
Dichloromethane	<100	<100	<10	BMDL	<10	BMDL
1,1-Dichloroethene	<100	<100	<10	BMDL	<10	BMDL
1,1-Dichloroethane	<100	<100	<10	BMDL	<10	BMDL
Trans-1,2-Dichloroethene	<100	<100	<10	BMDL	80**	11**
Chloroform	<100	<100	<10	BMDL	<10	BMDL
1,2-Dichloroethane	<100	<100	<10	BMDL	<10	BMDL
1,1,1-Trichloroethane	<100	<100	<10	BMDL	<10	BMDL
Carbon Tetrachloride	<100	<100	<10	BMDL	<10	BMDL
Dichlorobromomethane	<100	<100	<10	BMDL	<10	BMDL
1,2-Dichloropropane and Cis-1,3-Dichloropropene	<100	<100	<10	BMDL	<10	BMDL
Trichloroethene	<100	<100	<10	BMDL	39	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	<100	<100	<10	BMDL	<10	BMDL
Bromoform	<100	<100	<10	BMDL	<10	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	2700	1300	310	BMDL	340	BMDL
EPA Method 602						
Tert-Butyl Methyl Ether	<100	<100	<10	BMDL	<10	BMDL
Benzene	<100	<100	<10	BMDL	<10	BMDL
Toluene	<100	<100	<10	BMDL	<10	BMDL
Chlorobenzene	<100	<100	<10	BMDL	<10	BMDL
Ethyl Benzene	<100	<100	<10	BMDL	<10	BMDL
o-,m- and p-Xylene	<100	<100	<10	BMDL	<10	BMDL
1,3-Dichlorobenzene	<100	<100	<10	BMDL	<10	BMDL
1,2-Dichlorobenzene	<100	<100	<10	BMDL	<10	BMDL
1,4-Dichlorobenzene	<100	<100	<10	BMDL	<10	BMDL
Tetrachloroethene*	2800	1300	310	BMDL	360	BMDL

NOTE: *From Photo Ionization Detector
**Data suggests presence of mixed CIS and trans isomers. Quanitation based on trans isomers.
Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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

EPA Method 601	#56463 PW-26 (ppb)	#56464 PW-23 (ppb)	#56465 T.B. (ppb)	#56466 MWC-6A (ppb)	#56467 MWC-6B (ppb)
Chloromethane	BMDL	BMDL	BMDL	<10	BMDL
Bromomethane	BMDL	BMDL	BMDL	<10	BMDL
Vinyl Chloride	BMDL	BMDL	BMDL	<10	BMDL
Chloroethane	BMDL	BMDL	BMDL	<10	BMDL
Dichloromethane	BMDL	BMDL	BMDL	<10	BMDL
1,1-Dichloroethane	BMDL	BMDL	BMDL	<10	BMDL
1,1-Dichloroethane	BMDL	BMDL	BMDL	<10	BMDL
Trans-1,2-Dichloroethene	BMDL	1.2**	BMDL	<10	BMDL
Chloroform	BMDL	BMDL	BMDL	<10	BMDL
1,2-Dichloroethane	BMDL	BMDL	BMDL	<10	BMDL
1,1,1-Trichloroethane	BMDL	BMDL	BMDL	<10	BMDL
Carbon Tetrachloride	BMDL	BMDL	BMDL	<10	BMDL
Dichlorobromomethane	BMDL	BMDL	BMDL	<10	BMDL
1,2-Dichloropropane and Cis-1,3-Dichloropropene	BMDL	BMDL	BMDL	<10	BMDL
Trichloroethene	BMDL	4.6	BMDL	<10	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	BMDL	BMDL	BMDL	<10	BMDL
Bromoform	BMDL	BMDL	BMDL	<10	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	BMDL	26	BMDL	520	8.0
EPA Method 602					
Tert-Butyl Methyl Ether	BMDL	BMDL	BMDL	<10	BMDL
Benzene	BMDL	BMDL	BMDL	<10	BMDL
Toluene	BMDL	BMDL	BMDL	<10	BMDL
Chlorobenzene	BMDL	BMDL	BMDL	<10	BMDL
Ethyl Benzene	BMDL	BMDL	BMDL	<10	BMDL
o-,m- and p-Xylene	BMDL	BMDL	BMDL	<10	BMDL
1,3-Dichlorobenzene	BMDL	BMDL	BMDL	<10	BMDL
1,2-Dichlorobenzene	BMDL	BMDL	BMDL	<10	BMDL
1,4-Dichlorobenzene	BMDL	BMDL	BMDL	<10	BMDL
Tetrachloroethene*	BMDL	28	BMDL	560	7.3

NOTE: *From Photo Ionization Detector
**Data suggests presence of mixed CIS and trans isomers. Quanitation based on trans isomers.
Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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CH2M HILL ENVIRONMENTAL LABORATORIES
7201 N.W. 11th Place, P.O. Box 1647
Gainesville, Florida 32602
904/377-2442
State of Florida Certification No.: 82112, E82124

Sample Nos. 56542-56543
Number of Samples: 2
Date Completed: 08/19/88
Date Reported: 08/24/88

REPORT OF ANALYSIS

Client: City of Delray
Attention: Mark Morris/Dawn Sanders/DFB
Address: CH2M HILL Deerfield Beach Office

Project No. SEF24708.A9
Received: 08/10/88

Description of Sample: Water Samples
Location:
Collected on 08/10/88 by Richard Nevalis
Samples were iced and chemically preserved

REVISED
10/04/88 MWS

EPA Method 601	#56542 Production Well 24 (ppb)	#56543 Travel Blank (ppb)
Chloromethane	<100	BMDL
Bromomethane	<100	BMDL
Vinyl Chloride	<100	BMDL
Chloroethane	<100	BMDL
Dichloromethane	<100	BMDL
1,1-Dichloroethene	<100	BMDL
1,1-Dichloroethane	<100	BMDL
Trans-1,2-Dichloroethene	93 (F), (T)	BMDL
Chloroform	<100	BMDL
1,2-Dichloroethane	<100	BMDL
1,1,1-Trichloroethane	<100	BMDL
Carbon Tetrachloride	<100	BMDL
Dichlorobromomethane	<100	BMDL
1,2-Dichloropropane and Cis-1,3-Dichloropropene	<100	BMDL
Trichloroethene	77 (F)	BMDL
Dibromochloromethane and 1,1,2-Trichloroethane and Trans-1,3,-Dichloropropene	<100	BMDL
Bromoform	<100	BMDL
Tetrachloroethene and 1,1,2,2-Tetrachloroethane	770	BMDL

NOTE: (F) Presence indicated but less than stated Method Detection Limit of ppb (Dilution Factor: 1:)
(T) Data suggests presence of mixed CIS and Trans isomers. Quanitation based on Trans isomers.
Method Detection Limit = 1 ppb unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Laboratory Manager

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

REVISED

10/04/88 mws

EPA Method 602	#56542 Production Well 24 (ppb)	#56543 Travel Blank (ppb)
Tert-Butyl Methyl Ether	<100	BMDL
Benzene	<100	BMDL
Toluene	<100	1.0
Chlorobenzene	<100	BMDL
Ethyl Benzene	<100	BMDL
o-,m- and p-Xylene	<100	BMDL
1,3-Dichlorobenzene	<100	BMDL
1,2-Dichlorobenzene	<100	BMDL
1,4-Dichlorobenzene	<100	BMDL
Tetrachloroethene (P)	480	BMDL

NOTE: (P) From Photo Ionization Detector
Method Detection Limit = 1 ppb
unless specified otherwise
ppb = Parts per billion
BMDL = Below Method Detection Limit

Respectfully submitted,

Thomas E. Erskine
Laboratory Manager

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

Appendix I
Results of the Groundwater Flow Modeling of the 20-Series Well Field

GROUNDWATER FLOW MODELING OF THE 20-SERIES WELL FIELD FOR THE CITY OF DELRAY BEACH

INTRODUCTION

LOCATION

The City of Delray Beach is located in southeastern Palm Beach County. The City currently maintains three well fields, the North, the South, and the 20-Series (Figure 1). The North and South Well Fields consist of 17 production wells along Swinton Avenue, from N.E. 8th Street south to 10th Street. Both of these well fields currently have a permitted capacity of approximately 7.0 million gallons per day (mgd). The 20-Series Well Field is the City's largest capacity well field and is permitted to pump 8.8 mgd. The well field consists of six production wells (PW-21 through PW-26) located along S.W. 15th Avenue between S.W. 7th Street and Royal Palm Drive.

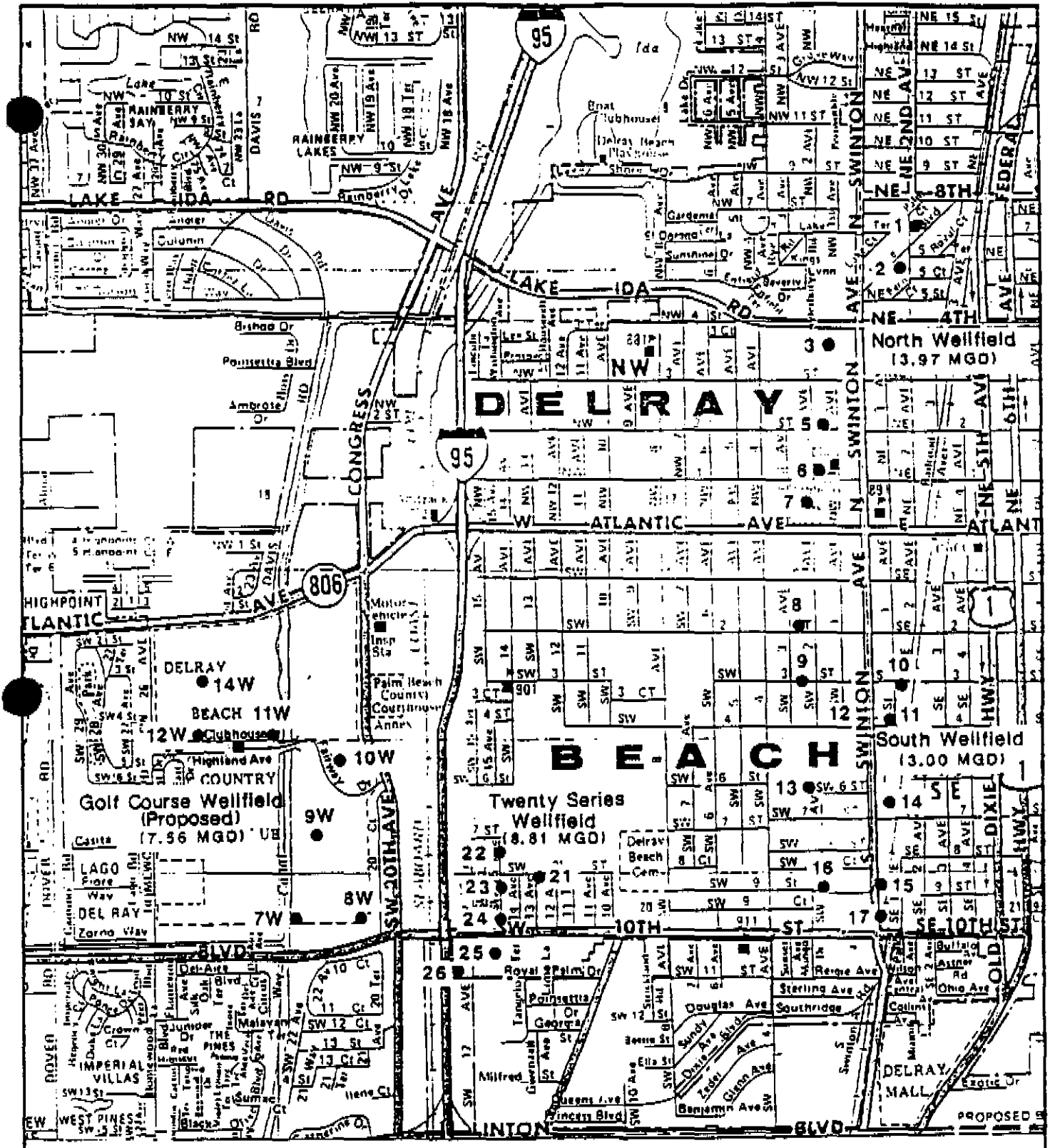
A fourth well field (Figure 1) is under construction within the property boundaries of the Delray Beach Municipal Golf Course. This well field is referred to as the Golf Course Well Field and comprises seven wells between Atlantic Avenue to the north, Lowson Boulevard to the South, Congress Avenue to the east, and Homewood Boulevard (S.W. 26th Avenue) to the west. The well field is scheduled to be in operation by the fall of 1988, and will have a permitted capacity of 7.5 mgd.

For purposes of this report, the study area encompassed all of the well fields; however, the 20-Series and Golf Course Well Fields were emphasized.

BACKGROUND

The City of Delray Beach 20-Series Well Field was found to be contaminated with the volatile organic solvents tetrachloroethene (PCE) and trichloroethene (TCE) in July 1987. Before this discovery, this well field had provided a steady source of water since its installation in the late 1970s.

After the discovery of contamination in the 20-Series Well Field, five of the six wells were shut down. Production Well 26 (PW-26) has continued operating, since levels of contamination in this well have been below the State of Florida established maximum contaminant level (MCL). Four of the wells were recently equipped with granulated activated carbon (GAC) units to remedy the contamination and provide a safe water supply. PW-21 has not been equipped with a GAC



0 1/4 1/2

Scale in Miles

LEGEND

● CITY OF DELRAY BEACH PRODUCTION WELLS

(3.97) REPRESENTS TOTAL PERMITTED YIELD FROM WELLFIELD

FIGURE 1

LOCATION OF CITY OF DELRAY BEACH'S WELLFIELDS

CH2M HILL

unit and has therefore remained out of service. Figure 2 depicts the 20-Series Well Field and the production wells with GAC units installed.

The Florida Department of Environmental Regulation (FDER) has identified Aero-Dri, a division of Davie Compressor, as the suspected source of contamination. Aero-Dri overhauls compressors and related equipment and is located approximately 1,000 feet southeast of the 20-Series Well Field (Figure 2).

During a meeting between the South Florida Water Management District (SFWMD) and the City on February 10, 1988, SFWMD expressed concern about the possibility of known contaminants within the bounds of the 20-Series Well Field migrating towards the Golf Course Well Field once it becomes operational. They stated that before operation of the Golf Course Well Field would be allowed, the City must demonstrate that contamination in the 20-Series Well Field would not migrate towards the operating Golf Course Well Field.

One method of estimating the ability of the 20-Series Well Field to contain the known extent of the contaminant plume and prevent it from migrating towards the City's other well fields is through groundwater flow and contaminant transport modeling. However, the necessary information to accurately perform contaminant transport modeling, are unavailable. The data required include: (1) the time when the contaminant discharge occurred, (2) the magnitude of the discharge, (3) the length of time for which the discharge occurred, and (4) the concentration of the constituents that made up the discharge material. Without these data, contaminant transport models are ineffective.

As an alternative, a groundwater flow model was used in conjunction with a particle tracking routine to trace the movement of groundwater towards the well fields over time. The particle tracking routine uses the water levels simulated by the groundwater flow model to determine the velocity field of the resulting groundwater flow patterns. Although unable to estimate contaminant concentrations, this routine can clearly illustrate the simulated movement of groundwater and contaminants in the well field areas.

PURPOSE

CH2M HILL conducted the groundwater flow modeling effort to:

1. Simulate the groundwater behavior within the study area and the effects of the well fields on the groundwater flow.

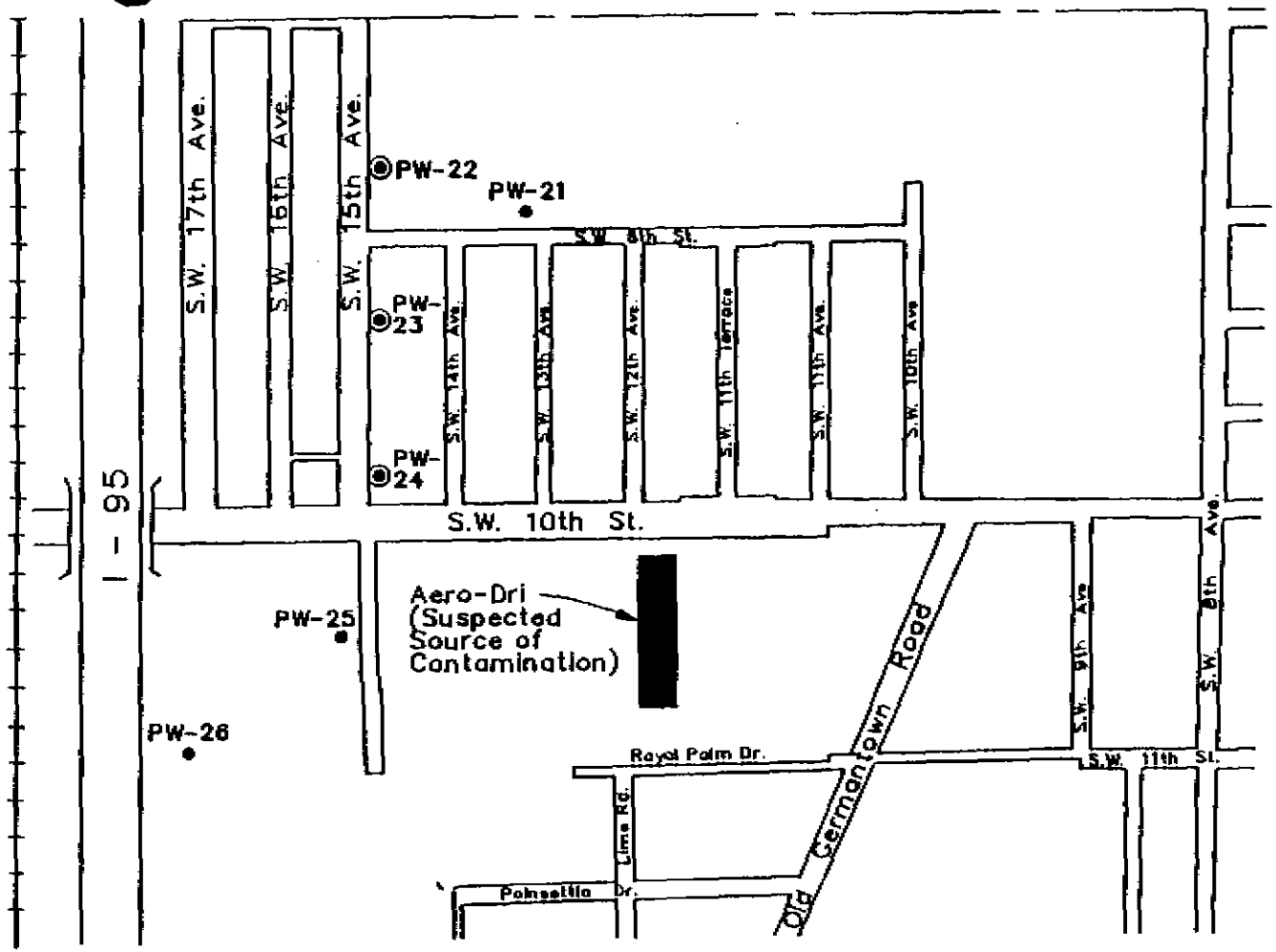


FIGURE 2

Locations of "20-Series" Wellfield and suspected Source of Contamination

-2.DWG

2. Trace the path of water particles during the period preceding the discovery of contamination in the 20-Series Well Field.

3. Trace the path of water in the 20-Series Well Field during the period after the discovery of contamination when production wells were turned on and off.

4. Evaluate operation of the 20-Series Well Field and estimate the necessary pumpage to prevent the contaminant plume from migrating towards the Golf Course Well Field.

5. Make recommendations regarding the operation of the 20-Series and Golf Course Well Fields, and the establishment of an early-warning monitor well network.

HYDROGEOLOGY

The well fields in Delray Beach withdraw groundwater from the unconfined surficial aquifer. Most of the production wells are constructed to a total depth of 130 to 150 feet below land surface (bls). The production interval of these wells extends from approximately 100 feet bls to the total depth of the wells.

The geology of the surficial aquifer in the vicinity of Delray Beach is composed of the Pamlico Sand and Anastasia formations. Lithologic logs from two wells in the Golf Course Well Field show fine to medium sand to approximately 70 feet bls. Calcareous sandstone with shell fragments are found below the sand layers to approximately 200 feet bls. The bottom of the surficial aquifer is bounded by layers of clay and silt beds.

Pumping tests conducted by other City consultants on the Golf Course Well Field indicated that the portion of the aquifer tapped by the production wells responds as an unconfined aquifer. No laterally-persistent confining layers appear to be present above 200 feet bls.

Water levels in the surficial aquifer range from 8 feet above the national geodetic vertical datum (NGVD) to less than zero feet NGVD near the City's North and South Well Fields. The direction of regional groundwater flow appears to be towards the east-southeast (Land et al., 1973), but canals and pumping well fields tend to alter and intercept the flow patterns. The primary source of recharge to the aquifer is rainfall; however, some of the recharge is provided through canal leakage, particularly near the pumping well fields.

MODEL DESCRIPTION

Groundwater conditions were simulated by using a computer code developed by the U.S. Geological Survey (McDonald and Harbaugh, 1984). The code, MODFLOW, simulates three-dimensional transient or steady-state groundwater flow for confined or unconfined aquifers by applying a numerical solution technique to solve groundwater flow equations. To adequately simulate groundwater flow, aquifer characteristics and other effects on the groundwater must be estimated and entered into the computer program during the model setup and calibration.

The particle tracking routine uses the water level distributions in the aquifer provided by the groundwater flow model to determine the velocity field of the resulting groundwater flow. It then releases an imaginary water particle at the center of each computational cell in the model grid and tracks it until it is either captured by a pumping well or terminates along the model grid boundary. The tracks of these particles outline the areas of the grid that contribute flow to each of the wells.

The particle tracking maps were superimposed on a base map showing the estimated contaminated areas. By showing the approximate particle flow lines along with the estimated contaminated areas, potential migration of the contaminant plume was evaluated for various pumping periods.

MODEL SETUP

An appropriate modeled area was chosen to include hydrologic factors that may significantly affect water levels in the areas of interest. The surface water bodies surrounding the City of Delray Beach provided convenient hydrologic boundaries for the model. The northern, southern, and western boundaries were delineated by canals that are controlled by the Lake Worth Drainage District. The Intracoastal Waterway provided the eastern boundary.

The model grid was constructed over the modeled area and encompassed all significant hydrologic boundaries and the North, South, 20-Series, and Golf Course Well Fields. By reducing the grid spacing in the area of the 20-Series and Golf Course Well Fields, a focused and more accurate estimate of the groundwater movement in these areas was obtained. A larger grid spacing was used around the North and South Well Fields because their influences were considered remote from the areas of concern (i.e., the 20-Series and Golf Course Well Fields).

Initial estimates of the areal hydrologic characteristics were derived from several sources of information. The hydraulic conductivity, specific yield, and thickness of the aquifer were obtained from published values (Russel and Axon, 1984; Schroeder et al., 1958) and compared with other models that have been used in the area (Palm Beach County Well Field Protection Ordinance, 1987). The effects of canals on groundwater levels were estimated from publications (Miller, 1984), communication with SFWMD, and data from the Lake Worth Drainage District.

MODEL CALIBRATION

Initial estimates of the model parameters were adjusted in the calibration process to ensure an accurate simulation of observed hydrologic conditions. Groundwater levels were measured in non-pumping wells at the North, South, 20-Series, and Golf Course Well Fields on April 1, 1988. Water level measurements were also collected from a series of U.S. Geological Survey monitor wells. All measurements were made in reference to NGVD.

The goal of the calibration phase was to recreate the hydrologic conditions leading up to April 1, 1988, and match the observed and simulated groundwater levels as closely as possible. Calibration runs of the model included distinct time frames representing nine pumping periods preceding April 1, 1988, in the City's operational well fields. The pumping data was based on information originating from the City's water treatment plant (WTP).

SENSITIVITY ANALYSIS

Groundwater flow is affected by many hydrologic factors, the significance of which may vary. A sensitivity analysis was therefore performed to observe which hydrologic characteristics have the greatest effect on the groundwater flow in the area. The analysis involved changing certain variable parameters and observing the changes in water level distribution across the modeled area. This is an important procedure for those characteristics, such as canal conductance, evapotranspiration, and recharge, which cannot or have not been accurately measured. The results of the analysis showed that aquifer tranmissivity and hydrologic conductance between the canals and groundwater in the well field areas had the most significant effects on groundwater levels.

After completion of calibration and the sensitivity analysis, the model was used to simulate past, present, and future conditions of the aquifer.

HISTORICAL SIMULATIONS

Since the detection of contamination in the 20-Series Well Field in July 1987, a number of the production wells have been operated intermittently. To demonstrate how the contaminant plume traveled in the well field during the period from the initial detection of contamination to when contamination had been detected in all six 20-Series wells, a series of transient groundwater flow simulations were run. These runs depicted changes in the pumping scheme of the 20-Series Well Field and the associated groundwater level distributions. With the aid of the particle tracking program, flow lines were generated and capture zones for each well were delineated. Three scenarios were developed to illustrate major changes in well field pumpage schemes, and also to reveal how the contaminant plume was spread throughout the well field.

Since the full horizontal extent of the contaminant plume has not been clearly defined, the contaminant plume can only be delineated around the production wells that have revealed contamination. The contaminant plume depicted in the figures contained in this report is for illustration only and does not reflect the contamination outside the bounds of the production wells.

PERIOD 1--PRIOR TO SEPTEMBER 31, 1987 (STEADY STATE)

This initial pumping period was modeled as a steady-state pumping condition to simulate groundwater flow in the aquifer when all wells were pumping at their historical flow rates. Information obtained from well field pumpage records indicated that all 20-Series wells were pumping before September 31, 1987.

By September 31, 1987, contamination had been detected in PW-21, PW-23, and PW-24. Figure 3 depicts the simulated steady-state groundwater levels generated by MODFLOW and the approximate extent of the known contaminant plume at that time. Contamination above the MCL had not yet been detected in PW-25 or PW-26. Some contamination was found in PW-22 on August 27, 1987, but later analytical results indicated that no contamination was present in PW-22 at the time of this simulation.

The groundwater level contours depicted in Figure 3 represent groundwater elevations in reference to NGVD. Groundwater flow is caused by changes in groundwater elevations over a horizontal distance, and the direction of flow is usually perpendicular to the groundwater level contours. In this case, Figure 3 depicts groundwater flow as converging towards the 20-Series Well Field. Dissolved contaminants in the

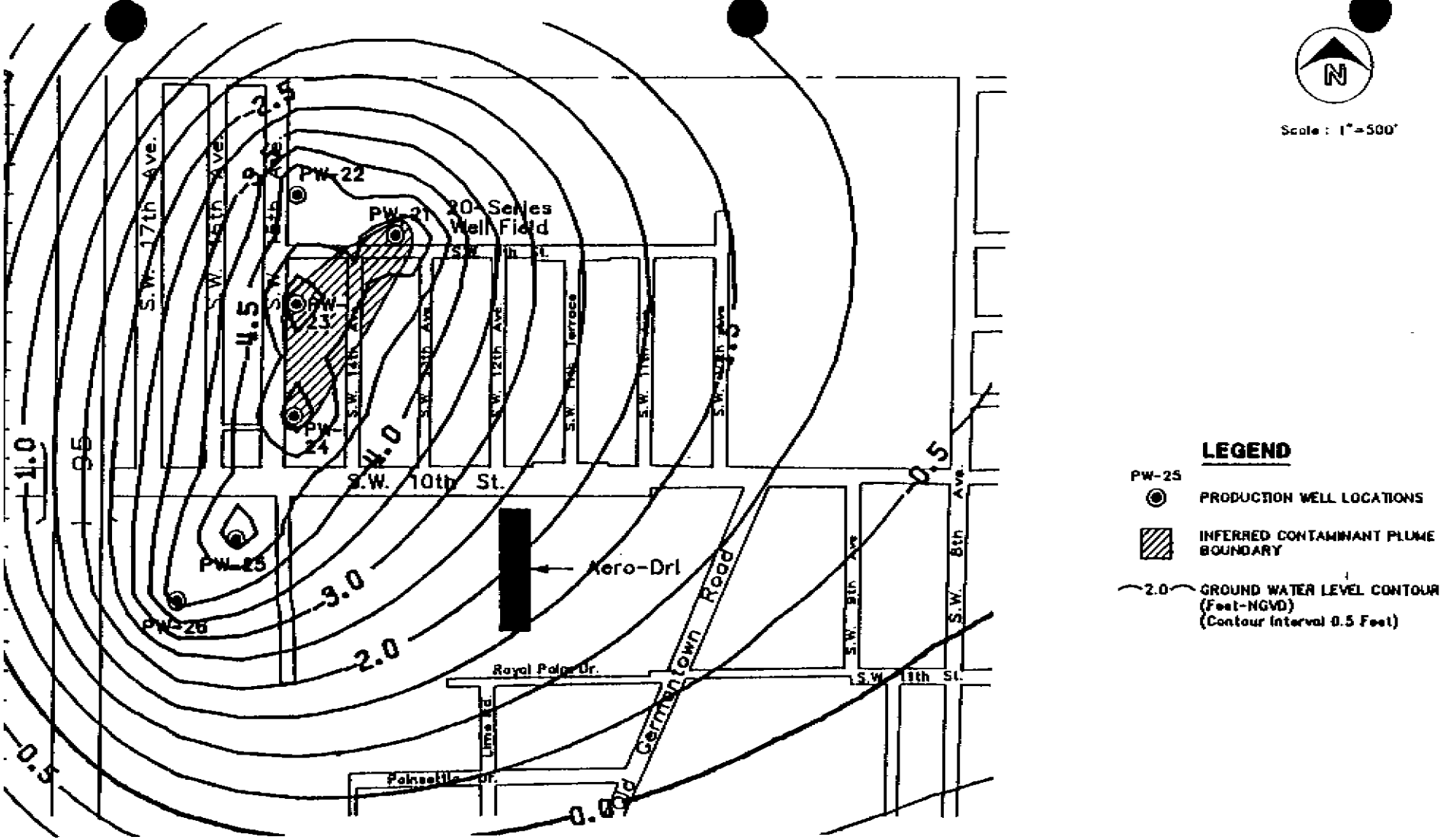


FIGURE 3

Steady-State Ground Water Level Contours-Period 1 (Prior to September 31, 1987)

groundwater generally follow the flow paths of the groundwater and would therefore be converging towards the well field also.

PERIOD 2--FROM OCTOBER 1, 1987 TO JANUARY 28, 1988

After contamination was confirmed to be above the MCL in PW-21, PW-23, and PW-24, these wells were taken out of service to prevent contamination from entering the finished water at the WTP. During this period, mechanical failures in the pumps forced shutdown of PW-25 and PW-26. PW-25 was restored to service by December 21, 1987, and and PW-26 by January 6, 1988. During the last 22 days of this time period, PW-22, PW-25, and PW-26 were operational, and PW-21, PW-23, and PW-24 were out of service.

By January 28, 1988, contamination exceeding the MCL was found in PW-22 and PW-25. No contamination had yet been detected in PW-26. Figure 4 depicts the simulated groundwater level distribution in the aquifer and the estimated contaminant plume boundary at the end of this pumping period.

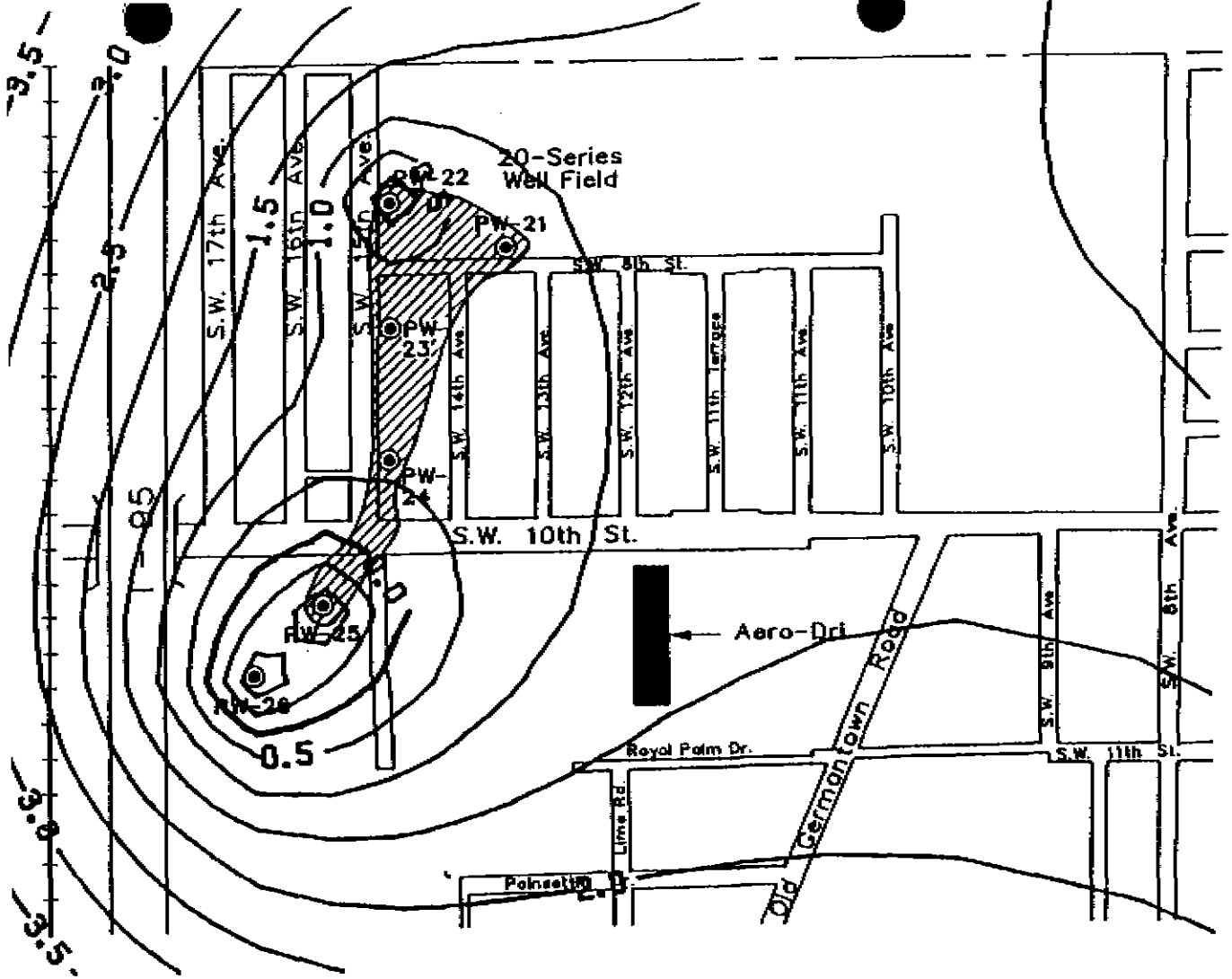
Figure 5 depicts the flow lines generated by the particle tracking routine. The flow lines help illustrate how the contaminant plume spread from the area surrounding PW-21, PW-23, and PW-24 to the areas surrounding PW-22 and PW-25. Also note that an apparent groundwater divide occurs east of the 20-Series Well Field. A groundwater divide is a groundwater mound where water flow is split into two opposite directions, perpendicular to the divide.

PERIOD 3--JANUARY 29 TO MARCH 26, 1988

When contamination in PW-22 and PW-25 exceeded the MCL, the City shut down these wells. During this period, GAC units were being installed on PW-22, PW-23, and PW-24. Only the North and South Well Fields and PW-26 were available to meet the City's raw water demand.

Although installation and startup of the GAC units on PW-22, PW-23, and PW-24 were completed within 3 weeks, contamination was found in PW-26, the City's remaining, previously uncontaminated 20-Series production well. Although contamination levels increased during the 3 weeks preceding GAC installation, MCLs were never exceeded.

Figure 6 depicts the simulated water level distribution in the aquifer and the approximated contaminant plume boundary at the end of this transient pumping period. Figure 7 depicts the flow lines generated by the particle tracking routine.



N

Scale : 1"=500'

LEGEND

PW-25 — PRODUCTION WELL LOCATIONS

INFERRED CONTAMINANT PLUME BOUNDARY

1.0 — GROUND WATER LEVEL CONTOUR (Feet-NGVD) (Contour Interval 0.5 Feet)

FIGURE 4

Simulated Ground Water Level Contours-Period 2 (Prior to January 28, 1988)

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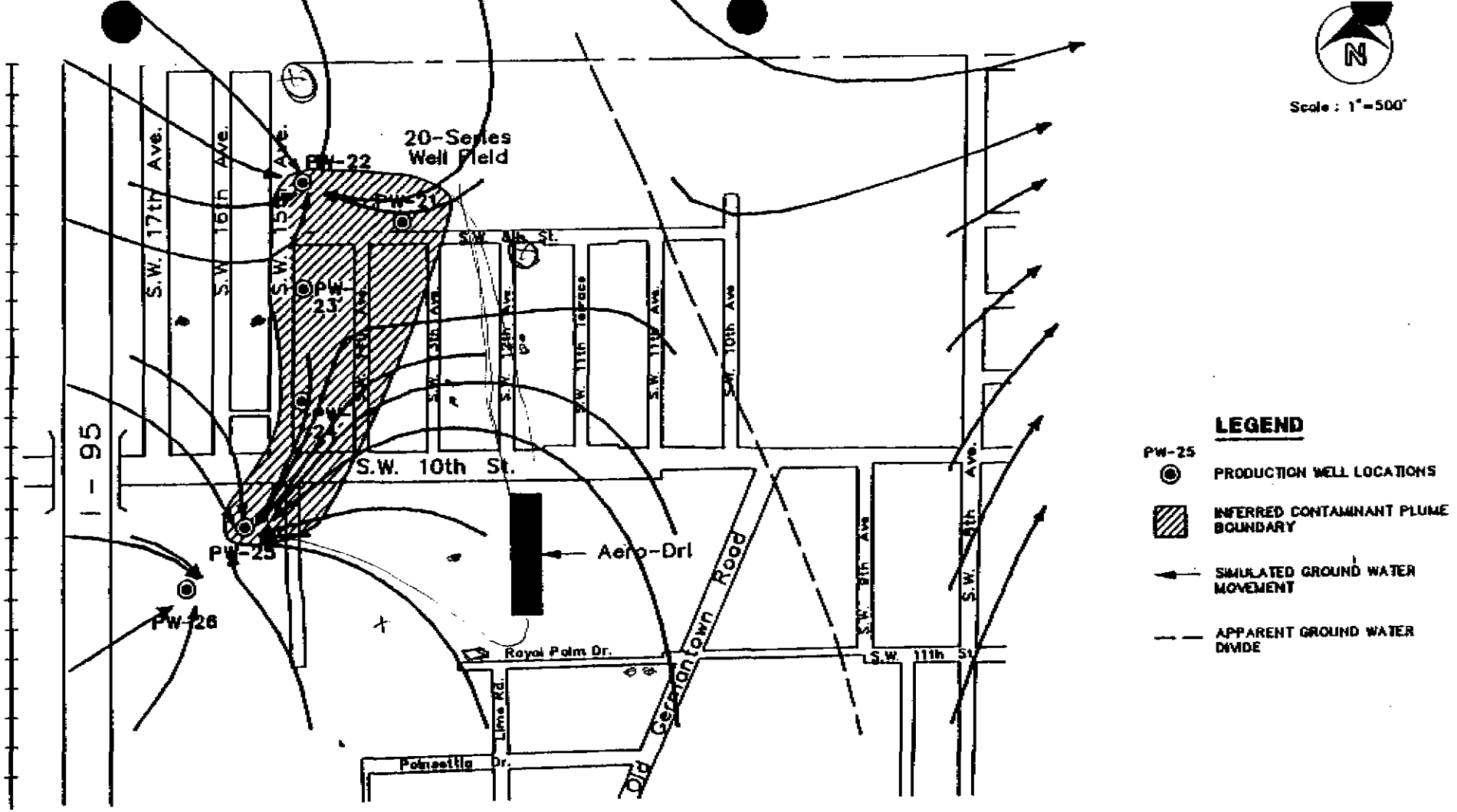

FIGURE 5

Simulated Ground Water
Flow Lines-Period 2
(Prior to January 28, 1988)

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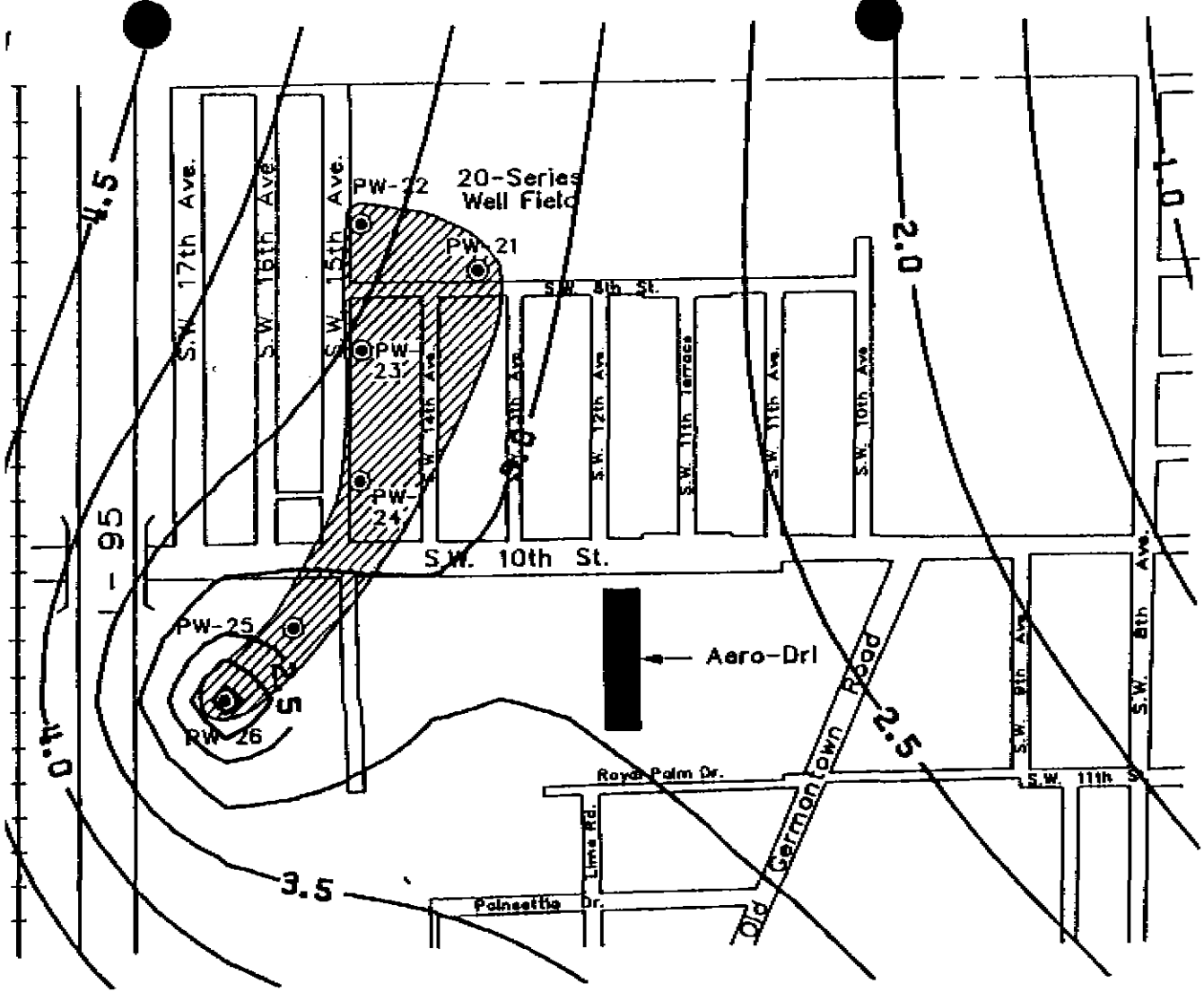

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Scale : 1"=500'

LEGEND

PW-25 — PRODUCTION WELL LOCATIONS

INFERRED CONTAMINANT PLUME BOUNDARY

3.0 — GROUND WATER LEVEL CONTOUR (Feet-NGVD) (Contour Interval 0.5 Feet)

FIGURE 6

Simulated Ground Water Level Contours-Period 3 (Prior to March 26, 1988)

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F6.DWG

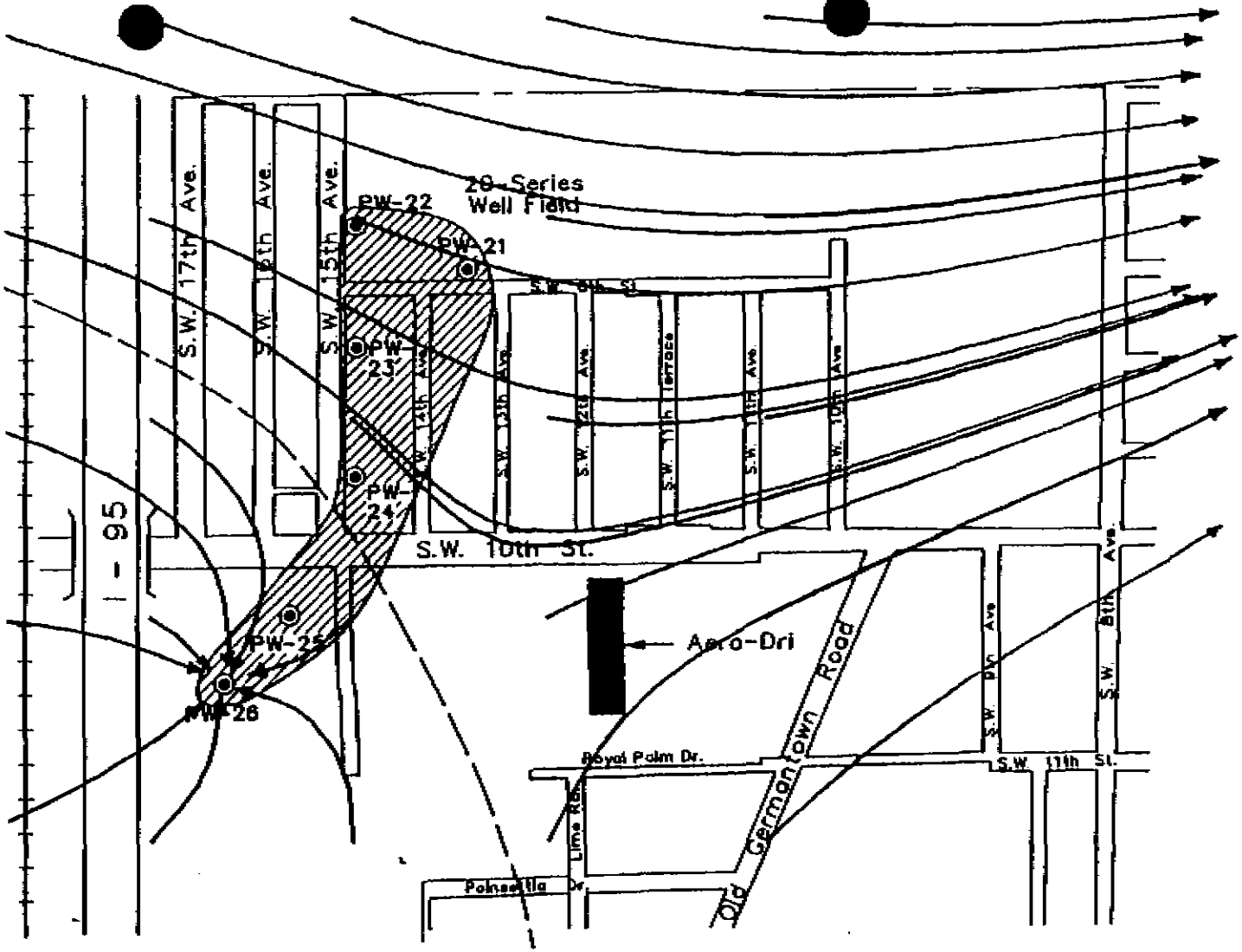

FIGURE 7

Simulated Ground Water
Flow Lines-Period 3
(March 26, 1988)

.DWG

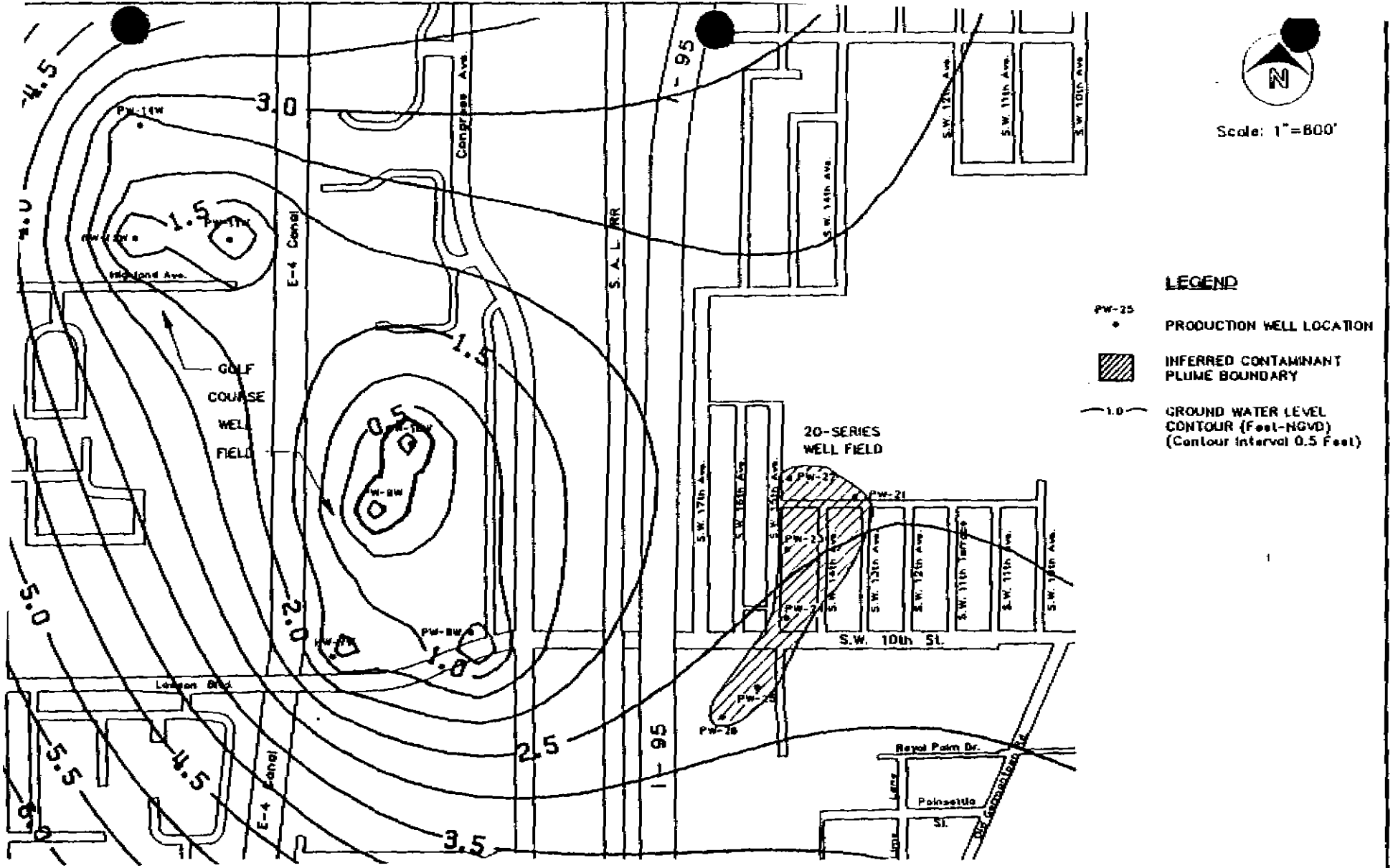

FIGURE 8

Simulated Ground Water Level Contours-Golf Course Wells On/20-Series Wells Off

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The flow lines show how the contaminant plume spread from the area surrounding PW-21, through PW-25, and to the area surrounding PW-26.

The sequence of pumping periods and the changing approximated plume boundaries reflect the mobility of contaminants within the influence of the pumping wells, and substantiate the importance of maintaining a consistent pumping schedule within the well field. The groundwater flow model, which has provided insight into the past movements of the contaminants, can also predict future paths of contaminants once the Golf Course Well Field becomes operational.

PREDICTIVE SIMULATIONS

Predictive simulations were performed to estimate the future impact of the Golf Course Well Field on groundwater levels in the area, especially near the contaminated 20-Series Well Field. Before the well field is put into service, groundwater effects of the production wells must be evaluated with respect to the movement of contamination from the 20-Series Well Field toward the Golf Course Well Field. The Golf Course Well Field is expected to be operational by the fall of 1988.

After the Golf Course Well Field is put into service, potential risks can be evaluated by analyzing best case and worst case scenarios. The greatest risk to the Golf Course Well Field occurs if the 20-Series Well Field becomes inoperative. The resulting groundwater flow pattern would provide the most likely scenario for contaminant migration towards the Golf Course wells. The safest scenario would be when all 20-Series wells are pumping. Both scenarios were simulated with MODFLOW and the particle tracking routine.

Figure 8 shows the predicted groundwater levels when the Golf Course wells are operating at their permitted capacity (7.5 mgd) and the 20-Series wells are not operating. Without the 20-Series wells pumping, the Golf Course wells appear to influence the groundwater surrounding the 20-Series Well Field. Figure 9 shows the predicted paths the groundwater and contaminants could follow under this pumping scenario. The simulation predicts that contaminated groundwater within the 20-Series Well Field area could eventually be drawn towards PW-8W, PW-9W, and PW-10W in the Golf Course Well Field. In addition, the flow lines in Figure 9 show that contaminated groundwater may also migrate to the east, toward the City's South Well Field.

Figure 10 shows the predicted groundwater levels that would occur when all wells in the Golf Course and 20-Series Well Fields are operational. Influences from the 20-Series wells extend approximately 1,600 feet to the west and buffer the

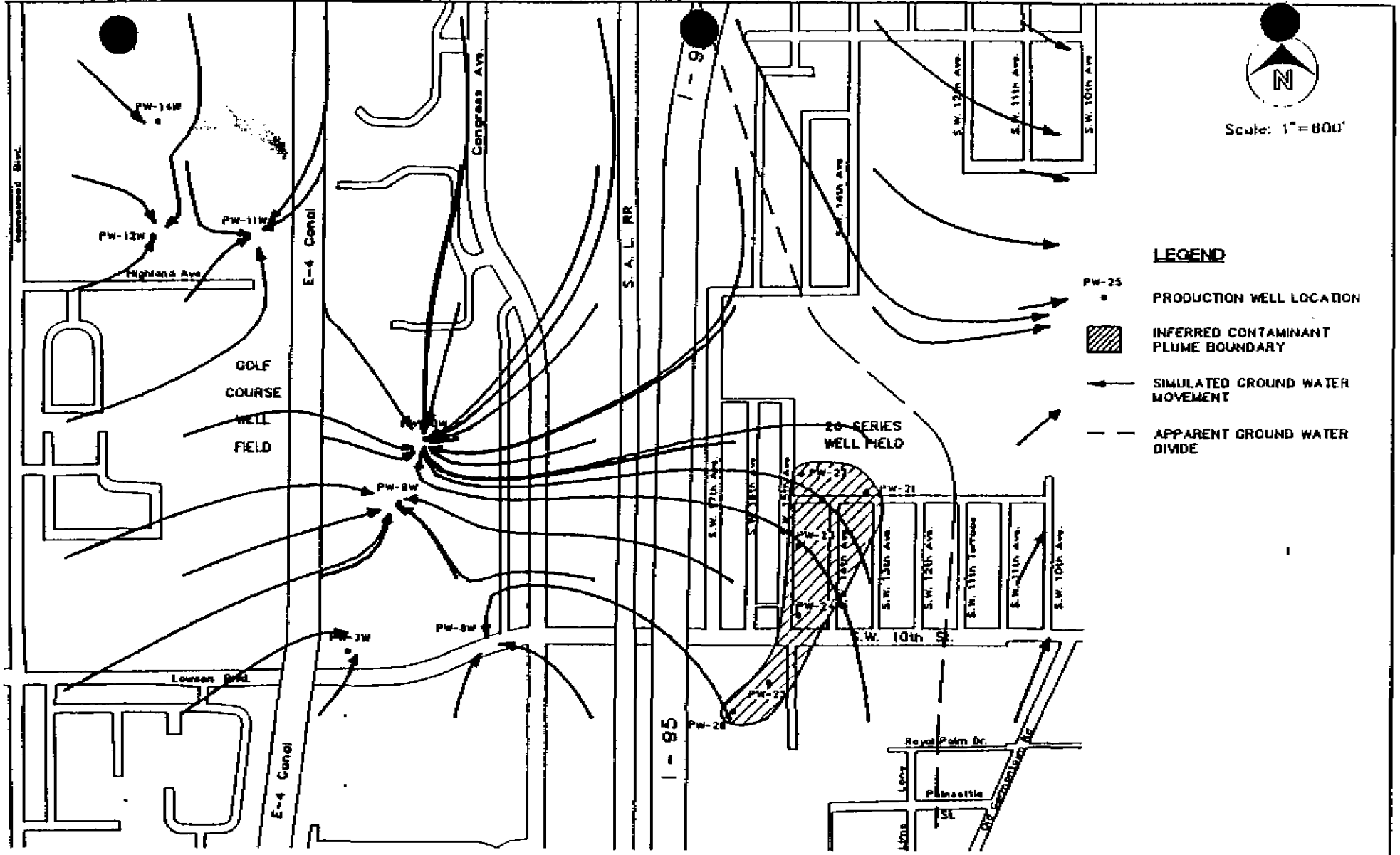

FIGURE 9

Simulated Ground Water Flow Lines-Golf Course Wells On/20-Series Wells Off

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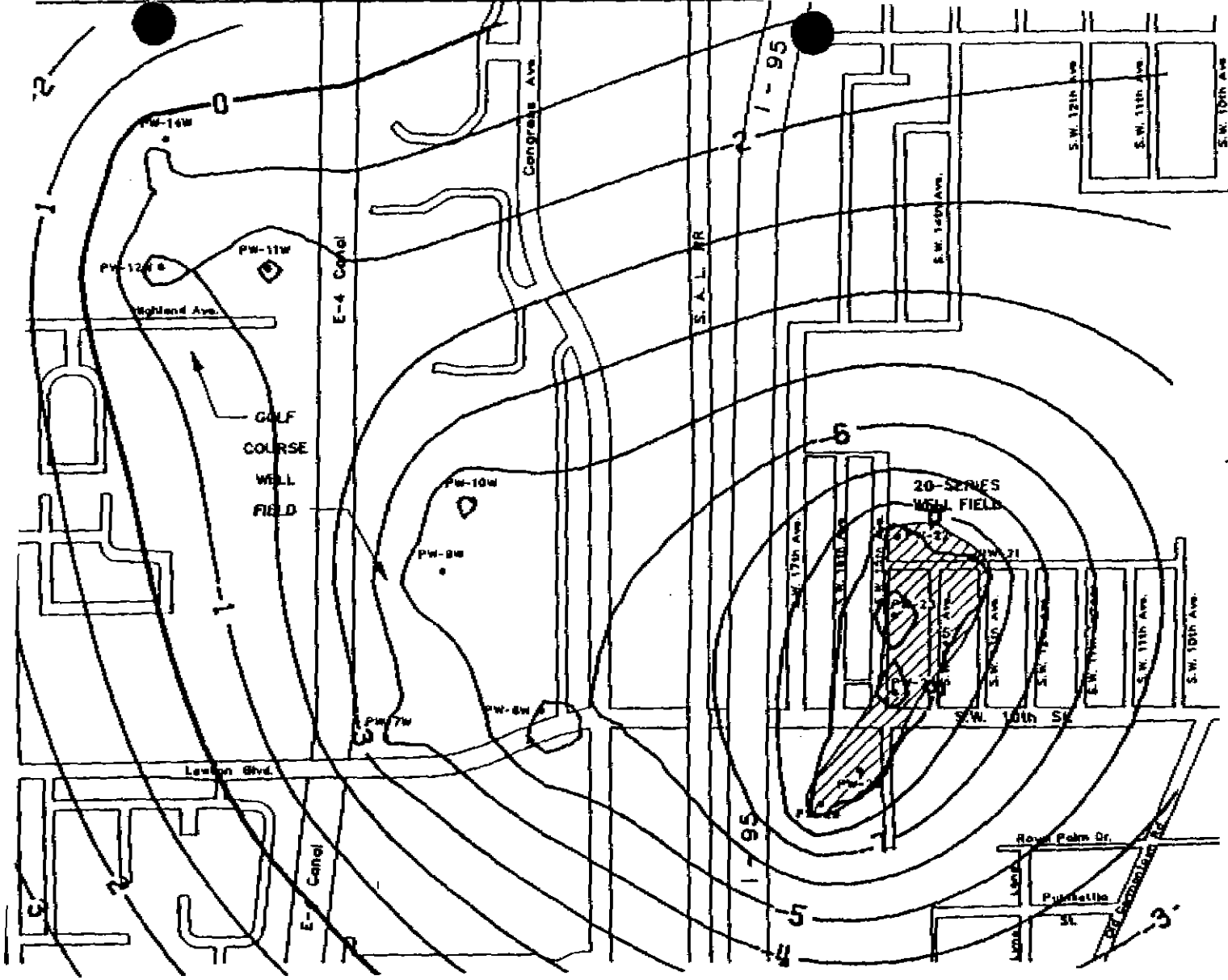

FIGURE 10

Simulated Ground Water Level Contours-Golf Course Wells On/20-Series Wells On

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effects of the Golf Course Well Field on the contaminated area. This is shown in Figure 11 with the flow lines and by the presence of a groundwater divide just to the west of Congress Avenue. The presence of the groundwater divide is important in preventing the Golf Course Well Field from influencing contaminated groundwater from the 20-Series Well Field area.

It is likely that at least one well in the 20-Series Well Field will become inoperative for a period of time. For this scenario, PW-24 was chosen to be simulated as inoperative because it is centrally located in the well field and is expected to be an effective deterrent to the encroaching influences of the Golf Course Well Field. Figure 12 shows the predicted groundwater levels, and Figure 13 illustrates the predicted groundwater flow paths for this scenario. Little change is evident in the flow paths between these two figures and Figures 10 and 11. Note that the location of the groundwater divide also remains unchanged.

The absence of one well in the 20-Series Well Field apparently has minimal impact on the eastern extent of the Golf Course Well Field influence; however, removing more than one 20-Series production well from service would possibly cause the protective groundwater divide to move further east. This would shift the influence of the Golf Course well field further east also, and increase the chances of drawing contamination towards the production wells as was predicted in Figures 8 and 9.

CONCLUSIONS AND RECOMMENDATIONS

The City of Delray Beach has three operational well fields--the North, South, and 20-Series--and one well field under construction (the Golf Course Well Field). These well fields tap the unconfined surficial aquifer and are vulnerable to above-ground sources of contamination.

The 20-Series Well Field was found to be contaminated in July 1987 with solvent-type volatile organic compounds, PCE and TCE. The alleged source of the contamination is a compressor rebuilder, Aero-Dri Corp., a division of Davie Compressor. Aero-Dri is located approximately 1,000 feet southeast of the 20-Series Well Field, the City's largest capacity well field.

The Golf Course Well Field, located approximately 2,000 feet west of the contaminated 20-Series Well Field, is expected to be operational by the fall of 1988. Because of the proximity of the Golf Course Well Field to the known area of contamination, the City must demonstrate to SFWMD that the contaminant plume is likely to be contained within the area

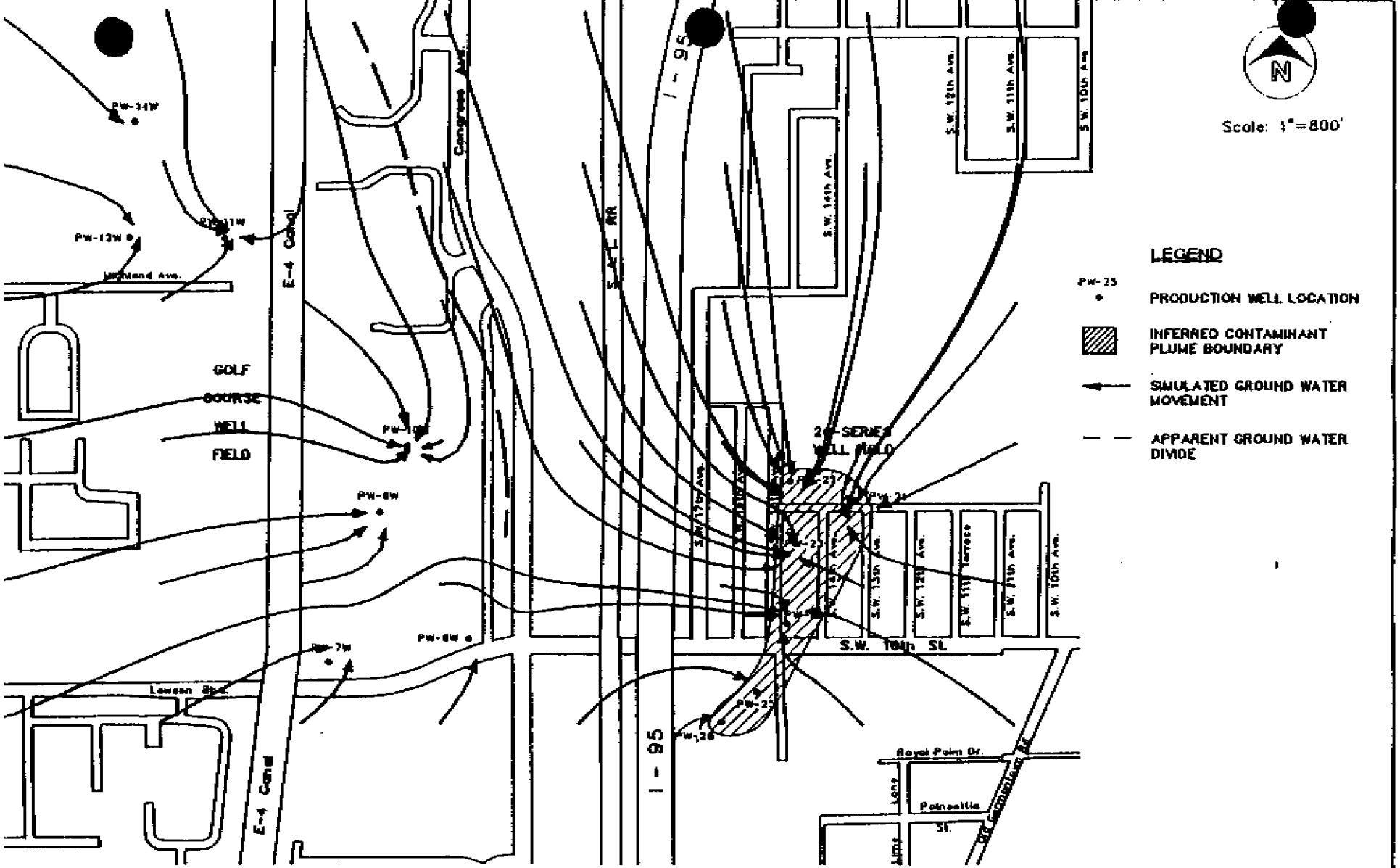

FIGURE 11

Simulated Ground Water Flow Lines-Golf Course Wells On/20-Series Wells On

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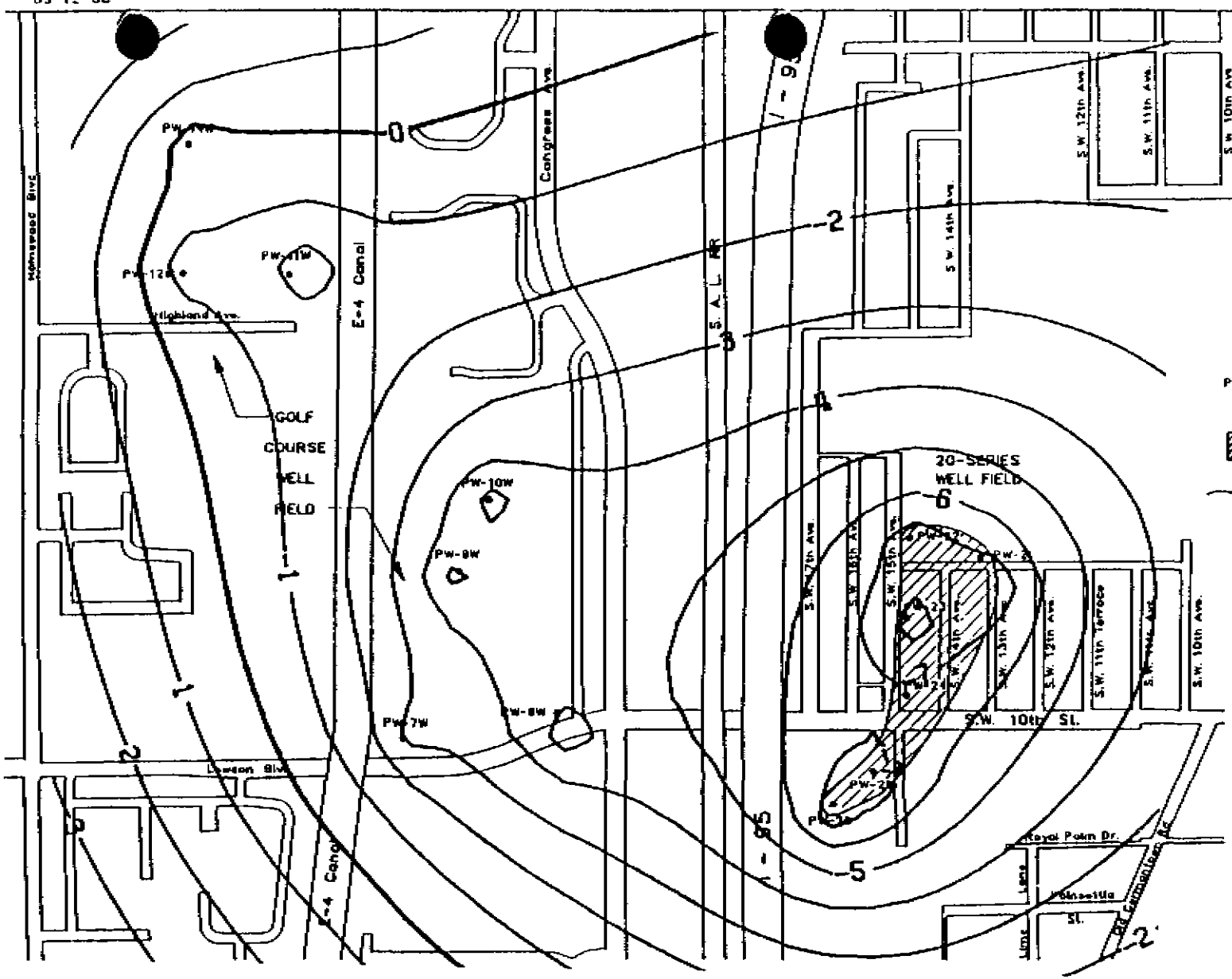

FIGURE 12

Simulated Ground Water Level Contours-Golf Course Wells On/ 20-Series PW-24 Off

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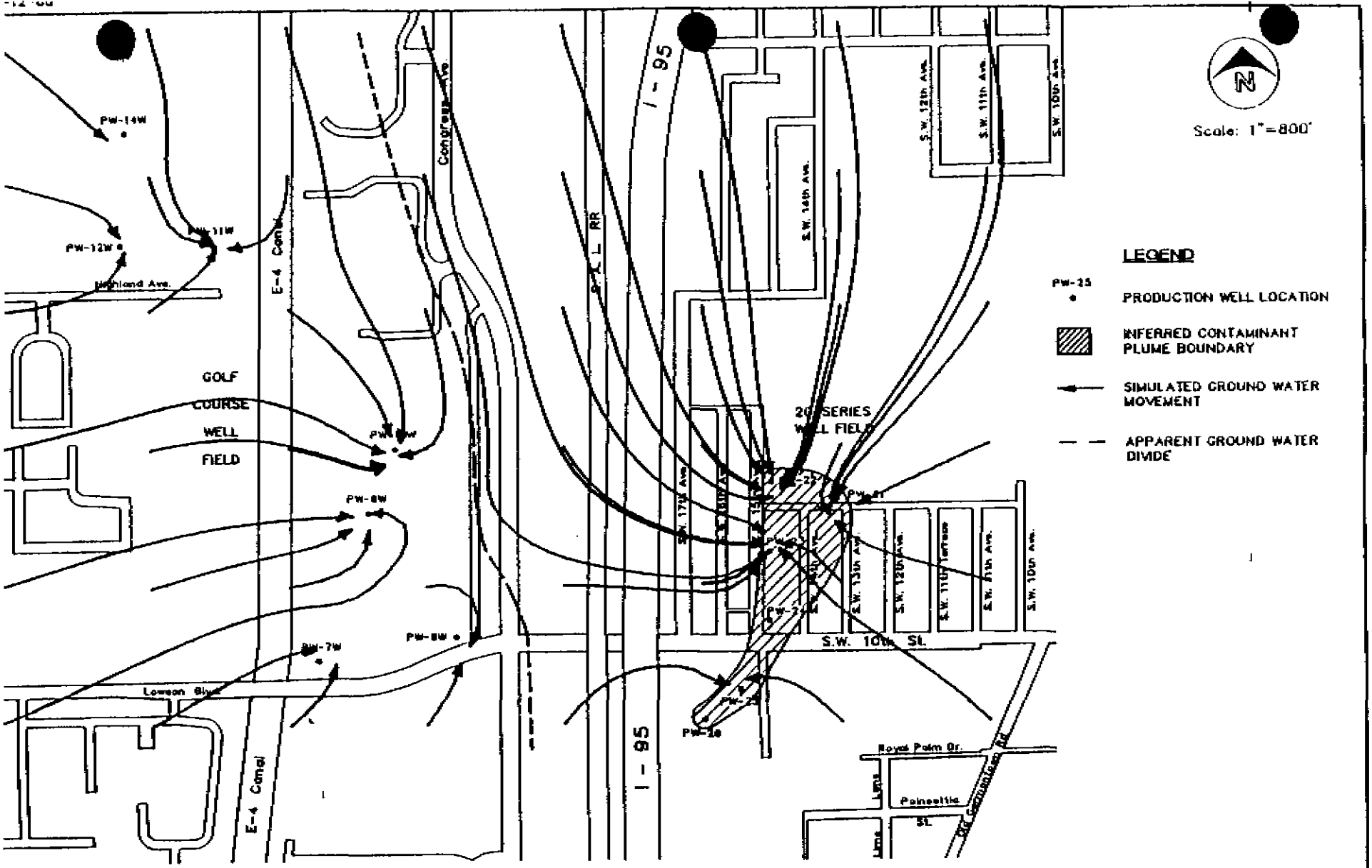

FIGURE 13

Simulated Ground Water Flow Lines-Golf Course Wells On / 20-Series PW-24 Off

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of the 20-Series Well Field. Groundwater and contaminant plume movement was estimated by using a flow model and particle tracking routine.

The results of the groundwater flow modeling and particle tracking predicted that if the Golf Course Well Field becomes operational, the 20-Series Well Field must also be operated. If all the 20-Series wells are turned off, the modeling projected that the influence of the Golf Course Well Field would extend to the east and possibly permit contaminant migration towards PW-8W, PW-9W, and PW-10W. The modeling also suggested that without pumping the 20-Series wells, the influence of the South Well Field wells and the natural groundwater gradient may allow contamination to migrate towards the South Well Field.

The results of the simulations also predicted that if all production wells in the 20-Series Well Field are operational while the Golf Course wells are pumping, the known extent of the groundwater contamination should not migrate from the influence of the 20-Series wells. This assumes that the area of contamination does not extend beyond what is depicted as the inferred plume boundary in previous figures.

In the event that a production well in the 20-Series Well Field becomes inoperative, the modeling predicted that the remaining five wells should be able to contain the contaminant plume. If more than one production well were out of service, the flow from PW-8W, PW-9W, and PW-10W in the Golf Course Well Field probably should be reduced by 50 percent until at least five 20-Series wells were again operational. It is also recommended that the City make repairs to the nonoperational well(s) as soon as possible.

An early-warning monitor well network would be helpful in protecting the Golf Course and South Well Fields. Regular groundwater sampling and analysis from the early-warning monitor wells would permit the City to track the movement of contaminants towards these well fields. Recommended locations of early-warning monitor wells are shown in Figure 14. Proposed Monitor Wells 1 and 2 would be used to monitor contaminant movement towards the Golf Course Well Field, and Monitor Well 3 would be used to monitor any movement of contamination towards the South Well Field. The monitor wells should be constructed into the 100- to 150-foot-bls production interval.

Once the early-warning monitor wells are installed, water samples should be collected and analyzed for the same volatile organic compounds detected in the 20-Series Well Field. These analytical results will provide baseline water quality data for comparison with subsequent sampling and analyses.

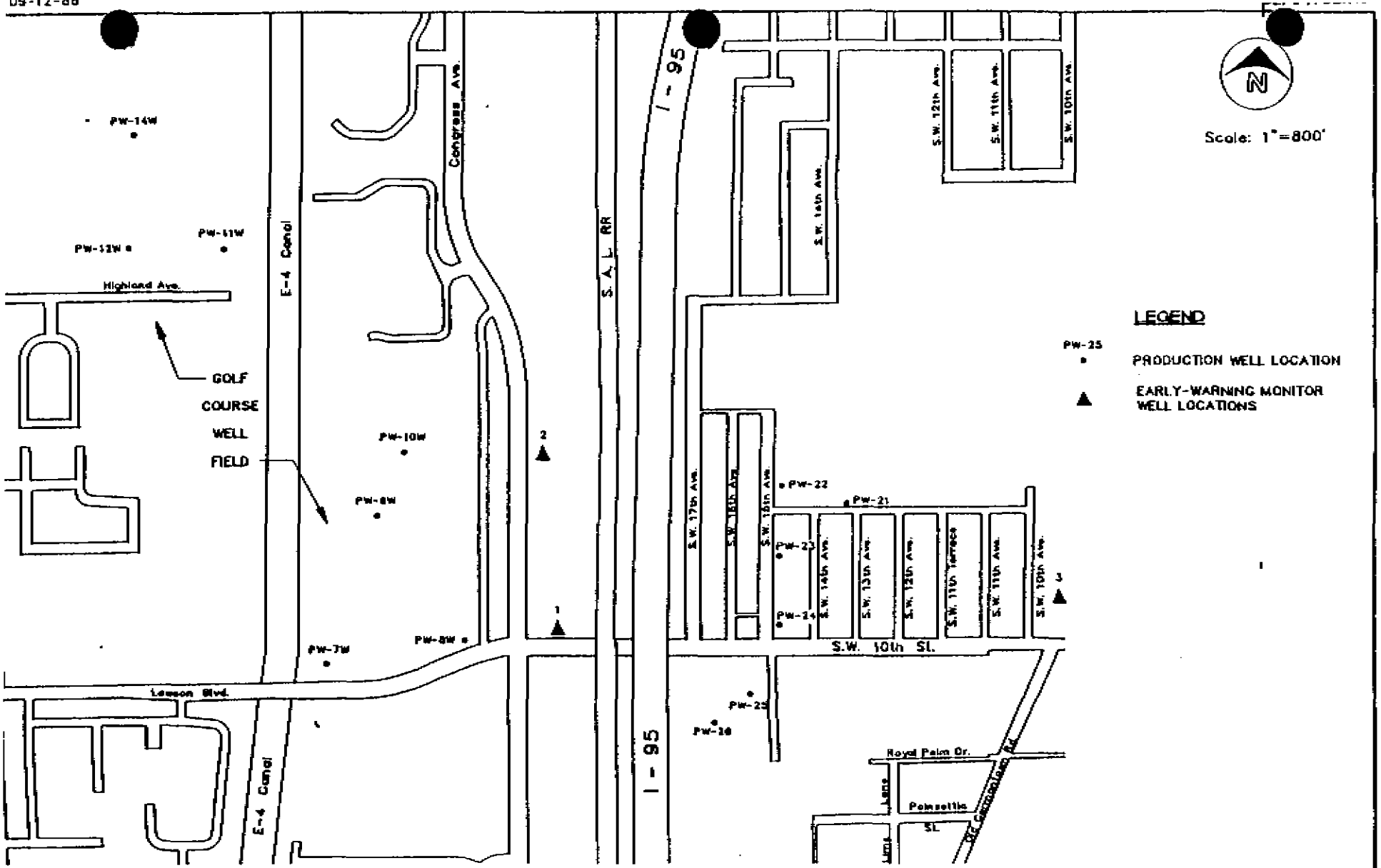

FIGURE 14

Locations of Suggested Early-Warning Monitor Wells

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714.DWG

ter the initial samples are collected and analyzed, quarterly sampling is recommended for the first year and semi-annual sampling thereafter.

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Land, L. F., H. G. Rodis, and J. J. Schneider. Appraisal of the Water Resources of Eastern Palm Beach County, Florida. Florida Bureau of Geology Report of Investigation 67. 1973.

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Schroeder, M. C., D. L. Milliken, and S. K. Love. Water Resources of Palm Beach County, Florida. U.S. Geological Survey Report of Investigations No. 13. 1954

Water Resources Management Advisory Board. Report of the Well Field Protection Ordinance Subcommittee. Palm Beach County, Florida. 1987.

GEOPHYSICAL WELL SURVEY

CLIENT City of Delray Beach Date July 20, 1988

Well No. G-2 Project No. SEF24708.A8

Location: State Florida County Palm Beach

___ ¼ ___ ¼ ___ ¼ Sec. ___ T. 46 ☐ N ■ S R 43 ■ E ☐ W

Logged by P. Kwiatkowski Observer L. Rainger

Owner: City of Delray Beach

Well: G-2

Driller: Ground Water Protection Date Drilled: JULY 1988

Surface Elevation: ___ ft. ☐ Estimated ☐ Measured Above MSL

T.D. Logged 113' T.D. Driller 115'

Hole Dia. 2" to 115'

Casing Dia. N/A

Finish: ☐ Open hole ☐ Screen ☐ Gravel ☐ Other

Water Level: 2 ft. ☐ Above ■ Below MP, A.P. ☐ Above ■ Below ■ Land Surface ☐ Pad Surface

Yield: Flow n/A gpm Pump ___ gpm

Drawdown: N/A ft. after ___ hours pumping @ ___ gpm

Use: ☐ Dom. ☐ Stock ☐ PS ☐ Ind. ☐ Irr. ■ Test ☐ Heating or cooling ☐ Drainage ☐ Disposal ☐ Obs.

Water Quality: N/A Drilling Mud

Temp. ___ °F; Sp.Cond. ___ ; Iron ___ mg/L

Cl⁻ ___ mg/L; $SO_4^=$ ___ mg/L; Total Hardness ___ mg/L

Color ___ Odor ___ Taste ___

Remarks: ___

Electric
- ☐ 16" Normal
- ☐ 64" Normal
- ☐ Single Point
- ☐ S.P.

- ☐ Caliper
- ☐ Fluid Resistivity
- ☐ Fluid Velocity
- ■ Gamma Ray
- ☐ Temperature

Log Scales

Electric Log

SP 40 millivolts/inch

Res. 20 ohm-meters/inch

Res. ___ ohms/inch

Fluid Resisvilivy

___ ohm meters/inch

@ ___ °F

Gamma Ray Log

10 Counts/sec/inch

Time Constant 4 sec.

Logging speed 25 FPM

Fluid Velocity

___ Counts/min/inch

___ FPM (Continuous)

Q = ___ gpm

Temperature

___ °F to ___ °F

Logging speed ___ FPM

Caliper

___ inches to ___ inches

Logging speed ___ FPM

Water Samples

Depths sampled: ___, ___, ___, ___, ___

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Hillsboro Executive Center North
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Deerfield Beach, Florida 33441
Palm Beach County—305/395-3800
Broward County—305/426-4008

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Tampa Florida 33607
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Pinellas County—813/536-9454

Sheet ____ of ____ File # ____

GEOPHYSICAL WELL SURVEY

CLIENT City of Delray Beach Date July 27, 1988

Well No. G-2 Project No [illegible]

Location: State Florida County Palm Beach

¼ ¼ ¼ Sec. ____ T. 46 ☐ N ■ S R 43 ■ E ☐ W

Logged by P. Kwiatkowski Observer [illegible]

Owner: City of Delray Beach

Well: G-2

Driller: Ground Water Protection Date Drilled July 1988

Surface Elevation: ____ ft ☐ Estimated ☐ Measured Above MSL

T.D. Logged 113' T.D. Driller 115'

Hole Dia. 2" to 115'

Casing Dia. N/A

Finish: ☐ Open hole ☐ Screen ☐ Gravel ☐ Other

Water Level: 2 ft ☐ Above ■ Below MP A" ☐ Above ■ Below ■ Land Surface ☐ Pad Surface

Yield Flow N/A gpm Pump ____ gpm

Drawdown N/A ft after ____ hours pumping @ ____ gpm

Use: ☐ Domestic ☐ Stock ☐ PS ☐ Irrig ☐ Ind ■ Test ☐ Heating or cooling ☐ Drainage ☐ Disposal ☐ Obs

Water Quality N/A Drilling Mud

Temp. ____ °F; Sp Cond ____ Iron ____ mg/L

Cl ____ mg/L SO_4 ____ mg/L Total Hardness ____ mg/L

Color ____ Odor ____ Taste ____

Remarks ____

☐ Electric
- ☐ 16" Normal
- ☐ 64" Normal
- ■ Single Point
- ■ S.P.

☐ Caliper
☐ Fluid Resistivity
☐ Fluid Velocity
☐ Gamma Ray
☐ Temperature

Log Scales

Electric Log

SP 40 millivolts/inch

Res 20 ohm-meters/inch

Res. ____ ohms/inch

Fluid Resistivity

____ ohm meters/inch

@ ____ °F

Gamma Ray Log

10 Counts/sec/inch

Time Constant 1 sec.

Logging speed 24 FPM

Fluid Velocity

____ Counts/min/inch

____ FPM (Continuous)

Q ____ gpm

Temperature

____ °F to ____ °F

Logging speed ____ FPM

Caliper

____ inches to ____ inches

Logging speed ____ FPM

Water Samples

Depths sampled ____, ____, ____, ____, ____

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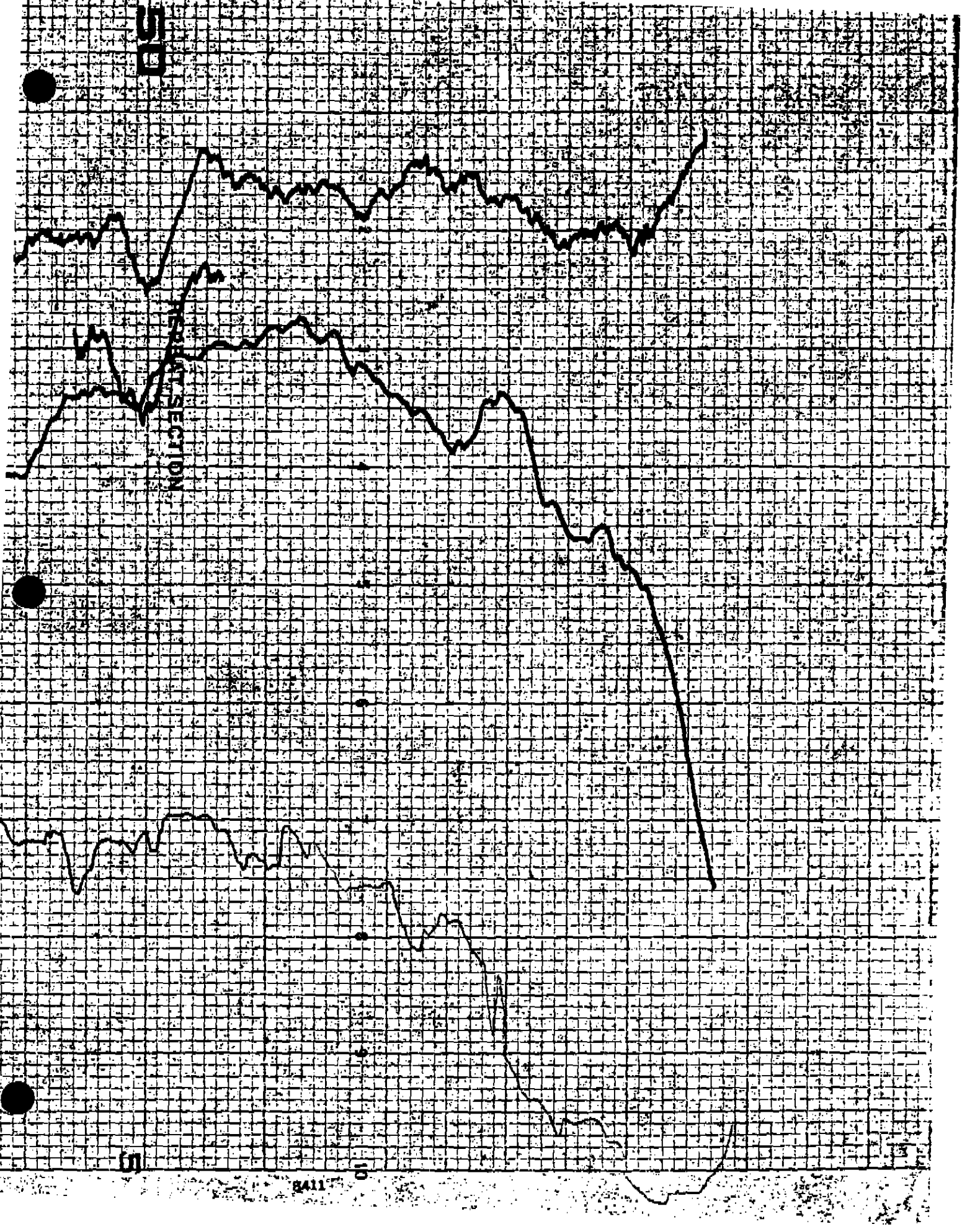
Fort Myers, Florida 33907
813/275-3121

Tampa Office
Rocky Point Centre
3030 North Rocky Point Drive West
Suite 350
Tampa Florida 33607
Hillsborough County [illegible]
Pinellas County [illegible]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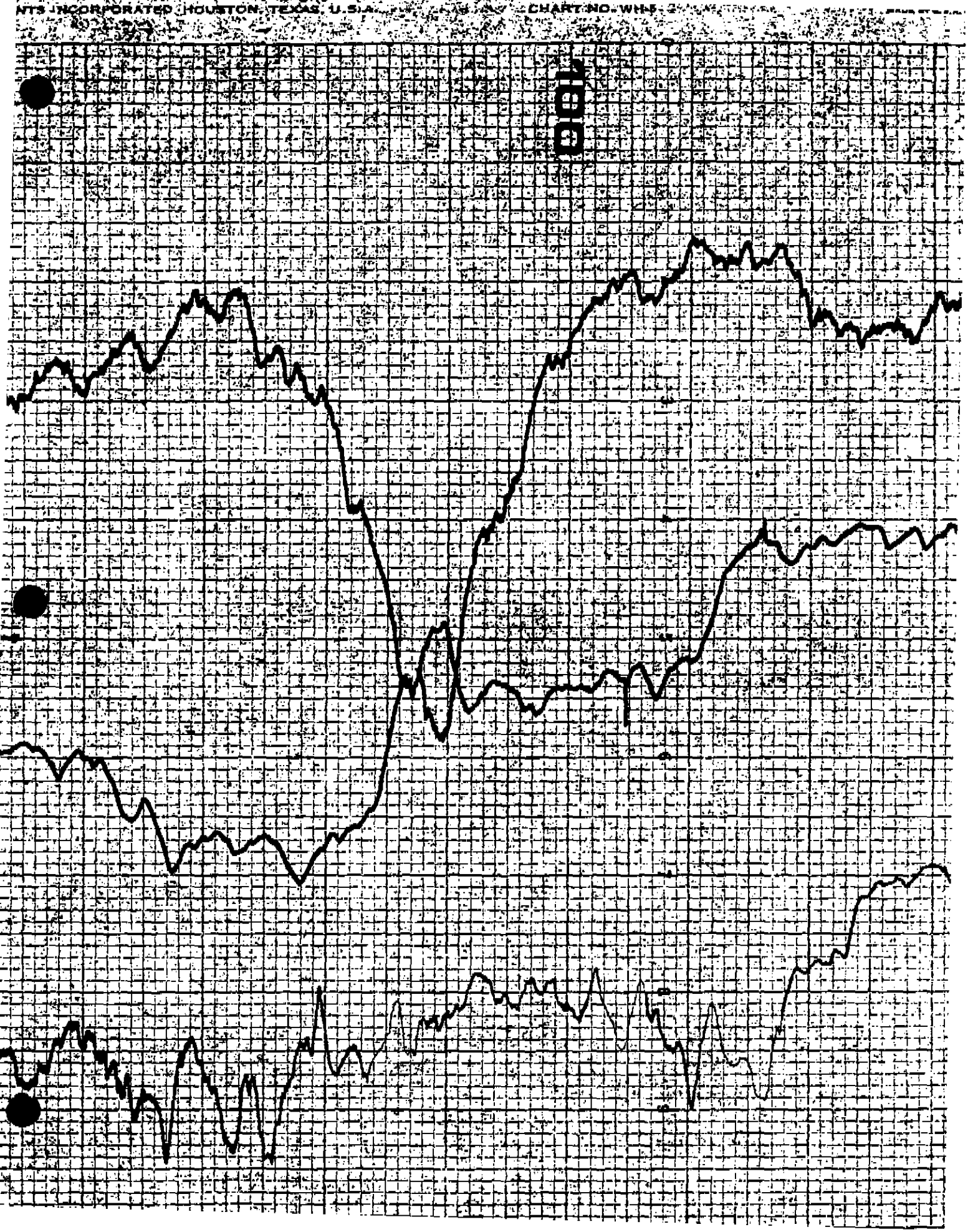

NTS INCORPORATED HOUSTON, TEXAS, U.S.A.
CHART NO. WH-5

200

0 20 30 40 50 60

GAMMA CPS

SP

40 mV/IN

RES

10 OHM / IN

Sheet 1 of 1 File # 0050-0113

GEOPHYSICAL WELL SURVEY

CLIENT City of Delray Beach Date August 19, 1988

Well No. G-2A Project No. SE124705.A8

Location: State Florida County Palm Beach

¼ ¼ ¼ Sec T. 46 ☐ N ■ S R 43 ■ E ☐ W

Logged by P. Kwiatkowski Observer L. Ratinger

Owner City of Delray Beach

Well G-2A

Driller Groundwater Protection Date Drilled August, 1988

Surface Elevation ft ☐ Estimated ☐ Measured Above MSL

T.D. Logged 202' T.D. Driller 202'

Hole Dia.

Casing Dia N/A

Finish ☐ Open hole ☐ Screen ☐ Gravel ☐ Other

Water Level 0 ft ☐ Above ■ Below MP ☐ Above ■ Land Surface ☐ Below ☐ Pad Surface

Yield Flow N/A gpm Pump gpm

Drawdown N/A ft after hours pumping at gpm

Use ☐ Dom ☐ Stock ☐ PS ☐ Ind ☐ Irr ■ Test ☐ Heating or cooling ☐ Drainage ☐ Disposal ☐ Obs

Water Quality N/A Date Lab Rpt

Temp F. Sp Cond Iron mg/L

Cl mg/L SO_4 mg/L Total Hardness mg/L

Color Odor Taste

Remarks

☐ Electric
☐ 16" Normal
☐ 64" Normal
■ Single Point
■ S.P.

☐ Caliper
☐ Fluid Resistivity
☐ Fluid Velocity
■ Gamma Ray
☐ Temperature

Log Scales

Electric Log

SP 40 millivolts/inch

Res ohm-meters/inch

Res 50 ohms/inch

Fluid Resistivity

ohm meters/inch

@ °F

Gamma Ray Log

10 Counts/sec/inch

Time Constant 4 sec

Logging speed 4 FPM

Fluid Velocity

Counts/min/inch

FPM (Continuous)

Q = gpm

Temperature

°F to °F

Logging Speed FPM

Caliper

inches to inches

Logging speed FPM

Water Samples

Depths sampled

CH2M HILL
Water Resources Division
P.O. Box 1647
Gainesville, Florida 32620
904/377-2442

Deerfield Beach Office
Hillsboro Executive Center North
350 Fairway Drive, Suite 210
Deerfield Beach, Florida 33441
Palm Beach County 305/395-3800
Broward County 305/426-4008

Fort Myers Office
The Financial Center
1550 College Parkway, Suite 307
Fort Myers, Florida 33907
813/275-3121

Tampa Office
Rocky Point Centre
3030 North Rocky Point Drive, West
Suite 350
Tampa Florida 33607
Hillsborough County 813/888-6777
Pinellas County 813/536-9454

Sheet 1 of 1 File # 88-11-0111

GEOPHYSICAL WELL SURVEY

CLIENT City of Delray Beach Date July 20, 1988

Well No G-1 Project No. SEF24708.AB

Location: State Florida County Palm Beach

¼ ¼ ¼ Sec T. 46 ☐ N ■ S R 43 ■ E ☐ W

Logged by P. Kwiatkowski Observer L. Ruinger

Owner City of Delray Beach

Well G-1

Driller Ground Water Protection Date Drilled July 1988

Surface Elevation ft ☐ Estimated ☐ Measured Above MSL

T.D. Logged 199' T.D. Driller 202'

Hole Dia 8" to 202'

Casing Dia N/A

Finish: ☐ Open hole ☐ Screen ☐ Gravel ☐ Other

Water Level 11' ft ☐ Above ■ Below MP. AP ☐ Above ☐ Below ■ Land Surface ☐ Pad Surface

Yield Flow N/A gpm Pump gpm

Drawdown N/A ft after hours pumping @ gpm

Use: ☐ Dom ☐ Stock ☐ PS ☐ Ind ☐ Irr ■ Test ☐ Heating or cooling ☐ Drainage ☐ Disposal ☐ Obs.

Water Quality: N/A Drilling mud

Temp °F, Sp Cond ; Iron mg/L

Cl mg/L, SO_4 mg/L, Total Hardness mg/L

Color Odor Taste

Remarks

Electric
- ☐ 16" Normal
- ☐ 64" Normal
- ■ Single Point
- ■ S.P.

- ☐ Caliper
- ☐ Fluid Resistivity
- ☐ Fluid Velocity
- ■ Gamma Ray
- ☐ Temperature

Log Scales

Electric Log

SP 40 millivolts/inch

Res ohm meters/inch

Res. 20 ohms/inch

Fluid Resistivity

ohm meters/inch

@ °F

Gamma Ray Log

10 Counts/sec/inch

Time Constant 4 sec

Logging speed 20 FPM

Fluid Velocity

Counts/min/inch

FPM (Continuous)

Q gpm

Temperature

°F to °F

Logging speed FPM

Caliper

inches to inches

Logging speed FPM

Water Samples

Depths sampled

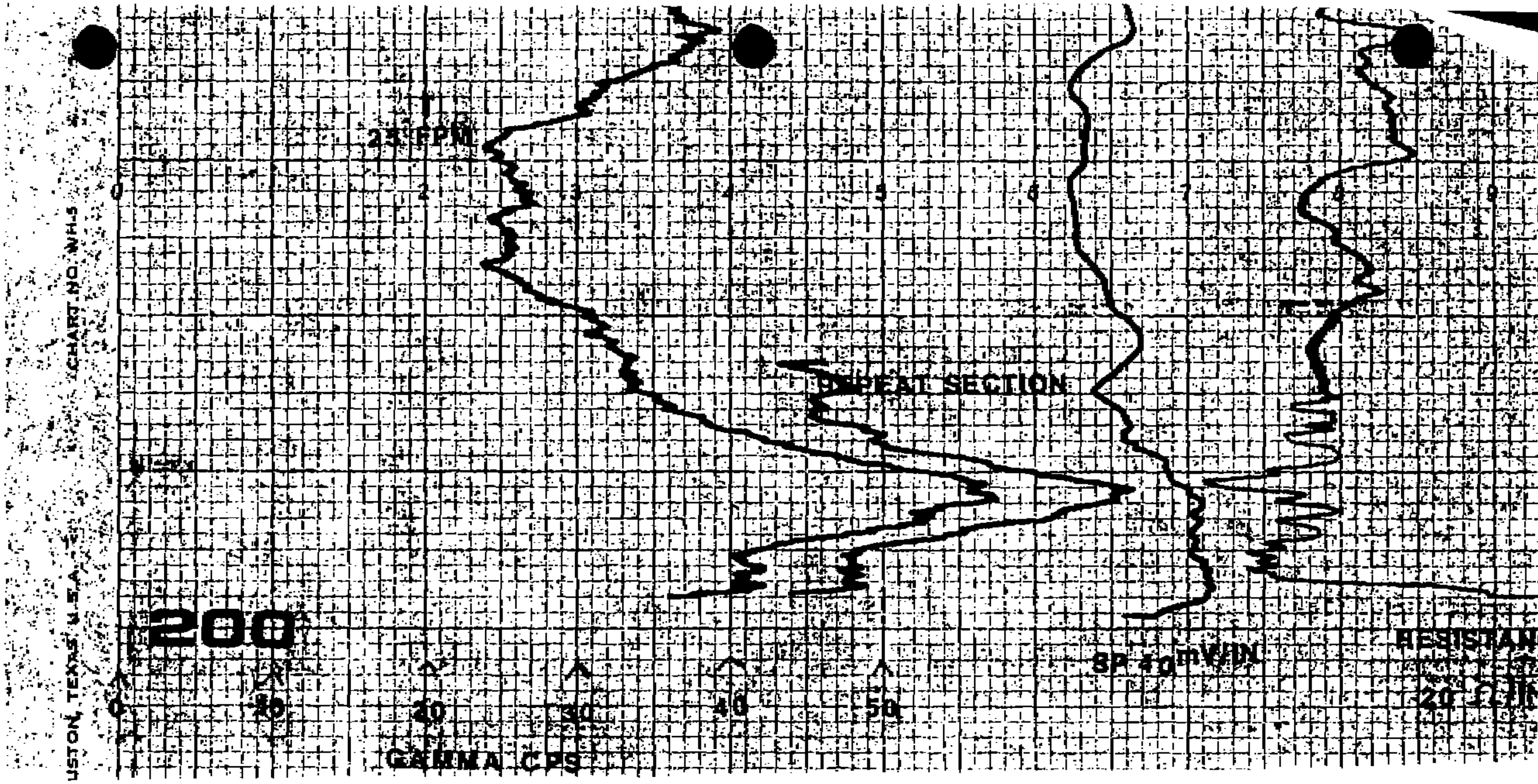
CH2M HILL
Water Resources Division
P.O. Box 1647
Gainesville, Florida 32620
904/377-2442

Deerfield Beach Office
Hillsboro Executive Center North
350 Fairway Drive, Suite 210
Deerfield Beach, Florida 33441
Palm Beach County 305/395-3800
Broward County 305/426-8888

Fort Myers Office
The Financial Center
1550 College Parkway, Suite 307
Fort Myers, Florida 33907
813/275-3121

Tampa Office
Rocky Point Centre
3030 North Rocky Point Drive West
Suite 350
Tampa Florida 33607
Hillsborough County 813/888-[illegible]
Pinellas County 813/536-94[illegible]

100
35 EPM
SP 40 MM/IN
RESISTANCE
20 Ω/IN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GAMMA CPS
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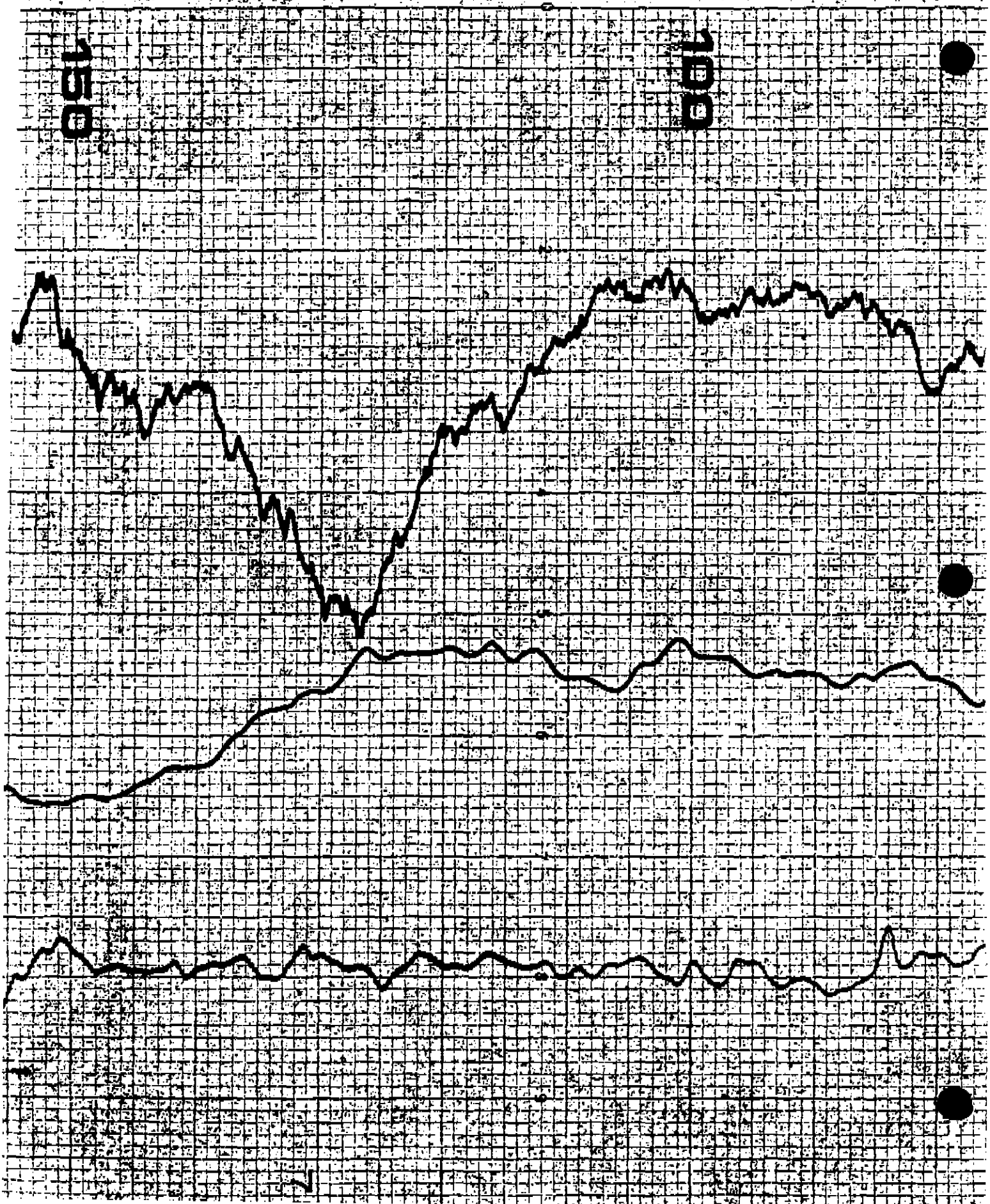

0
50
REPEAT SECTION
REPEAT SECTION

TEXAS INSTRUMENTS INCORPORATED HOUSTON
25 FPM
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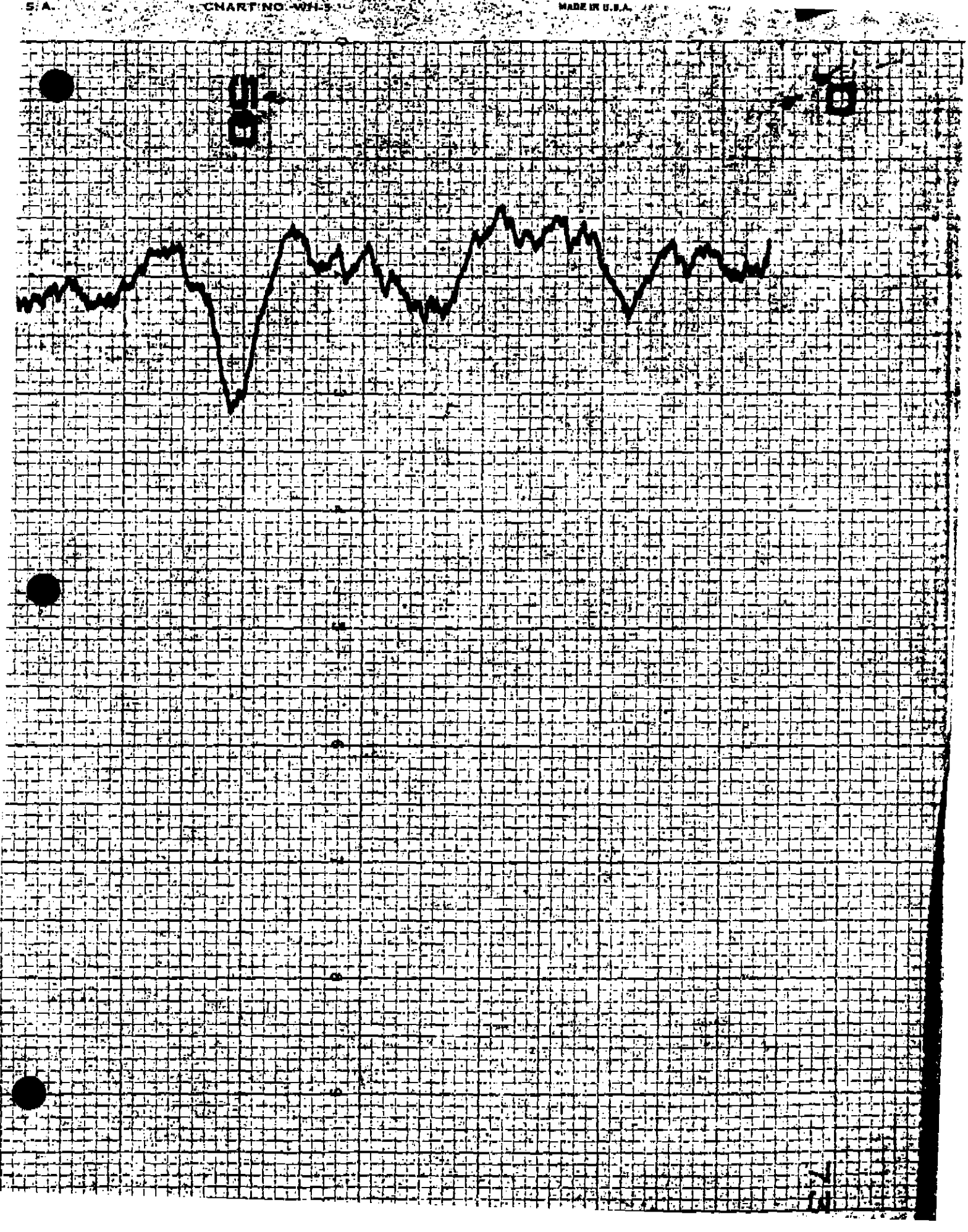
0
REPEAT SECTION
10
20
30
40
50
60
70
80
90
GAMMA CPS


5 A
CHART NO. WH-5
MADE IN U.S.A.

Sh 2 of 2 File # 0050-0112

GEOPHYSICAL WELL SURVEY

CLIENT City of Delray Beach Date July 20, 1988

Well No. G-2 Project No. SEF24708.A8

Location: State Florida County Palm Beach

¼ ¼ ¼ Sec. T. 46 ☐ N ■ S R 43 ■ E ☐ W

Logged by P. Kwiatkowski Observer L. Ringer

Electric
- ☐ 16" Normal
- ☐ 64" Normal
- ☐ Single Point
- ☐ S.P.

- ☐ Caliper
- ☐ Fluid Resistivity
- ☐ Fluid Velocity
- ☒ Gamma Ray
- ☐ Temperature

Owner: City of Delray Beach

Well: G-2

Driller: Ground Water Protection Date Drilled: JULY 1988

Surface Elevation: _____ ft. ☐ Estimated ☐ Measured Above MSL

T.D. Logged 113' T.D. Driller 115'

Hole Dia. 2" to 115'

Casing Dia. N/A

Finish: ☐ Open hole ☐ Screen ☐ Gravel ☐ Other

Water Level: 2 ft. ☐ Above ■ Below MP, AP ☐ Above ■ Land Surface ☐ Below ☐ Pad Surface

Yield: Flow n/A gpm Pump _____ gpm

Drawdown: N/A ft. after _____ hours pumping @ _____ gpm

Use: ☐ Dom. ☐ Stock ☐ PS ☐ Ind. ☐ Irr. ■ Test ☐ Heating or cooling ☐ Drainage ☐ Disposal ☐ Obs.

Water Quality: N/A Drilling Mud

Temp. _____ °F; Sp Cond. _____ ; Iron _____ mg/L

Cl^- _____ mg/L; $SO_4^=$ _____ mg/L; Total Hardness _____ mg/L

Color _____ Odor _____ Taste _____

Remarks: _____

Log Scales

Electric Log

SP 40 millivolts/inch

Res. 20 ohm-meters/inch

Res _____ ohms/inch

Fluid Resisvitivy

_____ ohm meters/inch

@ _____ °F

Gamma Ray Log

10 Counts/sec/inch

Time Constant 1 sec.

Logging speed 25 FPM

Fluid Velocity

_____ Counts/min/inch

_____ FPM (Continuous)

Q = _____ gpm

Temperature

_____ °F to _____ °F

Logging speed _____ FPM

Caliper

_____ inches to _____ inches

Logging speed _____ FPM

Water Samples

Depths sampled _____, _____, _____, _____, _____ '

CH2M HILL
Water Resources Division
P.O. Box 1647
Gainesville, Florida 32620
904/377-2442

Fort Myers Office
The Financial Center
1550 College Parkway, Suite 307
Fort Myers, Florida 33907
813/275-3121

Deerfield Beach Office
Hillsboro Executive Center North
350 Fairway Drive, Suite 210
Deerfield Beach, Florida 33441
Palm Beach County—305/395-3600
Broward County—305/426-4008

Tampa Office
Rocky Point Centre
3030 North Rocky Point Drive, West
Suite 350
Tampa Florida 33607
Hillsborough County—813/888-6777
Pinellas County—813/536-9454

Engineers
Planners
Economists
Scientists

May 19, 1989

SEF24708.DO

Herbert W. A. Thiele, Esq.
City Attorney
310 S.E. 1st Street, Suite 4
Delray Beach, Florida 33483

Dear Herb:

Subject: Data Comparison and Summary, 20-Series Well Field

Attached is a short report summarizing the data collected from the Aero-Dri monitor wells and City monitor wells installed in the vicinity of the 20-Series Production Wells. This information is also being submitted to Crowell and Moring for their use.

If you have any questions regarding this information, please call me.

Sincerely,

Mark S. Morris

Mark S. Morris, Ph.D., P.E.
Project Manager

dbt012/014.50
Attachment
cc: Ridgeway M. Hall/Crowell & Moring
Gregory T. McIntyre/CH2M HILL
Robert Wright II/CH2M HILL

DATA COMPARISON AND SUMMARY

Prepared for
THE CITY OF DELRAY BEACH

Prepared by
CH2M HILL SOUTHEAST, INC.

MAY 1989
SEF24708.DO

CONTENTS

Section 1
INTRODUCTION

1.1 BACKGROUND

The City of Delray Beach 20-Series Well Field is located in South Palm Beach County between Linton Boulevard and Atlantic Avenue. The 20-Series Wells are about 400 feet east of I-95 on both sides of S.W. 10th Street. Tetrachloroethene (3.17 ppb) (also called perchloroethylene or perc) was detected in the finished water at the City of Delray Beach Water Treatment Plant in July. A subsequent analysis of groundwater from the City's production wells revealed that Wells 21, 22, 23 and 24 had measureable quantities of tetrachloroethene, trichloroethene and cis-1,2-dichloroethene. This initial indication of production well contamination prompted an investigation of local industries by the Florida Department of Environmental Regulation (FDER).

FDER conducted a hazardous waste inspection of Aero-Dri Corporation on September 30, 1987. Aero-Dri, a division of Davie Compressor, overhauls and refurbishes air compressors and related equipment. Aero-Dri is located approximately 1,000 feet southeast of the contaminated production wells. The resulting Hazardous Waste Inspection Report cited Aero-Dri with 11 violations of hazardous waste regulations. As a result, a Warning Notice (No. 50-419-87-HW) was issued on November 12, 1987. In accordance with the terms of the Warning Notice, enforcement meetings were held November 23, 1987, and December 7, 1987, between FDER, Aero-Dri, their representatives, L&J Enterprises (the property owner), and the Palm Beach County Health Department (PBCHD). A draft Consent Order was given to attorneys representing Aero-Dri and L&J Enterprises, at a December 23 meeting.

Aero-Dri installed two monitor wells labeled MW-1 and MW-2 on October 22, 1987, in an area of a tetrachloroethene spill. Tetrachloroethene levels in groundwater were 5,600 parts per billion (ppb) in MW-1 and 531,500 ppb in MW-2. Monitor Well MW-1 is screened from 20 to 25 feet and MW-2 is screened from 40 to 45 feet. In addition, 450 ppb and 430 ppb trichloroethene were measured in groundwater from MW-1 and MW-2, respectively. Soil samples collected during the monitor well installation contained as much as 585,000 ppb tetrachloroethene. The 585,000 ppb reading was detected at a depth of 0 to 2 feet. These results were summarized in the December 21, 1987, Preliminary Contamination Assessment Report (PCAR) (Dames & Moore, 1987). Tables 1-1 and 1-2 summarize these results.

Dames & Moore, Aero-Dri's engineering consultant, prepared a Contamination Assessment Plan (CAP) (Dames & Moore, 1987) dated December 21, 1987. The CAP described tasks to further investigate the migration of contaminants spilled at the Aero-Dri facility.

Table 1-1
SUMMARY OF PERTINENT SOIL SAMPLE ANALYSES
FROM THE AERO-DRI SITE

	Concentration (ppb) Soil Depth (feet)			
	Surface	5	10	15
MW-1				
Benzene	<0.1	5	<0.1	<0.1
Ethylbenzene	<0.1	4	11	1
Toluene	<0.1	8	7	12
o-Xylene	<0.1	11	35	3
m-Xylene	<0.1	11	32	4
p-Xylene	<0.1	<0.1	<0.1	<0.2
Chloroform	6,900	<250	<250	<250
Trichloroethene	<250	<250	<250	<250
Tetrachloroethene	4,030	4,469	2,274	26
MW-2				
Benzene	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	<0.1	18	<0.1	<0.1
Toluene	<0.1	6	<0.1	<0.1
o-Xylene	<0.1	66	<0.1	<0.1
m-Xylene	<0.1	30	<0.1	<0.1
p-Xylene	<0.1	42	<0.1	<0.1
Chloroform	<250	<250	<250	<250
Trichloroethene	<250	<250	<250	<250
Tetrachloroethene	585,000	480	408,000	4,600

Source: Compiled from Preliminary Contamination Assessment Report, Perchloroethylene Spill, Aero-Dri Corporation Site, Dames & Moore, December 21, 1987.

Table 1-2
SUMMARY OF PERTINENT GROUNDWATER SAMPLE ANALYSES
FROM THE AERO-DRI SITE
(OCTOBER 30, 1987)

Compound	Concentration (ppb) MW-1	MW-2
Benzene	<0.1	12
Ethylbenzene	17	14
Toluene	<0.1	<0.1
o-Xylene	1	4
m-Xylene	<0.1	6
p-Xylene	<0.1	3
Trichloroethene	450	430
Tetrachloroethene	5,600	531,500

Source: Compiled from Preliminary Contamination Assessment Report, Perchloroethylene Spill, Aero-Dri Corporation Site, Dames & Moore, December 21, 1987.

The CAP was revised to incorporate comments from FDER and resubmitted as a revised Contamination Assessment Plan (Dames & Moore, 1988). The results of the contamination assessment activities conducted by Aero-Dri were summarized in the Contamination Assessment Report (CAR) (Dames & Moore, 1988).

During the Aero-Dri contamination assessment activities, 19 additional wells were installed. Fifteen of the wells were installed on the Aero-Dri and L&J Enterprise property, while the remaining 4 wells were installed between the Aero-Dri facility and the City's 20-Series Well Field. The Aero-Dri monitor wells were sampled in May and August 1988. Thirty-two soil borings were also conducted onsite. Of these, 14 borings were placed on the immediate vicinity of the trench area which is located southwest of the Aero-Dri building.

On May 27, 1988, the City of Delray Beach authorized CH2M HILL to conduct a preliminary contamination assessment in the vicinity of the 20-Series Well Field. During this effort, 7 monitor wells were installed. Two monitor wells (W-9B and W-10B) were located southeast of the Aero-Dri facility along Poinsettia Drive. One monitor well (MW-1) was installed west of the City Production Well 24 adjacent to S.W. 16th Avenue. The remaining 4 monitor wells were placed between Aero-Dri and Production Well 24. The results of this study are summarized in the Preliminary Contamination Assessment Report (PCAR) (CH2M HILL, 1988).

1.2 PURPOSE

The purpose of this report is to summarize and combine data from the Dames & Moore CAR and the CH2M HILL PCAR.

Section 2
DATA SUMMARY

At the direction of the City, CH2M HILL obtained samples from monitor wells installed by Aero-Dri. Two such sampling events occurred. The first began on May 25, 1988 and the second started on August 4, 1988. During the first split sampling activity, 14 monitor wells located on the Aero-Dri site plus Production Wells 22, 23, 24 and 25 were sampled. Seven additional monitor wells were installed by Aero-Dri after the first split sampling event. Four of the additional monitor wells were off the Aero-Dri property. The Palm Beach County Health Department (PBCHD) also split samples with the Aero-Dri consultant.

Table 2-1 summarizes the split sampling results for tetrachloroethene analyzed by Dames & Moore and CH2M HILL during the May 1988 sampling event. Much of the data is similar, however, there are a few notable exceptions. For monitor well MW-1, CH2M HILL detected 15,000 ppb tetrachloroethene, whereas, Dames & Moore measured only 1,430 ppb. Dames & Moore either did not analyze samples from the City production wells or did not report the results.

Table 2-2 summarizes the August 1988 split sampling tetrachloroethene analysis reported by CH2M HILL, Dames & Moore, and PBCHD. The CH2M HILL and PBCHD data were similar for all wells except possibly monitor well MW-2. CH2M HILL reported 63,000 ppb tetrachloroethene, while 24,919 ppb tetrachloroethene was detected by PBCHD. Comparison of the Dames & Moore data with the CH2M HILL and PBCHD indicates numerous inconsistencies. CH2M HILL and PBCHD detected 63,000 ppb and 24,191 ppb tetrachloroethene, respectively, in MW-2, however, Dames & Moore reported 3,180 ppb for the same monitor well. CH2M HILL and PBCHD did not detect tetrachloroethene contamination in the sample from monitor well MW-4, whereas, Dames & Moore reported 616 ppb tetrachloroethene in a sample from the same well. CH2M HILL and PBCHD measured 24 ppb and 7.41 ppb tetrachloroethene, respectively, in the sample from MW-5. Dames & Moore reported 537 ppb in this sample. In MW-6, CH2M HILL measured 2,800 ppb while PBCHD reported 1,996 ppb. Dames & Moore, however, did not detect tetrachloroethene contamination in a sample from the same well.

The monitor wells installed by CH2M HILL during the Preliminary Contamination Assessment activities were sampled on September 1, 1988, and November 21, 1988 (Table 2-3). This data indicates tetrachloroethene and trichloroethene contamination in the monitor wells located between Aero-Dri and Production Well 24. Monitor well W-1 did not contain tetrachloroethene or trichloroethene in the September or November samples. Monitor wells W-9B and W-10B did not contain tetrachloroethene or trichloroethene in the September sample. In the November sample, 2.2 ppb tetrachloroethene was detected in W-9B; and 6.2 ppb tetrachloroethene was

Table 2-1
SUMMARY OF TETRACHLOROETHENE ANALYSIS
BY CH2M HILL AND DAMES & MOORE
FOR SPLIT SAMPLES (MAY 1988)

Well Number	Tetrachloroethene Concentration (ppb)	
	CH2M HILL	Dames & Moore
MW-1	15,000	1,430
MW-2	53,000	55,200
MW-3	220	237
MW-4	Not Installed	Not Installed
MW-5	Not Installed	Not Installed
MW-6	Not Installed	Not Installed
MWC1-A	4,100	3,660
MWC1-B	1,800	1,330
MWC1-C	1.6	BMDL
MWC2-A	BMDL	BMDL
MWC2-B	BMDL	BMDL
MWC2-C	BMDL	BMDL
MWC3-A	BMDL	BMDL
MWC3-B	BMDL	BMDL
MWC4-A	BMDL	BMDL
MWC4-B	BMDL	BMDL
MWC4-C	BMDL	3.4
MWC-5A	Not Installed	Not Installed
MWC-5B	Not Installed	Not Installed
MWC-6A	Not Installed	Not Installed
MWC-6B	Not Installed	Not Installed
PW-22	BMDL	Not Reported
PW-23	21	Not Reported
PW-24	190	Not Reported
PW-25	BMDL	Not Reported
PW-26	Not Sampled	Not Sampled

BMDL = Below Method Detection Limit

Table 2-2
SUMMARY OF TETRACHLOROETHENE ANALYSIS
BY CH2M HILL, PBCHD, AND DAMES & MOORE
FOR SPLIT SAMPLES (AUGUST 1988)

Well Number	Tetrachloroethene Concentration (ppb)		
	CH2M HILL	PBCHD	Dames & Moore
MW-1	3,700	3,411	2,290
MW-2	63,000	24,919	3,180
MW-3	29	27	BMDL
MW-4	BMDL	BMDL	616
MW-5	24	7.41	537
MW-6	2,800	1,996	BMDL
MWC1-A	2,900	3,069	1,550
MWC1-B	1,100	1,580	1,170
MWC1-C	BMDL	BMDL	BMDL
MWC2-A	BMDL	BMDL	2.6
MWC2-B	1.7	BMDL	4.7
MWC2-C	BMDL	BMDL	BMDL
MWC3-A	BMDL	BMDL	9.1
MWC3-B	BMDL	BMDL	BMDL
MWC4-A	3.0	1.40	4.0
MWC4-B	4.1	2.75	16.5
MWC4-C	7.4	3.56	13.1
MWC-5A	1,300	1,458	1,350
MWC-5B	310	236.8	349
MWC-6A	560	394.8	349
MWC-6B	7.3	3.19	3.8
PW-22	BMDL	BMDL	BMDL
PW-23	28	17.56	12.2
PW-24	480	294.9	537
PW-25	360	269.5	303
PW-26	BMDL	BMDL	BMDL

BMDL = Below Method Detection Limit

Table 2-3
SUMMARY OF GROUNDWATER ANALYSIS FOR
MONITOR WELLS INSTALLED BY CH2M HILL
IN THE VICINITY OF THE 20-SERIES WELL FIELD

Well Number	Constituent	Concentration (ppb) September 1988	Concentration (ppb) November 1988
W-1	Tetrachloroethene	BMDL	BMDL
	Trichloroethene	BMDL	BMDL
	1,2-Dichloroethane	BMDL	1.1
W-3[a]	Tetrachloroethane	1,200[b]	980
	Trichloroethene	60[b]	≤100
	Acetone	43[b]	NA
	bis (2-Ethylhexyl) Phthalate	34[c]	NA
W-4	Tetrachloroethene	47	55
	Trichloroethene	3.2	5.1
W-5[a]	Tetrachloroethene	250[b]	3,600
	Trichloroethene	87[b]	110
	Acetone	27[b]	NA
W-6	Tetrachloroethene	650	990
	Trichloroethene	13	150
W-9B	Tetrachloroethene	BMDL	2.2
	Trichloroethene	BMDL	BMDL
W-10B	Tetrachloroethene	BMDL	6.2
	Trichloroethene	BMDL	BMDL

[a]Priority pollutant metals and pesticides analyzed for September sample but not detected.

[b]Analyzed by EPA Method 624.

[c]Analyzed by EPA Method 625.

Note: Summary does not include compounds detected in Quality Control blank. Samples analyzed by EPA Methods 601/602 unless otherwise indicated.

BMDL = Below Method Detection Limit
NA = Not Analyzed

measured in W-10B. Trichloroethene was not detected in the November samples from W-9B and W-10B.

During the September sampling event, groundwater from W-3 and W-5 were analyzed for volatiles by EPA Method 624, semivolatiles by EPA Method 625, priority pollutant metals, and pesticides. EPA Methods 624 and 625 use gas chromatography plus mass spectrometry. All other samples were analyzed for volatile organic compounds by EPA Methods 601/602. These methods use only gas chromatography.

The EPA Method 624 analysis detected 43 ppb acetone in W-3 and 27 ppb in W-5 during the September sample. Acetone is not detected by the EPA Method 601/602 analysis. Acetone, therefore, may be present in other samples but remain undetected. Acetone is a component of #7 Lacquer Thinner and #10 Laquer Thinner. These compounds were used at the Aero-Dri facility according to Material Safety Data Sheets (MSDS) provided for review. Additional analysis by EPA 624 may be necessary to confirm if acetone is contained in groundwater from other monitor wells.

EPA Method 625 analysis for semivolatile compounds detected 34 ppb bis (2-ethylhexyl) phthalate in groundwater from monitor well W-3. This compound was not detected in W-5. An additional sample may be necessary to confirm the presence of this compound.

There has been no single sampling event which included the monitor wells installed by Dames & Moore and those installed by CH2M HILL. An approximate plume map can be constructed, however, from the data collected from the August, 1988 split sampling and the September 1988 sampling of the CH2M HILL monitor wells. These two sets of data were selected for construction of the plume maps because the samples were collected within 1 month.

Figure 2-1 shows the location of three cross-sections constructed across the contamination site. Cross-section A'-A' includes monitor wells MWC3-A, MWC3-B, MW-3, MW-1, MW-2, and Production Well 25. Cross-section B'-B' includes monitor wells W-9B, W-10B, MW-1, MW-2, MW-5, MW-6, MW-4, W-5, W-6, W-3, W-4, W-1, and Production Well 24. Cross- section C'-C' includes monitor wells MWC2-A, MWC2-B, MWC2-C, MW-1, MW-2, MWC1-A, MWC1-B, MWC1-C, MWC-5A, MWC-5B, MWC-6A, MWC-6B and Production Well 23.

Figures 2-2 through 2-4 show the profiles for the three cross-sections. The tetrachloroethene concentrations reflect the CH2M HILL data from the August, 1988 split sampling event and the September, 1988 results from the monitor wells installed during the preliminary contamination assessment for the well field. The CH2M HILL data was used rather than the Dames & Moore data because of the close agreement between the CH2M HILL and PBCHD data for the August split sampling event.

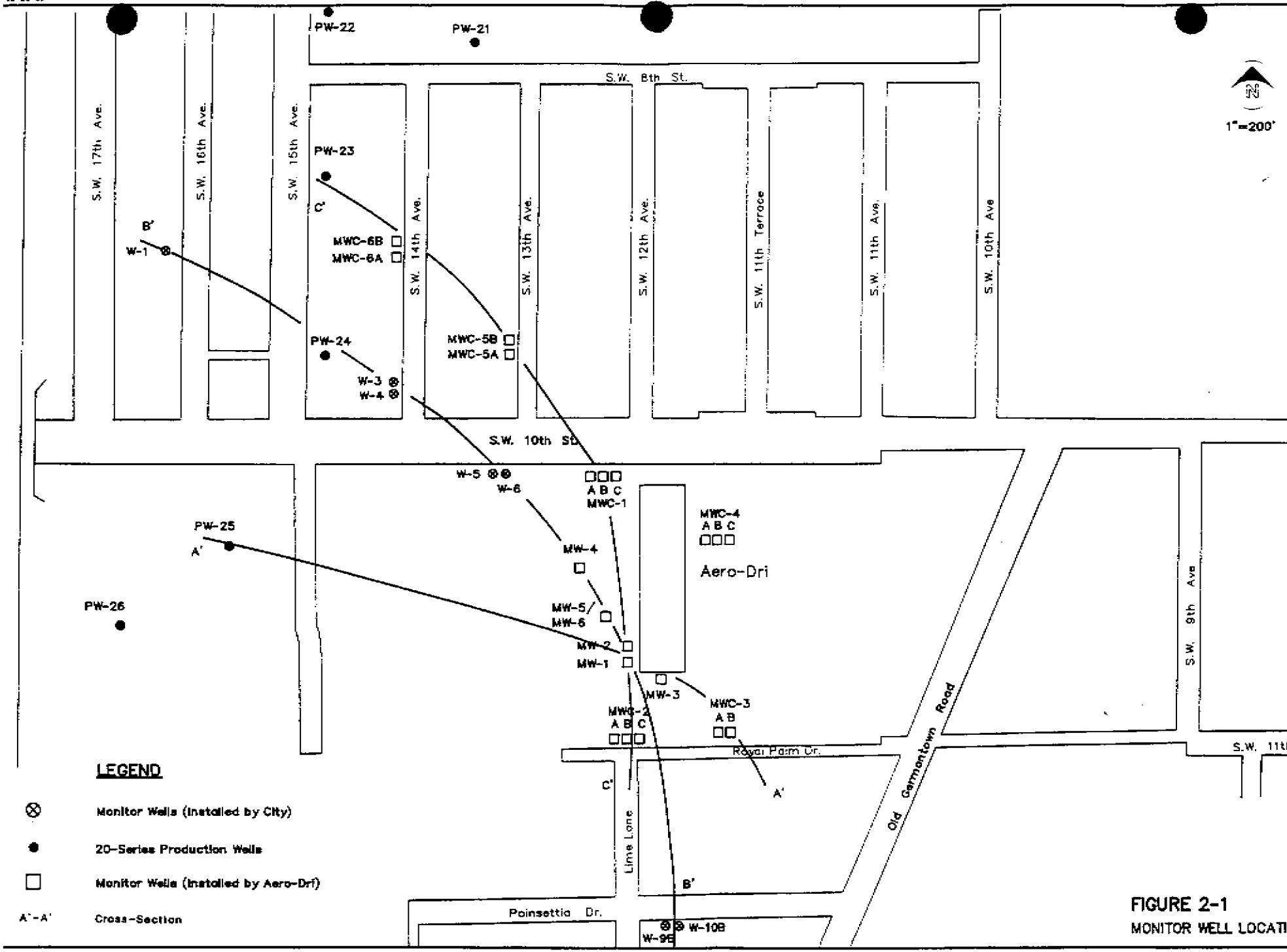
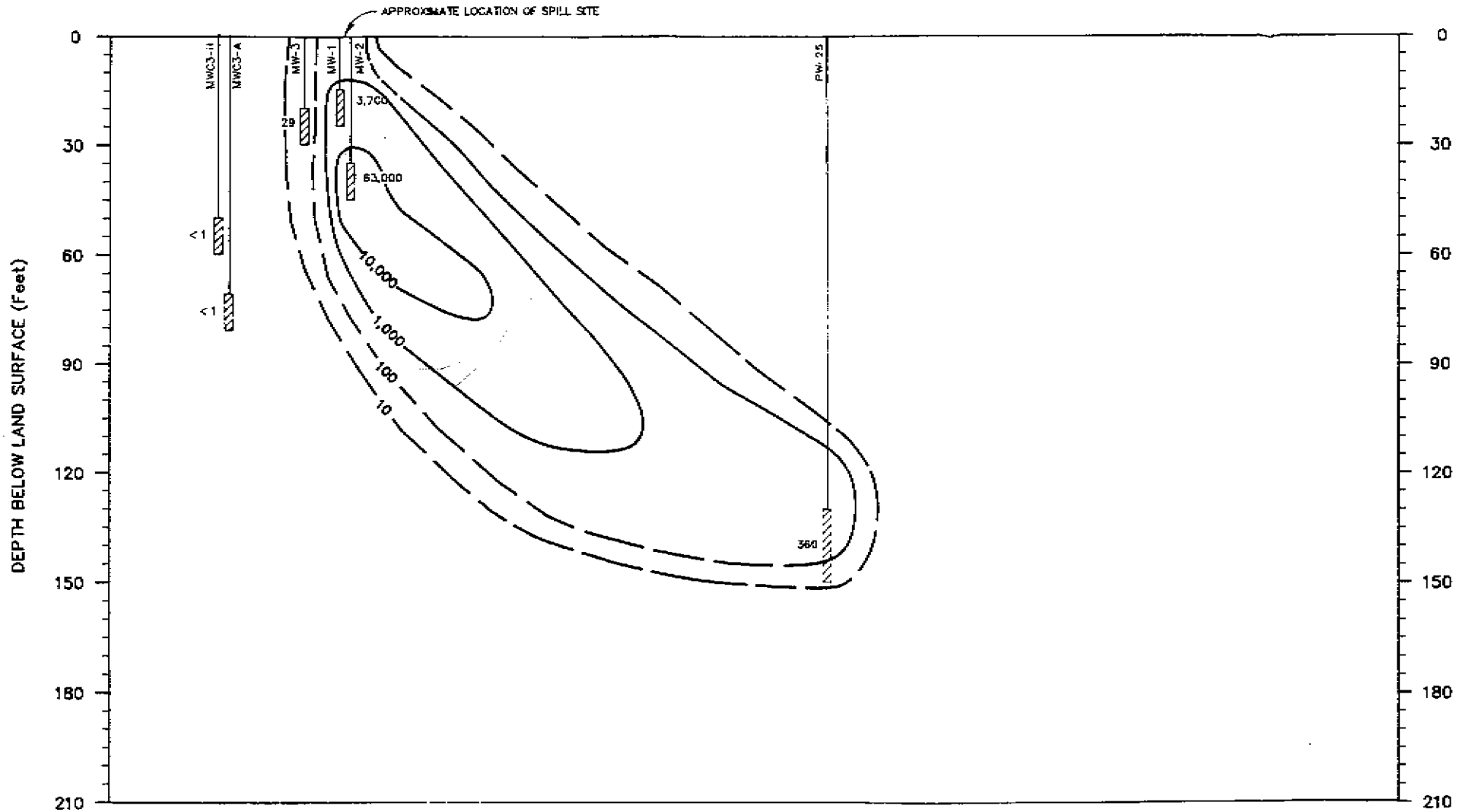


FIGURE 2-1
MONITOR WELL LOCATI



LEGEND

TETRACHLOROETHENE CONCENTRATION (ppb) { 3,700 } MW-1 WELL SCREEN INTERVAL

10 APPROXIMATE PLUME CONTOUR

10 INFERRED PLUME CONTOUR

NOTE:

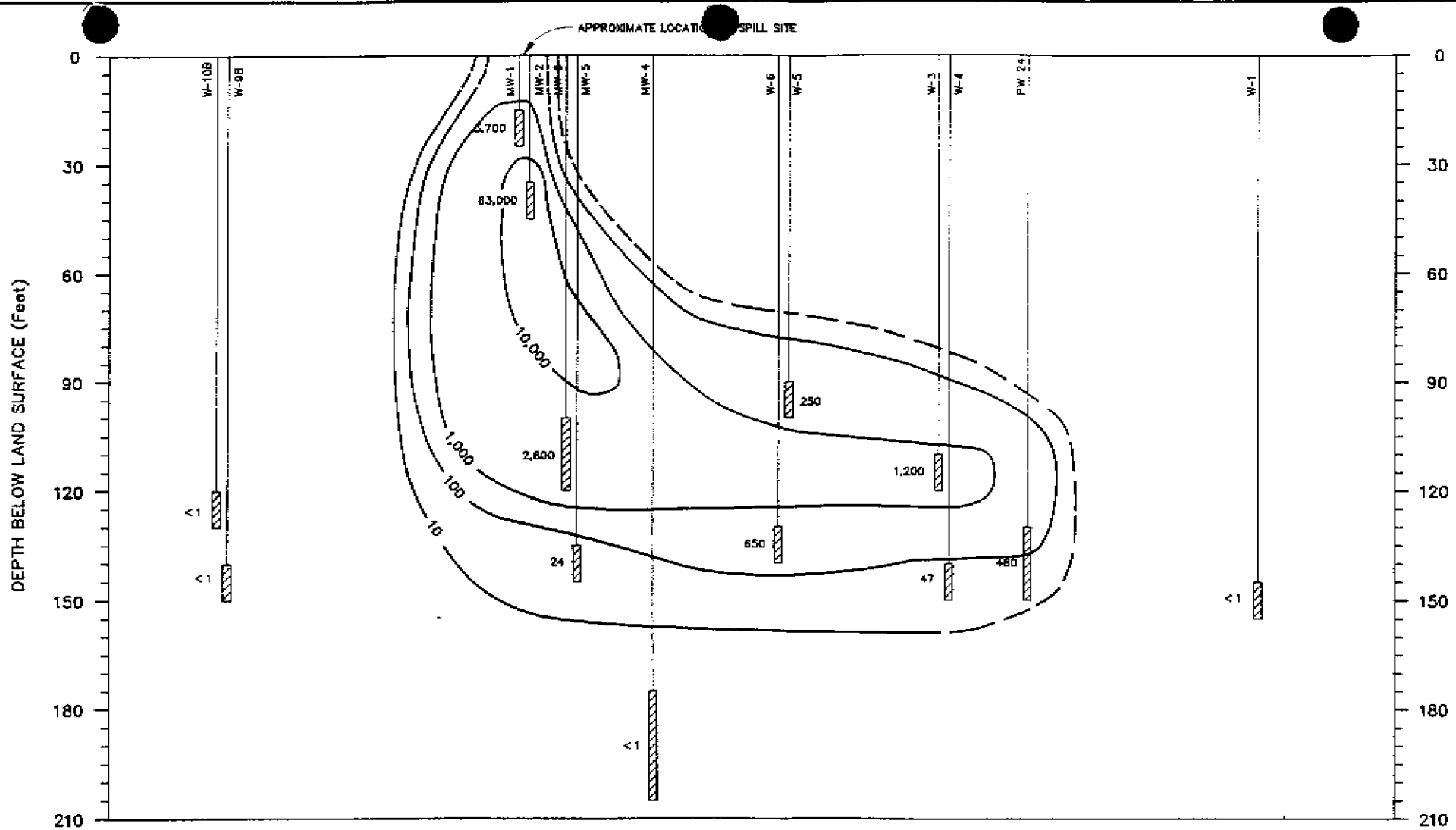
HORIZONTAL SCALE: 1"=200'

SAMPLES COLLECTED AUGUST 1988

FIGURE 2-2

TETRACHLOROETHENE CO
ALONG CROSS-SECTION A

'24705.80\SECTION.DWG



LEGEND

MW-1

TETRACHLOROETHENE CONCENTRATION (ppb) { 3,700 } WELL SCREEN INTERVAL

10 APPROXIMATE PLUME CONTOUR

10 INFERRED PLUME CONTOUR

NOTE:

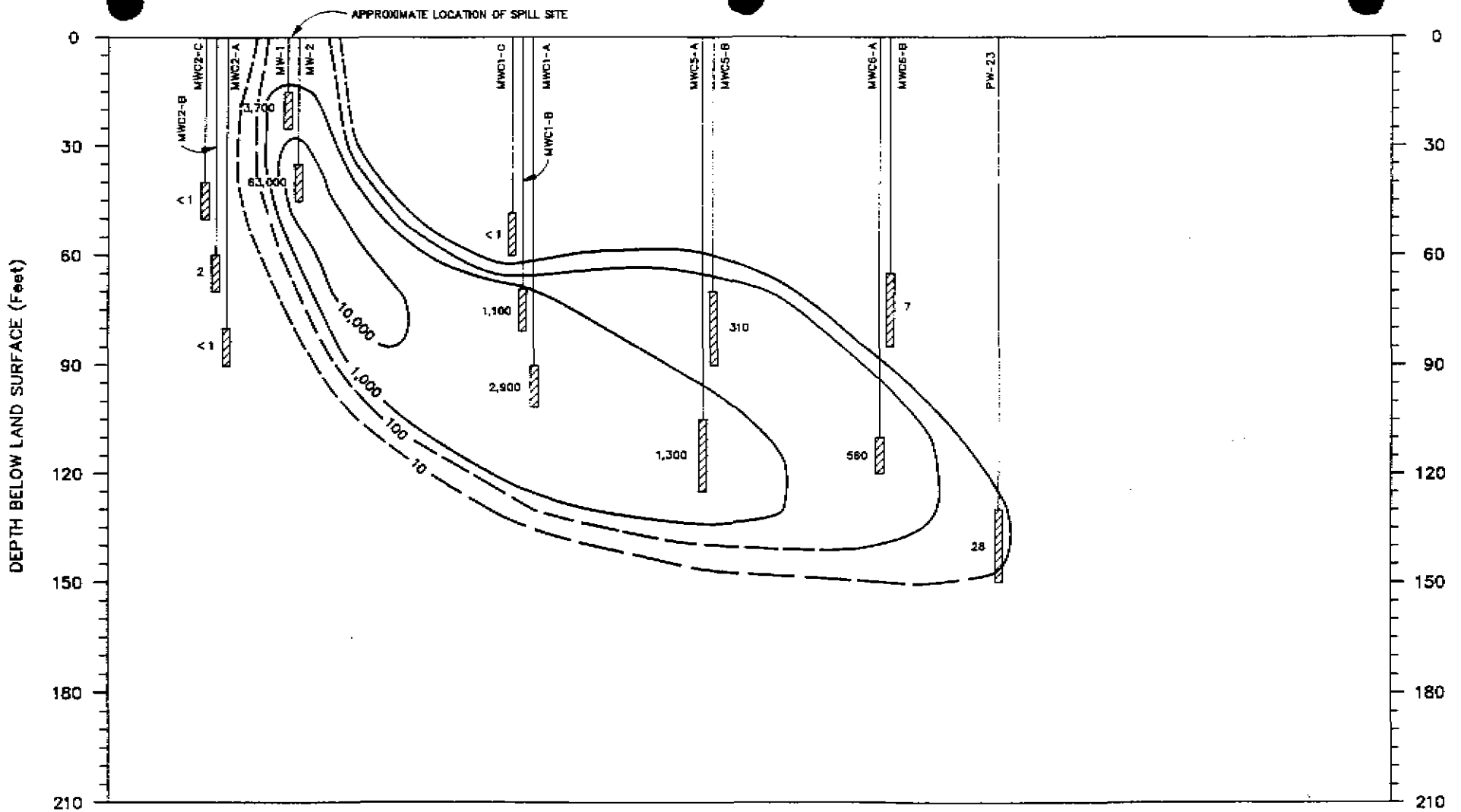
HORIZONTAL SCALE: 1"=200'

SAMPLES FOR W-1, W-3, W-4, W-5, W-6, W-9B & W-10B COLLECTED SEPTEMBER 1988. ALL OTHER SAMPLES COLLECTED AUGUST 1988.

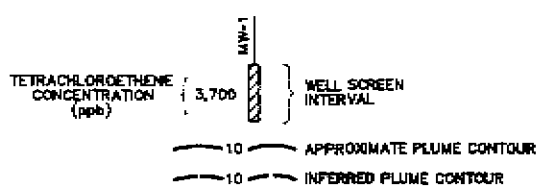
FIGURE 2-3

TETRACHLOROETHENE C
ALONG CROSS-SECTION

\387\14704.001\SECTION.DWG



LEGEND



NOTE:

HORIZONTAL SCALE: 1"=200'

SAMPLES COLLECTED AUGUST 1988

FIGURE 2-4

TETRACHLOROETHENE CON
ALONG CROSS-SECTION C'-

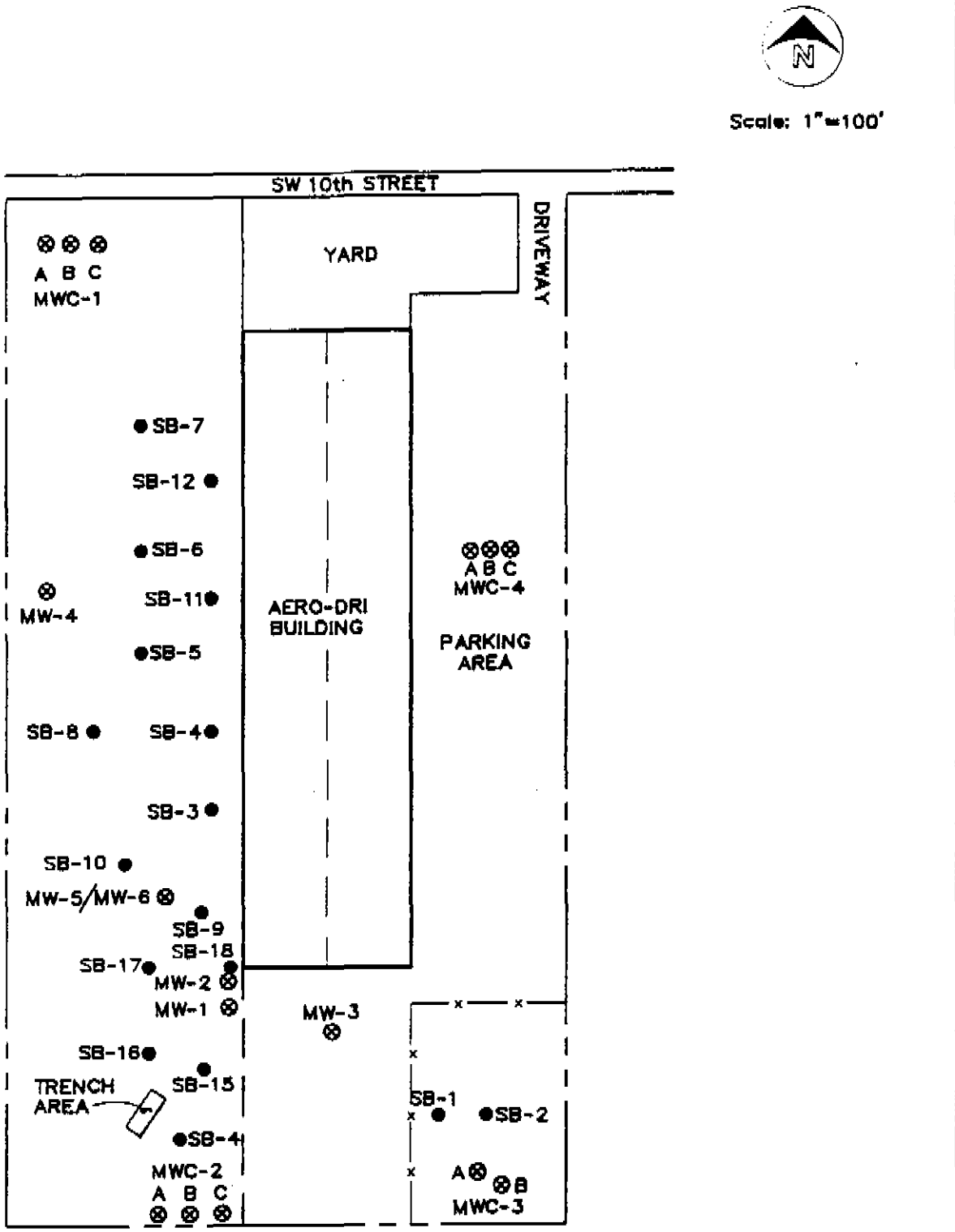
14708.00\SECTION.DWG

Each of the cross-sections reveal contamination between Aero-Dri and the production wells. Monitor wells MWC3-A, MWC3-B, W-9B, W-10B, MWC2-A, MWC2-B, and MWC2-C proved to be background wells. Each of these wells is located south-southeast of the Aero-Dri facility. The contamination is highest in the vicinity of the suspected spill site as indicated by the analytical results for monitor wells MW-1 and MW-2. From this location, the contamination appears to move vertically down in the aquifer as it is drawn horizontally toward the production wells.

Only one monitor well, W-1, has been installed west of the production wells. This well did not indicate contamination during the September sampling event. This area may be a background area, however, more sampling is necessary to confirm the absence of tetrachloroethene. W-1 is screened from 145 to 155 feet.

Soil borings conducted on the Aero-Dri site provide limited information regarding the extent of contamination. Figure 2-5 shows the locations for soil borings on the Aero-Dri property. Laboratory analysis of soil samples taken from the saturated zone may be useful for detecting contaminants which adsorb to the soil. In this situation, groundwater samples from monitor wells may underestimate the level of contamination. Only a low level of tetrachloroethene would be expected to adsorb to a sandy soil which contains low amounts of naturally occurring organics. Groundwater samples, therefore, will provide a representative level of contamination in the aquifer. The soil boring information has not been emphazised in this report since groundwater data is available.

Based on the data available thus far, tetrachloroethene contamination in City Production Wells 23, 24, and 25 is linked to tetrachloroethene contamination beneath the Aero-Dri property. The original samples collected by Dames & Moore from MW-1 and MW-2 in October 1987 indicated severe VOC contamination in the surface soils and shallow groundwater. More recent analysis reveals that groundwater from these wells is still highly contaminated. Tetrachloroethene was detected in most of the monitor wells between the Aero-Dri building and the City Production Wells. Little if any contamination was detected in monitor wells south, southeast, and east of the Aero-Dri building. This pattern is consistent with the observed groundwater gradient in this area. The groundwater gradient under the influence of the 20-Series Production Wells is north/northwest from Aero-Dri. The single monitor well west of Production Well 24 did not indicate tetrachloroethene contamination. The contamination, therefore, appears to be limited to the area between Aero-Dri and the 20-Series Wells based on the data available. Additional data, however, needs to be collected to further evaluate the condition of the aquifer west of the 20-Series Well Field and to provide more recent analytical results for all monitor wells installed in the vicinity of Aero-Dri and the production wells.



LEGEND

⊗ MONITOR WELL (Installed by Aero-Dri)

● SOIL BORING

FIGURE 2-5

MONITOR WELL AND SOIL BORING LOCATIONS ON THE AERO-DRI PROPERTY

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Section 3
SUMMARY AND CONCLUSIONS

The data indicates that only a low level of contamination is present in monitor wells south-southeast and east of the Aero-Dri facility. This area can be considered background. Contamination present at the Aero-Dri facility and in the production wells did not originate from these areas.

Monitor well W-1, located west of Production Well 24, did not indicate contamination of the types and levels shown in the production wells. Only one volatile organic, 1,2-dichloroethene (1.1 ppb) was detected in the November 1988 sample. This trace level may be a laboratory artifact. This data suggests that contamination present in Production Well 24 is not entering the well from the western direction. Monitor well W-1 is screened within the screen interval of Production Well 24; therefore, contamination entering Well 24 from the west should also be present in W-1. Since W-1 does not contain any of the contaminants found in Well 24, it is unlikely that Well 24 contamination originated from the western direction. Additional monitor wells located west of the City Production Wells may be necessary to further characterize the condition of the aquifer in this region.

A consistent pattern of contamination can be traced from the source at the southwest corner of the Aero-Dri facility to the 20-Series Production Wells. This conclusion is based on CH2M HILL data collected during the August 1988 split sampling event with PBCHD and Dames & Moore; and the September 1988 data from wells installed by CH2M HILL. The CH2M HILL data from the split sampling event was used because of close agreement with the PBCHD data. The two monitor wells installed by Dames & Moore during their preliminary contamination assessment activities continue to show the highest levels of contamination since this was the area of contaminant spills. The concentration decreases as the plume is drawn toward the City production wells. The highly contaminated areas near MW-1 and MW-2, however, continue to provide a source of production well contamination.

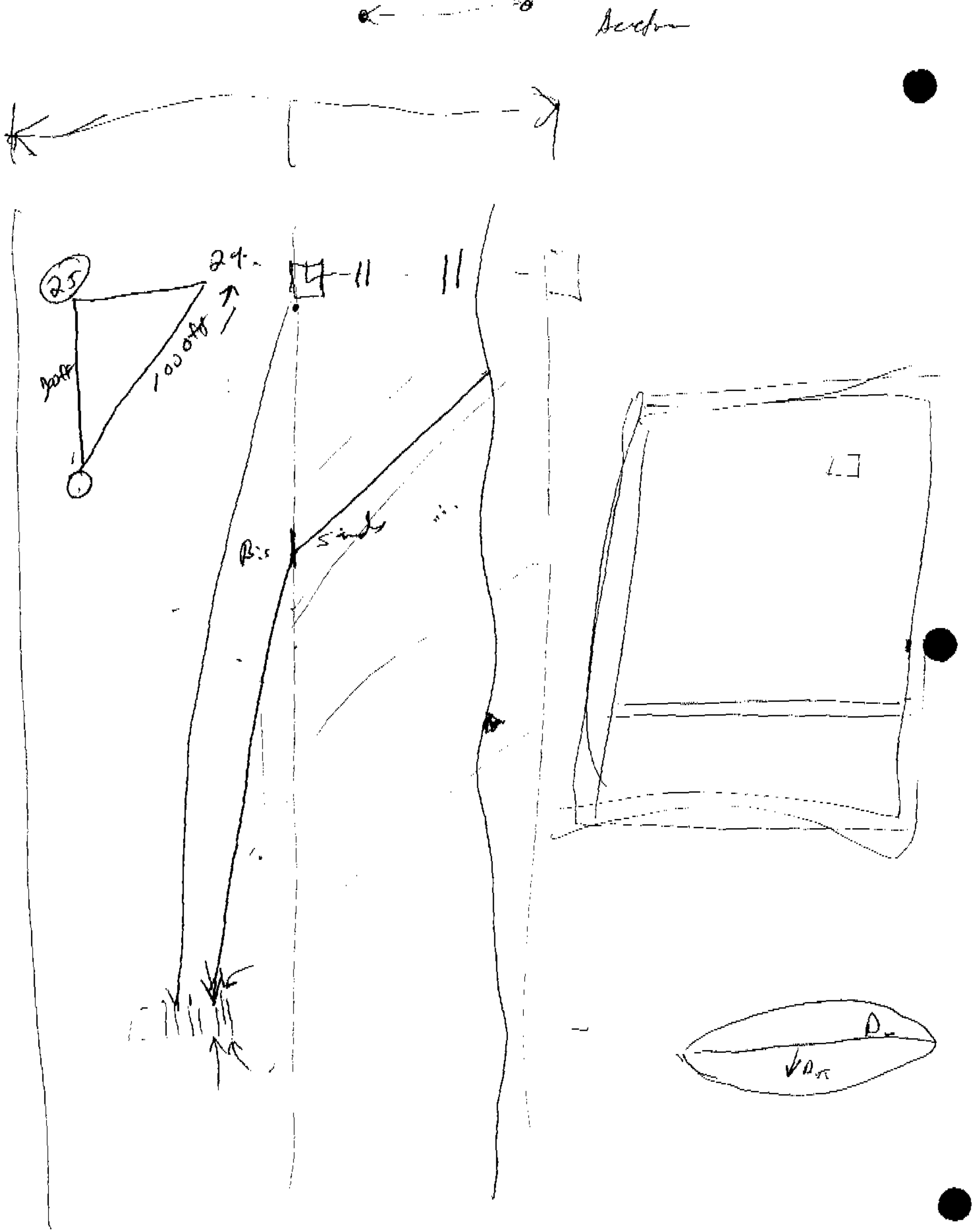
Section 4
REFERENCES

1. Dames and Moore, Preliminary Contamination Assessment Report. December 21, 1987.

2. Dames and Moore, Contamination Assessment Plan. December 21, 1987.

3. Dames and Moore, Revised Contamination Assessment Plan. February 1988.

4. CH2M HILL, Prelminary Contamination Assessment Report. December, 1988.


25
1000ft

PRELIMINARY CONTAMINATION ASSESSMENT PLAN

Prepared for

CITY OF DELRAY BEACH

Prepared by

CH2M HILL SOUTHEAST, INC.

May 1988

SEF24708.A3

CONTENTS

TABLES

FIGURES

Section 1
INTRODUCTION

1.1 BACKGROUND

In July 1987, 3.17 parts per billion (ppb) of the volatile organic chemical (VOC) tetrachloroethene were detected in the finished water at the City of Delray Beach Water Treatment Plant. A subsequent analysis of groundwater from the City's production wells revealed that Wells 21, 22, 23, and 24 had measurable quantities of tetrachloroethene, trichloroethene, and cis-1,2-dichloroethene. This initial indication of production well contamination prompted an investigation of local industries by the Florida Department of Environmental Regulation (FDER).

On September 30, 1987, FDER conducted a hazardous waste inspection of Aero-Dri Corporation, which is located approximately 1,000 feet southeast of the contaminated production wells. The resulting Hazardous Waste Inspection Report cited Aero-Dri with 11 violations of hazardous waste regulations, and a Warning Notice (No. 50-419-87-HW) was issued on November 12, 1987. In accordance with the terms of the Warning Notice, meetings were held November 23, 1987, and December 7, 1987, between FDER, Aero-Dri and Aero-Dri representatives, L&J Enterprises (the property owner), and the Palm Beach County Health Department (PBCHD). FDER proposed a draft Consent Order to Aero-Dri and L&J Enterprises at a December 23 meeting.

Aero-Dri representatives conducted a preliminary investigation at the site by collecting soil samples on October 22, 1987, and groundwater samples on October 30, 1987. The results of these analyses, which indicated contamination, were given to FDER and PBCHD on November 23, 1987. Aero-Dri was fined and required to take corrective actions according to FDER guidelines.

By February 1988, the City was forced to shut down five of the six 20-Series wells because of high contaminant levels. This created a water shortage of approximately 4 million to 5 million gallons per day (mgd). The City imposed a moratorium restricting the use of water for irrigation and nonessential uses. At the same time, the South Florida Water Management District (SFWMD) ordered the City to reduce its water consumption from 6 mgd to 3 mgd in the North and South Well Fields because of the potential for saltwater intrusion.

CH2M HILL was authorized by the City to design and procure an interim treatment system. This action allowed three of the 20-Series wells to be restarted, thus alleviating the City's water shortage.

Granular activated carbon (GAC) was proposed as the only viable treatment alternative that could be provided on a timely basis. Other types of treatment systems to produce flow rates exceeding 4 mgd were not available within a short time frame. Calgon Carbon Corporation agreed to provide two GAC systems within one week after entering into an agreement with the City and a third unit one week later. The first carbon unit arrived on March 23, and the second unit arrived the following day. PBCHD approved the effluent from each carbon system on March 28, and the City began using Wells 22 and 23 that same day. The third carbon unit at Well 24 was put into operation on April 4.

1.2 LOCATION

The City of Delray Beach 20-Series Well Field is located in south Palm Beach County between Linton Boulevard and Atlantic Avenue. Figures 1-1 and 1-2 show the location of these wells. The 20-Series wells are about 400 feet east of Interstate 95 on both sides of S.W. 10th Street. Well 21 is located on the north side of S.W. 8th Street between 12th and 13th Avenues. Wells 22, 23, and 24 are located on the east side of S.W. 15th Avenue between S.W. 7th Street and S.W. 10th Street. Well 25 is located about 100 feet south of S.W. 10th Street near a Florida Power & Light (FPL) transformer station. Well 26 is located just east of Interstate 95 near the FPL transformer station. Table 1-1 summarizes construction data provided by the City for the 20-Series wells.

1.3 PURPOSE

The purpose of this preliminary contamination assessment plan (PCAP) is to obtain information confirming a potential source of production well contamination and provide an initial estimate of the magnitude of the contaminant plume. The study is designed to determine ~~if~~ the~~re is an~~ association between the one identified potential responsible party and the production well contamination, and does not include an investigation of other potential contamination sources. The PCAP will also determine whether chemical constituents other than volatile organics are present in or near the production wells.

The tasks described in this PCAP are based on FDER guidelines for conducting preliminary contamination assessment actions. The field investigations include a site inventory and groundwater sampling. The results of this study will be used to prepare the preliminary contamination assessment report (PCAR) and define the tasks necessary to prepare a more detailed contamination assessment plan (CAP).

A detailed summary of existing data and specific work elements to be completed in the preliminary contamination assessment are described in this PCAP.

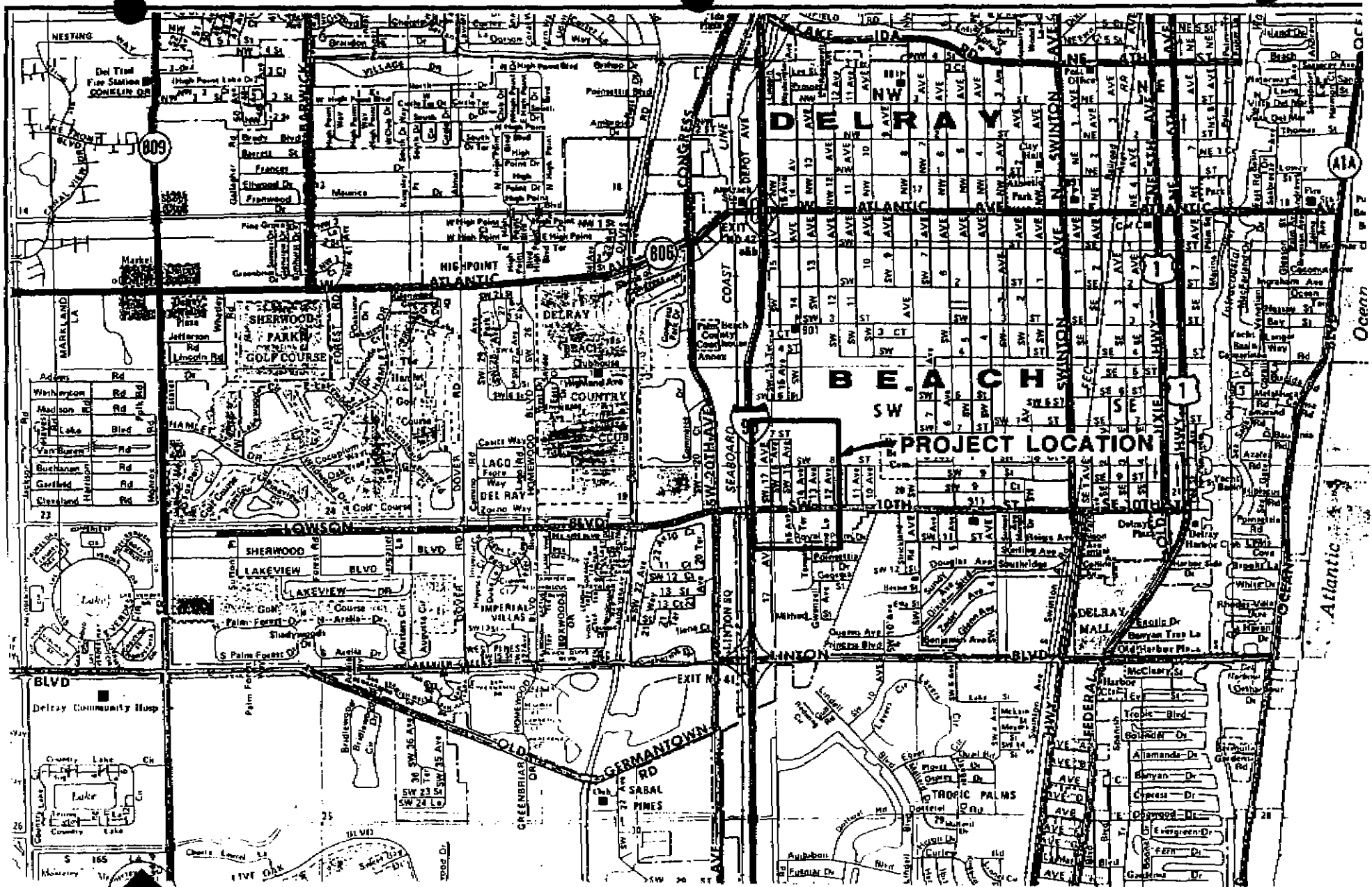
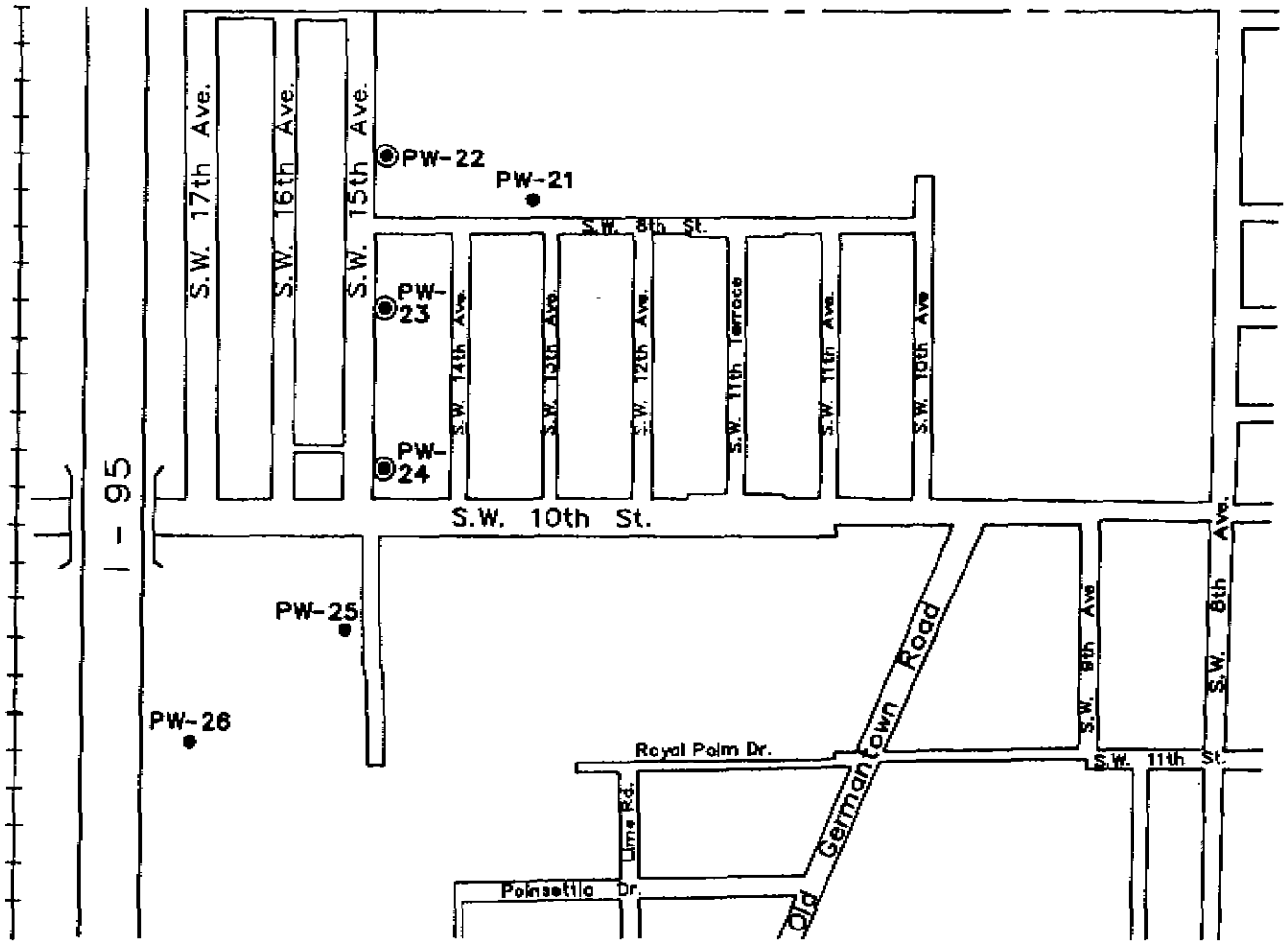


FIGURE 1-1
Project Location

CH2MHILL



Scale : 1"=500'

LEGEND

PW-25 "20-Series" Production Wells

PW-22 "20-Series" Wells with GAC Units Installed

FIGURE 1-2

Locations of "20-Series" Wellfield in Delray Beach

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Table 1-1
DATA SHEET, 20-SERIES WELLS

Well Number	Diameter (inches)	Approximate Cased Interval (feet)	Approximate Screened Interval (feet)	Rated Capacity (gpm)
21	12	0-110	110-150	900
22	12	0-110	110-150	1,000
23	12	0-100	100-140	1,000
24	12	0-110	110-150	1,000
25	12	0-110	110-150	1,000
26	12	0-110	110-150	1,000

Section 2
SUMMARY OF EXISTING DATA

2.1 PREVIOUS SITE INVESTIGATIONS

Aero-Dri conducted preliminary sampling of the contamination in the immediate vicinity of the suspected dumping. This data is summarized in Preliminary Contamination Assessment Report, Perchloroethylene Spill, Aero-Dri Corporation Site (Dames & Moore, 1987). On October 22, 1987, two monitor wells (MW) were installed next to Aero Dri's building to collect groundwater samples. The screen intervals for MW-1 and MW-2 were 20-25 feet and 40-45 feet, respectively. Four soil samples were collected at approximately 5-foot intervals during the installation of the wells, at which time a gross measurement of organic vapor was also conducted.

Groundwater and soil from MW-1 and MW-2 were analyzed by EPA Methods 601 (purgeable halocarbons) and 602 (purgeable hydrocarbons). The Method 601 analysis showed elevated levels of tetrachloroethene in the range of 26 ppb in soil taken from a depth of 15 feet at MW-1, to 585,000 ppb in soil taken from near the surface at MW-2. A more detailed summary of the available soil analysis is given in Table 2-1.

Tetrachloroethene levels in groundwater were 5,600 ppb in MW-1 and 531,500 ppb in MW-2. In addition, 450 ppb and 430 ppb of trichloroethene were measured in groundwater from MW-1 and MW-2, respectively. Table 2-2 summarizes the available groundwater sample data for the two Aero-Dri monitor wells.

The Method 602 analysis indicated the presence of benzene, ethylbenzene, toluene, and xylene in soil samples from MW-1 and MW-2. Each of these compounds, except toluene, was also detected in the groundwater. At MW-1, 5 ppb benzene, 11 ppb ethylbenzene, 7 ppb toluene, 35 ppb o-xylene, and 32 ppb m-xylene were found at a depth of 10 feet in the soil column. Similar concentrations were detected in soil from MW-2. In the groundwater, 17 ppb ethylbenzene and 1 ppb o-xylene were measured at MW-1, while 14 ppb ethylbenzene, 12 ppb benzene, 4 ppb o-xylene, 6 ppb xylene, and 3 ppb p-xylene were detected in MW-2. The presence of these compounds typically indicates contamination by petroleum products.

2.2 WATER QUALITY DATA

The City sampled groundwater from the 20-Series wells, and analysis was performed by Broward Testing Laboratory, Inc. The study indicated contamination by tetrachloroethene in

Table 2-1
SUMMARY OF PERTINENT SOIL SAMPLE ANALYSIS
FROM THE AERO-DRI SITE

	Concentration (ppb) Soil Depth (feet)			
	Surface	5	10	15
MW-1				
Benzene	<0.1	5	<0.1	<0.1
Ethylbenzene	<0.1	4	11	1
Toluene	<0.1	8	7	12
o-Xylene	<0.1	11	35	3
m-Xylene	<0.1	11	32	4
p-Xylene	<0.1	<0.1	<0.1	<0.2
Chloroform	6,900	<250	<250	<250
Trichloroethene	<250	<250	<250	<250
Tetrachloroethene	4,030	4,469	2,274	26
MW-2				
Benzene	<0.1	<0.1	<0.1	<0.1
Ethylbenzene	<0.1	18	<0.1	<0.1
Toluene	<0.1	6	<0.1	<0.1
o-Xylene	<0.1	66	<0.1	<0.1
m-Xylene	<0.1	30	<0.1	<0.1
p-Xylene	<0.1	42	<0.1	<0.1
Chloroform	<250	<250	<250	<250
Trichloroethene	<250	<250	<250	<250
Tetrachloroethene	585,000	480	408,000	4,600

Source: Compiled from Preliminary Contamination Assessment Report, Perchloroethylene Spill, Aero-Dri Corporation Site, Dames & Moore, December 21, 1987.

Table 2-2
SUMMARY OF PERTINENT GROUNDWATER SAMPLE ANALYSIS
FROM THE AERO-DRI SITE

Compound	Concentration (ppb) MW-1	MW-2
Benzene	<0.1	12
Ethylbenzene	17	14
Toluene	<0.1	<0.1
o-Xylene	1	4
m-Xylene	<0.1	6
p-Xylene	<0.1	3
Trichloroethene	450	430
Tetrachloroethene	5,600	531,500

Source: Compiled from Preliminary Contamination Assessment Report, Perchloroethylene Spill, Aero-Dri Corporation Site, Dames & Moore, December 21, 1987.

all wells. In many cases, trichloroethene and 1,2-dichloroethene were also detected. The available groundwater test results are summarized in Table 2-3.

The tetrachloroethene concentration reported in the groundwater sample from MW-2 was approximately 531 ppm. Because the solubility of tetrachloroethene is 200 ppm at 20°C, a non-aqueous tetrachloroethene phase could be present in the aquifer. In addition, the density of tetrachloroethene (1.63 g/cc) could result in non-aqueous tetrachloroethene sinking to the bottom of the aquifer and forming a pool of solvent. This pool could serve as a continuing contamination source of dissolved solute that would move with the groundwater head gradients.

2.3 SITE GEOLOGY

The geology of the surficial aquifer in the vicinity of Delray Beach is composed of the Pamlico Sand and Anastasia Formation. Lithologic logs from two wells in the Golf Course Well Field show fine to medium sand down to about 70 feet below land surface (bls). Calcareous sandstone with shell fragments are found below the sand layers to a depth of 180 feet bls. The bottom of the surficial aquifer is bounded by layers of clay and silt beds, although the lithologic logs at the golf course wells do not extend to the expected depth of those layers between 200 and 250 feet.

Table 2-3
SUMMARY OF PERTINENT GROUNDWATER SAMPLE ANALYSIS
FROM 20-SERIES WELL FIELD

Well Number	Sample Date	Concentration (ppb) Tetrachloroethene	Trichloroethene	1,2-Dichloroethene
21	08/22/87	35.0	<1.0	<1.0
	10/03/87	29.0	<1.0	NA
	10/30/87	58.7	<1.0	60.5
	01/25/88	30.3	NA	NA
	02/26/88	22.0	<5.0	<5.0
	03/11/88	2.9	0.5	0.5
22	08/22/87	24.9	4.0	4.8
	10/03/87	<1.0	2.4	8.5
	10/30/87	<1.0	2.7	5.0
	01/25/88	4.6	NA	NA
	02/26/88	19.0	3.3	2.6
	03/11/88	<0.5	2.2	6.9
23	08/22/87	12.0	1.6	2.6
	10/03/87	9.0	<1.0	<1.0
	10/30/87	1.2	1.0	NA
	12/09/87	12.5	0.4	NA
	12/11/87	1.5	<1.0	NA
	12/14/87	1.0	<1.0	NA
	01/25/88	12.4	NA	NA
	02/26/88	43.0	3.7	<5.0
	03/11/88	1.5	0.6	<0.5
24	08/28/87	51.0	11.8	23.8
	10/03/87	99.6	30.1	26.9
	10/30/87	87.6	16.8	NA
	12/09/87	43.6	9.7	22.7
	12/11/87	12.8	2.1	2.9
	12/14/87	5.2	<1.0	NA
	01/25/88	6.2	NA	NA
	02/26/88	130.0	20.0	<5.0
	03/14/88	65.0	13.0	13.0
25	01/25/88	20.8	NA	NA
	02/26/88	11.0	1.9	<5.0
	03/11/88	17.0	3.1	1.3
26	01/25/88	0	NA	NA
	02/26/88	<5.0	<5.0	<5.0
	03/11/88	1.5	<0.5	<0.5

NA = Not analyzed

Note: Sampled by City of Delray Beach and analyzed by Broward Testing Laboratory, Inc.

Section 3
PROPOSED FIELD INVESTIGATION

3.1 SITE INVENTORY

A visual site survey will be conducted to locate surface waters and public and private water supply wells within a one-half mile radius of the 20-Series Well Field. The local geology and hydrogeology that potentially affect the movement of subsurface contaminants will be determined from previous well installation records and other available information.

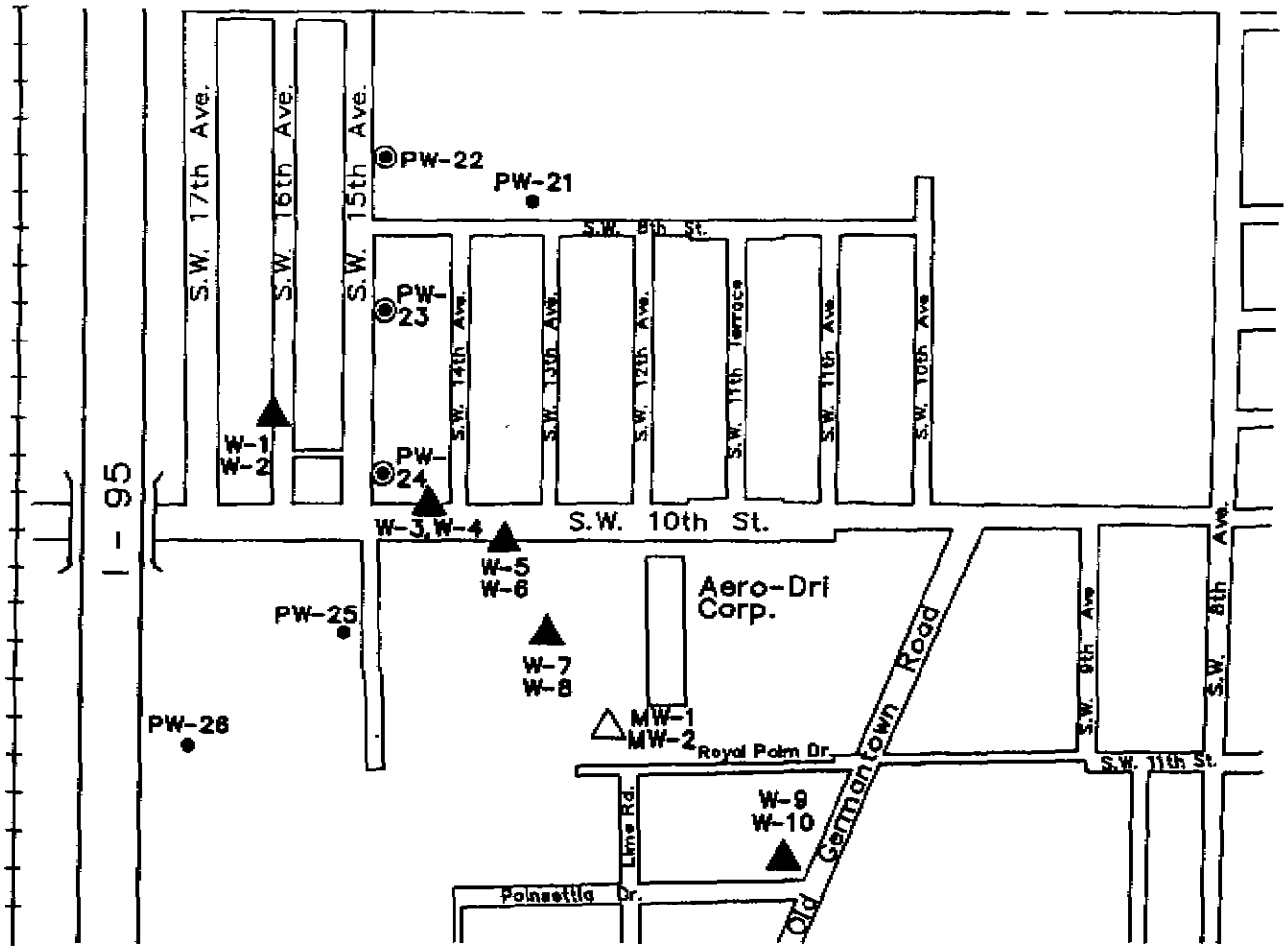
3.2 MONITOR WELL INSTALLATION

Ten monitor wells will be installed in the vicinity of the Aero-Dri site and the 20-Series Well Field. Six of the monitor wells will be placed between Aero-Dri and the 20-Series wells, while the remaining wells will be located east of Aero-Dri and west of the well field. These ten wells will be located at five sites with two wells placed at each site. The proposed locations of these wells are shown in Figure 3-1. The depths of the monitor wells will vary depending on the distance from the suspected source of contamination and the anticipated depth of the contamination within the aquifer. The monitor well locations and depths have been proposed by interpolating between the contaminated Aero-Dri monitor wells (MW-1 and MW-2) and the most contaminated City production well (PW-24) Construction details for the monitor wells are shown in Table 3-1. The exact depth of each monitor well will be determined in the field as dictated by the site geology.

Wells will be installed by the mud rotary drilling technique. The wells will be constructed with 2-inch Schedule 40 PVC casing and screen. Figure 3-2 shows the monitor well construction details. The PVC casing sections will be flush-joined by either threaded and coupled joints, integral mechanical couplings designed for PVC pipe, or slip-on coupling using stainless steel set-screws. To avoid potential contamination after construction, no solvent-welded joints will be used in the monitor well construction. The well screens will have an approximately 0.02-inch slot size.

The drilling equipment will be decontaminated by steam cleaning before arrival onsite. Sand blasting of equipment will be performed if necessary. Decontamination by steam cleaning of down-hole tools will be done between each monitor well installation.

Gravel pack consisting of 6/20 graded silica sand will be placed around the PVC well screen. The gravel pack material



Scale : 1"=500'

LEGEND

- PW-25 — "20-Series" Production Wells
- PW-22 — "20-Series" Wells with GAC Units Installed
- ▲ — Proposed Monitor Well Cluster
- △ — Existing Monitor Well Cluster

FIGURE 3-1
Proposed Monitor Well Locations

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33-1.DWG

Table 3-1
PROPOSED MONITOR WELL DATA SHEET

Well Number	Diameter (inches)	Approximate Cased Interval (feet)	Approximate Screened Interval (feet)
W-1	2	0-150	150-160
W-2	2	0-190	190-200
W-3	2	0-110	110-120
W-4	2	0-140	140-150
W-5	2	0-90	90-100
W-6	2	0-130	130-140
W-7	2	0-60	60-70
W-8	2	0-100	100-110
W-9	2	0-60	60-70
W-10	2	0-100	100-110

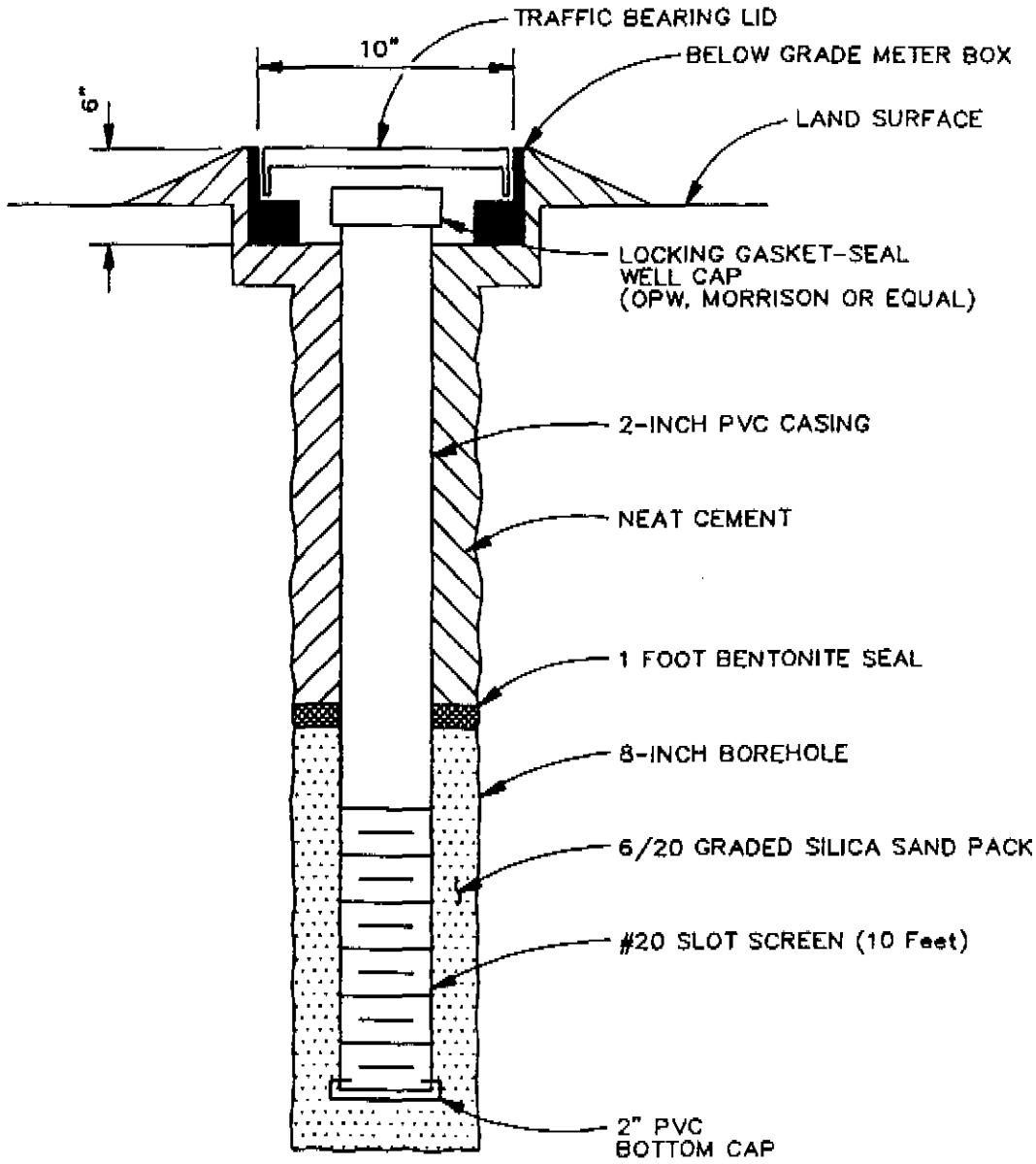

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FIGURE 3-2
Typical Monitor Well
Construction Diagram

CH2M HILL

will be tremied in place with a 1.5-inch PVC pipe that extends to the bottom of the borehole. The gravel pack material will be placed approximately 5 feet above the well screen.

A bentonite mixture will be placed above the gravel pack to seal the annular space. The seal will be at least 1 foot thick to prevent unconsolidated material above the screen from sloughing into the gravel pack.

Cement grouting will be placed above the bentonite seal to ensure a water-tight seal around the well casing and prevent surface contamination from seeping into the well. The cement grouting will fill the space between the bentonite seal and the ground surface.

A locking cap and flush-mounted cover will be placed over each well. The cover will have a permanent marker that clearly identifies each monitor well. Each monitoring well will be surveyed to determine top of casing elevation and horizontal location.

Each well will be developed by surging and pumping until clear, sand-free formation water is produced. Development time is estimated to be from 30 minutes to 1 hour for each well. Water used in developing the wells will be pumped into the sanitary sewer.

Drill cuttings and drilling muds will be containerized and transported to a staging area. A composite sample from this material will be analyzed for VOC contamination. Background soil will also be sampled and analyzed for VOC contamination. The background sample may or may not contain trace quantities of contamination from surface runoff or the atmosphere. If the VOC concentrations in the drilling material are less than or equal to the background sample, the cuttings and muds will be disposed at an appropriate location by the City. If the VOC concentration in the drill material is significantly greater than background, the drill material will be disposed by the City according to methods specified by FDER.

3.3 GEOPHYSICAL LOGGING

During the drilling of three monitor wells, gamma ray and electrical logs will be conducted to describe stratigraphic conditions. The upper sediment layers (strata) in the study area consist mainly of unconsolidated sands, silts, and shells. These materials are generally very permeable; however, deeper sediments may contain less permeable horizons, characterized by the presence of silts and clays. These soils can act as barriers to water movement. The gamma ray log detects clay and silt while the electric log yields

qualitative changes in sediment permeability through the soil profile.

3.4 SOIL SAMPLING

Soil samples in the saturated zone will be collected during the installation of at least two of the monitor wells. The samples will be analyzed for volatile organic compounds and total organic carbon (TOC).

3.5 SITE SURVEY

Each monitor well will be surveyed to establish vertical elevations to within ±0.01 feet and horizontal locations to within ±1.0 feet.

3.6 GROUNDWATER SAMPLING

Samples will be collected from each of the monitor wells. At least one week will be allowed between well development and sampling to help ensure that the samples are representative of the groundwater. Groundwater sampling, handling, and analysis will be conducted according to the procedures outlined in the CH2M HILL Quality Assurance Project Plan (QAPP) for the City of Delray Beach.

Sample bottles and containers will be prepared according to procedures outlined in Standard Operating Procedures for the Handling and Collection of Groundwater and Surface Water Samples (FDER, 1981). Borosilicate glass bottles will be washed with alconox detergent followed by a liberal tap water and deionized water rinse. All sampling materials will be dried for 60 minutes at 105°C.

Groundwater samples will be collected by the following techniques. Each well will be purged prior to sample collection. Specific conductance, pH, and temperature will be measured during the purging operation. Once the readings for these parameters have stabilized, the purging will be complete. A three- to five-well volume purge is anticipated. Two bailers of well water will then be collected and discarded. A third bailer of well water will be collected and transferred to the appropriate sample containers. Samples collected for VOC measurement will be completely filled to eliminate air bubbles within the bottle after capping.

Groundwater samples will be stored in containers and preserved according to guidelines outlined in the October 26, 1984, Federal Register (49 FR 43260, Table II). The information applicable to this PCAP is summarized in Table 3-2.

Table 3-2
SAMPLE CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Sample Parameter	Container[a]	Preservation Technique[b,c]	Maximum Holding Time[d]
Metals [except Chromium (VI) and Mercury]	P,G	HNO_3 to pH <2	6 months
Chromium (VI)	P,G	Cool to 4°C	24 hours
Mercury	P,G	HNO_3 to pH <2	28 days
Purgeable Halocarbons[f]	G, Teflon-lined septum	Cool to 4°C	14 days
Purgeable Aromatics[f]	G, Teflon-lined septum	Cool to 4°C HCl to pH <2[g]	14 days
Base/Neutral Extractables[f]	G, Teflon-lined septum	Cool to 4°C	7 days until extraction, 40 days after extraction
Acid Extractables[f]	G, Teflon-lined septum	Cool to 4°C	7 days until extraction, 40 days after extraction
Pesticides[h]	G, Teflon-lined cap	Cool to 4°C pH 5-9[i]	7 days until extraction, 40 days after extraction
CN^-	P,G	Cool to 4°C, NaOH to pH >12	14 days[e]
EDB	G, Teflon-lined septum	Cool to 4°C	14 days

[a]Polyethylene (P) or Glass (G).

[b]Sample preservation should be performed immediately upon sample collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

[c]When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table 6-1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); nitric acid (NHO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

[d]Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if data on file shows that the specific types of samples under study are stable for the longer time, and has received a variance from the U.S. EPA Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show that this is necessary to maintain sample stability.

[e]Maximum holding time is 24 hours when sulfide is present. Optionally all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

Table 3-2
(Continued)

[f]Guidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

[g]Sample receiving no pH adjustment must be analyzed within seven days of sampling.

[h]When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for seven days before extraction and for forty days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote e (re: the requirement for thiosulfate reduction of residual chlorine).

[i]For the analysis of diphenylnitrosamine, add 0.008% $Na_2S_2O_3$ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

A sample from each of the monitor wells will be screened for tetrachloroethene and trichloroethene by a portable photoionization gas chromatograph. The two samples with the highest VOC concentrations will be analyzed for purgeable organics (EPA Method 624), base neutral and acid extractable compounds (EPA Method 625), and priority pollutant metals and pesticides (EPA Method 608). The remaining eight samples, plus travel and bailer blanks and duplicates, will be analyzed for only purgeable organics with EPA Methods 601 and 602. These methods will be used in lieu of Method 624 to minimize costs. Methods 601 and 602 use only gas chromatography, whereas Method 624 uses gas chromatography and mass spectrometry.

Water level measurements will be determined for each well before purging through the wetted-tape method. Depth to water will be measured from top of casing. The tape will be rinsed with deionized water, wiped with a fresh paper towel soaked in isopropanol, and air-dried between consecutive water level measurements.

3.7 SITE SAFETY

Health and safety considerations necessary for implementing this PCAP are described in Site Safety for Field Investigations (CH2M HILL, in progress).

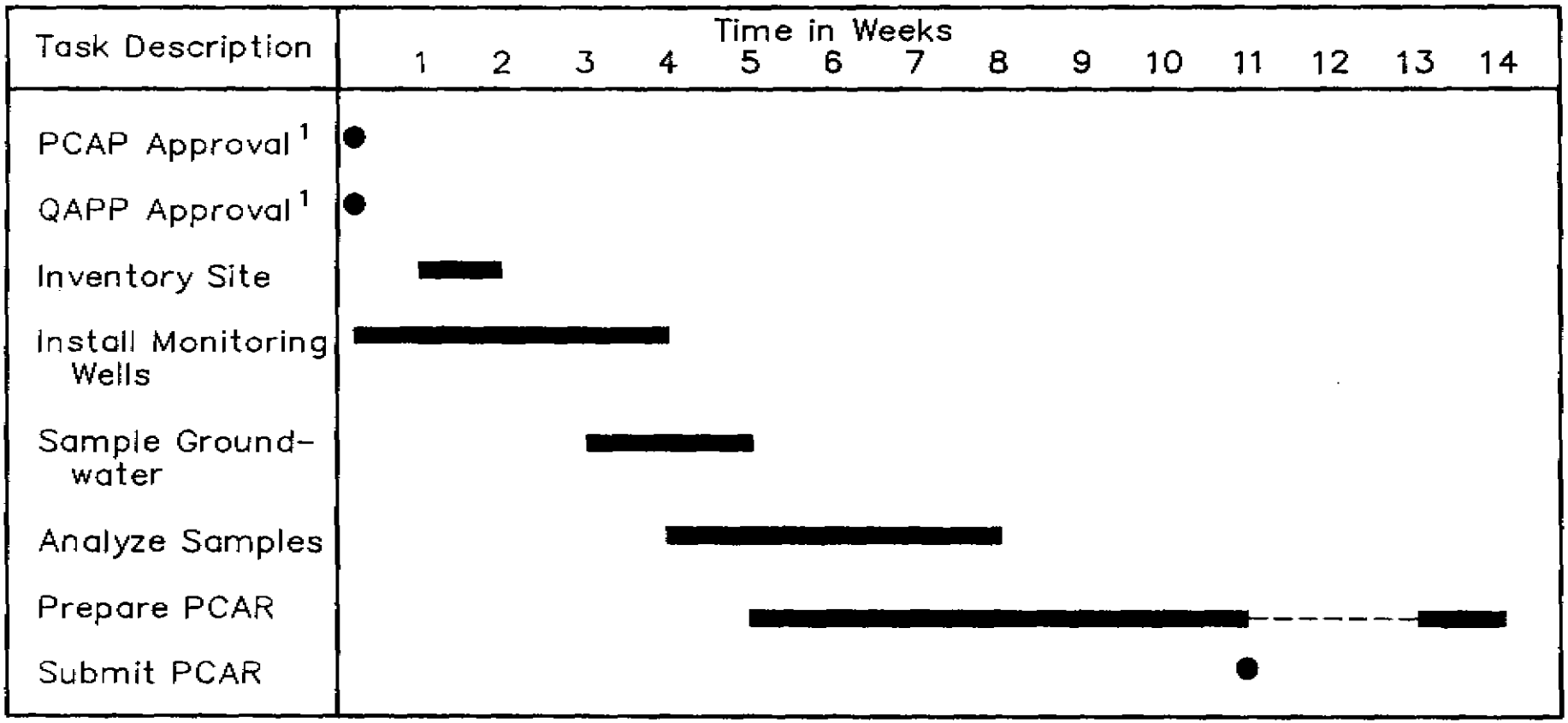
Section 4
DATA EVALUATIONS

Analytical results from the field investigations will be used to evaluate the suspected source of contamination and the potential impact on nearby surface and groundwater supplies. Water level measurements from the monitoring wells will be evaluated along with regional and local hydrogeological data. This information will be used to analyze local groundwater flow patterns and the potential for migration of contamination from the suspected source to the 20-Series Well Field.

The results of the preliminary contamination assessment will be summarized in a preliminary contamination assessment report. The PCAR will present the results of all tasks outlined in the PCAP, and will determine the course of action for subsequent contamination assessment.

Section 5
SCHEDULE

The schedule for the preliminary contamination assessment and preparation of the PCAR is shown in Figure 5-1. Field investigations will begin within one week after this PCAP and the QAPP have been approved. The draft PCAR will be submitted within 3 weeks after completion of the field work and laboratory analysis. This schedule assumes that the PCAP and QAPP are approved at about the same time. The schedule also assumes a 2-week client and FDER review of the draft PCAR before the final PCAR is produced.

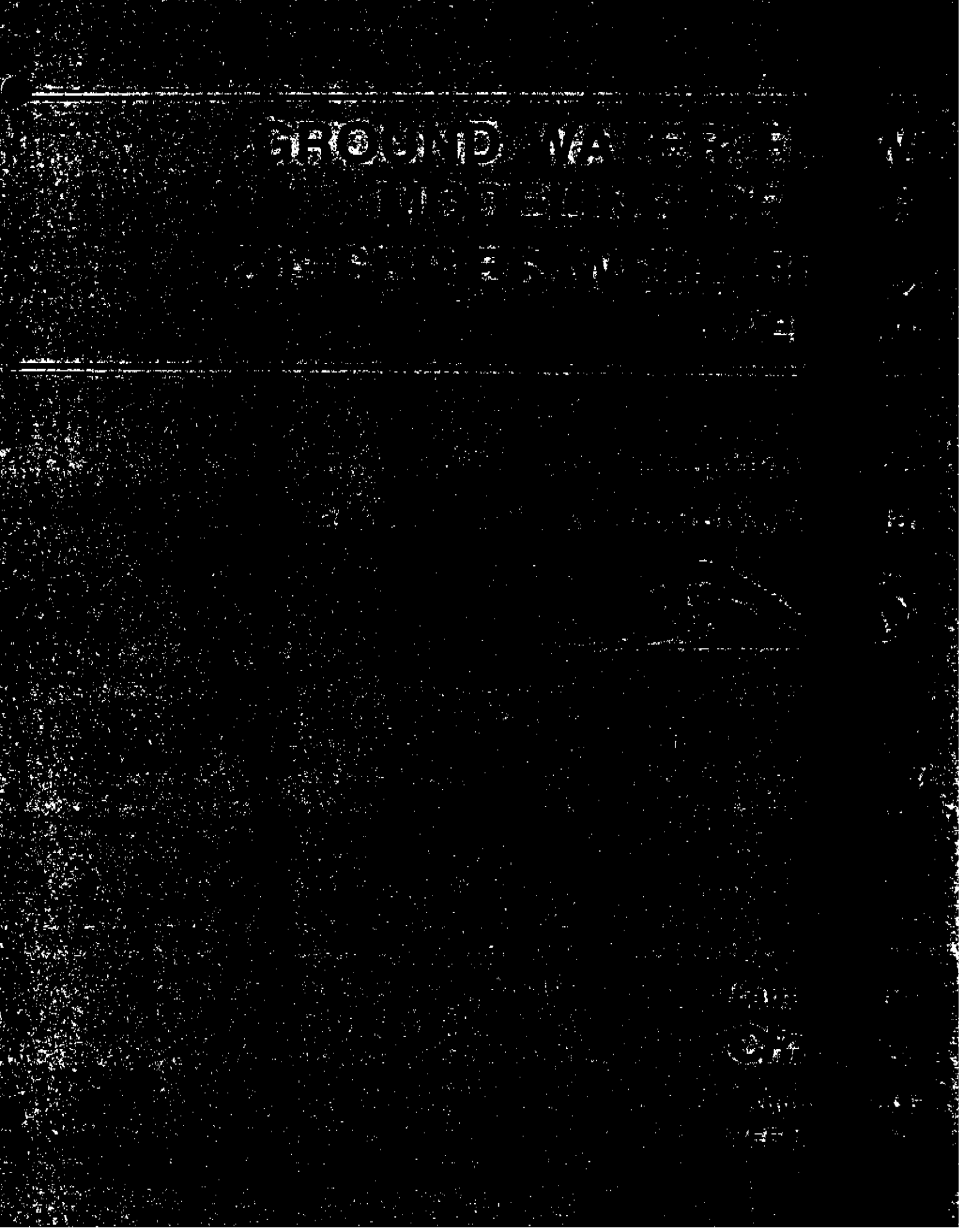


● Deliverable

---- Client and FDER Review

[1]Assumes PCAP and QAPP Approved At The Same Time

FIGURE 5-1
Preliminary Contamination Assessment Plan Schedule



GROUNDWATER FLOW MODELING OF THE 20-SERIES WELL FIELD
ADDENDUM TO THE SEPTEMBER 1988 REPORT
JULY 1989

INTRODUCTION

A computer simulation of the groundwater flow in the Delray Beach area was completed and submitted to the City in September 1988 (CH2M HILL, September 1988). The study focused on the groundwater flow near the City of Delray Beach's 20-Series Well Field. Based on the results of the computer model, inferences were made about the direction and velocity of groundwater or contaminants. Historical simulations, presented in the 1988 modeling report, showed how various pumping scenarios may have influenced the distribution of contaminants in the aquifer.

Subsequent contamination assessments near the 20-Series Well Field have increased our understanding of the area's hydrogeology (Dames & Moore, 1988; CH2M HILL, December 1988). Both studies included additional monitoring wells, soil borings, and slug tests which provided more information on the hydrogeologic characteristics of the surficial aquifer.

One significant conclusion from the Dames & Moore contamination assessment was that two distinct hydrogeologic layers may exist within the surficial aquifer. Based on the information available at the time, the original groundwater flow model (CH2M HILL, September 1988) assumed one distinct geologic layer (hydrostratiographic unit) through which groundwater flow was occurring. Depending on the degree of hydraulic communication between the layers, a multi-layered system may have a different groundwater flow pattern than a system which is represented as a single layer. This could potentially affect the migration of contaminants.

Before amending the original groundwater flow model, CH2M HILL conducted a pumping test and slug tests to gather additional hydrogeologic information. A 72-hour pumping and recovery test was performed at the City of Delray Beach's Golf Course Well Field. Slug tests were also conducted at various monitoring wells at the golf course. All tests were conducted, and data analyzed, to better understand the hydrogeologic characteristics of the area before updating the groundwater flow model.

PURPOSE

The purpose of this addendum is to report on the modification of the original groundwater flow model to include two distinct

hydrostratiographic layers. Significant differences or similarities between the original one-layer model and the modified two-layer model are outlined in this report as they relate to the movement of groundwater and contaminants.

HYDROGEOLOGICAL TESTS

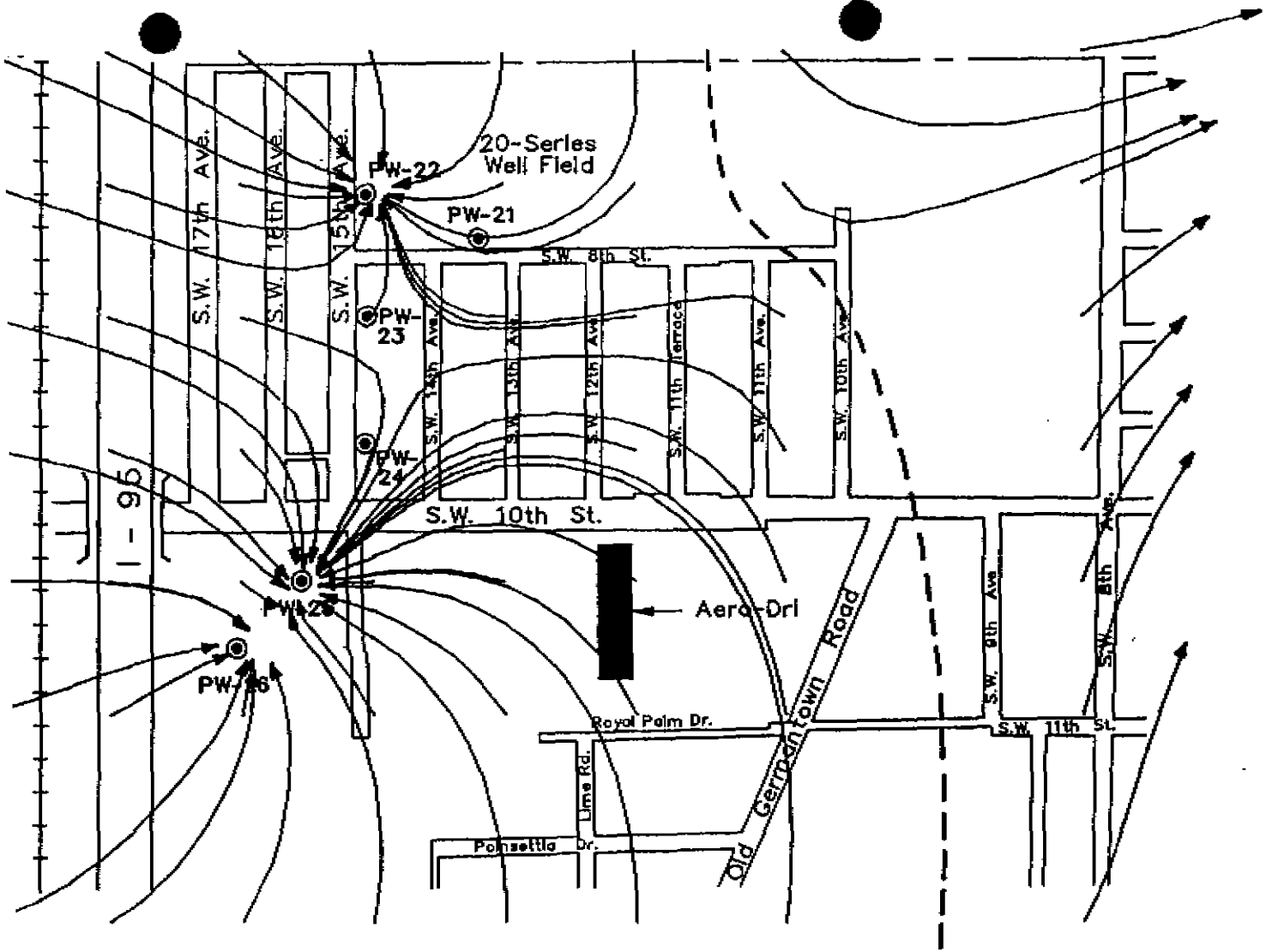
Results from slug tests at shallow monitor wells near the 20-Series Well Field (Dames & Moore, 1988) indicated that the hydraulic conductivity of the shallow sands (zero to 50 feet below land surface [bls]) within the surficial aquifer was approximately an order of magnitude lower than the producing zone (greater than 50 feet bls). The producing zone of the surficial aquifer is loosely defined in this report as the section of the aquifer which yields the majority of groundwater to the 20-Series Well Field. Because the 20-Series wells are pumping from a depth of 110 to 150 feet bls, depths greater than 50 feet bls in the surficial aquifer are termed the producing zone.

CH2M HILL conducted additional aquifer tests to evaluate whether two distinct layers exist. A pumping and recovery test were performed at the City of Delray Beach's Municipal Golf Course. The tests were conducted by stressing the middle section of the aquifer (80 to 130 feet bls). These tests primarily yielded information on the hydraulic characteristics of the producing zone of the aquifer. From the test, the approximate aquifer transmissivity for the producing zone was 200,000 gallons per day per foot (gpd/ft). Assuming a producing zone thickness of 250 feet (Water Resources Management Advisory Board, 1987), the hydraulic conductivity of the producing zone of the aquifer is 107 feet per day (ft/day).

Slug tests were also conducted on shallow monitoring wells at the City golf course to provide an estimate of the hydraulic conductivity of the shallow sands (15 to 30 feet bls). The average hydraulic conductivity from the slug tests was 12 ft/day. Estimated hydraulic conductivity from the Dames & Moore tests (Dames & Moore, 1988) was 7 ft/day. These results from the tests on the shallow sands were compared with the results from the pumping and recovery tests on the producing zone (107 ft/day). Comparison of the tests indicate that two distinct hydrostratiographic layers may exist.

MODEL CALIBRATION

Incorporation of two distinct layers into the model required the recalibration of the groundwater flow model. Predicted



Scale : 1"=500'

LEGEND

PW-25 ◉ PRODUCTION WELL LOCATIONS

⟵ SIMULATED GROUND WATER MOVEMENT

– – APPARENT GROUND WATER DIVIDE

FIGURE 8

Simulated Ground Water Flow Lines-Producing Zone (Prior to January 28, 1988)

CH2MHILL

DWG 9E24708.A6\F-8.DWG

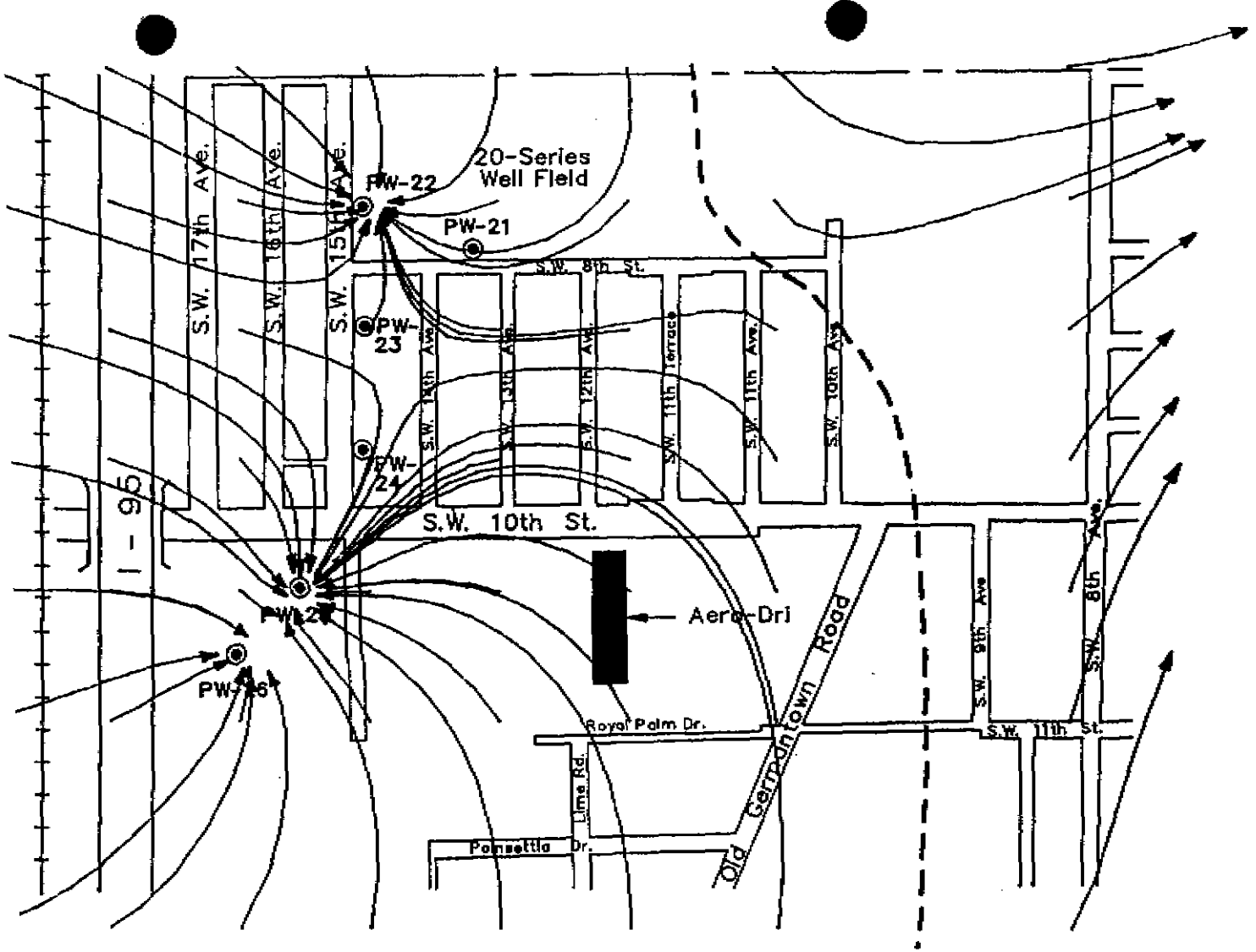
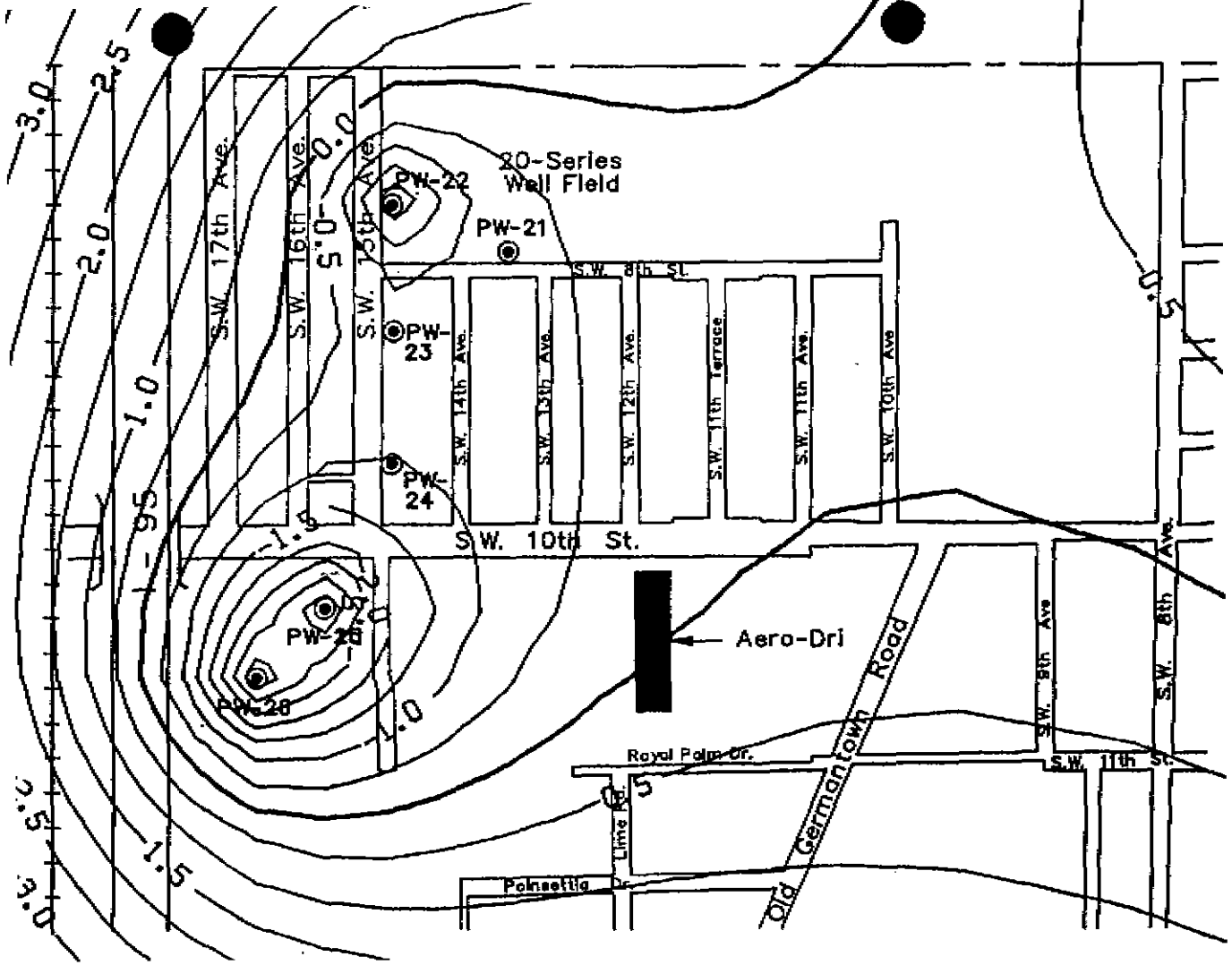


FIGURE 7

Simulated Ground Water Flow Lines-Shallow Zone (Prior to January 28, 1988)

CH2MHILL

6294708.A6\F-7.DWG



Scale : 1"=500'

LEGEND

PW-25 ◉ PRODUCTION WELL LOCATIONS

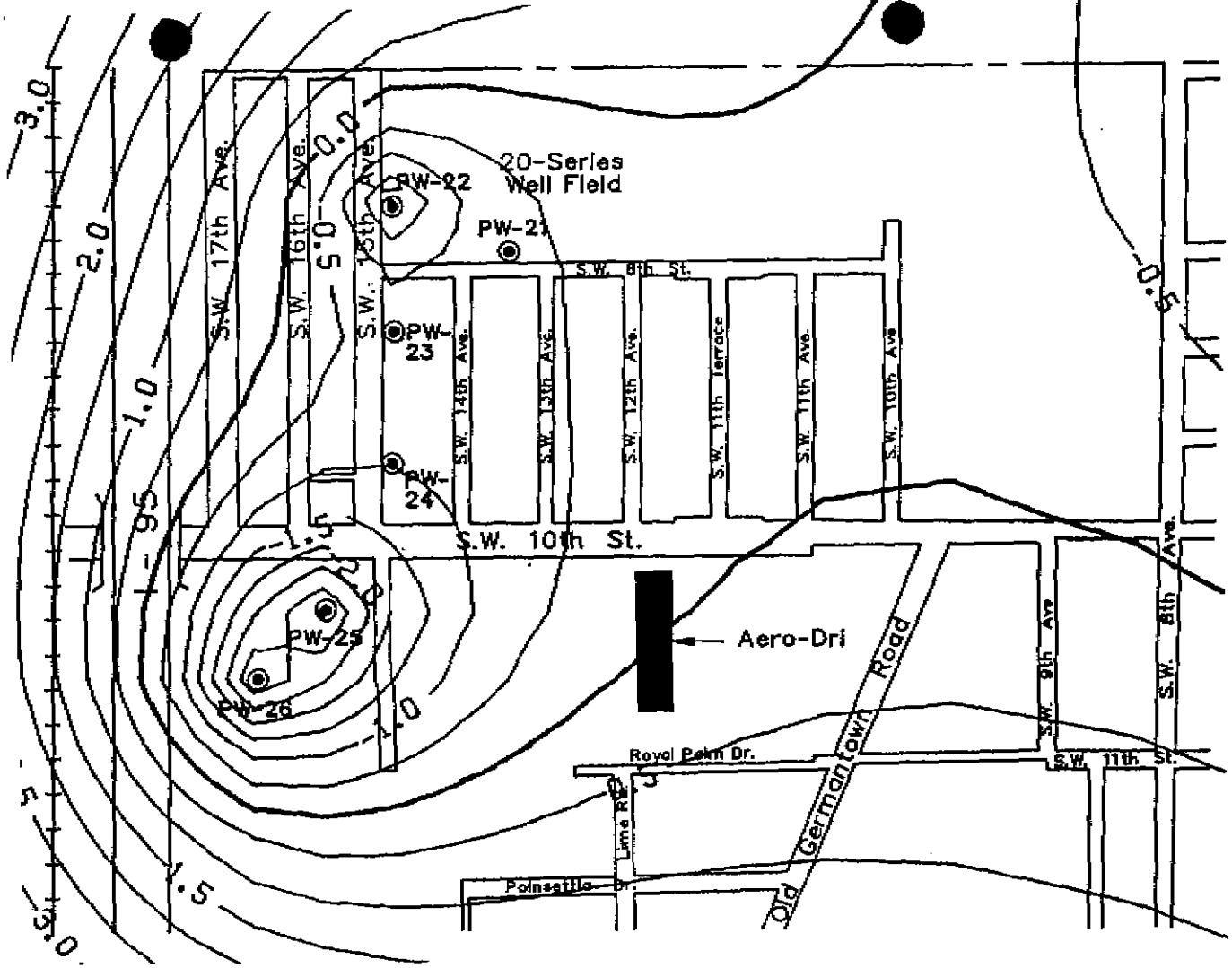
—1.0— GROUND WATER LEVEL CONTOUR (Feet-NGVD) (Contour Interval 0.5 Feet)

FIGURE 6

Simulated Ground Water Level Contours-Producing Zone (Prior to January 28, 1988)

CH2MHILL

\SE24708.A6\F-6.DWG



Scale : 1"=500'

LEGEND

PW-25 ◉ PRODUCTION WELL LOCATIONS

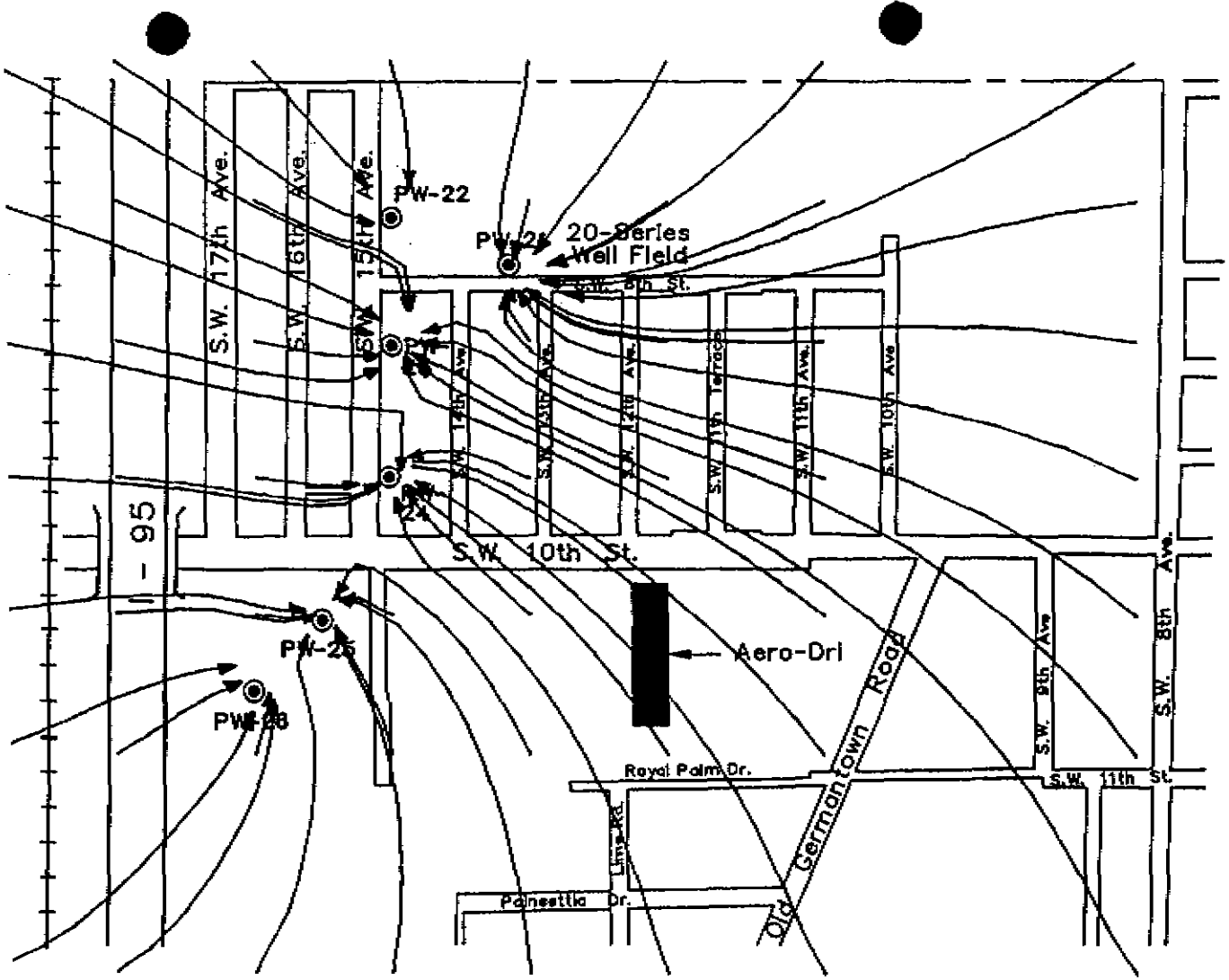
—1.0— GROUND WATER LEVEL CONTOUR (Feet-NGVD) (Contour Interval 0.5 Feet)

FIGURE 5

Simulated Ground Water Level Contours-Shallow Zone (Prior to January 28, 1988)

CH2MHILL

SE24708.A6\F-5.DWG



N

Scale : 1"=500'

LEGEND

PW-25 ◉ PRODUCTION WELL LOCATIONS

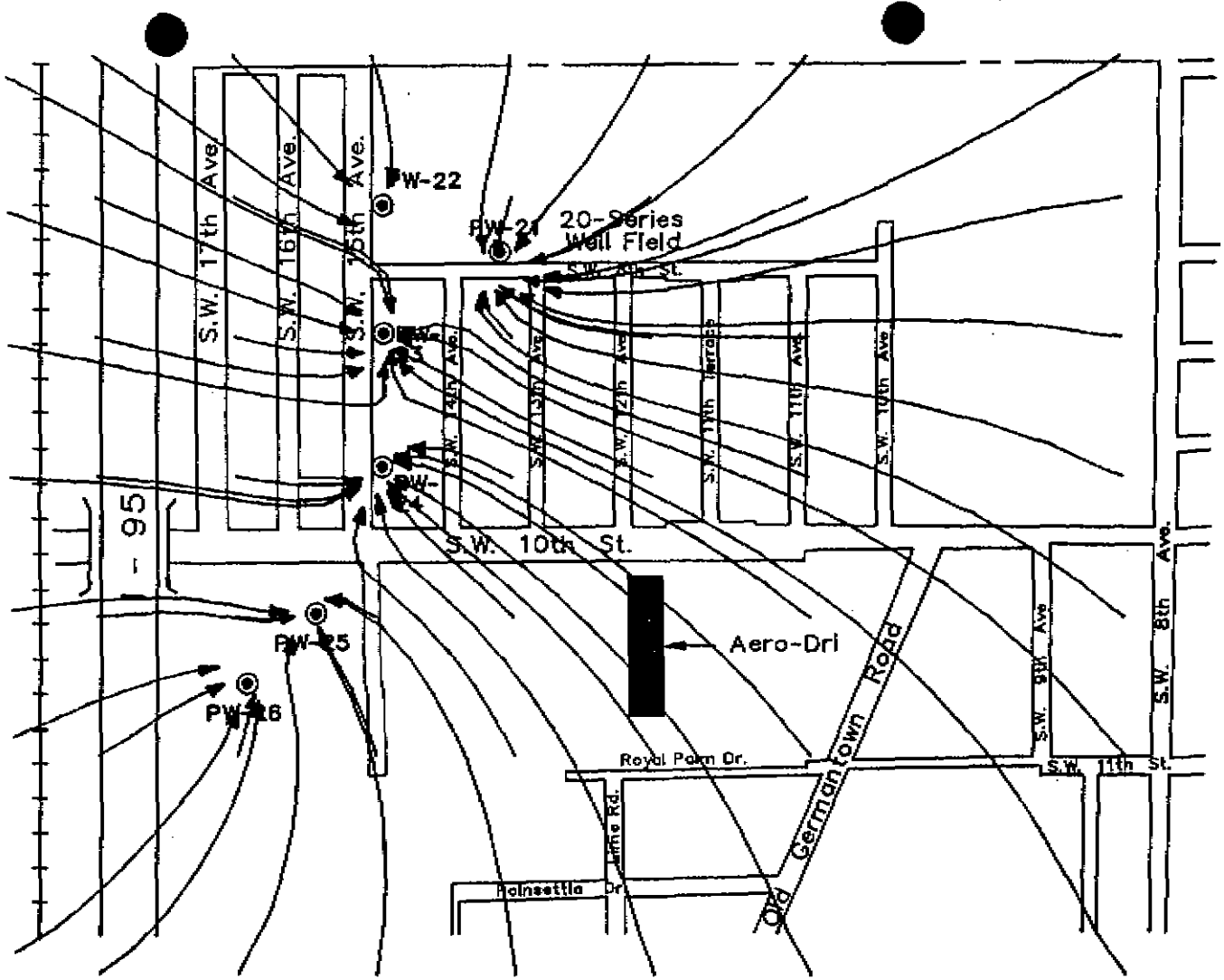
SIMULATED GROUND WATER MOVEMENT

FIGURE 4

Steady-State Ground Water Flow Lines-Producing Zone (Prior to September 31, 1987)

CH2MHILL

\SE24708.A6\F-4.DWG



N

Scale : 1"=500'

LEGEND

PW-25 ◉ PRODUCTION WELL LOCATIONS

← SIMULATED GROUND WATER MOVEMENT

FIGURE 3

Steady-State Ground Water Flow Lines-Shallow Zone (Prior to September 31, 1987)

CH2MHILL

SE24708.A6\FIG3.DWG

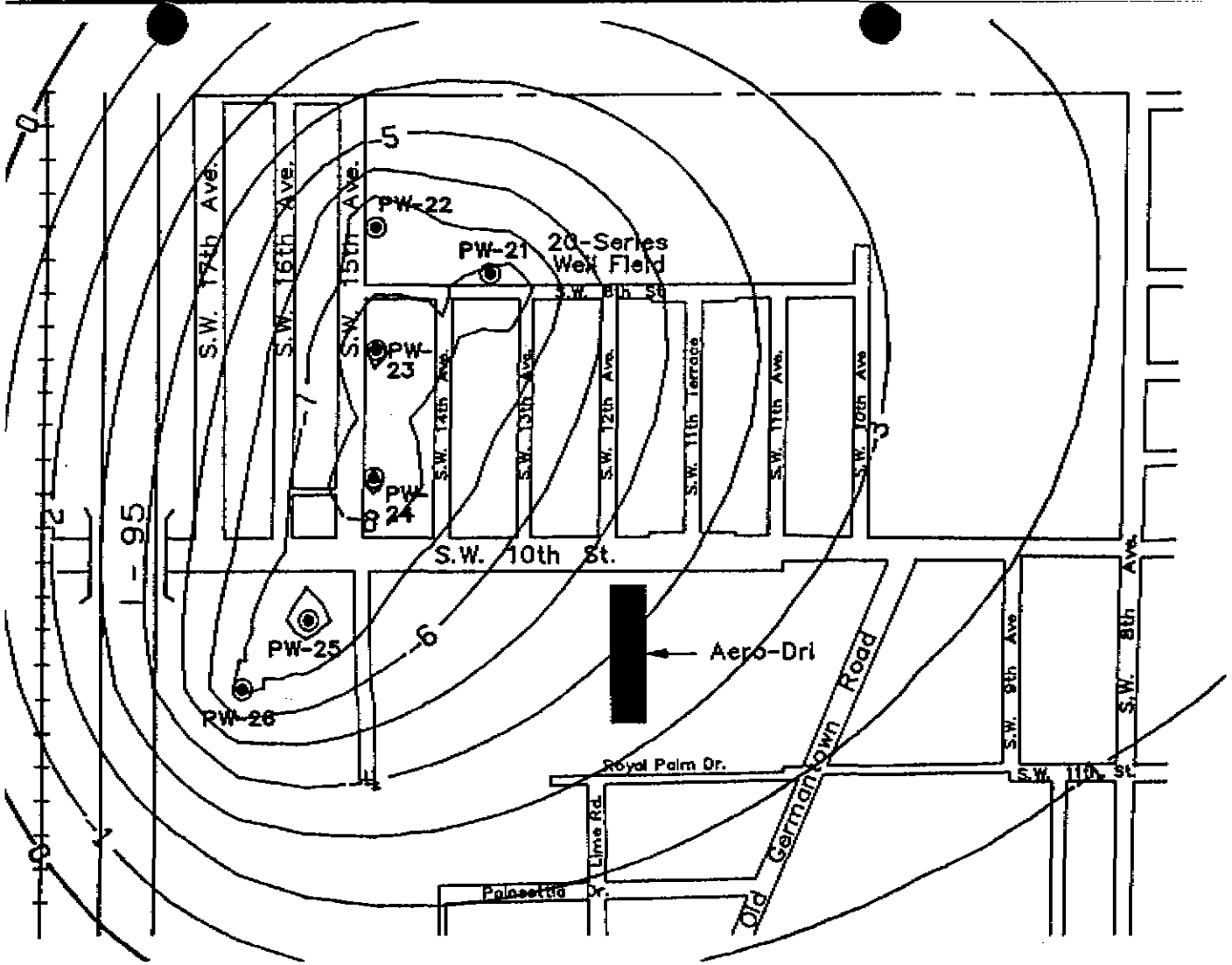


FIGURE 2

Steady-State Ground Water Level Contours-Producing Zone (Prior to September 31, 1987)

CH2MHILL

:\SE24706.A6\F2.DWG

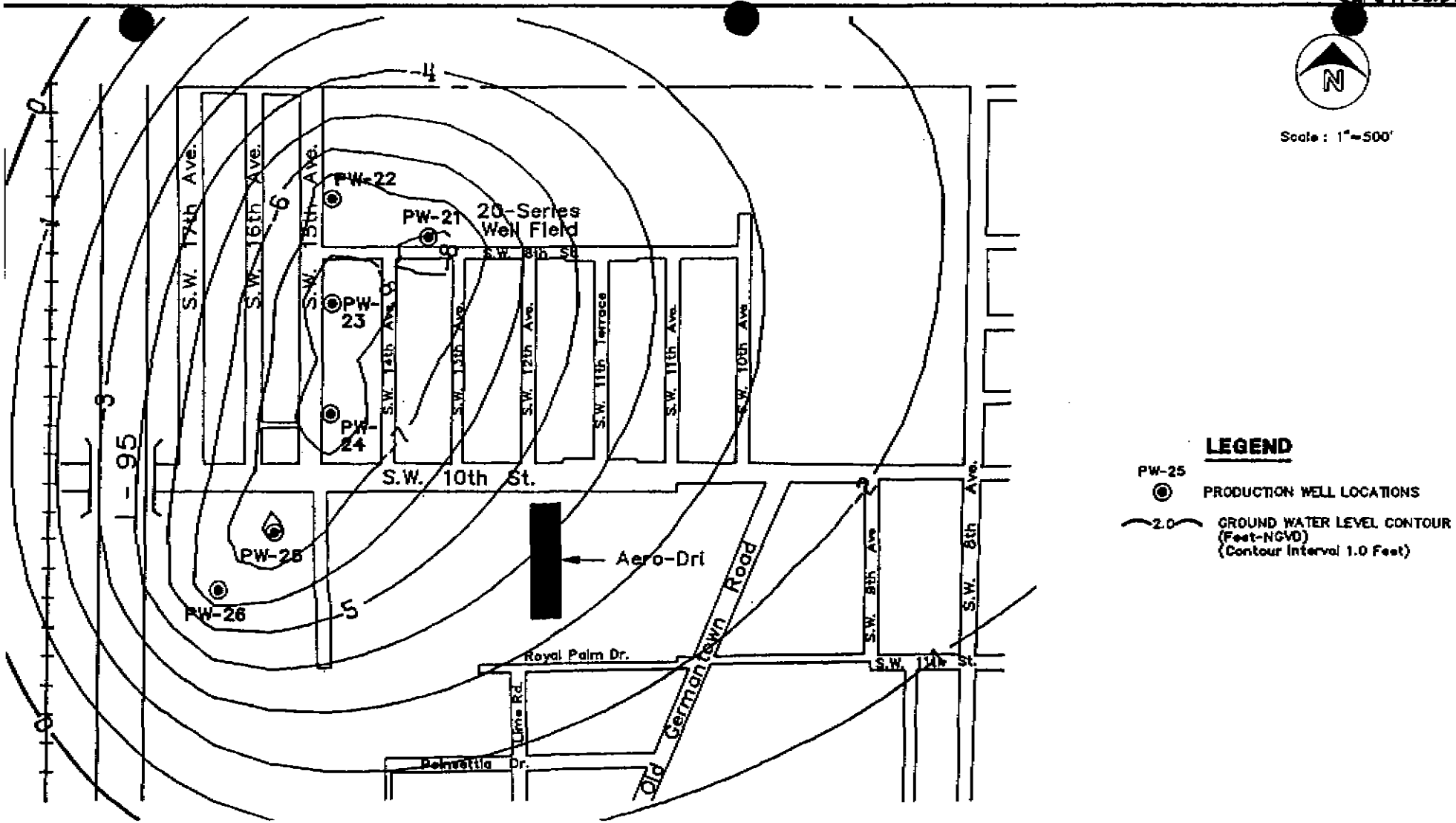


FIGURE 1

Steady-State Ground Water Level Contours-Shallow Zone (Prior to September 31, 1987)

CH2MHILL

F3.DWG

Groundwater level contours and flow lines prior to September 31, 1987, for the shallow and producing zones are shown in Figure 1 through Figure 4. Groundwater levels in the shallow and producing zones are shown in Figures 1 and 2. The resulting direction of groundwater flow in the shallow and producing zones is shown in Figures 3 and 4. Comparison of Figure 1 with Figure 2 and Figure 3 with Figure 4 shows that there is no significant difference between the shallow and producing zones. This result indicates good hydraulic communication between the shallow sands and producing zone. Good hydraulic communication between two distinct layers infers that no hydraulic barrier or confining layer exists between the distinct layers which would impede the flow of water. This result is important because the lack of a confining layer indicates that pumping from the producing zone will similarly affect the shallow zone. Groundwater flow and contaminant movement, therefore, will be similar.

Comparison of Figure 1 and Figure 2 of this addendum with Figure 3 of the September 1988 report illustrates two points. First, the configuration of groundwater level contours and groundwater flow direction is very similar between the one- and two-layer models. Second, the two-layer model predicts slightly lower water levels around the well field than the one-layer model. The difference in water levels may be attributed to different calibration processes between the one- and two-layer models and does not change the direction of groundwater movement in the well field.

Contaminant migration is primarily toward Production Well PW-24 during Period 1 for both the one- and two-layer models. This can be seen by noticing the groundwater flow directions depicted in Figures 3 and 4. Production wells PW-23 and PW-25 would be less affected by the contamination.

PERIOD 2--OCTOBER 1, 1987, TO JANUARY 28, 1988

Pumping Period No. 2 occurred during the initial discovery of contamination at the 20-Series Well Field. Production Wells PW-21, PW-23, and PW-24 were taken out of service during this period to prevent contamination from entering the finished water at the Water Treatment Plant. Production Wells PW-22, PW-25, and PW-26 were assumed to be pumping during this period.

Groundwater level contours and flow lines from October 1, 1987, to January 28, 1988, for the shallow and producing zones are shown in Figure 5 through Figure 8. Groundwater levels in the shallow and producing zones are shown in Figures 5 and 6 respectively. Direction of groundwater flow in the shallow and producing zones is shown in Figures 7 and 8. There are no significant

groundwater levels from the model were compared with observed groundwater levels in numerous wells that monitor both the shallow and producing zones of the aquifer.

Other information was needed to properly calibrate and update the two-layer flow model. Estimates of the hydraulic characteristics of the shallow and producing zone from the most recent pumping and slug tests were included. Pumping records for the City of Delray Beach's production wells were collected for a period preceding and including the calibration date (March 16, 1989). Canal E-4 (El Rio Canal) stage data were gathered for the calibration period.

Following the collection of essential information, the two-layer groundwater model was calibrated to closely match the measured groundwater levels in both the shallow and producing zones of the aquifer. The calibrated two-layer model was then used to run historical simulations identical to those reported by CH2M HILL in the September 1988 report.

HISTORICAL SIMULATIONS

In the September 1988 modeling report, groundwater flow simulations were conducted for various pumping scenarios which preceded and followed the discovery of contamination at the well field. Three historical simulations included the pumping scenarios (1) for a "steady-state" period prior to September 31, 1987; (2) from October 1, 1987, through January 28, 1988; and (3) from January 29, 1988, through March 26, 1988. These pumping scenarios were logical breaks or changes in the pumping schemes of the 20-Series Well Field and helped to explain how contaminants may have moved throughout the well field during these time periods.

For this addendum, results from the two-layer groundwater flow model are presented for the same historical pumping periods and were compared with the original one-layer results. Following calibration of the two-layer model, predicted groundwater levels were generated for the shallow sands and producing zone for each historical time period.

PERIOD 1--PRIOR TO SEPTEMBER 31, 1987 (STEADY STATE)

Pumping Period No. 1 represents the time prior to the alteration of the 20-Series Well Field operation due to contamination. Before the change in well field operation, all six 20-Series wells were operated consistently over a long period of time (steady state).

differences in groundwater levels (or flow lines) between the shallow sands and producing zones of the surficial aquifer. Therefore, direction of groundwater movement in the shallow sands and the producing zone is similar.

Predicted groundwater levels and flowlines of the one- and two-layer models for this pumping scenario are also similar. Groundwater contours from the two-layer model (Figures 5 and 6) are similar to Figure 4 of the September 1988 report. Subsequently, no significant differences exist between the flow lines predicted by the one-layer model in the September 1988 report (Figure 5) and the flow lines from the two-layer model reported in this addendum (Figures 7 and 8). In general, the simulated groundwater flow in the one- and two-layer models is very similar.

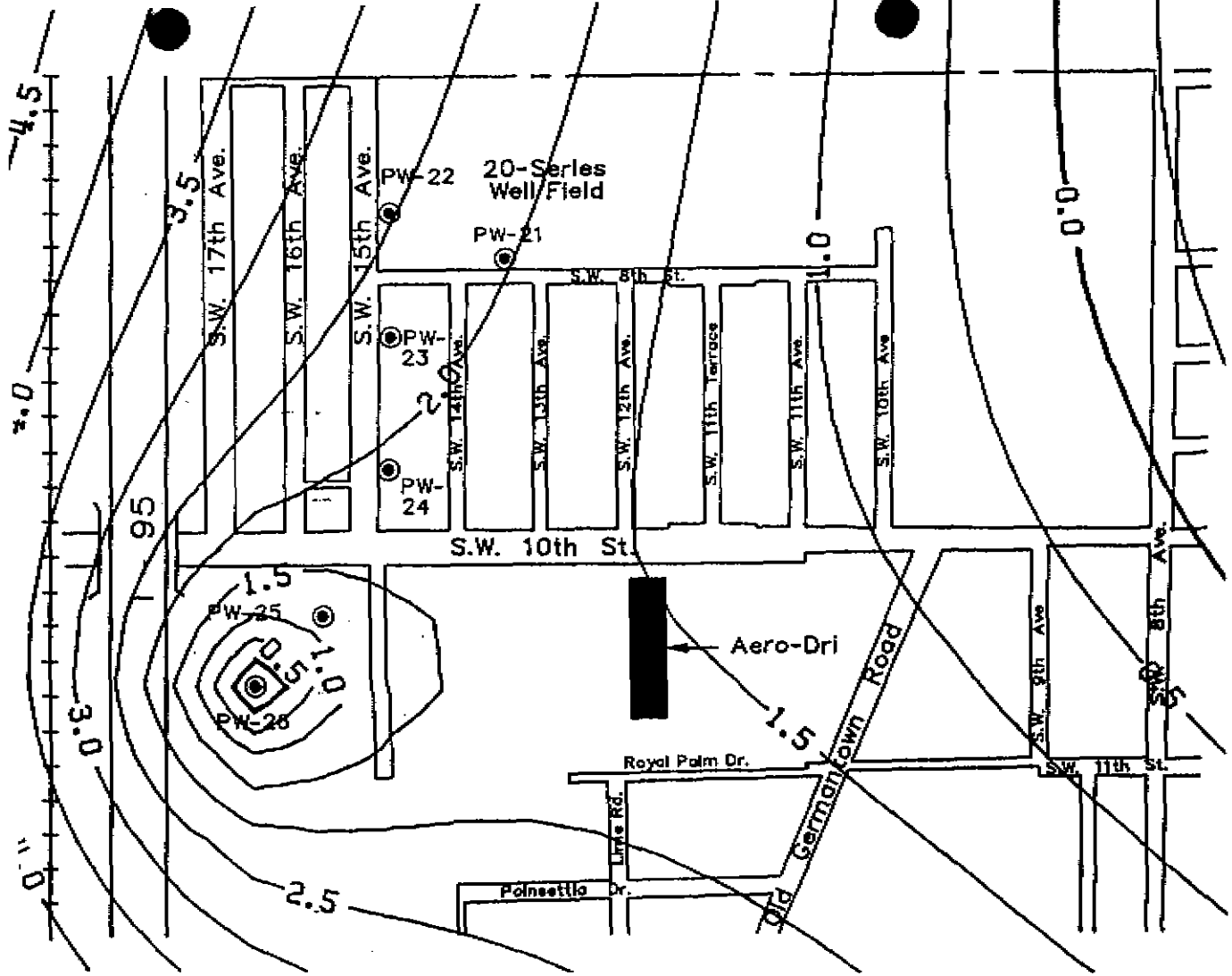
Contaminant migration during Period No. 2 is toward the operating production wells (PW-22, PW-25, and PW-26) as depicted in Figures 7 and 8. This pattern, which is the same for both the one- and two-layer models, caused an increased distribution of contaminants throughout the well field.

PERIOD 3--JANUARY 29, 1988, TO MARCH 26, 1988

Production Wells PW-21, PW-23, and PW-24 had been previously taken out of service due to contamination (Period No. 2). When contamination of Production Wells PW-22 and PW-25 was detected, Production Well PW-26 was the only 20-Series well continuing to pump during Period No. 3.

Groundwater level contours and flow lines from January 29, 1988, to March 26, 1988, are shown in Figure 9 through Figure 12. Water level contours and flow lines for the shallow aquifer are depicted in Figures 9 and 11. Water level contours and flow lines for the producing zone are depicted in Figures 10 and 12. Similar to the results from Periods 1 and 2, there are no significant differences in groundwater levels (or flow lines) between the shallow and producing zones. Therefore, direction of groundwater movement in the shallow sands and the producing zone is similar.

Predicted groundwater levels and flowlines of the one- and two-layer models for this pumping scenario are similar. Groundwater contours from the two-layer model (Figure 9 and 10) are similar to Figure 6 of the September 1988 report. Subsequently, no significant differences exist between the flow lines predicted by the one-layer model in the September 1988 report (Figure 7) and flow lines from the two-layer model reported in this addendum (Figures 11 and 12). In general, the simulated groundwater flow in the one- and two-layer models is similar.



Scale : 1"=500'

LEGEND

PW-25 ◉ PRODUCTION WELL LOCATIONS

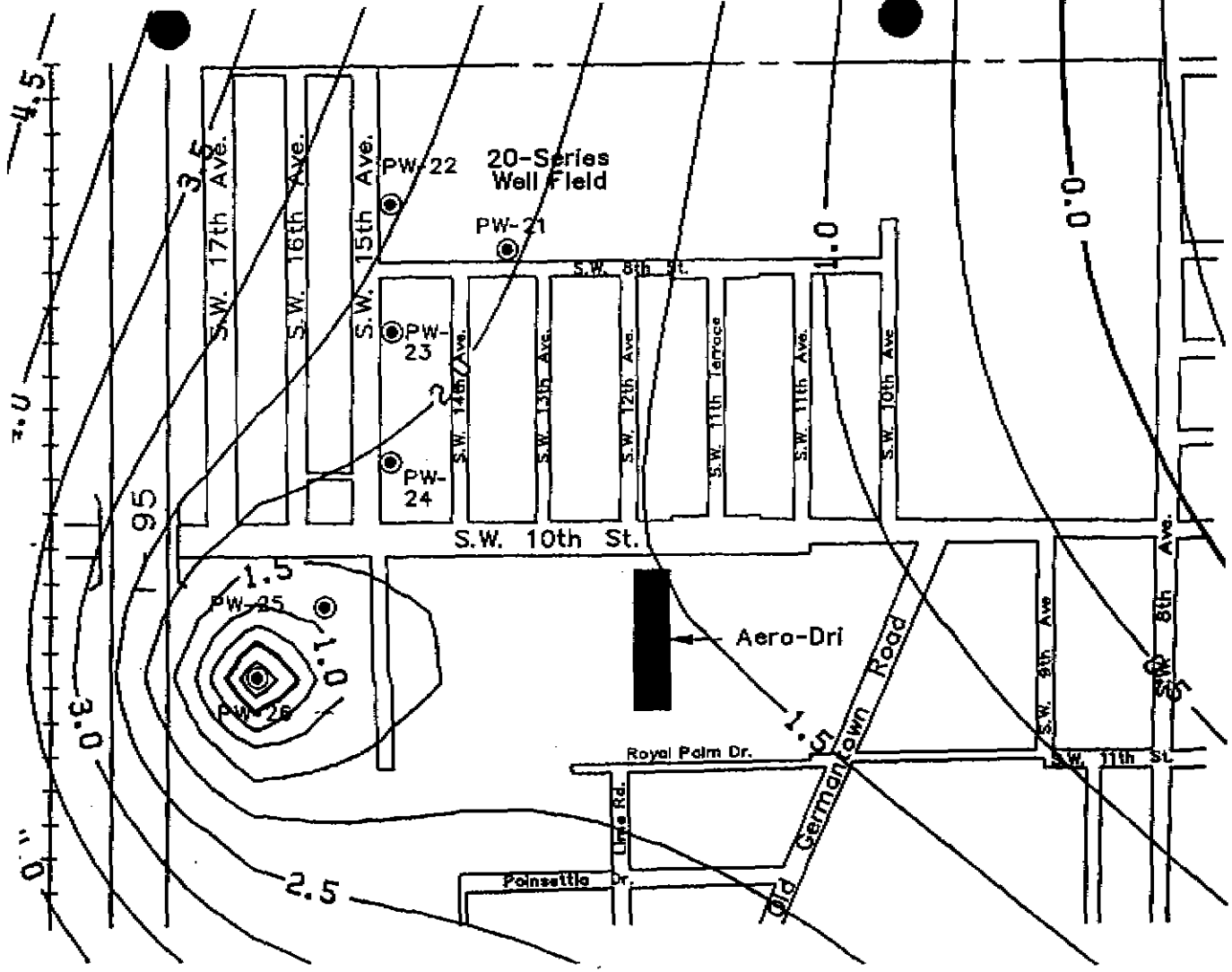
3.0 GROUND WATER LEVEL CONTOUR (Feet-NGVD) (Contour Interval 0.5 Feet)

FIGURE 9

Simulated Ground Water Level Contours-Shallow Zone (Prior to March 26, 1988)

CH2MHILL

\SB04908.A6\F-9.DWG



Scale : 1"=500'

LEGEND

PW-25 ◉ PRODUCTION WELL LOCATIONS

3.0 GROUND WATER LEVEL CONTOUR (Feet-NGVD) (Contour Interval 0.5 Feet)

FIGURE 10

Simulated Ground Water Level Contours-Producing Zone (Prior to March 26, 1988)

CH2M HILL

3824V08.A6\F-10.DWG

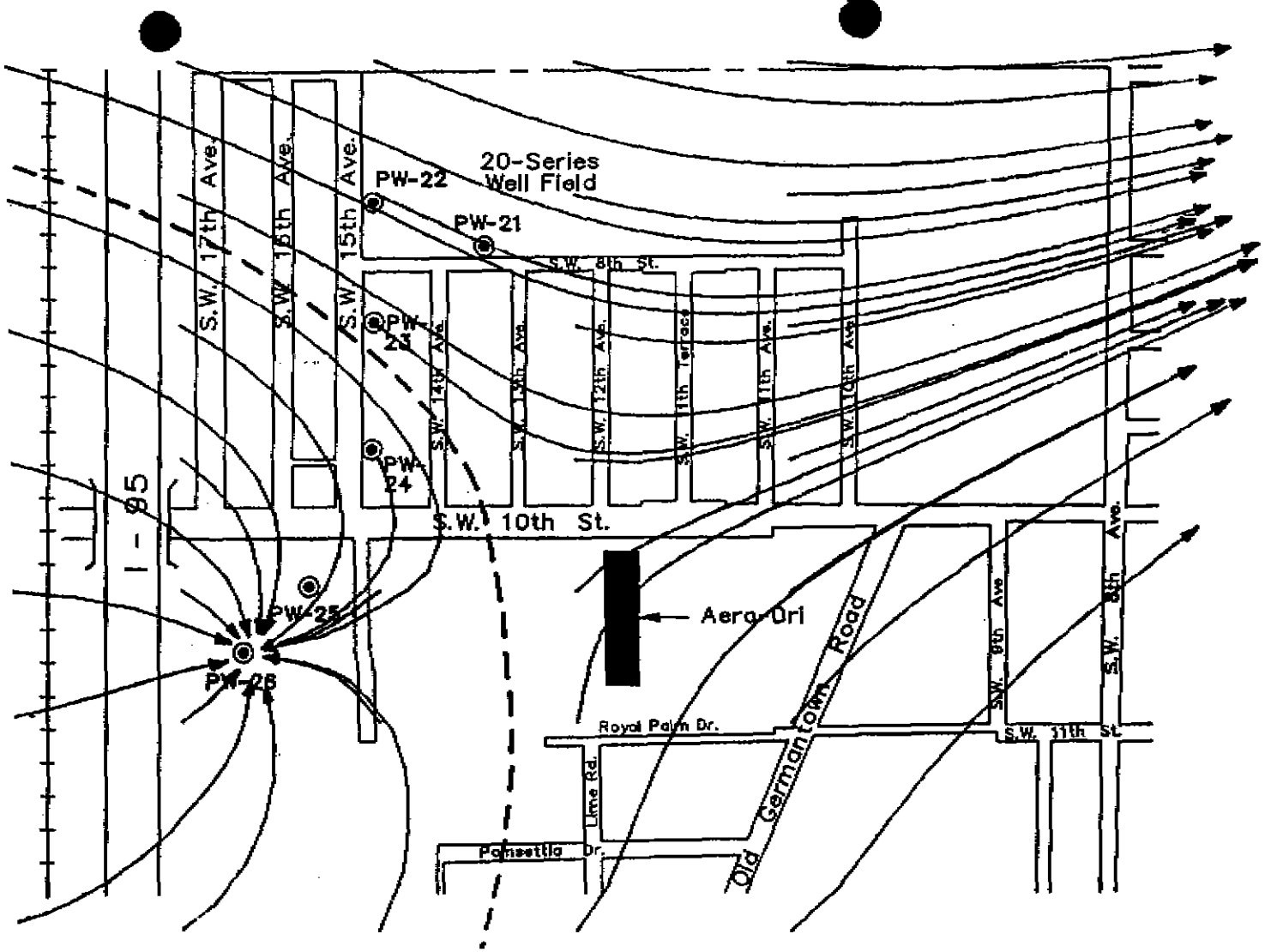


FIGURE 11

Simulated Ground Water Flow Lines-Shallow Zone (Prior to March 26, 1988)

\SE24708.A6\F-11.DWG

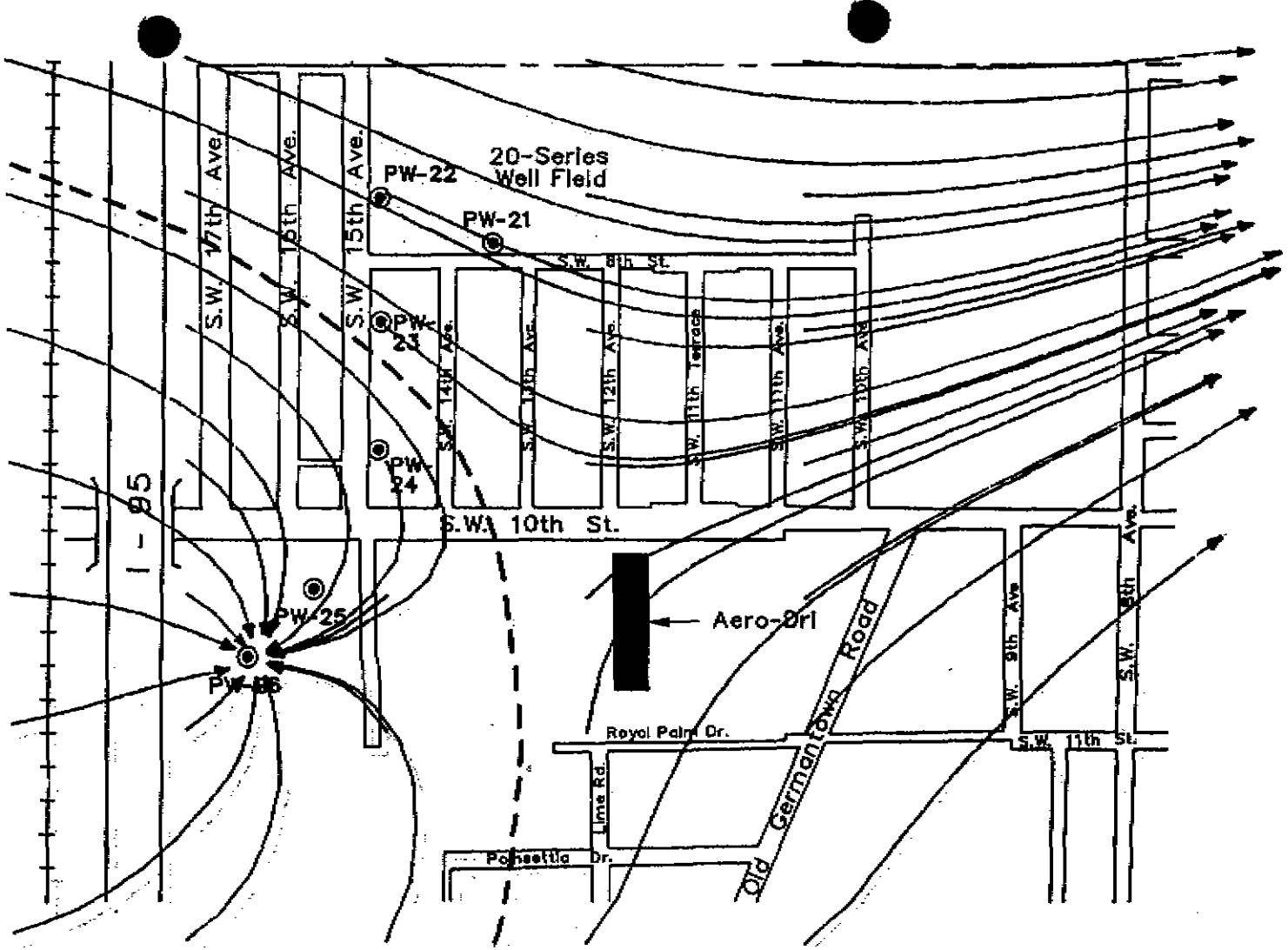


FIGURE 12

Simulated Ground Water Flow Lines-Producing Zone (Prior to March 26, 1988)

CH2M HILL

\SE24708.A6\F-12.DWG

Contaminant migration during Period 3 is toward the only operating well (PW-26). This result is the same for both the one- and two-layer models.

CONCLUSIONS

The purpose of this addendum to the Groundwater Flow Modeling of the 20-Series Well Field was to simulate the effects of a two-layer aquifer near the 20-Series Well Field. Simulation of the groundwater flow using a two-layer model was necessary because some evidence showed that two distinct layers existed in the area of the well field. This may have altered previous conclusions from the original report, which used a one-layer model to represent the aquifer. The results of the two-layer model were compared with the original one-layer model and any notable changes or similarities were made.

Conclusions from the two-layer model are:

1. Hydraulic heads (groundwater levels) in the shallow and producing zones are nearly identical. The implication of this result is that the layers, although distinct, appear to have good hydraulic communication and no significant confinement. Groundwater flow direction and contaminant flow direction, therefore, would be similar between the two layers.

2. The configuration of groundwater level contours is similar between the one- and two-layer models. The predicted direction of groundwater and contaminant flow, therefore, is nearly identical for the one- and two-layer models.

3. Results from the two-layer groundwater flow model did not alter conclusions from the original one-layer flow model presented in September 1988.

4. Because the conclusions were not altered as a result of the two-layer groundwater flow model, recommendations based on the one-layer model have not changed. The previous recommendations included pumping at least five 20-Series production wells to prevent migration to the City Golf Course Well Field. If less than five wells were operational, the flow should be reduced from the Golf Course Well Field.

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