8/25/89

Delta
Environmental
Consultants, Inc.

3330 Data Drive
Rancho Cordova, CA 95670
916/638-2085
FAX:916/638-8385

August 23, 1989

Mr. Dennis Byrne
Hazardous Materials Division
Alameda County Environmental Health Services
80 Swan Way, Room 200
Oakland, California 94621

Subject: *Phase I Hydrogeologic Assessment Report*
Shell Oil Company
3420 San Pablo Avenue
Oakland, California
Delta Project No. 40-88-666

Dear Mr. Byrne:

On behalf of Shell Oil Company, I have enclosed the subject report for your review. In order to further define the extent of hydrocarbon constituents in the soil and ground water at the site, Delta Environmental Consultants, Inc. (Delta), would like to implement the recommendations in the report as soon as approval is obtained from your office.

If you have any questions about the report or the project in general, please contact me at (916) 638-2085.

Sincerely,

DELTA ENVIRONMENTAL CONSULTANTS, INC.

Darrell Nations

Darrell L. Nations
Sr. Hydrogeologist/Project Manager

DLN:law
Enclosure

cc/enc: Ms. Lisa McCann, California Regional Water Quality Control Board
San Francisco Bay Region
Ms. Diane Lundquist, Shell Oil Company

Sample Identification/Field Chain of Custody Record

DELTA
ENVIRONMENTAL CONSULTANTS, INC.

Project: Oakland Shell
Shipped by: Greyhound Hal Hansen
Shipped to: Central Coast Analytical
Comments:

W.O. # 40-88-666-01

Attention of:
Hazardous materials suspected? (yes/no)

Sampling Point	Location	Field ID #	Date	Sample Type	No. of Containers	Analysis Required
MW-1	5.5 feet	MW-1-1	4-11-89	6" brass tube	1	8260 fuel fingerprint 7421 total lead
MW-1	10.5 feet	MW-1-2	4-11-89	6" brass tube	1	8260 fuel fingerprint 7421 total lead
MW-2	10.5 feet	MW-2-2	4-10 89	6" brass tube	1	8260 fuel fingerprint 7421 total lead
MW-3	10.5 feet	MW-3-2	4-10-89	6" brass tube	1	8260 fuel fingerprint 7421 total lead
MW-4	10.5 feet	MW-4-2	4-10-89	6" brass tube	1	8260 fuel fingerprint 7421 total lead

Sampler(s) (signature) Hal Hansen

Field ID	Relinquished by: (signature)	Received by: (signature)	Date/Time		Comments
	Hal Hansen Hal Hansen		4-12-89	0900	

Sealed for shipment by: (signature) Hal Hansen Date/Time 4-12-89 0900 Shipment method: Greyhound

Received for Lab by: (signature) Shellie Hoyd Date/Time 4-13-89 0930 Comments

Samples rec'd sealed, intact & cold -SK

Receiving Laboratory: Please return original form after signing for receipt of samples.

PHASE I HYDROGEOLOGIC ASSESSMENT REPORT

3420 SAN PABLO AVENUE
OAKLAND, CALIFORNIA
DELTA PROJECT NO. 40-88-666

Delta
Environmental
Consultants, Inc.

Sample Identification/Field Chain of Custody Record

DELTA
ENVIRONMENTAL CONSULTANTS, INC.

Project: Oakland Shell
W.O. # 40-EF-560 01
Shipped by: Grey Hound
Shipped to: Central coast Analytical
Attention of:
Comments:
Hazardous materials suspected? (yes/no)

6

Sampling Point	Location	Field ID #	Date	Sample Type	No. of Containers	Analysis Required
Oakland Shell	MW-4	417898	4/17/89	40ml	1	5442 full fingerprint BTXE [illegible]
↓	MW-4	417899	↓	↓	↓	↓ spare

Sampler(s) (signature) Hal Hansen

Field ID	Relinquished by: (signature)	Received by: (signature)	Date/Time		Comments
	Hal Hansen		4/18/89	1500	

Sealed for shipment by: (signature) Hal Hansen Date/Time 4/18/89 1500 Shipment method: greyhound
Received for Lab by: (signature) Shellie Floyd Date/Time 4-19-89 1000 Comments

Samples rec'd sealed, intact & cold - sh

Receiving Laboratory: Please return original form after signing for receipt of samples.

PHASE I HYDROGEOLOGIC ASSESSMENT REPORT

3420 SAN PABLO AVENUE
OAKLAND, CALIFORNIA
DELTA PROJECT NO. 40-88-666

Prepared by:

Delta Environmental Consultants, Inc.
11030 White Rock Road, Suite 110
Rancho Cordova, California 95670
(916) 638-2085

August 22, 1989

Sample Identification/Field Chain of Custody Record

DELTA
ENVIRONMENTAL CONSULTANTS, INC.

W.O. # 40-88-666-01

Project: Oakland Shell
Shipped by: Grey Hound
Shipped to: Coastal Coast Analytical
Comments:

Attention of:
Hazardous materials suspected? (yes/no)

Sampling Point	Location	Field ID #	Date	Sample Type	No. of Containers	Analysis Required
Oakland Shell	MW-1	417891	4/17/89	40 ml	1	524.2 fuel fingerprint BTXE TPH
	MW-1	417892				spare
	trip blank	417893				524.2
	MW-2	417894	4/17/89			524.2
	MW-2	417895				spare
	MW-3	417896				524.2
	MW-3	417897				spare

Sampler(s) (signature) Hal Hansen

Field ID	Relinquished by: (signature)	Received by: (signature)	Date/Time		Comments
	Hal Hansen		4/18/89	1500	

Sealed for shipment by: (signature) Hal Hansen Date/Time 4/18/89 1500 Shipment method: grey hound

Received for Lab by: (signature) Shellie Hoyt Date/Time 4-19-89 1000 Comments

Samples rec'd sealed, intact & cold sk

Receiving Laboratory: Please return original form after signing for receipt of samples.

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TOTAL VOLATILE HYDROCARBON MATRIX SPIKE REPORT
EPA METHOD 8015

Sample I.D. : 1859 B-5-1,2,3
Matrix : SOIL
Date sampled : 08-09-88
Date analyzed : 08-15-88

Anametrix I.D. : 8806086-01
Analyst : mh
Supervisor : JMS
Date Released : 08-18-88

COMPOUND	SPIKE AMT. (ug/Kg)	MS (ug/Kg)	%REC MS	MSD (ug/Kg)	%REC MSD	RPD	%REC LIMITS
Gasoline	10000	10000	100%	9500	95%	-5%	50-150

Limits established by Anametrix, Inc.

PHASE I HYDROGEOLOGIC ASSESSMENT REPORT

3420 SAN PABLO AVENUE
OAKLAND, CALIFORNIA
DELTA PROJECT NO. 40-88-666

1.0 INTRODUCTION

Delta Environmental Consultants, Inc. (Delta), has been authorized by Shell Oil Company (Shell) to conduct a Phase I Hydrogeologic Assessment Investigation at the Shell Station located at 3420 San Pablo Avenue, in Oakland, California (site) (Figure 1). Delta's investigation was prompted by a soil investigation conducted at the site in August 1988 by Ensco Environmental Services, Inc. The soil investigation identified the presence of petroleum constituents in the soils at the site.

1.1 Purpose

The purpose of the Phase I Hydrogeologic Assessment Investigation is to determine the lateral and vertical extent of petroleum constituents in the soils of the site, to determine the extent (if any) that petroleum constituents may have affected ground water at the site, and to make recommendations on future investigative and/or remedial activities to be carried out at the site.

1.2 Scope of Work

Activities that have been carried out in order to achieve the purpose of the investigation have included the following:

- Review available geologic and hydrogeologic data pertinent to the site.
- Drill four standard-penetration, hollow-stem-auger soil borings.
- Classify soils according to the Unified Soil Classification System (USCS).
- Complete each soil boring as a monitoring well.
- Screen soil samples with a portable photoionization detector for total organic vapors.
- Select soil samples from each boring according to soil-screening results for submittal to a California-certified laboratory to be analyzed for ethylene dibromide (EDB), 1,2-dichloroethane (EDC), benzene, toluene, ethylbenzene, xylenes (BTEX), and total purgeable hydrocarbons (TPH) by U. S. Environmental Protection Agency (EPA) Method 8240 and total lead by Solid Waste Method 7421.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 1859 B-5-(1-3)COMP.
Matrix : SOIL
Date sampled : 08-09-88
Date anl. TVH: 08-15-88
Date ext. TEH: NA
Date anl. TEH: NA

Anametrix I.D. : 8808086-01
Analyst : mt
Supervisor : JMS
Date released : 08-18-88
Date ext. TOG : NA
Date anl. TOG : NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

- Properly develop the monitoring wells and collect water samples from each well for submittal to a California-certified laboratory to be analyzed for EDB, EDC, BTEX, and TPH by EPA Method 524.2.

- Conduct slug tests in all monitoring wells to evaluate hydraulic conductivity.

- Prepare this report of our finding and make recommendations regarding future assessment and/or remedial activities at the site.

2.0 SITE SOILS AND GEOLOGY

The surface of the site consists of a 2-inch-thick layer of asphalt immediately underlain by a 6-inch-thick aggregate base. The site is covered everywhere by asphalt with the exception of the area immediately overlying the underground storage tanks (USTs) which is covered by a 2- to 4-inch-thick layer of concrete.

Subsurface geology at the site has been inferred from soil borings drilled in August 1988 by Ensco Environmental Services, Inc. (Ensco), and April 1989 by Delta. These borings show that immediately beneath the aggregate base the site is underlain everywhere by a clay stratum which is dark gray in color, highly plastic, and contains little or no sand. This uppermost clay stratum varies in thickness from about 4 to 11 feet across the site. The uppermost clay stratum is underlain by a stratum of sandy/silty clay which is greenish gray in color, moderately plastic, and contains some gravel near the base. This sandy/silty clay unit ranges from about 19 to 22 feet in thickness. Everywhere that borings have penetrated to sufficient depth, a gravelly sand stratum has been encountered beneath the sandy/silty clay. This unit consists of a very coarse sand, brown in color, which contains gravel ranging in size from 0.25 to 0.5 inch. The maximum penetrated depth of this unit has been 6.5 feet.

Soil cross-sections have been constructed to illustrate inferred subsurface relationships at the site. The cross-sections locations are illustrated in Figure 2 and cross-sections A-A' and B-B' are presented in Figures 3 and 4. Soil boring logs are presented in Appendix A.

3.0 SITE HYDROGEOLOGY

Four monitoring wells (MW-1, MW-2, MW-3, and MW-4) were completed at the site on April 10 and 11, 1989. The locations of these wells are shown in Figure 2. Monitoring wells MW-1, MW-3, and MW-4 were completed at depths ranging from 25 to 27.5 feet beneath the surface. These wells were screened across a silty clay and gravelly sand. The gravelly sand was penetrated near the base

ANAMETRIX, INC.
LABORATORY SERVICES
ENVIRONMENTAL • ANALYTICAL CHE[illegible]
1961 CONCOURSE DR. SUITE E • SAN JOSE [illegible]131
TEL. (408) 432-8192 • FAX (408) 43[illegible]

Dave Blunt
Ensco/Exceltech
41674 Christy Street
Fremont, CA 94538-3114

August 18, 1988
Work Order Number 8808086
Date Received 08/11/88
Project No. 1859

Dear Mr. Blunt:

One soil sample was received for analysis of total volatile hydrocarbons as gasoline by gas chromatography, using the following EPA method(s):

ANAMETRIX I.D.	SAMPLE I.D.	METHOD(S)
8808086-01	1859 B-5-(1-3)COMP.	8015

RESULTS

See enclosed data sheet, Page 2.

QUALITY ASSURANCE

See enclosed data sheet, Page 3.

If there is any more that we can do, please give us a call. Thank you for using ANAMETRIX, INC.

Sincerely,

Sarah Schoen

Sarah Schoen, Ph.D.
GC Manager

SRS/dg

of each well, with the penetrated thickness of the sand ranging from 3 (MW-1) to about 6 feet (MW-3 and MW-4). Well construction diagrams for all wells are presented in Appendix B. Depth to ground water in these wells, as measured on June 21, 1989, ranged from 8.59 (MW-4) to 10.28 (MW-3) feet below ground surface. Water level elevations for these wells range from 11.71 (MW-1) to 11.01 (MW-3) feet above mean sea level (MSL). Table 1 presents water level information and relative surface elevations for all monitoring wells at the site.

TABLE 1

Water Level Information

Well ID	Reference Elevation (feet)	Depth to Ground Water (feet)	Ground Water Elevation (feet)	Screened Interval Elevation (feet)
MW-1	21.28	9.57	11.71	16.28 - -3.72
MW-2	21.56	7.96	13.60	17.56 - 2.56
MW-3	21.78	10.77	11.01	14.28 - -5.72
MW-4	20.31	11.19	11.19	15.31 - 4.69

NOTE: All elevations relative to estimated bench mark elevation of 23 feet.
Water levels measured on June 21, 1989.

Because monitoring wells MW-1, MW-3, and MW-4 are screened across the silty clay and gravelly sand interface, water level elevations in these wells are believed to represent a composite of the water level elevations found in the silty clay and gravelly sand water-bearing zones at the locations of these wells.

Monitoring well MW-2 was completed at a depth of 19 feet below ground surface and screened entirely within the silty clay unit. The depth to ground water in this well, as measured on June 21, 1989, was 7.71 feet below ground level. The water level elevation at this well is 13.60 feet above MSL. Because this well was completed entirely within the silty clay water-bearing zone, this water level elevation is thought to be representative of the water level elevation within this zone at the location of monitoring well MW-2.

To further investigate the difference in water level elevations between the silty clay and gravelly sand water-bearing zones, water level and well completion information was obtained from the Alameda County Health Department on four monitoring wells installed immediately south of the site. Well completion information for these wells (Appendix B) indicates that these wells are also completed within the silty clay water-bearing zone. Figure 5A presents a water table contour map

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1859 B-4-1,2,3	Anametrix I.D.	: 8808061-08
Matrix	: SOIL	Analyst	: mh
Date sampled	: 08-08-88	Supervisor	: RJS
Date anl. TVH	: 08-10-88	Date released	: 08-12-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

of the silty clay water-bearing zone. This map is based on data collected from on-site monitoring well MW-2, as well as information from the off-site monitoring wells. Figure 5A shows the direction of ground water flow in the silty clay water-bearing zone to be in an westward direction.

The hydraulic conductivity of water-bearing materials at the site was determined by performing a slug test in all monitoring wells. Slug test data were evaluated in accordance with methods presented in Bouwer and Rice, 1976. Hydraulic conductivity results of the slug tests are summarized in Table 2 and presented in Appendix C. Slug test results for monitoring well MW-4 are not enclosed because the results are thought to be nonrepresentative due to well-completion problems encountered with this well. These problems resulted in the smearing of clay along the walls of the borehole during well installation, resulting in a lowering of the hydraulic conductivity measured in this well.

TABLE 2

Slug Test Results

Monitoring Well	Hydraulic Conductivity (ft/dy)
MW-1	3.07 (Lower Water-Bearing Zone)
MW-2	3.45 (Upper Water-Bearing Zone)
MW-3	2.13 (Lower Water-Bearing Zone)

The average hydraulic conductivity of the silty clay (or upper) water-bearing zone at the site, based on the analysis of slug tests performed in monitoring well MW-2 is 3.45 feet/day. The average rate of ground water movement within this water-bearing zone at the site can be calculated from the following formula (Freeze and Cherry, 1979):

$$V = \frac{KI}{n}$$

Where:

V = Average linear velocity.
K = Hydraulic conductivity.
I = Hydraulic gradient.
n = Effective porosity.

At the site:

$$V = \frac{(3.45 \text{ ft/day})(0.0093 \text{ ft/ft})}{0.30}$$

$$V = 0.106 \text{ ft/day} = 39.03 \text{ ft/yr.}$$

Note: n = Estimated.

The average linear velocity (V) may periodically shift with hydraulic gradient changes related to seasonal ground water level fluctuations.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 1859 B-3-1,2,3	Anametrix I.D.	: 8808061-07
Matrix	: SOIL	Analyst	: mk
Date sampled	: 08-08-88	Supervisor	: RJS
Date anl. TVH	: 08-10-88	Date released	: 08-12-88
Date ext. TEH	: NA	Date ext. TOG	: NA
Date anl. TEH	: NA	Date anl. TOG	: NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

Figure 5B presents water table contours as determined from water level elevations at monitoring wells MW-1, MW-3, and MW-4. Water table contours presented in Figure 5B are representative of water level elevations of the gravelly sand (or lower) water-bearing zone. Examination of Figure 6 indicates that the direction of ground water within this water-bearing zone is to the south. The ground water velocity of the lower water-bearing zone has not been estimated due to the close proximity of these wells to one another.

4.0 SOIL CHEMISTRY

Soil samples collected from soil and monitoring well borings were scanned with an hNu photoionization detector (PID) and selected samples submitted for laboratory analysis. The analytical results for these soil samples as well as previous soil samples taken by Ensco are summarized in Table 3. Laboratory reports are presented in Appendix D.

Results of soil analyses from Ensco borings B-1 and B-2 show TPH concentrations ranging from a high of 1,400 parts per million (ppm) (B-1-1) to a high of 580 ppm (B-2-2). TPH concentrations were below detection limits in soil samples taken from Ensco soil borings B-3, B-4, and B-5. TPH concentrations were also detected in soil samples taken from MW-1 and MW-2. Soil samples from monitoring well MW-1 showed a high of 1,400 ppm TPH (sample MW-1-1). The soil sample taken from MW-2 (MW-2-2) showed a TPH concentration of 70 ppm. Soil samples taken from monitoring wells MW-3 and MW-4 showed TPH concentrations below detection limits.

5.0 GROUND WATER CHEMISTRY

Table 4 presents the results of laboratory analyses of ground water samples collected from monitoring wells at the site. Laboratory reports are presented in Appendix D. As shown in Table 4, dissolved hydrocarbon constituents have been detected at or above California action levels in all monitoring wells.

6.0 DISCUSSION

6.1 Extent of Petroleum Constituents in the Soil

Based on the results of soil analyses (Table 3), the interpreted lateral extent of petroleum constituents found in soils at the site is shown in Figure 6. As shown in Figure 6, the lateral extent of petroleum constituents in the soils on site appears to be limited to the area in the immediate vicinity of the USTs and an area in the vicinity of MW-2, adjacent to the location of former pump islands at the site.

The geologic cross-sections presented in Figures 3 and 4 show the interpreted vertical extent of petroleum constituents in soil at the site. The vertical extent of petroleum constituents appears to be limited to about 17 feet beneath ground surface, approximately 2 feet beneath the estimated depth of the UST excavation.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 1859 B-2-2
Matrix : SOIL
Date sampled : 08-08-88
Date anl. TVH: 08-10-88
Date ext. TEH: NA
Date anl. TEH: NA

Anametrix I.D. : 8808061-06
Analyst : mh
Supervisor : BHS
Date released : 08-12-88
Date ext. TOG : NA
Date anl. TOG : NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	700
108-88-3	Toluene	200	3300
100-41-4	Ethylbenzene	200	7800
1330-20-7	Total Xylenes	200	48000
	TVH as Gasoline	5000	580000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

TABLE 3

Soil Chemical Analysis
Concentrations in Parts Per Million (ppm)

Sample Number	Benzene	Toluene	Xylenes	Ethyl-benzene	EDB	EDC	TPH[a]	Total Lead
B-1-1[b]	1.90	42.00	120.00	43.00	NA[c]	NA	1,400.00	NA
B-1-1	NA[c]	NA	NA	NA	NA	NA	80.00	NA
B-1-3	NA	NA	NA	NA	NA	NA	NF[d]	NA
B-1-4	NA	NA	NA	NA	NA	NA	NF	NA
B-2-1	1.50	16.00	33.00	35.00	NA	NA	550.0	NA
B-2-2	0.70	3.30	48.00	7.80	NA	NA	580.00	NA
B-3-1-2-3 (composite)	NA	NA	NA	NA	NA	NA	NF	NA
B-4-1-2-3 (composite)	NA	NA	NA	NA	NA	NA	NF	NA
B-5-1-2-3 (composite)	NA	NA	NA	NA	NA	NA	NF	NA
MW-1-1[e]	1.2	14	100	19	NF	NF	850	4
MW-1-2	NF	1.9	16	1.9	NF	NF	80	3
MW-2-2	0.4	1.5	15	1.7	NF	NF	70	8
MW-3-2	NF	0.010	0.069	0.008	NF	NF	<0.2	3
MW-4-2	NF	0.005	0.031	0.004	NF	NF	<0.2	2

[a]TPH as gasoline.
[b]Soil samples collected by Ensco Environmental Services, Inc.
[c]Not Analyzed.
[d]Not Found.
[e]Soil samples collected by Delta Environmental Consultants, Inc.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 1859 B-2-1
Matrix : SOIL
Date sampled : 08-08-88
Date anl. TVH: 08-11-88
Date ext. TEH: NA
Date anl. TEH: NA

Anametrix I.D. : 8808061-05
Analyst : [signature]
Supervisor : [signature]
Date released : 08-12-88
Date ext. TOG : NA
Date anl. TOG : NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	1500
108-88-3	Toluene	200	16000
100-41-4	Ethylbenzene	200	33000
1330-20-7	Total Xylenes	200	35000
	TVH as Gasoline	5000	550000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

6.2 Extent of Petroleum Constituents Dissolved in Ground Water

Dissolved petroleum constituents have been identified in water collected from all the monitoring wells installed at the site (Table 4). Highest dissolved petroleum concentrations were found at monitoring wells MW-2 (12,000 parts per billion (ppb) benzene) and MW-1 (1,400 ppb benzene). Monitoring wells MW-3 and MW-4 showed relatively low levels of dissolved hydrocarbons, 3.0 and 1.2 ppb benzene, respectively.

TABLE 4

Ground Water Chemical Analyses
All Concentrations in Parts Per Million (ppm)

Monitoring Well	Benzene	Toluene	Ethyl-benzene	Xylenes	EDB	EDC	TPH[a]
MW-1	1.4	2.3	6.6	1.1	NF[b]	0.01	12
MW-2	12	1.8	12	2.2	NF	NF	35
MW-3	0.003	0.002	0.009	0.001	NF	NF	0.1
MW-4	0.0012	NF	0.003	NF	NF	0.0015	<0.05

[a]TPH as gasoline.
[b]NF not found.

Based on the ground water chemistry results, the location of the former pump island and the area in the immediate vicinity of the USTs (Figure 2) appears to be the likely source area for dissolved petroleum constituents in the ground water.

7.0 RECOMMENDATIONS

Based on the results of the Phase I Hydrogeologic Assessment, Delta recommends the following:

- Installation of four additional ground water monitoring wells to be completed within the silty clay (upper) water-bearing zone. These wells would be installed in the area around monitoring well MW-2 (Figure 7) to further investigate the lateral and vertical extent of petroleum constituents in soil and ground water.

- Installation of one additional ground water monitoring well south of the USTs to further investigate the vertical and lateral extent of petroleum constituents in this area of the site. This well would be completed across the silty clay (upper) and gravelly sand (lower) water-bearing zones as are existing monitoring wells MW-1, MW-3, and MW-4.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 1859 B-1-4
Matrix : SOIL
Date sampled : 08-08-88
Date anl. TVH: 08-08-88
Date ext. TEH: NA
Date anl. TEH: NA

Anametrix I.D. : 8808061-04
Analyst : ml
Supervisor : RS
Date released : 08-12-88
Date ext. TOG : NA
Date anl. TOG : NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

- Collection of soil samples at 5-foot intervals during drilling of all additional monitoring wells.

- Submission of selected soil samples (selection based on results of field-screening samples with an hNu photoionization detector for total organic vapors) to a California-certified laboratory to be analyzed for BTEX, EDB, EDC, and TPH.

- Development and sampling of all additional monitoring wells at the site (MW-5 through MW-9).

- Submission of ground water samples to a California-certified laboratory to be analyzed for BTEX, EDB, EDC, and TPH.

- Collection of water level data from all wells (MW-1 through MW-9) in order to construct a map of ground water elevations in the silty clay (upper) and gravelly sand (lower) water-bearing zones.

- Preparation of a Phase II Hydrogeologic Assessment Report presenting results of the activities outlined above and recommendations (if needed) for soil and/or ground water remediation activities at the site.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 1859 B-1-3
Matrix : SOIL
Date sampled : 08-08-88
Date anl. TVH: 08-08-88
Date ext. TEH: NA
Date anl. TEH: NA

Anametrix I.D. : 8808061-03
Analyst : ml
Supervisor : RS
Date released : 08-12-88
Date ext. TOG : NA
Date anl. TOG : NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	BRL

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

8.0 REMARKS/SIGNATURES

The recommendations contained in this report represent our professional opinions, and are based in part on information supplied by the client. These opinions are based on currently available information and are arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

DELTA ENVIRONMENTAL CONSULTANTS, INC.

This report was prepared by: Darrell Nations Date 8/23/89

Darrell L. Nations
Senior Hydrogeologist/
Project Manager

This report was reviewed by: Chris W. Metzger Date 8/23/89

Chris W. Metzger
Senior Hydrogeologist/
California Registered Geologist #4673

REGISTERED GEOLOGIST
CHRIS W. METZGER
#4673
STATE OF CALIFORNIA

/law

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

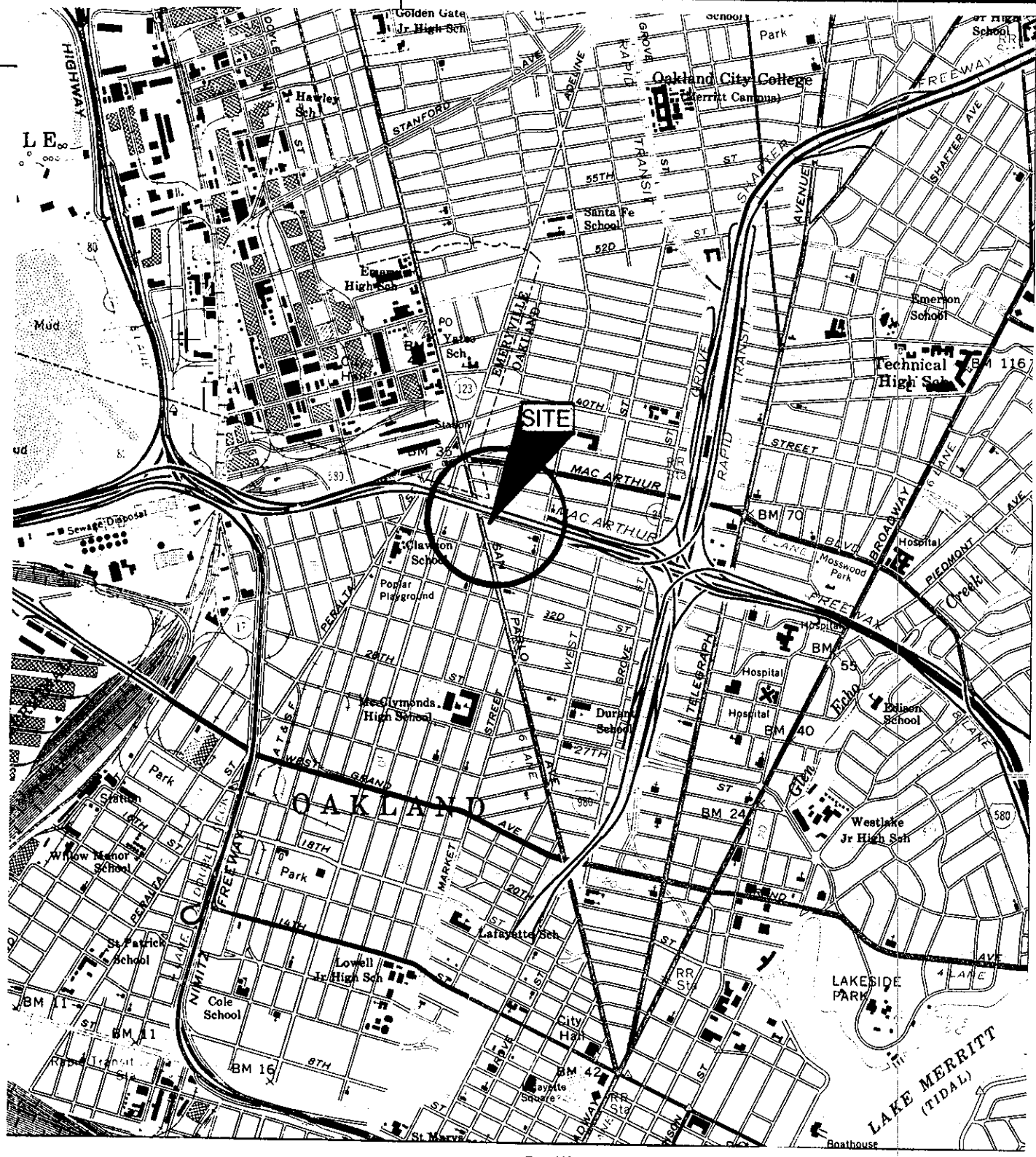
Sample I.D. : 1859 B-1-2
Matrix : SOIL
Date sampled : 08-08-88
Date anl. TVH: 08-11-88
Date ext. TEH: NA
Date anl. TEH: NA

Anametrix I.D. : 8808061-02
Analyst : mk
Supervisor : FJS
Date released : 08-12-88
Date ext. TOG : NA
Date anl. TOG : NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
	TVH as Gasoline	5000	80000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.



GENERAL NOTES:

BASE MAP FROM U.S.G.S.
OAKLAND WEST, CA.
7.5 MINUTE TOPOGRAPHIC
SCALE 1 : 24,000'

N

0 2000'

SCALE

CALIF

QUADRANGLE LOCATION

Delta Environmental Consultants, Inc.

FIGURE 1
SITE LOCATION MAP
3420 SAN PABLO AVENUE
OAKLAND, CA.

	DRAWN BY: GM 1-6-89
JOB NO. 40-88-666	CHK BY:

120865

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 1859 B-1-1
Matrix : SOIL
Date sampled : 08-08-88
Date anl. TVH: 08-10-88
Date ext. TEH: NA
Date anl. TEH: NA

Anametrix I.D. : 8808061-01
Analyst : [signature]
Supervisor : [signature]
Date released : 08-12-88
Date ext. TOG : NA
Date anl. TOG : NA

CAS #	Compound Name	Reporting Limit (ug/kg)	Amount Found (ug/kg)
71-43-2	Benzene	200	1900
108-88-3	Toluene	200	42000
100-41-4	Ethylbenzene	200	43000
1330-20-7	Total Xylenes	200	120000
	TVH as Gasoline	5000	1400000

BRL - Below reporting limit.
TVH - Total Volatile Hydrocarbons is determined by modified EPA 8015 with either headspace or purge and trap.
TEH - Total Extractable Hydrocarbons is determined by modified EPA 8015 with direct injection.
TOG - Total Oil & Grease is determined by Standard Method 503E.
BTEX- Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow CRWQCB Region 2 guidelines.

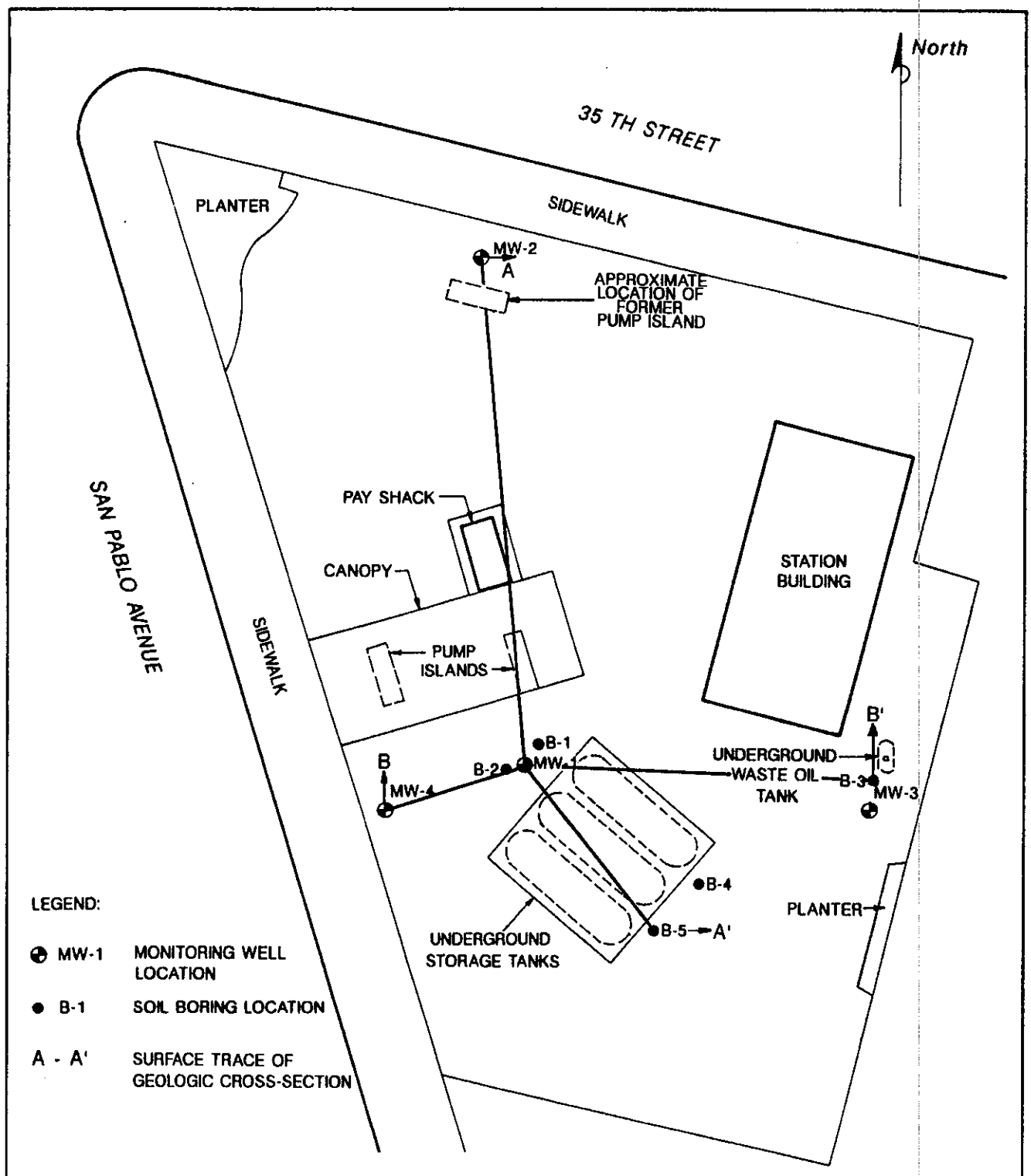


FIGURE 2

SITE MAP

3420 SAN PABLO AVENUE

OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	6/29/89
AUTOCAD NO.	REVIEWED BY
—	7/7/89

Delta Environmental Consultants, Inc.

ANAMETRIX, INC.
LABORATORY SERVICES
ENVIRONMENTAL • ANALYTICAL CHEMISTRY
1961 CONCOURSE DRIVE. SUITE E • SAN JOSE. CA 95131 • (408) 432-8192

Dave Blunt
Ensco/Exceltech
41674 Christy Street
Fremont, CA 94538-3114

August 12, 1988
Work Order Number 8808061
Date Received 08/09/88
PO No. 10309

Dear Mr. Blunt:

Nine soil samples were received for analysis of BTEX plus total volatile hydrocarbons as gasoline by gas chromatography, using the following EPA method(s):

ANAMETRIX I.D.	SAMPLE I.D.	METHOD(S)
8808061-01	1859 B-1-1	8015/8020
-02	" B-1-2	8015
-03	" B-1-3	"
-04	" B-1-4	"
-05	" B-2-1	8015/8020
-06	" B-2-2	"
-07	" B-3-1,2,3	8015
-08	" B-4-1,2,3	"
-09	" B-4-4	HOLD

RESULTS

See enclosed data sheets, Pages 2 thru 9.

If there is any more that we can do, please give us a call. Thank you for using ANAMETRIX, INC.

Sincerely,

Sarah Schoen

Sarah Schoen, Ph.D.
GC Manager

SRS/lm

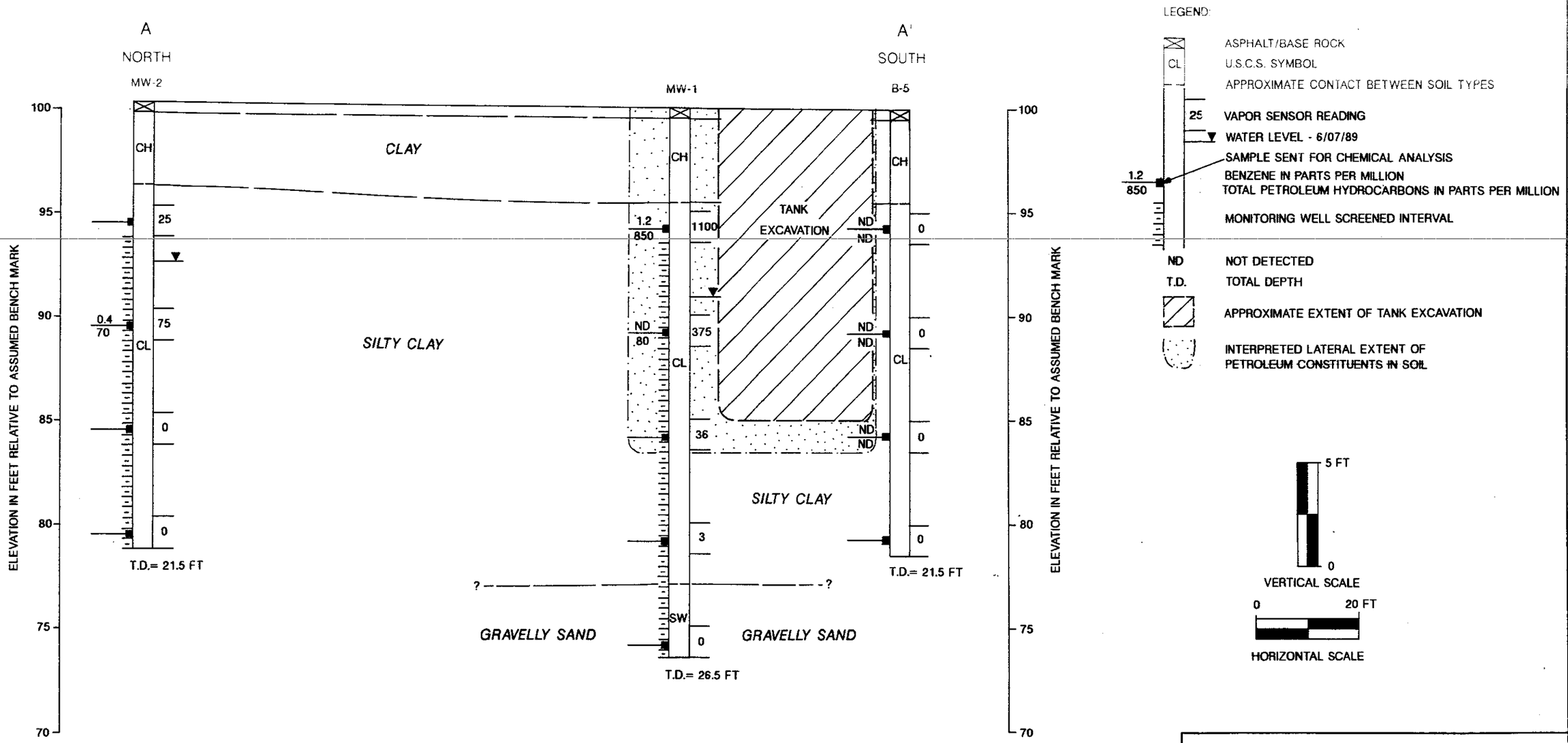


FIGURE 3

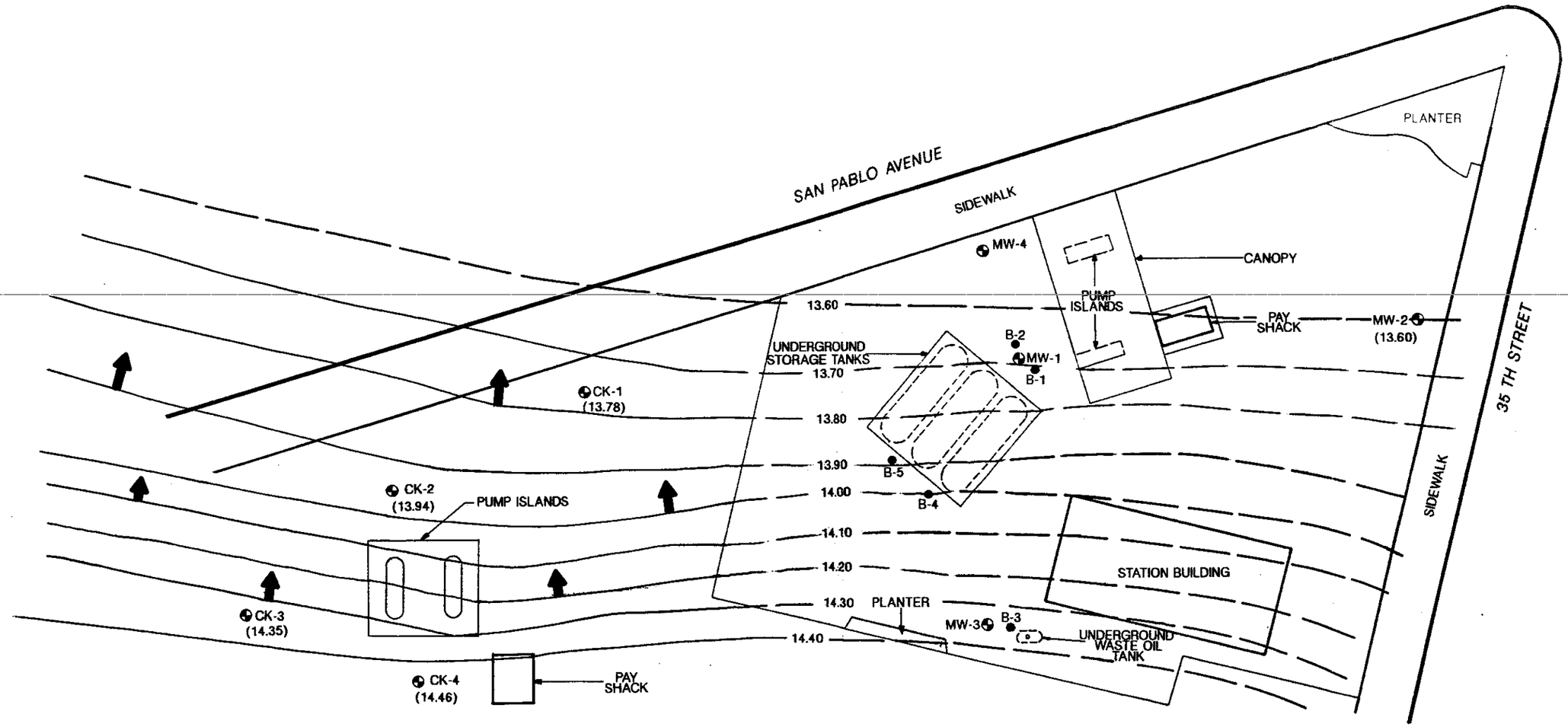
CROSS SECTION A - A'

3420 SAN PABLO AVENUE

OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	7/3/89
AUTOCAD NO.	REVIEWED BY
—	

Delta Environmental Consultants, Inc.



LEGEND:

- ● B-1 — SOIL BORING LOCATION
- ⊕ MW-2 — MONITORING WELL LOCATION
- (13.60) — GROUND WATER ELEVATION IN FEET RELATIVE TO ESTIMATED BENCH MARK ELEVATION OF 23 FT.
- — 14.10 — WATER TABLE CONTOUR IN FEET RELATIVE TO ESTIMATED BENCH MARK ELEVATION OF 23 FT.
- ↑ DIRECTION OF GROUND WATER FLOW

North

0 30 FT

SCALE

NOTE:

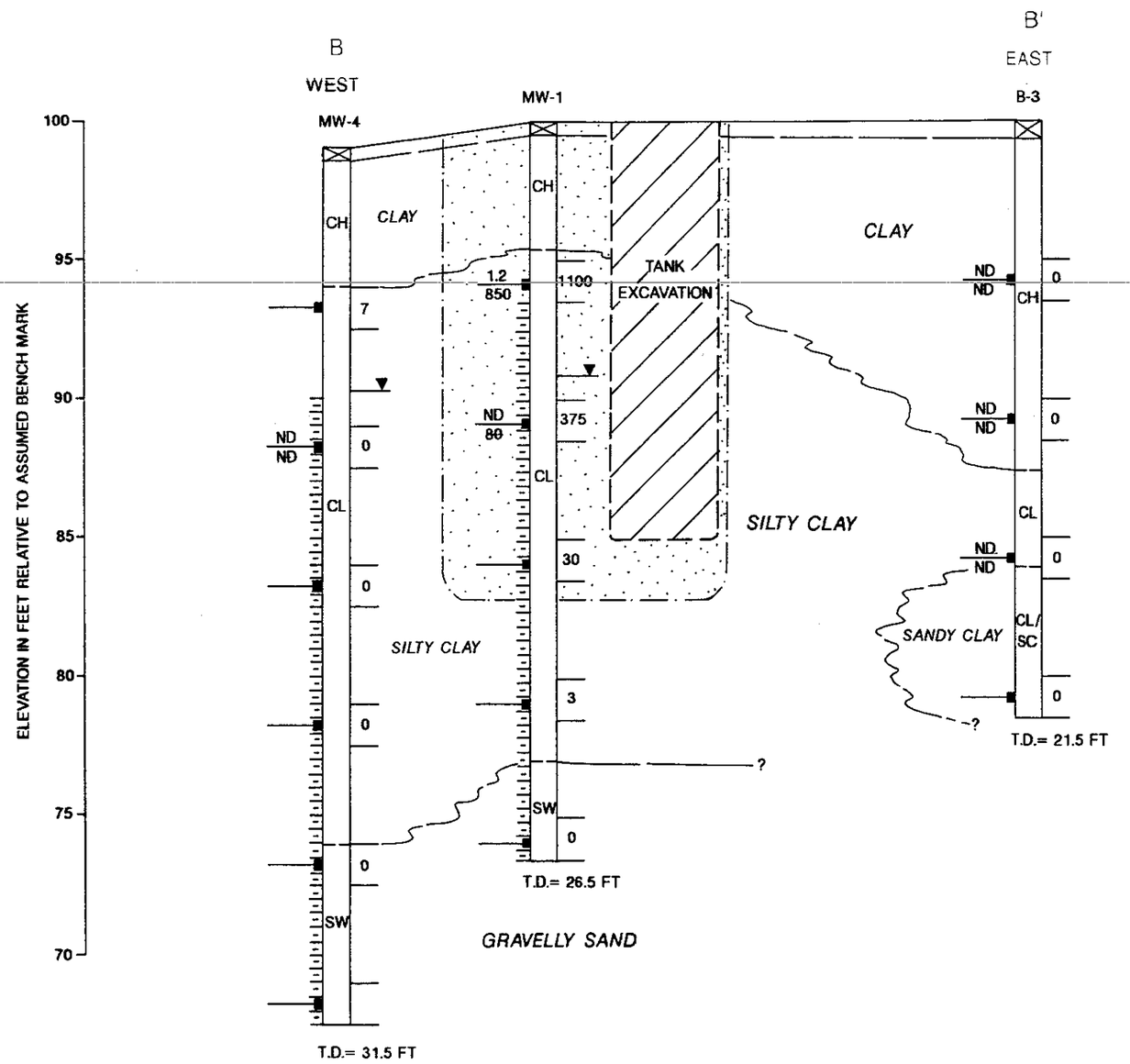
CONTOUR INTERVAL = 0.1 FEET.

FIGURE 5A

WATER TABLE CONTOUR MAP - 6/21/89
UPPER WATER BEARING ZONE
3420 SAN PABLO AVENUE
OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	P.L. 07/03/89
AUTOCAD NO.	REVIEWED BY
—	

Delta Environmental Consultants, Inc.



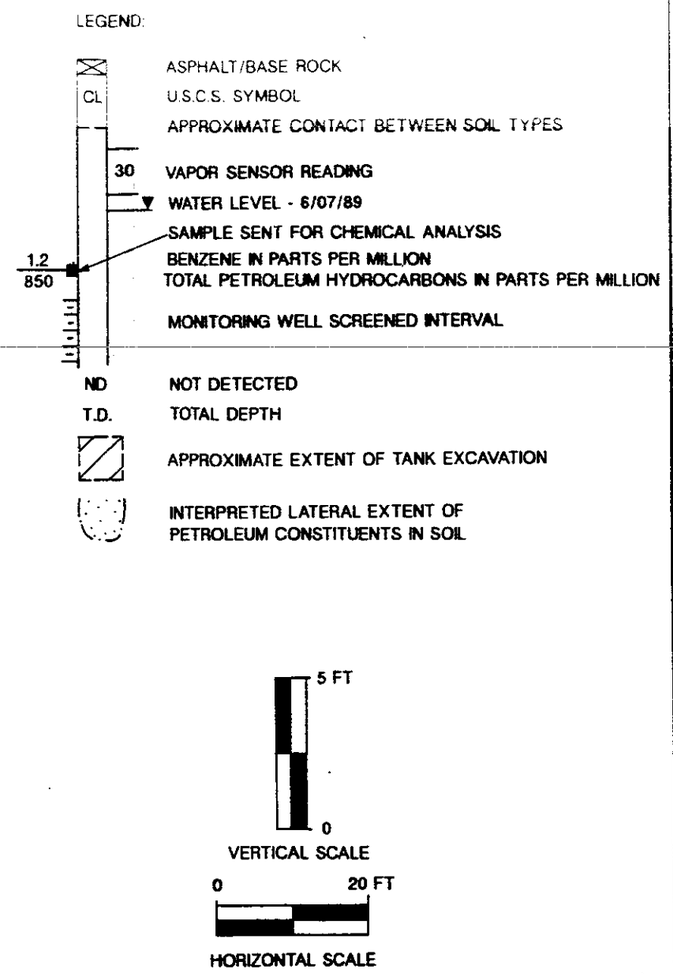


FIGURE 4

CROSS SECTION B - B'

3420 SAN PABLO AVENUE

OAKLAND, CA.

PROJECT NO. 40-88-666	PREPARED BY 7/3/89
AUTOCAD NO. —	REVIEWED BY

Delta Environmental Consultants, Inc.

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-04846
Collected: 04/17/89
Received: 04/19/89
Tested: 04/27/89
Collected by: H. Hansen

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

ATTN: Hal Hansen
Delta Environmental
11030 White Rock Rd.
Suite 110
Rancho Cordova, CA 95670

SAMPLE DESCRIPTION:
Oakland Shell, Delta #40-88-666-01,
Travel Blank - Client Supplied, Water

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.0001	not found
Toluene	0.001	not found
Ethylbenzene	0.001	not found
Xylenes	0.001	not found
1,2-Dichloroethane (EDC)	0.0001	not found
Ethylene Dibromide (EDB)	0.0001	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.05	<0.05
BTX as a Percent of Fuel		not applicable
Percent Surrogate Recovery		79.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
05-17-89
F04846f.wr1/68
MH/gb/js/rh

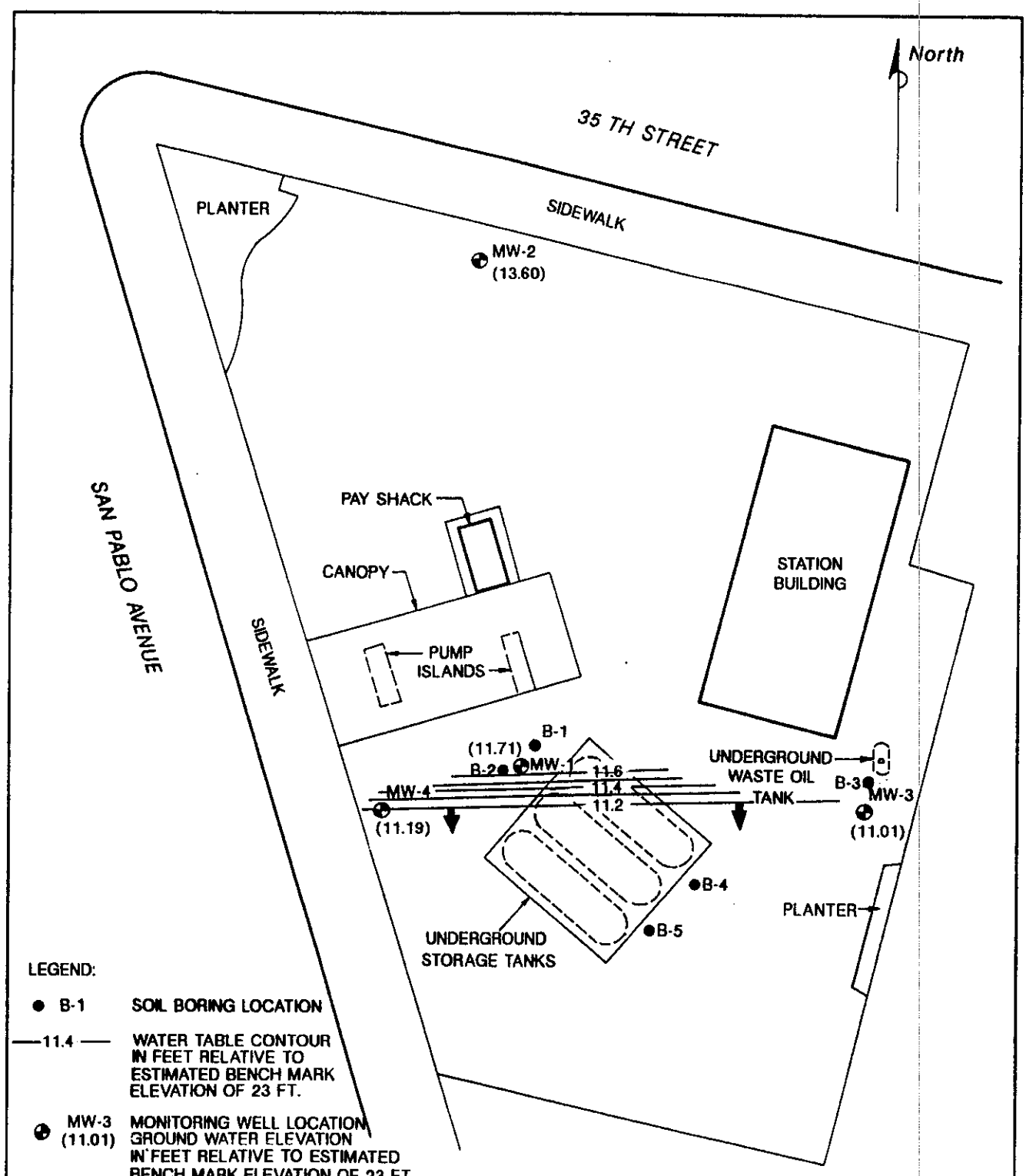


FIGURE 5B

WATER TABLE CONTOUR MAP - 6/21/89
LOWER WATER BEARING ZONE

3420 SAN PABLO AVENUE

OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	7/3/89
AUTOCAD NO.	REVIEWED BY
—	

Delta Environmental Consultants, Inc.

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-04845
Collected: 04/17/89
Received: 04/19/89
Tested: 04/26 & 05/08/89
Collected by: H. Hansen

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

ATTN: Hal Hansen
Delta Environmental
11030 White Rock Rd.
Suite 110
Rancho Cordova, CA 95670

SAMPLE DESCRIPTION:
Oakland Shell, MW-4, #40-88-666-01,
Water

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.0001	0.0012
Toluene	0.001	not found
Ethylbenzene	0.001	not found
Xylenes	0.001	0.003
1,2-Dichloroethane (EDC)	0.0001	0.0015
Ethylene Dibromide (EDB)	0.0001	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.05	<0.05
BTX as a Percent of Fuel		not applicable
Percent Surrogate Recovery		107.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
05/13/89
F04845f.wr1/66
MH/jm/jc/tl

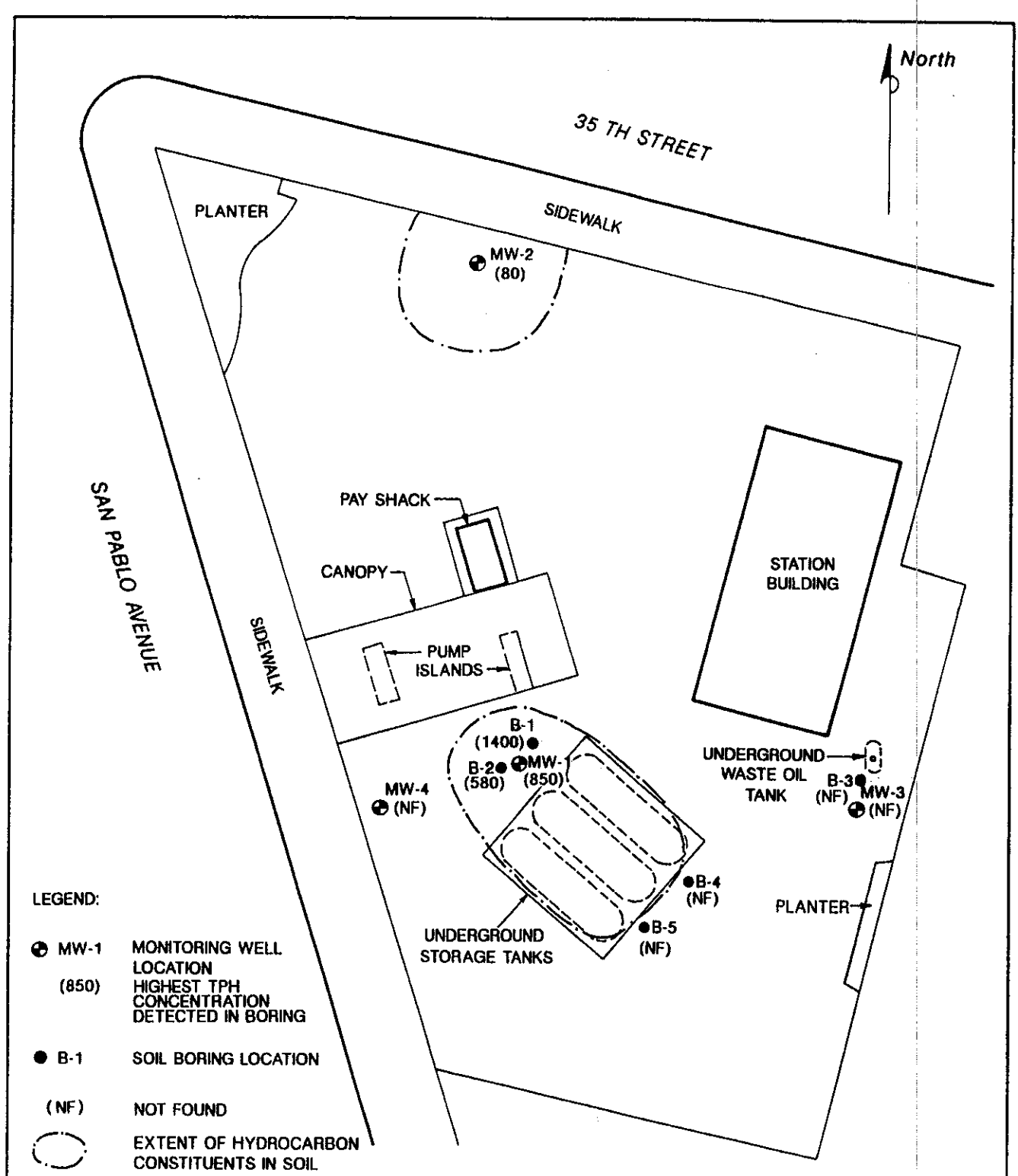


FIGURE 6

INTERPRETED LATERAL EXTENT OF PETROLEUM CONSTITUENTS IN SOIL

3420 SAN PABLO AVENUE

OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	7/3/89
AUTOCAD NO.	REVIEWED BY
—	

Delta Environmental Consultants, Inc.

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-04844
Collected: 04/17/89
Received: 04/19/89
Tested: 04/27/89
Collected by: H. Hansen

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

ATTN: Hal Hansen
Delta Environmental
11030 White Rock Rd.
Suite 110
Rancho Cordova, CA 95670

SAMPLE DESCRIPTION:
Oakland Shell, Delta #40-88-666-01,
MW-3, Water

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.001	0.003
Toluene	0.001	0.002
Ethylbenzene	0.001	0.001
Xylenes	0.001	0.009
1,2-Dichloroethane (EDC)	0.001	not found
Ethylene Dibromide (EDB)	0.001	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.1	0.1
BTX as a Percent of Fuel		14.
Percent Surrogate Recovery		94.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
05-17-89
F04844f.wr1/68
MH/gb/js/rh

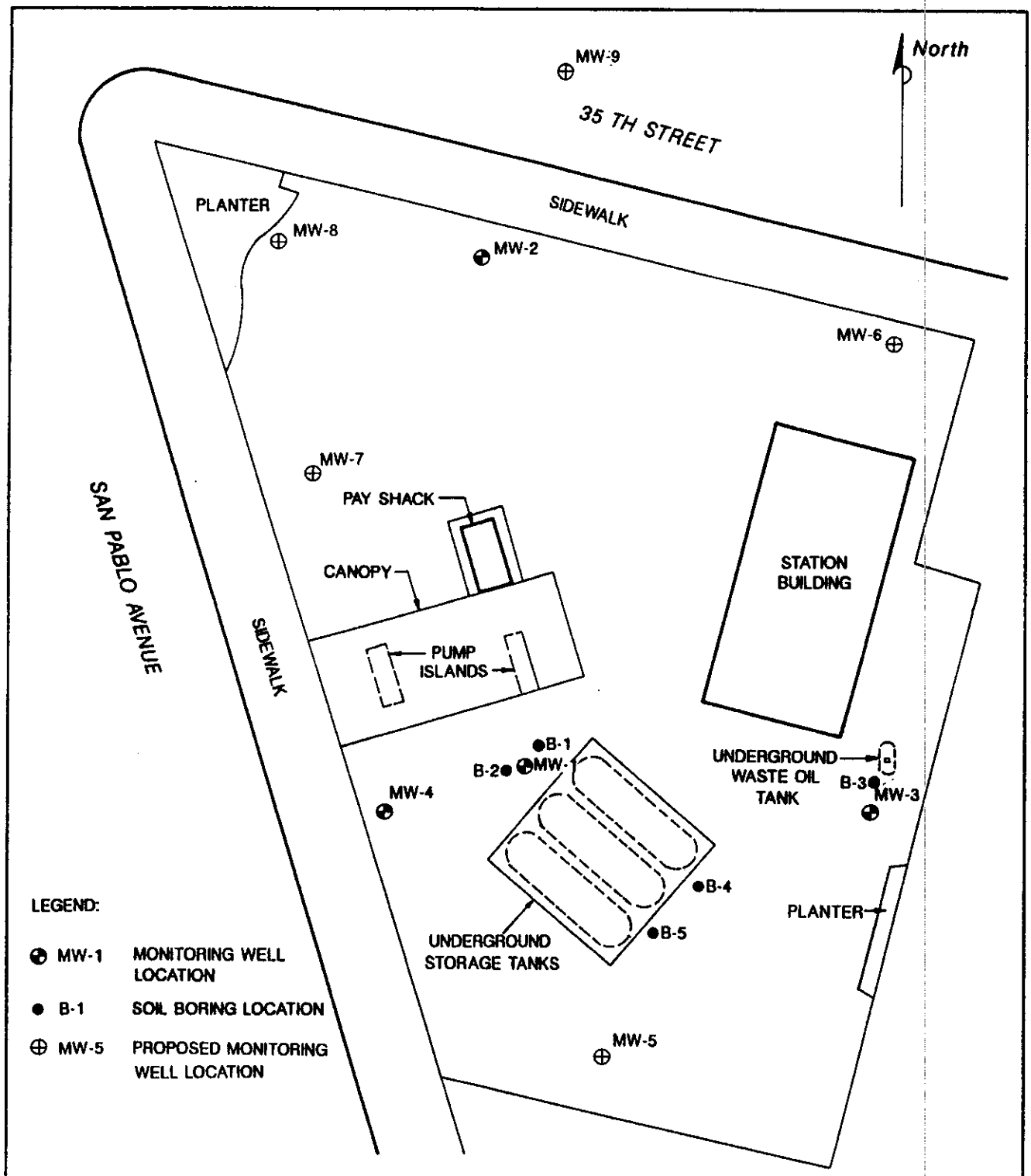


FIGURE 7

MONITORING WELL LOCATION MAP

3420 SAN PABLO AVENUE

OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	7/28/89
AUTOCAD NO.	REVIEWED BY
—	

Delta Environmental Consultants, Inc.

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-4843dup
Collected: 04/17/89
Received: 04/19/89
Tested: 04/26/89
Collected by: Hansen

Fuel Fingerprint Analysis - EPA Method 524.2/8240
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

Delta Environmental Consultants
11030 White Rock Road
Suite 110
Rancho Cordova, California 95670

SAMPLE DESCRIPTION:
Oakland Shell, MW-2, Water
Job # 40-88-6661
Duplicate Analysis

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.01	12.
Toluene	0.1	1.8
Ethylbenzene	0.1	2.2
Xylenes	0.1	12.
1,2-Dichloroethane (EDC)	0.1	0.036 **
Ethylene Dibromide (EDB)	0.1	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS 1. (GASOLINE)		35.
BTX as a Percent of Fuel		74.
Percent Surrogate Recovery		78.

*(Practical Quantitation Limit)
** Reported below PQL to illustrate agreement with duplicate.

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

John R Hilgart for

Mary Havlicek, Ph.D.
President

F-4843dup
MH/
JM/CRR/SCH
F4843DUP.WR1/S-130

APPENDIX A

Soil Boring Logs

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-4843
Collected: 04/17/89
Received: 04/19/89
Tested: 04/26/89
Collected by: Hansen

Fuel Fingerprint Analysis - EPA Method 524.2/8240
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

Delta Environmental Consultants, Inc
1130 White Rock Road
Suite 110
Rancho Cordova, California 95670

SAMPLE DESCRIPTION:
Oakland Shell, MW-2, Water
Job # 45-88-6661

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.01	>7.5
Toluene	0.01	1.5
Ethylbenzene	0.01	1.8
Xylenes	0.01	>8.1
1,2-Dichloroethane (EDC)	0.01	0.033
Ethylene Dibromide (EDB)	0.01	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.1	>19.
BTX as a Percent of Fuel		88.
Percent Surrogate Recovery		87.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

F-4843
JM/CRR/SCH
F4843FF.WR1/S-130

PROJECT NAME / LOCATION	PROJECT NUMBER: 40-88-666	BORING NUMBER: MW-1	SHEET 1 OF 2
3420 San Pablo Avenue Oakland, CA	CONTRACTOR: West Hazmat Drilling		DRILLING METHOD: H.S.A.
	DRILLER: Randy Reidhead		DRILLING RIG: CME-55
	START: 8:00		COMPLETED: 4-11-89/10:30
LAND OWNER: Shell Oil Company	SURFACE ELEVATION: 100.00 (relative)		LOGGED BY: Hal Hansen

SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	SAMPLE INT (ft)	SAMPLE RECOV (in)	DEPTH SCALE 1"= 4'	DESCRIPTIONS OF MATERIALS AND CONDITIONS	CONTAMINANT OBSERVATION INSTRUMENT: UNITS: Tip	GENERAL OBSERVATION NOTES Odor
					1	ASPHALT AND ROAD BASE		
					2	CLAY; very dark gray, highly plastic, slightly moist, no sand (CH)		
					3			
					4			
CA	MW1 1	9/ 12/ 15	5.0- 6.5	18	5	SANDY CLAY; dark greenish gray, moderately plastic, slightly moist, sand fine to coarse, some gravel toward the bottom of the unit (CL)	1100	Strong odor
					6			
					7			
					8			
					9			
CA	MW1 2	12/ 15/ 18	10.0- 11.5	18	10		375	Slight odor
					11			
					12			
					13			
					14			
CA	MW1 3	6/6/ 9	15.0- 16.5	17	15	SILTY CLAY; dark yellowish brown, moderately plastic, very moist, stiff, some gravel at the bottom of unit (CL)	30	Slight odor
					16			
					17			
					18			
					19			
CA	MW1 4	11/ 15/ 21	20.0- 21.5	15	20		3	Very slight odor
					21			
					22			
					23			

WATER LEVEL DATA			
DATE			
TIME			
GWL			
CASING DEPTH			

PROFESSIONAL GEOLOGIST

SIGNATURE

TYPED NAME

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 934Ø1
(8Ø5) 543-2553

Lab Number: F-4842
Collected: Ø4/17/89
Received: Ø4/19/89
Tested: Ø4/26/89
Collected by: Hansen

Fuel Fingerprint Analysis - EPA Method 524.2/824Ø
EXTRACTED BY EPA METHOD 5Ø3Ø (purge-and-trap)

Delta Environmental Consultants, Inc
11Ø3Ø White Rock Road
Suite 11Ø
Rancho Cordova, California 9567Ø

SAMPLE DESCRIPTION:
Oakland Shell, MW-1, Water
Job # 4Ø-88-666Ø1

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	Ø.Ø1	1.4
Toluene	Ø.Ø1	2.3
Ethylbenzene	Ø.Ø1	1.1
Xylenes	Ø.Ø1	6.6
1,2-Dichloroethane (EDC)	Ø.Ø1	Ø.Ø1
Ethylene Dibromide (EDB)	Ø.Ø1	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	Ø.1	12.
BTX as a Percent of Fuel		86.
Percent Surrogate Recovery		95.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

F-4842
JM/CRR/SCH
F4842FF.WR1/S-13Ø

PROJECT NAME / LOCATION	PROJECT NUMBER: 40-88-666	BORING NUMBER: MW-1	SHEET 2 OF 2
3420 San Pablo Avenue Oakland, CA	CONTRACTOR: West Hazmat	DRILLING METHOD: H.S.A.	
	DRILLER: Randy Reidhead	DRILLING RIG: CME-55	
	START: 8:00/4-11-89	COMPLETED: 10:30/4-11-89	
LAND OWNER: Shell Oil Company	SURFACE ELEVATION: 100.00 (relative)	LOGGED BY: Hal Hansen	

SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	SAMPLE INT (ft)	SAMPLE REC (in)	DEPTH SCALE 1"= 4'	DESCRIPTIONS OF MATERIALS AND CONDITIONS	CONTAMINANT OBSERVATION / INSTRUMENT: / UNITS: Tip	GENERAL OBSERVATION NOTES
CA	MW1 6	12/ 14/ 20	25.0- 26.5	6	25	GRAVELLY SAND; brown, very coarse sand, saturated, gravel 1/2 inch to 1/4 inch, minor plastic fines (SW)	Lost sample	No odor
					26			
					27	Total Depth 25.0 feet		
					28			
					29			
					30			
					31			
					32			
					33			
					34			
					35			
					36			
					37			
					38			
					39			
					40			
					41			
					42			
					43			
					44			
					45			
					46			
					47			

WATER LEVEL DATA				PROFESSIONAL GEOLOGIST
DATE				
TIME				
GWL				SIGNATURE
CASING DEPTH				TYPED NAME

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: B-04289
Collected:
Received:
Tested: 04/28/89
Collected by:

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

CCAS

SAMPLE DESCRIPTION:
INSTRUMENT BLANK

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.0001	not found
Toluene	0.001	not found
Ethylbenzene	0.001	not found
Xylenes	0.001	not found
1,2-Dichloroethane (EDC)	0.0001	not found
Ethylene Dibromide (EDB)	0.0001	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.05	<0.05
BTX as a Percent of Fuel		not applicable
Percent Surrogate Recovery		106.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
04/24/89
B0428 9f.wr1/53
MH/ec/jc/tl

PROJECT NAME / LOCATION	PROJECT NUMBER: 40-88-666	BORING NUMBER: MW-2	SHEET 1 OF 1
3420 San Pablo Avenue Oakland, CA	CONTRACTOR: West Hazmat		DRILLING METHOD: H.S.A.
	DRILLER: Randy Reidhead		DRILLING RIG: CME-55
	START: 8:00/4-10-89		COMPLETED: 9:45/4-10-89
LAND OWNER: Shell Oil Company	SURFACE ELEVATION: 100.29 (relative)		LOGGED BY: Hal Hansen

SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	SAMPLE INT (ft)	SAMPLE RECOV (in)	DEPTH SCALE 1"= 4'	DESCRIPTIONS OF MATERIALS AND CONDITIONS	CONTAMINANT OBSERVATION INSTRUMENT: UNITS: Tip	GENERAL OBSERVATION NOTES
					1	ASPHALT AND ROAD BASE		
					2	CLAY; very dark gray, highly plastic, slightly moist, no sand (CH)		
					3			
					4			
CA	MW2 1	6/ 19/ 19	5.0- 6.5	18	5	SANDY CLAY; dark greenish gray, moderately low plasticity, slightly moist, sand grades to gravel at bottom of the unit (CL)	25	Moderate odor
					6			
					7			
					8			
					9			
CA	MW2 2	9/ 10/ 14	10.0- 11.5	17	10		75	Moderate odor
					11			
					12			
					13			
					14			
CA	MW2 3	4/5/ 7	15.0- 16.5	16	15		0	No odor
					16	SILTY CLAY; dark yellowish brown, moderately low plasticity, moist stiff gravel toward bottom of the unit (CL)		
					17			
					18			
					19			
CA	MW2 4	12/ 26/ 35	20.0- 21.5	17	20	Total Depth 20.0 feet	0	No odor
					21			
					22			
					23			

WATER LEVEL DATA			
DATE			
TIME			
GWL			
CASING DEPTH			

PROFESSIONAL GEOLOGIST

SIGNATURE

TYPED NAME

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: QS-0420 9
Collected:
Received:
Tested: 04/26/89
Collected by:

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

CCAS

SAMPLE DESCRIPTION:
ROASTED SOIL SPIKE
Spiked with gasoline to 0.673 ppm

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration w/spike in ppm	Percent Recovery
Benzene	0.0001	0.026	94.
Toluene	0.001	0.081	98.
Ethylbenzene	0.001	0.017	98.
Xylenes	0.001	0.10	98.
1,2-Dichloroethane (EDC)	0.0001	not spiked	----
Ethylene Dibromide (EDB)	0.0001	not spiked	----
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.05	0.7	106.
BTX as a Percent of Fuel		31.	
Percent Surrogate Recovery		99.	

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
04/24/89
QS0420 9f.wr1/53
MH/jg/jc/tl

PROJECT NAME / LOCATION	PROJECT NUMBER: 40-88-666	BORING NUMBER: MW-3	SHEET 1 OF 2
3420 San Pablo Avenue Oakland, CA	CONTRACTOR: West Hazmat		DRILLING METHOD: H.S.A.
	DRILLER: Randy Reidhead		DRILLING RIG: CME-55
	START: 11:00/4-10-89		COMPLETED: 1:00/4-10-89
LAND OWNER: Shell Oil Company	SURFACE ELEVATION: 100.00 (relative)		LOGGED BY: Hal Hansen

SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	SAMPLE INT (ft)	SAMPLE RECOV (in)	DEPTH SCALE 1"= 4'	DESCRIPTIONS OF MATERIALS AND CONDITIONS	CONTAMINANT OBSERVATION INSTRUMENT: UNITS: Tip	GENERAL OBSERVATION NOTES
					1	ASPHALT AND ROAD BASE		
					2	CLAY; very dark gray, highly plastic, slightly moist, no sand (CH)		
					3			
					4			
CA	MW3-1	8/13/13	5.0-6.5	18	5		0	No odor
					6	SILTY CLAY; olive brown with light olive brown mottles, moderately high plasticity, slighty moist (CL)		
					7			
					8			
					9			
CA	MW3-2	13/23/21	10.0-11.5	18	10		0	No odor
					11			
					12			
					13			
					14			
CA	MW3-3	11/14/15	15.0-16.5	17	15	SANDY CLAY; yellowish brown, moderately low plasticity, moist, fine sands (CL)	0	No odor
					16			
					17			
					18			
					19			
CA	MW3-4	3/8/15	20.0-21.5	15	20		0	No odor
					21			
					22			
					23			

WATER LEVEL DATA			
DATE			
TIME			
GWL			
CASING DEPTH			

PROFESSIONAL GEOLOGIST

SIGNATURE

TYPED NAME

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: S-04209-2
Collected:
Received:
Tested: 04/20/89
Collected by:

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

CCAS

SAMPLE DESCRIPTION:
STD.1/2 X (#042089-4) BTE, EDB & EDC @ 0.020 ppm, Xylenes @ 0.060 ppm

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration w/spike in ppm	Percent Recovery
Benzene	0.0001	0.023	115.
Toluene	0.001	0.024	120.
Ethylbenzene	0.001	0.022	110.
Xylenes	0.001	0.069	115.
1,2-Dichloroethane (EDC)	0.0001	0.023	115.
Ethylene Dibromide (EDB)	0.0001	0.026	130.
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.05	not applicable	
BTX as a Percent of Fuel		not applicable	
Percent Surrogate Recovery		99.	

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#8
04/24/89
S042089f2.wr1/53
MH/ec/jc/tl

PROJECT NAME / LOCATION	PROJECT NUMBER: 40-88-666	BORING NUMBER: MW-3	SHEET 2 OF 2
3420 San Pablo Avenue Oakland, CA	CONTRACTOR: West Hazmat Drilling		DRILLING METHOD: H.S.A.
	DRILLER: Randy Reidhead		DRILLING RIG: CME-55
	START: 11:00/4-10-89		COMPLETED: 1:00/4-10-89
LAND OWNER: Shell Oil Company	SURFACE ELEVATION: 100.50' (relative)		LOGGED BY: Hal Hansen

SAMPLE TYPE	SAMPLER NUMBER	BLOW COUNTS	SAMPLE INT (ft)	SAMPLE REC (in)	DEPTH SCALE 1"= 4'	DESCRIPTIONS OF MATERIALS AND CONDITIONS	CONTAMINANT OBSERVATION INSTRUMENT: UNITS:	GENERAL OBSERVATION NOTES Odor
CA	MW3-5	25/25/42	25.0-26.5	14	24–25	GRAVELLY SAND; brown, coarse sand, gravel, saturated, minor plastic fines (SW)	0	No odor
CA	MW3-6	18/23/39	30.0-31.5	15	30	Total Depth 30.0 feet	0	No odor

WATER LEVEL DATA			
DATE			
TIME			
GWL			
CASING DEPTH			

PROFESSIONAL GEOLOGIST

SIGNATURE

TYPED NAME

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-04547
Collected: 04/10/89
Received: 04/13/89
Tested: 04/20/89
Collected by: H. Hansen

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

ATTN: Hal Hansen
Delta Environmental
11030 White Rock Rd.
Suite 110
Rancho Cordova, CA 95670

SAMPLE DESCRIPTION:
Oakland Shell, MW-4-2,
#40-88-666.01, Soil

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.002	not found
Toluene	0.002	0.005
Ethylbenzene	0.002	0.004
Xylenes	0.002	0.031
1,2-Dichloroethane (EDC)	0.002	not found
Ethylene Dibromide (EDB)	0.002	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.2	<0.2
BTX as a Percent of Fuel		not applicable
Percent Surrogate Recovery		105.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
04/24/89
F04547f.wr1/54
MH/jg/jc/tl

PROJECT NAME / LOCATION	PROJECT NUMBER: 40-88-666	BORING NUMBER: MW-4	SHEET 1 OF 2
3420 San Pablo Avenue Oakland, CA	CONTRACTOR: West Hazmat Drilling	DRILLING METHOD: H.S.A.	
	DRILLER: Randy Reidhead	DRILLING RIG: CME-55	
	START: 2:30/4-10-89	COMPLETED: 6:30/4-10-89	
LAND OWNER: Shell Oil Company	SURFACE ELEVATION: 99.03' (relative)	LOGGED BY: Hal Hansen	

SAMPLE TYPE	SAMPLER NUMBER	BLOW COUNTS	SAMPLE INT (ft)	SAMPLE RECOV (in)	DEPTH SCALE 1"= 4'	DESCRIPTIONS OF MATERIALS AND CONDITIONS	CONTAMINANT OBSERVATION INSTRUMENT: UNITS:	GENERAL OBSERVATION NOTES Odor
					1	ASPHALT AND ROAD BASE		
					2	LEAN CLAY; very dark gray, highly plastic, slightly moist, no sand (CH)		
					3			
					4			
CA	MW4-1	17/25/32	5.0-6.5	18	5		7	Slight odor
					6	SILTY CLAY; dark greenish gray, medium plasticity, slightly moist, some gravel (CL)		
					7			
					8			
					9			
CA	MW4-2	6/8/12	10.0-11.5	17	10	SILTY CLAY; dark yellowish brown, dark greenish-gray, mottles, moderately plastic, moist (CL)	0	No odor
					11			
					12			
					13			
					14			
CA	MW4-3	8/9/12	14.0-16.5	17	15	SANDY CLAY; yellowish brown, moderately plastic, moist, fine sand, grades to a coarse sand at the bottom of the unit (CL)	0	No odor
					16			
					17			
					18			
					19			
CA	MW4-4	9/8/24	20.0-21.5	15	20		0	No odor
					21			
					22			
					23			

WATER LEVEL DATA			
DATE			
TIME			
GWL			
CASING DEPTH			

PROFESSIONAL GEOLOGIST

SIGNATURE

TYPED NAME

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-04546
Collected: 04/10/89
Received: 04/13/89
Tested: 04/20/89
Collected by: H. Hansen

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

ATTN: Hal Hansen
Delta Environmental
11030 White Rock Rd.
Suite 110
Rancho Cordova, CA 95670

SAMPLE DESCRIPTION:
Oakland Shell, MW-3-2,
#40-88-666.01, Soil

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.002	not found
Toluene	0.002	0.010
Ethylbenzene	0.002	0.008
Xylenes	0.002	0.069
1,2-Dichloroethane (EDC)	0.002	not found
Ethylene Dibromide (EDB)	0.002	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	0.2	<0.2
BTX as a Percent of Fuel		not applicable
Percent Surrogate Recovery		112.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
04/24/89
F04546f.wr1/54
MH/jg/jc/tl

PROJECT NAME / LOCATION	PROJECT NUMBER: 40-88-666	BORING NUMBER: MW-4	SHEET 2 OF 2
3420 San Pablo Avenue Oakland, CA	CONTRACTOR: West Hazmat Drilling	DRILLING METHOD:	H.S.A.
	DRILLER: Randy Reidhead	DRILLING RIG:	CME-55
	START: 2:30/4-10-89	COMPLETED:	6:30/4-10-89
LAND OWNER: Shell Oil Company	SURFACE ELEVATION: 99.03 (relative)	LOGGED BY:	Hal Hansen

SAMPLE TYPE	SAMPLE NUMBER	BLOW COUNTS	SAMPLE INT (ft)	SAMPLE RECOV (in)	DEPTH SCALE 1"= 4'	DESCRIPTIONS OF MATERIALS AND CONDITIONS	CONTAMINANT OBSERVATION INSTRUMENT: UNITS:	GENERAL OBSERVATION NOTES Odor
CA	MW4-5	25/24/30	25.0-26.5	16	23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45	GRAVELLY SAND; brown, coarse sand, saturated, gravel 1/2" to 1", some plastic fines (SW)	0	No odor
CA	MW4-6	19/22/37	30.0-31.5	17		Total Depth 31.5	0	No odor

WATER LEVEL DATA			
DATE			
TIME			
GWL			
CASING DEPTH			

PROFESSIONAL GEOLOGIST

SIGNATURE

TYPED NAME

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-04545
Collected: 04/10/89
Received: 04/13/89
Tested: 04/20/89
Collected by: H. Hansen

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

ATTN: Hal Hansen
Delta Environmental
11030 White Rock Rd.
Suite 110
Rancho Cordova, CA 95670

SAMPLE DESCRIPTION:
Oakland Shell, MW-2-2,
#40-88-666.01, Soil

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.2	0.4
Toluene	0.2	1.5
Ethylbenzene	0.2	1.7
Xylenes	0.2	15.
1,2-Dichloroethane (EDC)	0.2	not found
Ethylene Dibromide (EDB)	0.2	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	20.	70.
BTX as a Percent of Fuel		24.
Percent Surrogate Recovery		107.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
04/24/89
F04545f.wr1/54
MH/jg/jc/tl

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: SHELL STATION
3420 SAN PABLO AVE.
OAKLAND, CA

PROJECT NUMBER: 1859G

BORING NO. B-1

DATE DRILLED: 8/8/88

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 2", baserock - 4"		
1-4			CL	SILTY CLAY, very dark gray (7.5YR 3/0), slight petroleum odor, moderately high plasticity, stiff, moist		
5	B-1-1	27	CH	SILTY CLAY, dark gray (10YR 4/1), some angular brown gravel sized fragments, petroleum odor, moderately high plasticity, very stiff, moist,		155
6-9			CL	SILTY CLAY, olive gray to gray (5Y 5/2 to 7.5Y 5/0), localized fine grained sands, some angular gravel up to 1.5" across, petroleum odor, moderate plasticity, very stiff, moist		
10	B-1-2	32				150
11-13						
14			CL	SANDY CLAY, mottled browns (10YR 5/4 to 10YR 5/8),some fine to medium sands and angular, medium gravels, no petroleum odor, stiff, moist to very moist		
15	B-1-3	13				0
16-18			CL	SILTY CLAY, mottled reddish yellow to light yellow (7.5YR 6/8 to 2.5Y 6/4), locally sandy areas, some gravels, no petroleum odor, very stiff, moist to very moist	▽	
19				8/8/88, Groundwater encountered - 19 ft.		
20	B-1-4	32				0
21				Bottom of boring =20.5 feet		

SUPERVISED AND APPROVED BY R.G./C.E.G.

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: F-04544
Collected: 04/11/89
Received: 04/13/89
Tested: 04/20/89
Collected by: H. Hansen

Fuel Fingerprint Analysis - EPA Method 8260
EXTRACTED BY EPA METHOD 5030 (purge-and-trap)

ATTN: Hal Hansen
Delta Environmental
11030 White Rock Rd.
Suite 110
Rancho Cordova, CA 95670

SAMPLE DESCRIPTION:
Oakland Shell, MW-1-2,
#40-88-666.01, Soil

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	0.05	not found
Toluene	0.5	1.9
Ethylbenzene	0.5	1.9
Xylenes	0.5	16.
1,2-Dichloroethane (EDC)	0.5	not found
Ethylene Dibromide (EDB)	0.5	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	50.	80.
BTX as a Percent of Fuel		22.
Percent Surrogate Recovery		110.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSD#6
04/24/89
F04544f.wr1/54
MH/jg/jc/tl

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: SHELL STATION
3420 SAN PABLO AVE.
OAKLAND, CA

PROJECT NUMBER: 1859G

BORING NO. B-2

DATE DRILLED: 8/8/88

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 2", baserock - 9"		
1-4			CH	SILTY CLAY, very dark gray (7.5 3/0), some fine grained sands and gravels, moderately high plasticity, petroleum odor, stiff, moist		
5-6	B-2-1	30	CL	SILTY CLAY to SANDY CLAY, gray (2.5Y 5/0), fine grained sands, some subangular gravels up to 0.5" across, petroleum odor, very stiff, moist		230
7-9			CL	SILTY CLAY, mottled light gray to grayish brown (7.5YR 6/0 to 10YR 5/2), some medium to coarse grained sands and gravels up to 0.5" across, petroleum odor, very stiff, moist	▽ 8/8/88, Groundwater encountered - 8 ft.	
10	B-2-2	30				210
11				Bottom of boring = 10.5 feet		
12-21						

SUPERVISED AND APPROVED BY R.G./C.E.G. [signature]

Central Coast Analytical Services

Central Coast
Analytical Services, Inc.
141 Suburban Road , Suite C-4
San Luis Obispo, California 934Ø1
(8Ø5) 543-2553

Lab Number: F-Ø4543
Collected: Ø4/11/89
Received: Ø4/13/89
Tested: Ø4/23/89
Collected by: H. Hansen

Fuel Fingerprint Analysis - EPA Method 826Ø
EXTRACTED BY EPA METHOD 5Ø3Ø (purge-and-trap)

ATTN: Hal Hansen
Delta Environmental
11Ø3Ø White Rock Rd.
Suite 11Ø
Rancho Cordova, CA 9567Ø

SAMPLE DESCRIPTION:
Oakland Shell, MW-1-1, ØØ-88-666.Ø1,
Soil

Compound Analyzed	Detection Limit in ppm (PQL)*	Concentration in ppm
Benzene	Ø.2	1.2
Toluene	Ø.2	14.
Ethylbenzene	Ø.2	19.
Xylenes	Ø.2	1ØØ.
1,2-Dichloroethane (EDC)	Ø.2	not found
Ethylene Dibromide (EDB)	Ø.2	not found
TOTAL PURGEABLE PETROLEUM HYDROCARBONS (GASOLINE)	2Ø.	85Ø.
BTX as a Percent of Fuel		14.
Percent Surrogate Recovery		93.

*(Practical Quantitation Limit)

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D.
President

MSDØ7
Ø5/Ø1/89
FØ4543f.wr1/55
MH/jl/re/tl

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: SHELL STATION
3420 SAN PABLO AVE.
OAKLAND, CA

PROJECT NUMBER: 1859G

BORING NO. B-3

DATE DRILLED: 8/8/88

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 2", baserock - 6"		
1-4			CH	SILTY CLAY, very dark gray (7.5YR 3/0), localized fine grained sands, no petroleum odor, moderately high plasticity, stiff, moist		
5	B-3-1	30	CH	SILTY CLAY, mottled strong brown to brownish yellow (7.5YR 6/6 to 7.5YR 6/5), localized fine grained sands and angular to subangular gravels up to 0.5" across, no petroleum odor, moderately high plasticity, very stiff, moist		0
10	B-3-2	25				0
13			CL	SANDY CLAY, mottled brownish yellow to yellowish brown (10YR 6/6 to 10YR 5/8), fine grained sands, no petroleum odor, stiff, moist to very moist		-
15	B-3-3	16				0
17-19			CL-SC	SANDY CLAY to CLAYEY SAND, mottled light gray to dark brown (10YR 7/1 to 10YR 3/8), fine grained sands up to 60%, no petroleum odor, stiff to medium dense, wet		
				8/8/88, Groundwater encountered - 19 ft.	▽	
20	B-3-4	16				0
21				Bottom of boring = 20.5 feet		

SUPERVISED AND APPROVED BY R.G./C.E.G. [signature]

AIR, WATER & HAZARDOUS WASTE LABORATORY (No.131) CERTIFIED by CALIFORNIA DEPT. of HUMAN SERVICES

Central Coast Analytical Services

Central Coast
Analytical Services
141 Suburban Road, Suite C-4
San Luis Obispo, California 93401
(805) 543-2553

Lab Number: As Listed
Collected: As Listed
Received: 04/13/89 @ 0900
Tested: As Listed
Collected by: Hal Hansen

ATTN: Hal Hansen
Delta Environmental
11030 White Rock Road
Suite 110
Rancho Cordova, CA 95670

Sample Description:

Oakland Shell, Project #40-88-666-01
Soil Samples As Listed

DIGESTED BY EPA METHOD 3050
ON 04/22/89 BY JJ.

REPORT

LAB NUMBER	SAMPLE DESCRIPTION	LEVEL FOUND
		TOTAL LEAD mg/kg
EPA METHOD----------		7420
DETECTION LIMIT(PQL)**-----		1.
DATE/ANALYST----------		04/27/89/RJ
***TTLC----------		1000.
F-4543	MW-1-1, Coll: 04/11/89	4.
F-4544	MW-1-2, Coll: 04/11/89	3.
F-4545	MW-2-2, Coll: 04/10/89	8.
F-4546	MW-3-2, Coll: 04/10/89	3.
F-4547	MW-4-2, Coll: 04/10/89	2.
	DUPLICATE----------	2.
	SPIKE----------	98. Percent Recovery

**Practical Quantitation Limit

***TOTAL THRESHOLD LIMIT CONCENTRATION as listed in 22 Cal Adm Code Art 11 Sec. 66699 as persistent & bioaccumulative toxic substance.

Respectfully submitted,
CENTRAL COAST ANALYTICAL SERVICES

Mary Havlicek, Ph.D., President

04/28/89
F4543DL.WR1/#41
MH/ke

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: SHELL STATION
3420 SAN PABLO AVE.
OAKLAND, CA

PROJECT NUMBER: 1859G

BORING NO. B-4

DATE DRILLED: 8/8/88

LOGGED BY: RAG

DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 2", baserock - 4"		
1-4			CH	SILTY CLAY, very dark gray (7.5YR 3/0), localized fine grained sands, no petroleum odor, moderately high plasticity, stiff, moist		
5	B-4-1	24	CL	SANDY CLAY, mottled gray to strong brown (7.5YR 5/0 to 7.5YR 5/6), fine to medium grained sands up to 40%, angular to subangular gravels up to 0.5" across, locally very sandy and gravelly, no petroleum odor, very stiff, moist		0
6-9			CL	SANDY CLAY, mottled brown to yellowish brown (10YR 5/3 to 10YR 5/6), fine grained sand, locally very sandy and very clayey, no petroleum odor, hard, moist		
10	B-4-2	35				0
11-13						-
14				Localized very gravelly beds, very stiff		
15	B-4-3	18		Root holes containing free water		0
16-17						
18					▽	
19				8/8/88, Groundwater encountered - 19 ft.		
20	B-4-4	30				0
21				Bottom of boring = 20.5 feet		

SUPERVISED AND APPROVED BY R.G./C.E.G.

APPENDIX D

Laboratory Reports

EXPLORATORY BORING LOG

ensco environmental services, inc.

PROJECT NAME: SHELL STATION
3420 SAN PABLO AVE.
OAKLAND, CA

PROJECT NUMBER: 1859G

BORING NO. B-5

DATE DRILLED: 8/8/88

LOGGED BY: RAG

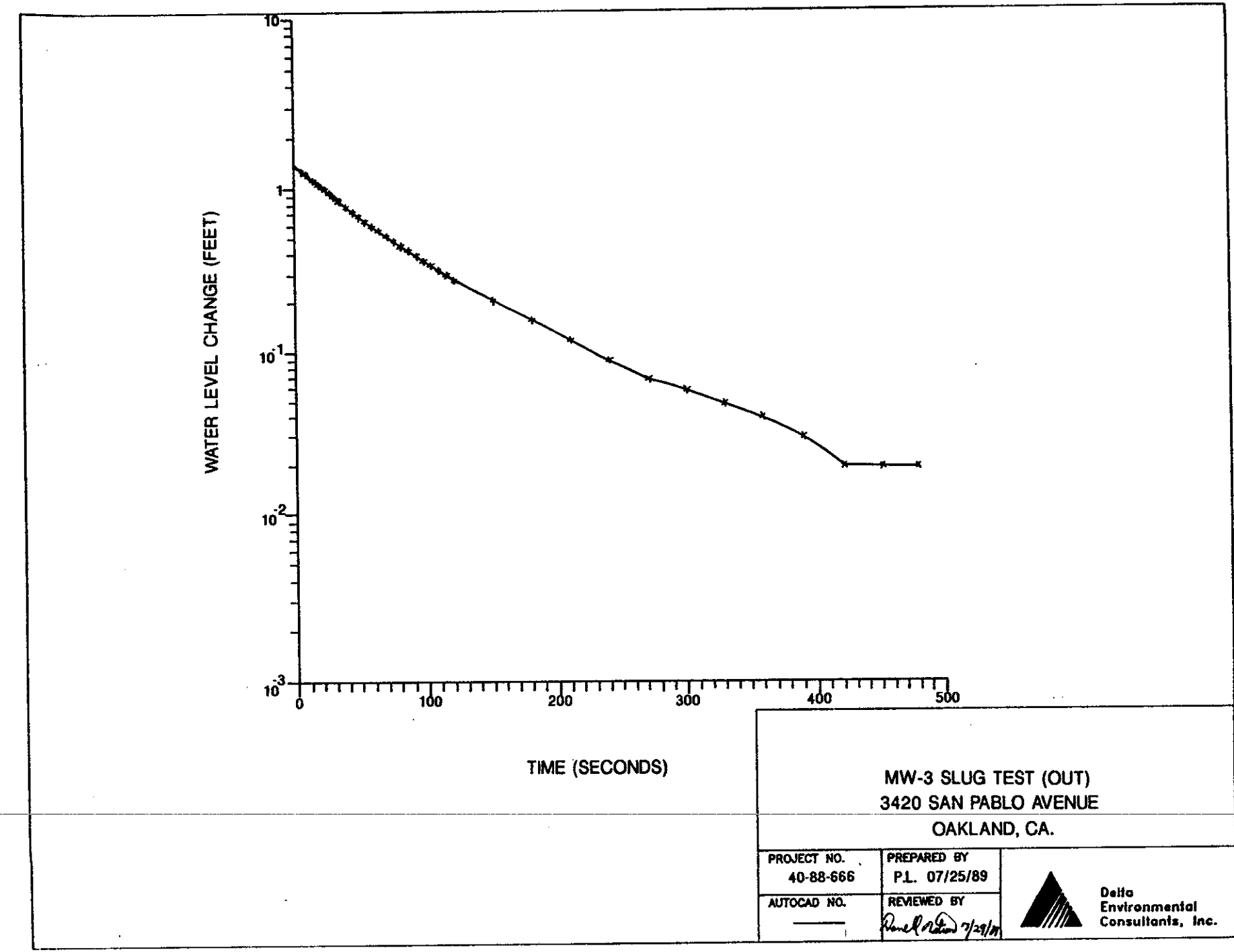
DEPTH (ft.)	SAMPLE No	BLOWS/FOOT 140 ft/lbs.	UNIFIED SOIL CLASSIFICATION	SOIL DESCRIPTION	WATER LEVEL	OVA READING ppm
				Asphalt - 2", baserock - 4"		
1-4			CH	SILTY CLAY, very dark gray (7.5YR 3/0), localized fine grained sands, no petroleum odor, moderately high plasticity, stiff, moist		
5-7	B-5-1	28	CL	SANDY CLAY, mottled grayish brown to yellowish brown (10YR 5/2 to 10YR 5/6), fine to coarse sand up to 40%, locally abundant gravels up to 0.5" across, no petroleum odor, very stiff, moist		0
8-9			CL	SANDY CLAY, mottled gray to brownish yellow (10YR 6/1 to 10YR 6/6), fine grained sands up to 30%, root holes, no petroleum odor, low plasticity, hard, moist		
10	B-5-2	38				0
11-13						-
14-15	B-5-3	13	CL	SANDY CLAY, mottled yellow browns (10YR 5/4 to 10YR 5/8), fine grained sands up to 40%, locally abundant gravels up to 0.5" across, no petroleum odor, stiff, moist to very moist, free water in root holes		0
16-18						
19				8/8/88, Groundwater encountered - 19 ft.	▽	
20	B-5-4	23		Decreasing sand, very stiff		0
21				Bottom of boring = 20.5 feet		

SUPERVISED AND APPROVED BY R.G./C.E.G.

```
C:\SLUG>SLUGTEST
Slug test for Hydraulic Conductivity
      of Unconfined Aquifer
Input Project Name:
OAKLAND SHELL
Input: 1= Partially Penetrating
       2= Fully Penetrating
1

Input:Well I.D.
MW-3
========

Input: Screen length(ft)
       Depth to Bottom of Well(ft)
       Depth to water table or flow zone(ft)
       Depth to Bottom of Aquifer(ft)
20,27.5,8.59,50.
Water level below top of screen - need adjusted rc
Input: Casing Radius(in), & Well Radius(in)
2,3.20

rc =   1.666667E-001 ft     rw =   2.666667E-001 ft
L/rw =          74.9999900
        3.8090060  = a;       6.627519E-001  = b
                        Screen length =          20.0000000
Height of water above bottom of well =          18.9100000
 Height of water above top of screen =          -1.0900000
          Total depth of water table =          41.4100000
Input drawdown time data: yo,to,yf,tf (ft and min)
1.,.33,.69,.83

Re =  .472E+01
Hydraulic Conductivity (cm/sec) =   .753E-03
                       (ft/day) =   .213E+01
    Transmissivity (ft sq/day) =   .883E+02
1= new type, 2= new well, 3= more data, 4=end
```

APPENDIX B

Monitoring Well Construction Diagrams



MW-3 SLUG TEST (OUT)
3420 SAN PABLO AVENUE
OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	P.L. 07/25/89
AUTOCAD NO.	REVIEWED BY
———	7/29/89

Delta Environmental Consultants, Inc.

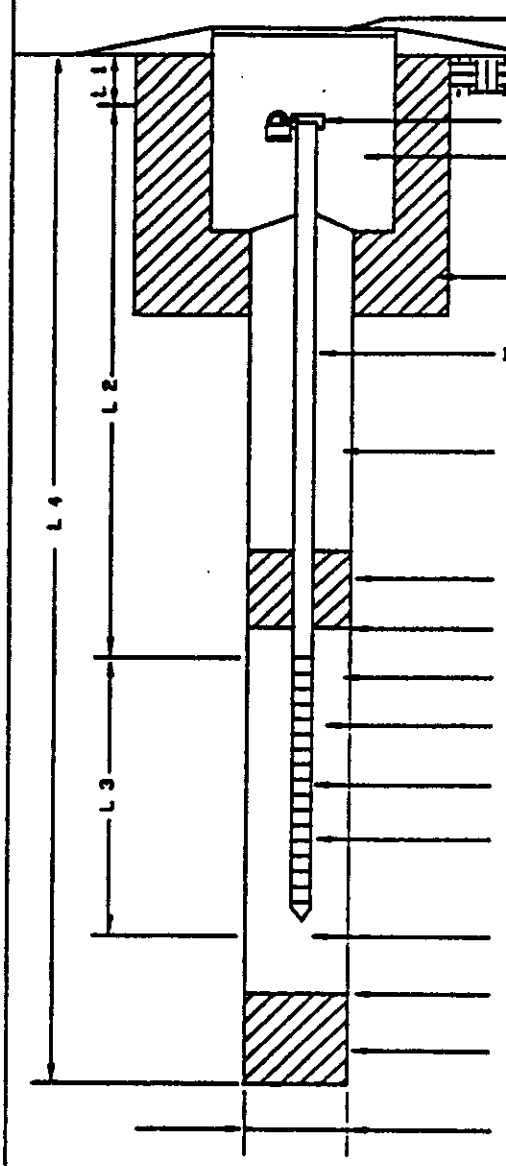
INSTALLATION OF FLUSH GRADE MONITORING WELL

PROJECT Oakland Shell

DELTA NO. 40-88-666

MONITORING WELL NO. MW-1

ELEVATIONS: TOP OF RISER 100.0 relative
GROUND LEVEL



FLUSH GRADE WELL CONSTRUCTION DIAMETER AND MATERIAL	15-inch galvanized
TOTAL LENGTH	12 inches
LENGTH ABOVE GROUND	0 foot
THICKNESS AND TYPE OF SEAL	18 inches, concrete
DIAMETER, MATERIAL AND JOINT TYPE OF RISER PIPE	4-inch PVC SCH 40 Flush-threaded
TYPE OF BACKFILL AROUND RISER	Concrete with 5% bentonite
THICKNESS AND TYPE OF SEAL	2 feet, bentonite pellets
DISTANCE OF FILTER SAND ABOVE TOP OF SCREEN	2 feet
TYPE OF FILTER AROUND SCREEN	16/40 clementine
MONITORING WELL MATERIAL	PVC SCH 40
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT SIZE)	0.01 inch
DIAMETER AND LENGTH OF SCREEN	4 inches 20 feet
DEPTH TO THE BOTTOM OF MONITORING WELL	25 feet
DEPTH TO THE BOTTOM OF FILTER SAND	25 feet
THICKNESS AND TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	10 inches

L 1 = 0.25 FT.

L 2 = 5 FT.

L 3 = 20 FT.

L 4 = 25 FT.

INSTALLATION COMPLETED:
DATE: 4-11-1989
TIME: 10:30

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	WATER LEVEL *
4-17-1989	13:25	6.30

* MEASURE POINT: Top of Casing

Delta Environmental Consultants, Inc.

1022 B/3-89

```
SLUGTEST
Slug test for Hydraulic Conductivity
       of Unconfined Aquifer
Input Project Name:
OAKLAND SHELL
Input: 1= Partially Penetrating
       2= Fully Penetrating
1

Input:Well I.D.
MW-2
=======

Input: Screen length(ft)
       Depth to Bottom of Well(ft)
       Depth to water table or flow zone(ft)
       Depth to Bottom of Aquifer(ft)
15,19,7.71,50
Water level below top of screen - need adjusted rc
Input: Casing Radius(in), & Well Radius(in)
3,3.20

rc =   1.666667E-001 ft     rw =   2.666667E-001 ft
L/rw =          56.2500000
        3.2205440  = a;       5.427318E-001  = b
                      Screen length =          15.0000000
Height of water above bottom of well =          11.2900000
Height of water above top of screen =           -3.7100000
         Total depth of water table =          42.2900000
Input drawdown time data: yo,to,yf,tf (ft and min)
.96,.33,.575,.83

Re =  .331E+01
Hydraulic Conductivity (cm/sec) =   .122E-02
                       (ft/day) =   .344E+01
     Transmissivity (ft sq/day) =   .146E+03
1= new type, 2= new well, 3= more data, 4=end
4
```

INSTALLATION OF FLUSH GRADE MONITORING WELL

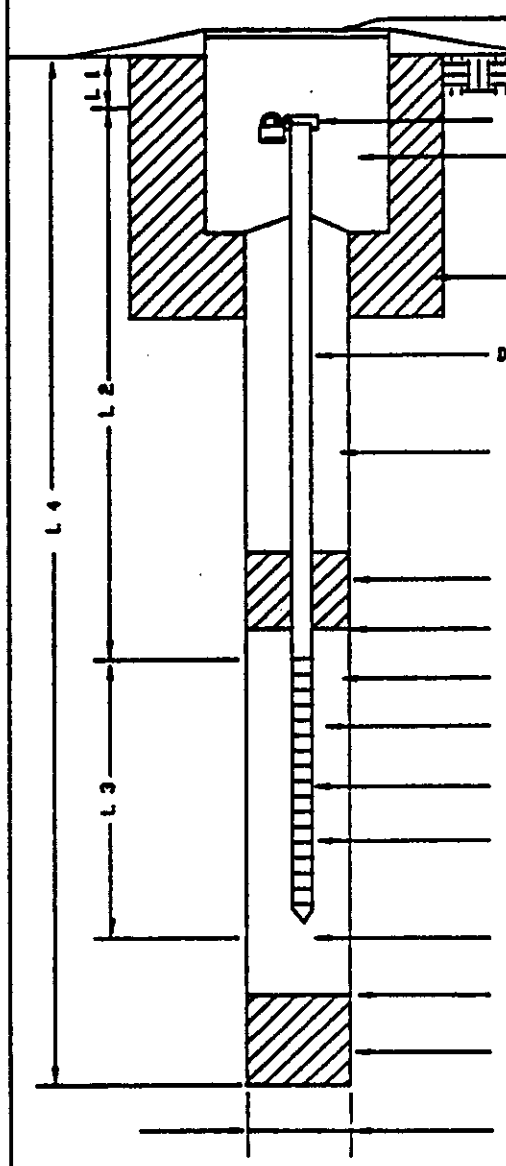
PROJECT Oakland Shell

DELTA NO. 40-88-666

MONITORING WELL NO. MW-2

ELEVATIONS: TOP OF RISER 100.29 relative

GROUND LEVEL



FLUSH GRADE WELL CONSTRUCTION DIAMETER AND MATERIAL	15-inch galvanized
TOTAL LENGTH	12 inches
LENGTH ABOVE GROUND	0 foot
THICKNESS AND TYPE OF SEAL	18 inches, concrete
DIAMETER, MATERIAL AND JOINT TYPE OF RISER PIPE	4-inch PVC SCH 40 Flush-threaded
TYPE OF BACKFILL AROUND RISER	Concrete with 5% bentonite
THICKNESS AND TYPE OF SEAL	2 feet, bentonite pellets
DISTANCE OF FILTER SAND ABOVE TOP OF SCREEN	2 feet
TYPE OF FILTER AROUND SCREEN	16/40 clementine
MONITORING WELL MATERIAL	PVC SCH 40
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT SIZE)	0.01 inch
DIAMETER AND LENGTH OF SCREEN	4 inches 20 feet
DEPTH TO THE BOTTOM OF MONITORING WELL	19 feet
DEPTH TO THE BOTTOM OF FILTER SAND	19 feet
THICKNESS AND TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	10 inches

L 1 = 0.25 / 4 FT.

L 2 = FT.

L 3 = 15 FT.

L 4 = 19 FT.

INSTALLATION COMPLETED:

DATE: 4-10-1989

TIME: 9:45

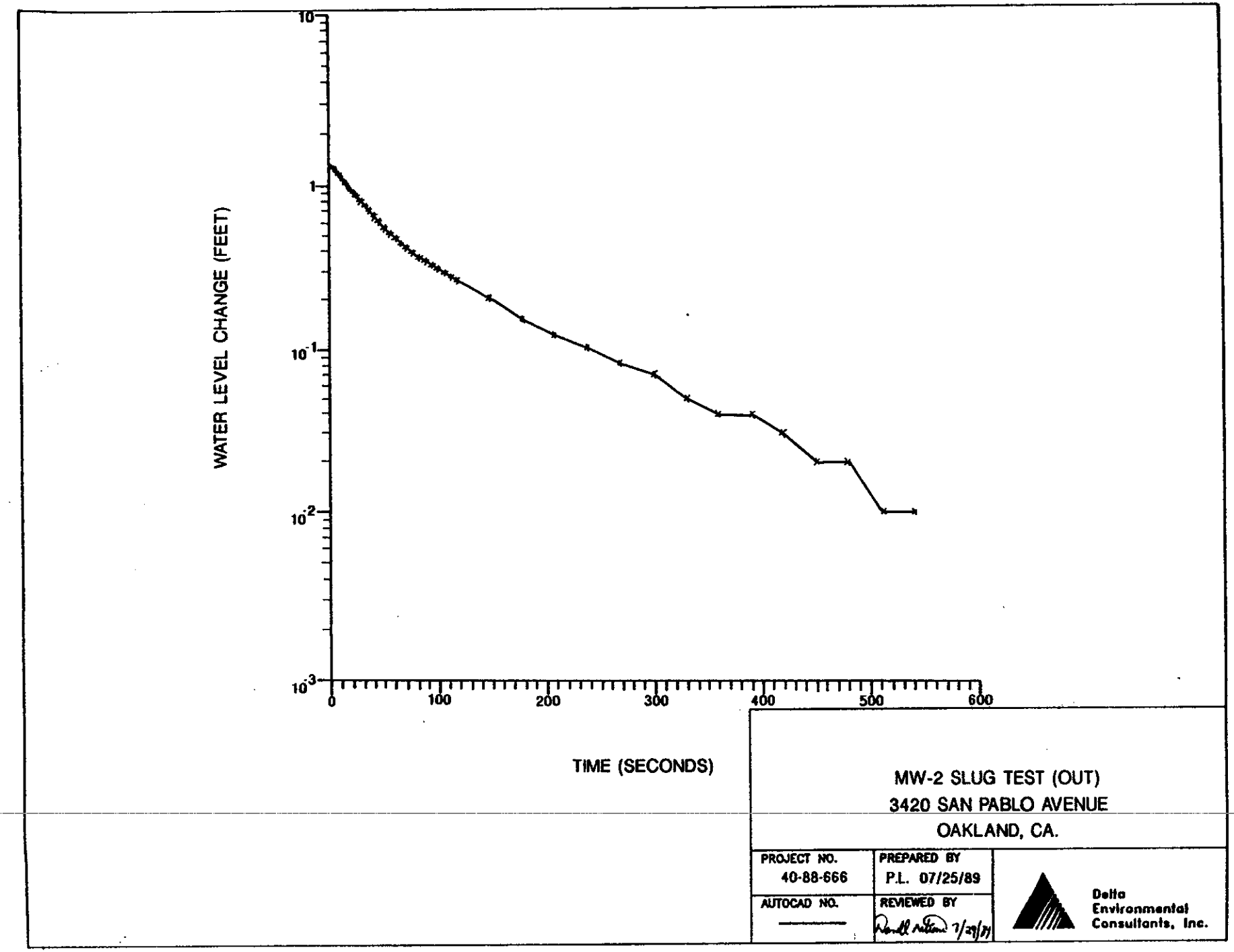
MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	WATER LEVEL *
4-17-1989	13:15	6.46

* MEASURE POINT: Top of casing

Delta Environmental Consultants, Inc.

1022 B/3-89



MW-2 SLUG TEST (OUT)
3420 SAN PABLO AVENUE
OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	P.L. 07/25/89
AUTOCAD NO.	REVIEWED BY
———	7/29/89

Delta Environmental Consultants, Inc.

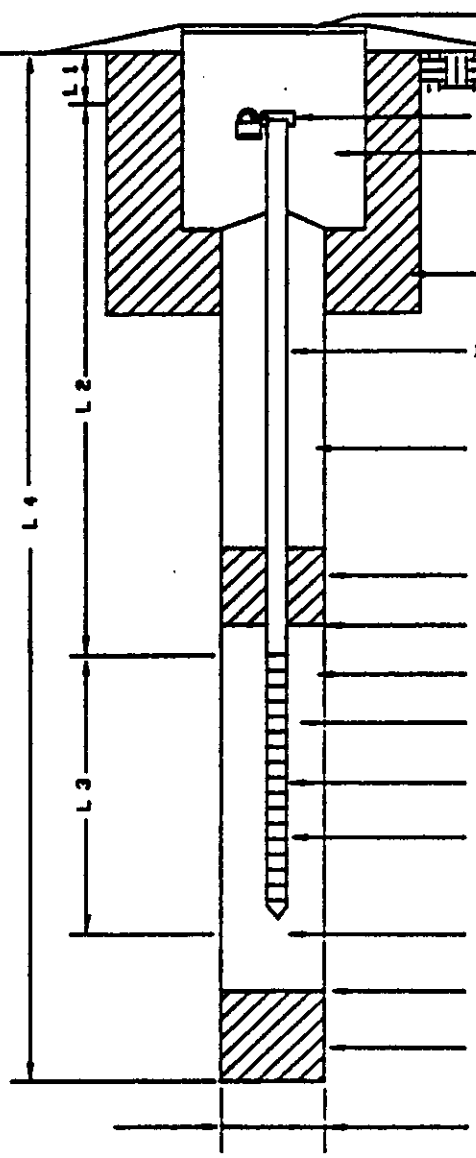
INSTALLATION OF FLUSH GRADE MONITORING WELL

PROJECT: Oakland Shell

DELTA NO.: 40-88-666

MONITORING WELL NO.: MW-3

ELEVATIONS: TOP OF RISER 100.50 relative
GROUND LEVEL: _____



FLUSH GRADE WELL CONSTRUCTION DIAMETER AND MATERIAL	15-inch galvanized
TOTAL LENGTH	12 inches
LENGTH ABOVE GROUND	0 foot
THICKNESS AND TYPE OF SEAL	15-inch concrete
DIAMETER, MATERIAL AND JOINT TYPE OF RISER PIPE	4-inch PVC SCH 40 Flush-threaded
TYPE OF BACKFILL AROUND RISER	Concrete with 5% bentonite
THICKNESS AND TYPE OF SEAL	2 feet, bentonite pellets
DISTANCE OF FILTER SAND ABOVE TOP OF SCREEN	2 feet
TYPE OF FILTER AROUND SCREEN	16/40 clementine
MONITORING WELL MATERIAL	PVC SCH 40
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT SIZE)	0.01 inch
DIAMETER AND LENGTH OF SCREEN	4 inches 20 feet
DEPTH TO THE BOTTOM OF MONITORING WELL	27.5 feet
DEPTH TO THE BOTTOM OF FILTER SAND	27.5 feet
THICKNESS AND TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	10 inches

L 1 = 0.25 FT.

L 2 = 7.5 FT.

L 3 = 20 FT.

L 4 = 27.5 FT.

INSTALLATION COMPLETED:
DATE: 4-10-89
TIME: 13:00

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	WATER LEVEL *
4-17-1989	13:20	5.81

* MEASURE POINT: Top of casing

Delta Environmental Consultants, Inc.

1022 B/3-89

```
ugtest
ug test for Hydraulic Conductivity
       of Unconfined Aquifer
put Project Name:
KLAND SHELL
Input: 1= Partially Penetrating
       2= Fully Penetrating


Input:Well I.D.
-1
=======

put: Screen length(ft)
       Depth to Bottom of Well(ft)
       Depth to water table or flow zone(ft)
       Depth to Bottom of Aquifer(ft)
,25,9.10,50
ter level below top of screen - need adjusted rc
Input: Casing Radius(in), & Well Radius(in)
3.20


rc =   1.666667E-001 ft     rw =   2.666667E-001 ft
rw =          74.9999900
        3.8090060   = a;        6.627519E-001   = b
                        Screen length =          20.0000000
ight of water above bottom of well =          15.9000000
Height of water above top of screen =          -4.1000000
          Total depth of water table =          40.9000000
put drawdown time data: yo,to,yf,tf (ft and min)
3,.33,.42,.83

Re =  .429E+01
draulic Conductivity (cm/sec) =    .108E-02
                     (ft/day) =    .307E+01
     Transmissivity (ft sq/day) =    .126E+03
 new type, 2= new well, 3= more data, 4=end


C:\SLUG>
```

INSTALLATION OF FLUSH GRADE MONITORING WELL

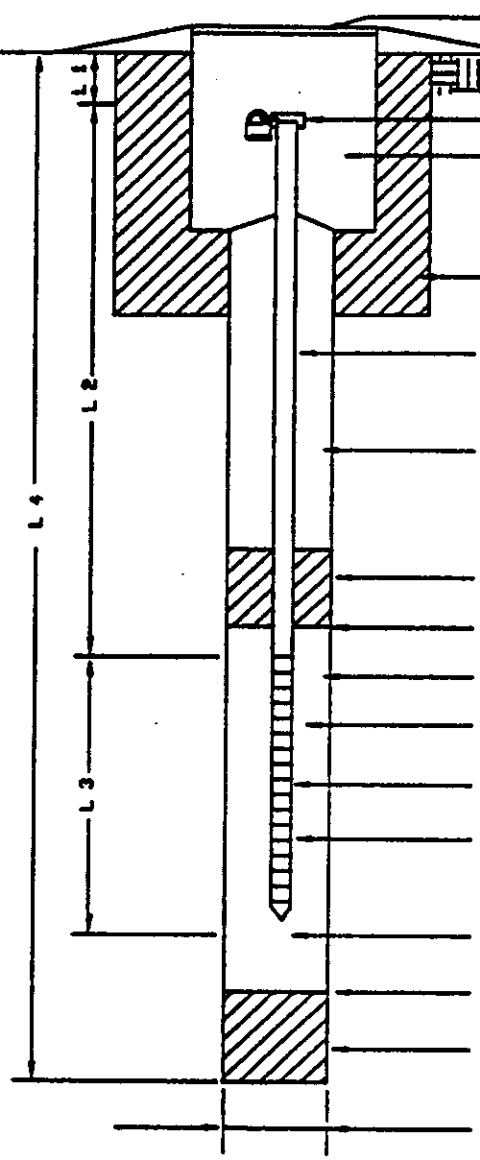
PROJECT Oakland Shell

DELTA NO. 40-88-666

MONITORING WELL NO. MW-4

ELEVATIONS: TOP OF RISER 99.03 relative

GROUND LEVEL



FLUSH GRADE WELL CONSTRUCTION DIAMETER AND MATERIAL	15-inch galvanized
TOTAL LENGTH	12 inches
LENGTH ABOVE GROUND	0 foot
THICKNESS AND TYPE OF SEAL	18-inch concrete
DIAMETER, MATERIAL AND JOINT TYPE OF RISER PIPE	4-inch PVC Flush-threaded
TYPE OF BACKFILL AROUND RISER	Concrete with 5% bentonite
THICKNESS AND TYPE OF SEAL	2 feet, bentonite pellets
DISTANCE OF FILTER SAND ABOVE TOP OF SCREEN	2 feet
TYPE OF FILTER AROUND SCREEN	16/40 clementine
MONITORING WELL MATERIAL	PVC SCH 40
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT SIZE)	0.01 inch
DIAMETER AND LENGTH OF SCREEN	4 inches 20 feet
DEPTH TO THE BOTTOM OF MONITORING WELL	25 feet
DEPTH TO THE BOTTOM OF FILTER SAND	25 feet
THICKNESS AND TYPE OF SEAL	N/A
DIAMETER OF BOREHOLE	10 inches

L 1 = 0.25 FT.

L 2 = 5 FT.

L 3 = 20 FT.

L 4 = 25 FT.

INSTALLATION COMPLETED:

DATE: 4-10-1989

TIME: 18:30

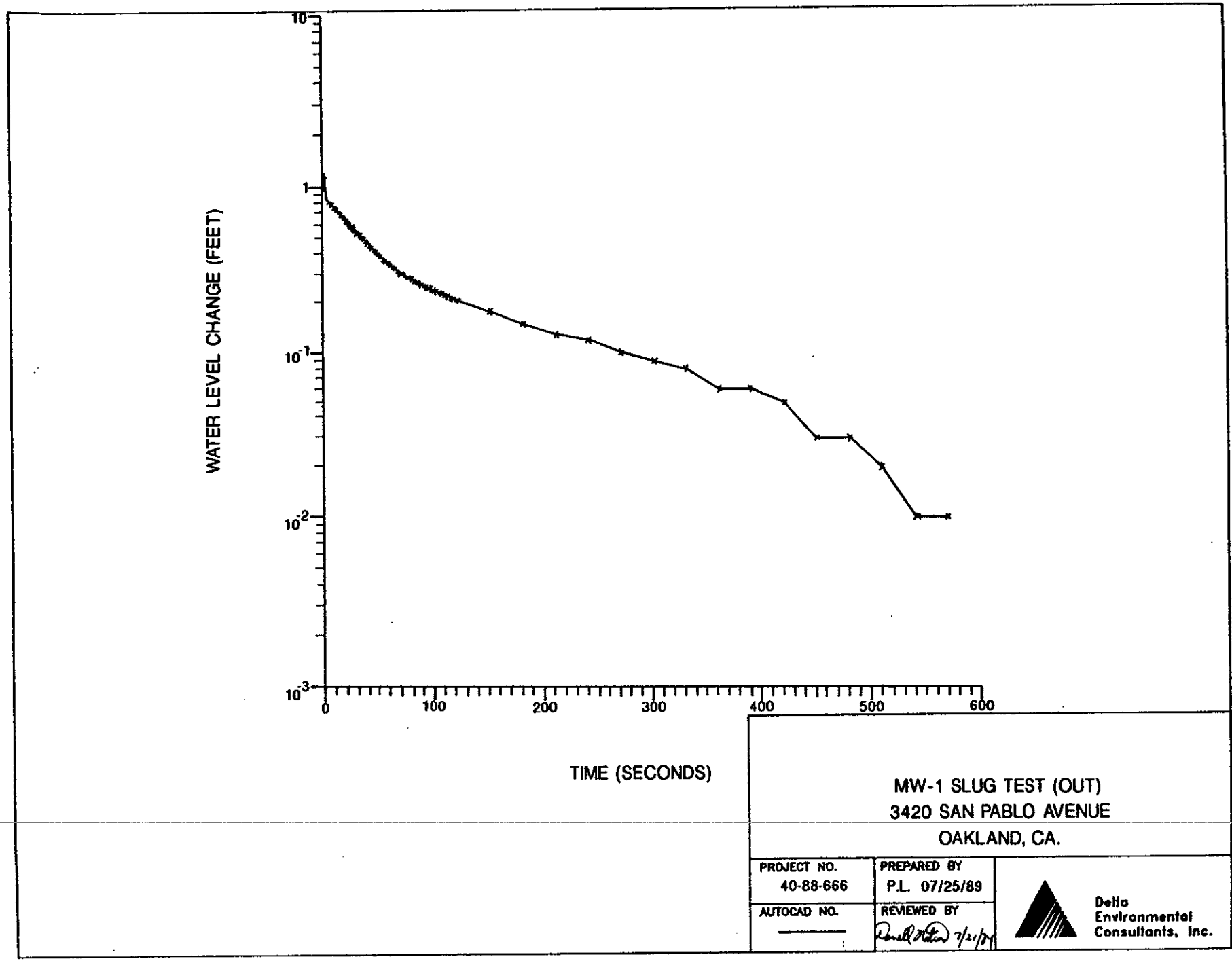
MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	WATER LEVEL ▼
4-17-1989	13:30	6.30

▼ MEASURE POINT: Top of casing

Delta Environmental Consultants, Inc.

1022 B/3-89



MW-1 SLUG TEST (OUT)
3420 SAN PABLO AVENUE
OAKLAND, CA.

PROJECT NO.	PREPARED BY
40-88-666	P.L. 07/25/89
AUTOCAD NO.	REVIEWED BY
———	7/21/89

Delta Environmental Consultants, Inc.

TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number MW 1

Project Arco/San Pablo Owner Arco Petroleum

Location 3400 San Pablo Ave. Project Number 20-8126

Date Drilled 7/31/86 Total Depth of Hole 25 ft. Diameter 8 in.

Surface Elevation ____ Water Level, Initial ____ 24-hrs. ____

Screen: Dia. 2 in. Length 20 ft. Slot Size .020

Casing: Dia. 2 in. Length 5 ft. Type PVC

Drilling Company Sierra Pacific Drilling Method H. S. Auger

Driller L. Pera Log by B. Channell

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0		PID			Concrete
1				CL	Black clay, stiff, damp, no odor
2					
3				CL	Green gray clay, stiff, damp, moderate odor
4					
5				CL	Brown silty clay, stiff, damp, moderate odor
6					
7				CL	Brown sandy clay, soft, wet, pebbles, moderate odor
8		3 ppm	A 12		
9			16		Grey gravel and brown clay, dry, crumbly, moderate
10			27	▼ 7/31/86	odor
11					
12					
13		0 ppm	B	GC	Gray gravel in brown clay, soft, wet, no odor
14			9		
15			8		
16			7		
17					
18					
19					
20				CL	Brown silty clay, stiff, dry, no odor
21					
22					
23					
24					
25					

02100144

Page 1 of 1

APPENDIX C

Slug Test Results

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number MW 2

Project Arco/San Pablo Owner Arco Petroleum

Location 3400 San Pablo Ave. Project Number 20-8126

Date Drilled 7/31/86 Total Depth of Hole 25 ft. Diameter 8 in.

Surface Elevation _____ Water Level, Initial _____ 24-hrs. _____

Screen: Dia. 2 in. Length 20 ft. Slot Size .020

Casing: Dia. 2 in. Length 5 ft. Type PVC

Drilling Company Sierra Pacific Drilling Method H. S. Auger

Driller L. Pera Log by B. Channell

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0		PID			Concrete
1					Black clay, stiff, dry, no odor
2					
3					Green gray clay, stiff, camp, moderate odor
4				CL	
5					
6					Brown clay, soft, moist, pebbles, moderate odor
7					
8					
9		12 ppm	A 5 6 7		Brown silty clay, stiff, pockets of water, minor pebbles, no odor
10					▼ 7/31/86
11					
12					
13		7 ppm	B 3 4 6		
14					
15					
16				CL	Brown silty clay, very stiff, damp, no odor
17					
18					
19					
20					
21					
22					
23					
24					
25					

02100144

ct No.: 90386A

e: 11-14-86

Elevation.

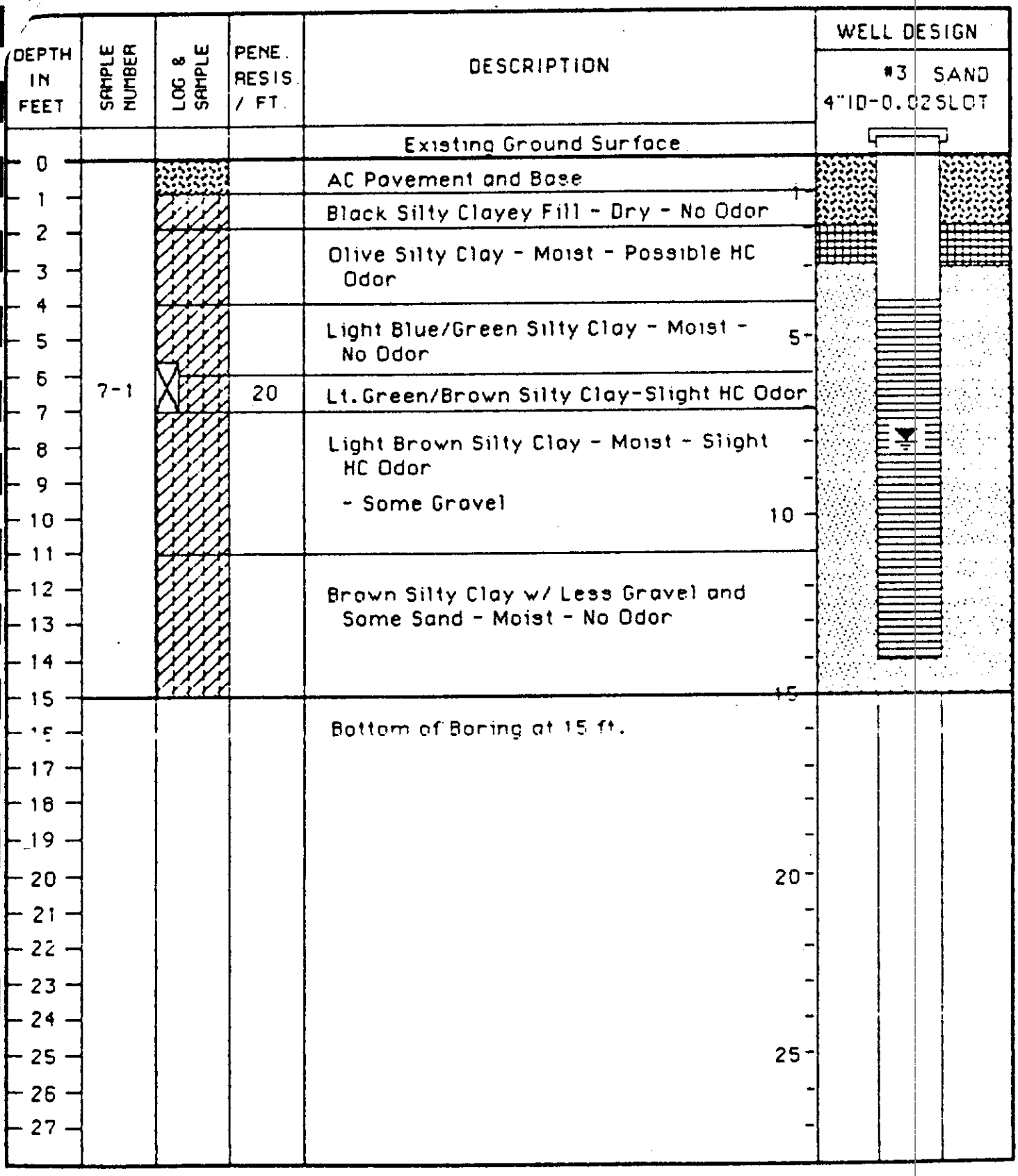


Figure 5 - Test Boring Log No. B-7
- Monitoring Well No. MW-7

Woodward-Clyde Consultants

GROUNDWATER TECHNOLOGY

Division of Oil Recovery Systems, Inc.

Drilling Log

Well Number MW 3.

Project Arco/San Pablo — Owner Arco Petroleum

Location 3400 San Pablo Ave. — Project Number 20-8126

Date Drilled 7/31/86 — Total Depth of Hole 25 ft. — Diameter 8 in.

Surface Elevation ____ — Water Level, Initial ____ — 24-hrs. ____

Screen: Dia. 2 in. — Length 20 ft — Slot Size .020 in.

Casing: Dia. 2 in. — Length 5 ft. — Type PVC

Drilling Company Sierra Pacific — Drilling Method H. S. Auger

Driller L. Pera — Log by B. Channell

Sketch Map

Notes

Depth (Feet)	Well Construction	Notes	Sample Number	Graphic Log	Description/Soil Classification (Color, Texture, Structures)
0		PID			Concrete
1				CL	Black clay, stiff, damp, slight odor
2					
3		15 ppm	A 4 4 4		
4				CL	Gray silty clay, soft, damp, minor gravel, moderate odor
5					
6					
7					
8		15 ppm	B 4 4 6		Brown silty clay, stiff, damp, pebbles, slight odor
9					
10				▼ 7/31/86	
11					
12					
13		0 ppm	C 4 5 7		
14				CL	Brown silty clay, stiff, dry, no odor
15					
16					
17					
18					
19		0 ppm	D 5 7 13		
20					
21					
22					
23					
24					
25					

02100144

ct No.: 90386A

e: 11-14-86

Elevation.

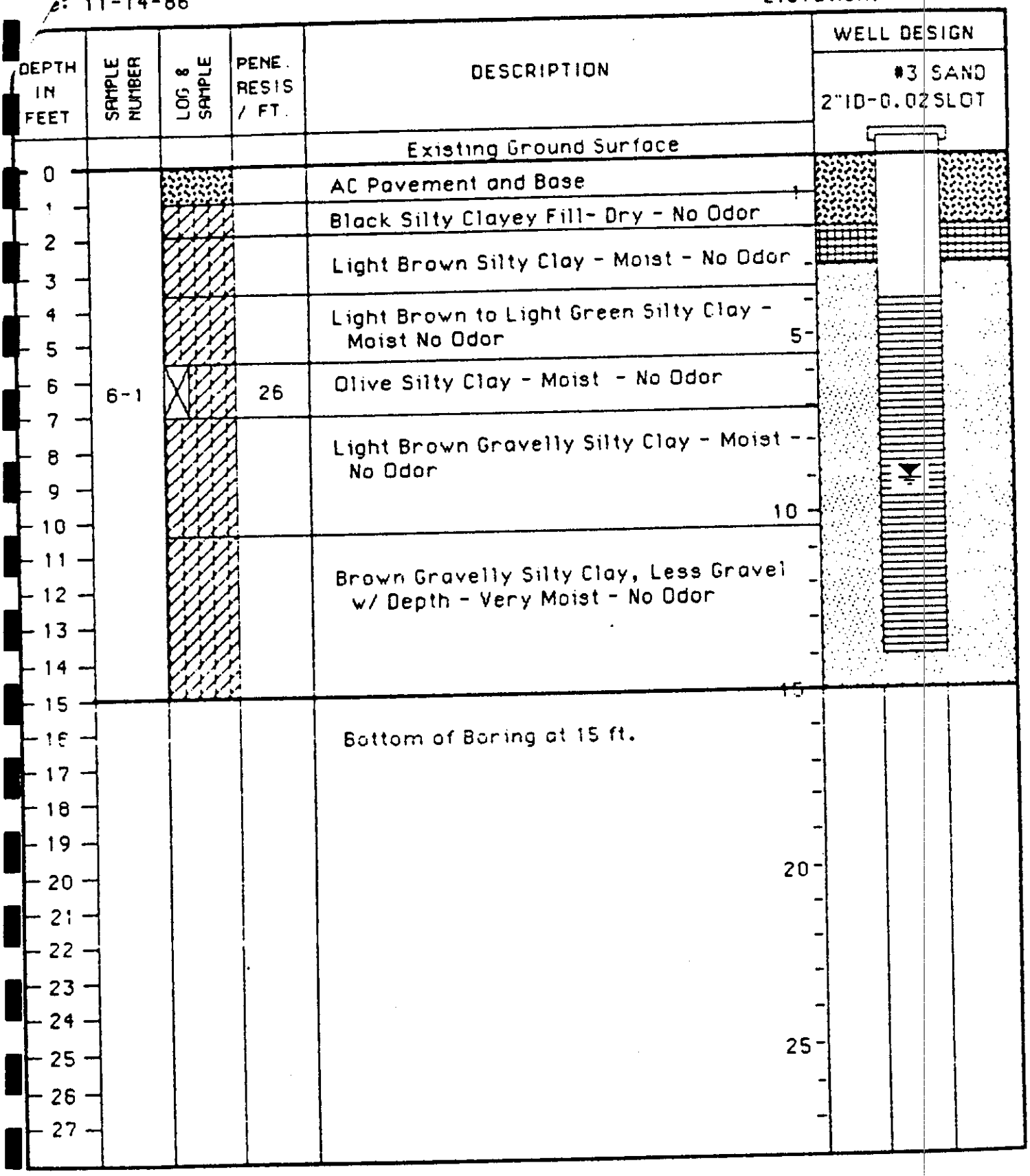


Figure 4 - Test Boring Log No. B-3
- Monitoring Well No. MW-6

Woodward-Clyde Consultants

No.: 90386A
11-14-86

Elevation.

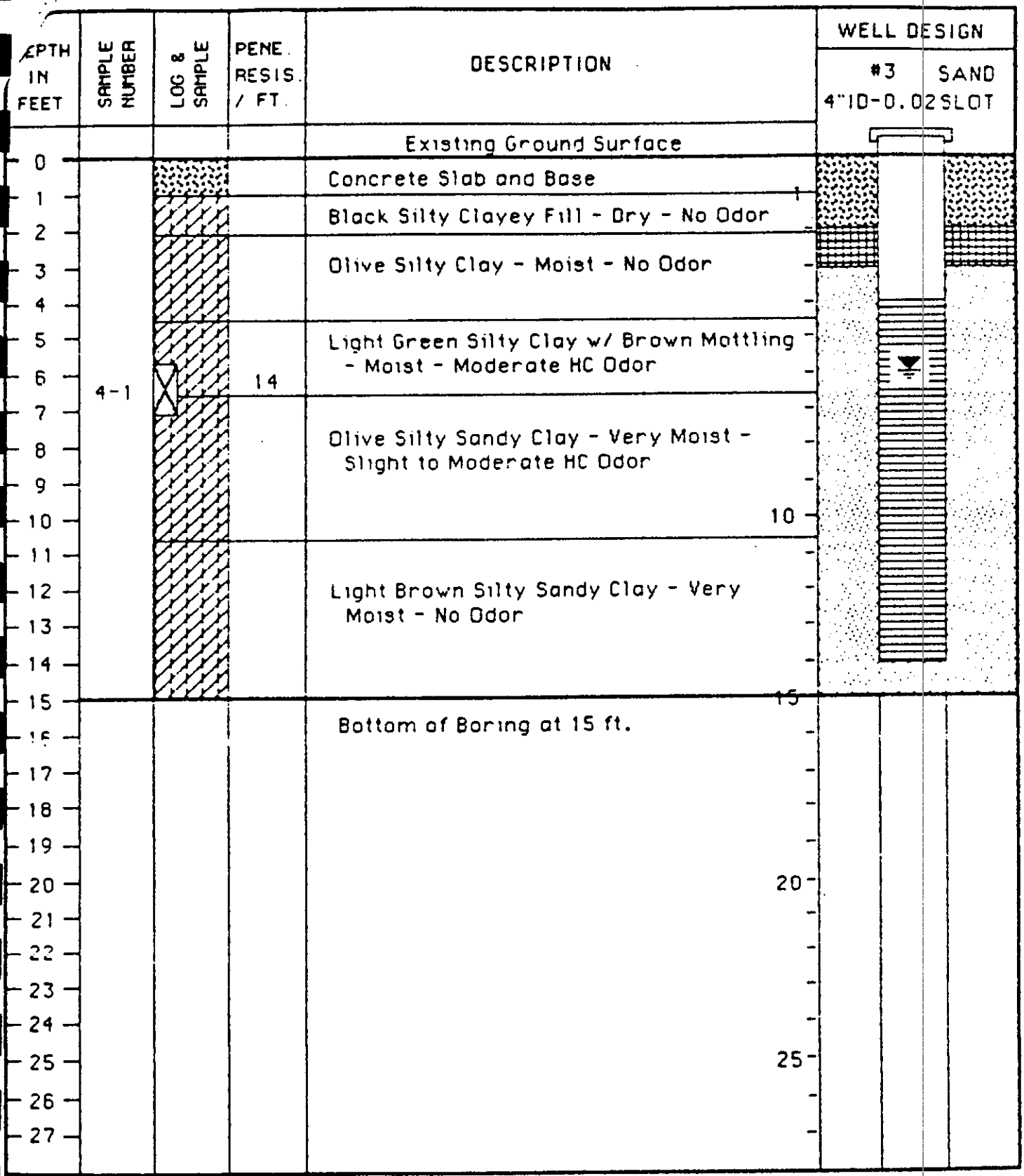


Figure 2 - Test Boring Log No. B-1
- Monitoring Well No. MW-4

Woodward-Clyde Consultants

ct No.: 90386A

: 11-14-86

Elevation.

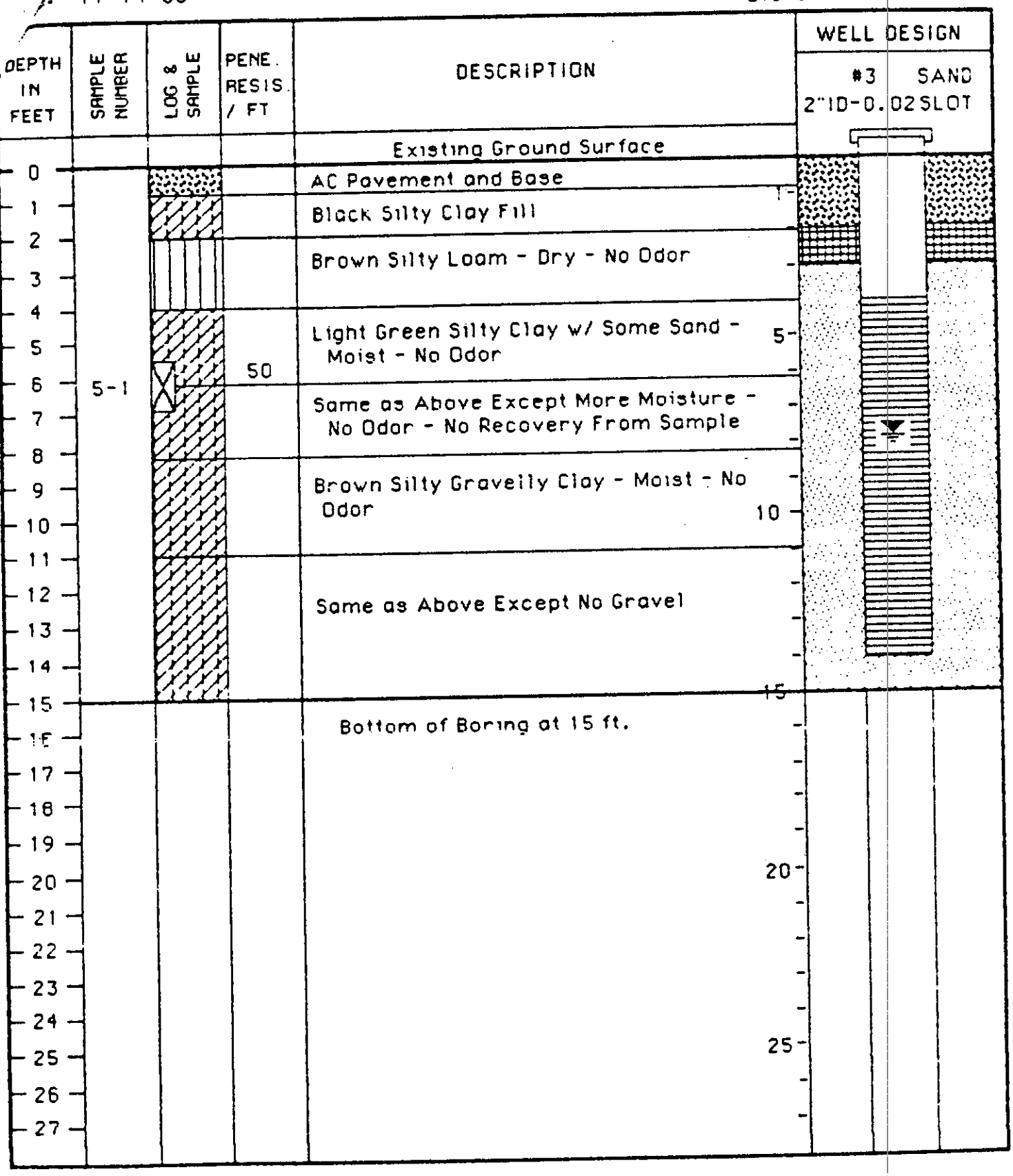


Figure 3 - Test Boring Log No. B-2
- Monitoring Well No. MW-5

Woodward-Clyde Consultants