Delta
Environmental
Consultants, Inc.

11030 White Rock Road, Suite 110
Rancho Cordova, CA 95670
916 638-2085

2/16/89
ALAMEDA COUNTY
DEPT. OF ENVIRONMENTAL HEALTH
HAZARDOUS MATERIALS

February 14, 1989

Mr. Dennis Byrne
Alameda County Environmental Health Services
Hazardous Materials Department
470 27th Street
Oakland, CA 94607

Subject: Hydrogeologic Site Assessment Work Plan
Shell Oil Company
3420 San Pablo Avenue
Oakland, CA
Delta Project No. 40-88-666

Dear Mr. Byrne:

Please find enclosed the subject work plan for this site. Delta would like to begin the hydrogeologic investigation described in the work plan as soon as approval is obtained from your office. I will call you the week of the 13th of February to verify that you have received the work plan and to check on the approval status. If you have any questions, please contact me at (916) 638-2085.

Sincerely,

DELTA ENVIRONMENTAL CONSULTANTS, INC.

Darrell L. Nations
Sr. Hydrogeologist/Project Manager

DLN:mjd

Enclosure

cc: Ms. Lisa McCann, California Regional Water Quality Control Board
San Francisco Bay Region
Ms. Diane Lundquist, Shell Oil Company
Mr. Chris W. Metzger, Delta Environmental Consultants, Inc.
Mr. Tod D. Christenson, Delta Environmental Consultants, Inc.

SITE 381

HYDROGEOLOGIC ASSESSMENT WORK PLAN

SHELL OIL COMPANY

3420 SAN PABLO AVENUE

OAKLAND, CALIFORNIA

DELTA PROJECT NO. 40-88-666

Delta
Environmental
Consultants, Inc.

HYDROGEOLOGIC ASSESSMENT WORK PLAN

SHELL OIL COMPANY

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, CA 95670
916/635-2085

January 19, 1989

TABLE OF CONTENTS

Tables

Figures

Appendices

HYDROGEOLOGIC ASSESSMENT WORK PLAN

SHELL OIL COMPANY

3420 SAN PABLO AVENUE

OAKLAND, CALIFORNIA

DELTA PROJECT NO. 40-88-666

1.0 INTRODUCTION

Delta Environmental Consultants, Inc. (Delta), has prepared this work plan describing the proposed hydrogeologic assessment to be performed at 3240 San Pablo Avenue in Oakland, California (site) (Figure 1). The hydrogeologic assessment described in this work plan is in response to the detection of petroleum hydrocarbons in the soils near the underground storage tanks during a previous soil assessment at the site (Ensco, 1988).

1.1 Purpose

The purpose of the hydrogeologic site assessment is to determine the lateral and vertical extent of petroleum constituents in the soils of the site, 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

To accomplish the above objectives, the following activities are proposed:

- Review available geologic and hydrogeologic data pertinent to the site.
- Drill four standard-penetration, hollow-stem auger soil borings.
- Complete four soil borings as ground water monitoring wells.
- Classify soils according to the Unified Soil Classification System (USCS).
- Screen soil samples with a portable photoionization detector (PID) for total organic vapors.
- Select soil samples from each boring according to soil-screening results for submittal to a certified laboratory to be analyzed for benzene, toluene, ethylbenzene, xylenes, (BTEX), and total purgeable hydrocarbons (TPH), and total lead by EPA Methods 8020, 8015, and 7421 respectively. Organic lead will be analyzed by California Department of Health Services (CDHS) methodology.
- Develop and sample the monitoring wells.
- Submit ground water samples to a California-certified laboratory to be analyzed for BTEX and TPH by EPA Methods 602 and 8015 respectively.
- Conduct slug tests in all monitoring wells to evaluate hydraulic conductivity.

- Prepare a *Hydrogeologic Assessment Report* presenting results of the investigation and recommendations for further investigative and/or remedial activities at the site.

1.3 Previous Work Summary

On August 8, 1988, Ensco Environmental Services, Inc. (Ensco), conducted a soil investigation at the site to assess potential site contamination prior to relinquishment of the property by Shell. The soil investigation included the drilling of five borings at the site, collection of soil samples from the borings, and analysis of the soil samples for BTEX and total volatile hydrocarbons (TVH) as gasoline by EPA Methods 8020 and 8015, respectively. The locations of the soil borings are shown on Figure 2. Soil boring logs are presented in Appendix A. Laboratory reports of soil analyses are presented in Appendix B and summarized in Table 1. The major findings of the soil investigation are:

- The five soil borings were drilled to a maximum depth of 20.5 feet and encountered primarily silty and sandy clay with a minor amount of clayey sand.

- Ground water was encountered in all the soil borings at depths ranging from 8 to 19 feet below grade.

- TVH as gasoline were detected in soil borings SB-1 and SB-2 at concentrations ranging from a high of 1,400 parts per million (ppm) (SB-1) to a high of 580 ppm at SB-2. Petroleum constituents were not detected in soil borings SB-3, SB-4 and SB-5.

2.0 SITE DESCRIPTION

2.1 Area of Investigation

The site is located at 3420 San Pablo Avenue at the southeast corner of the intersection of San Pablo Avenue and 35th Street in Oakland, California (Figure 1). This area of Oakland is a mixed-use residential/commercial area being more residential southeast of the intersection of San Pablo Avenue and the MacArthur Freeway and becoming more commercial northwest of this intersection.

2.2 Site Topography and Surface Water Features

The ground elevation of the site is approximately 30 feet above mean sea level (ft msl). The topography slopes gently to the west at a rate of about 0.008 foot/foot (ft/ft). The primary surface water bodies in the vicinity of the site are San Francisco Bay which is located about 6,000 feet due

west of the site, the Oakland Inner Harbor located approximately 2.3 miles south of the site, and Lake Merrit, a tidal lake, located about 1.4 miles southeast of the site.

2.3 Site History

The site has been owned by Shell Oil Company and has been operated by various lessees for the past 22 years. In January 1985, steel tanks and product lines were replaced with double-walled, fiberglass, tanks and double-walled, fiberglass, product lines.

2.4 Spill History

During the installation of an electronic gasoline dispenser at the site in December, 1984 gasoline saturated soil was discovered beneath the pump island. At that time all product lines were tested and the super unleaded and regular systems failed. A review of inventory records indicated a loss of 2,500 gallons of super unleaded and 1,500 gallons of regular gasoline. Tanks and product lines were replaced as described in Section 2.3. No lost product was recovered.

2.5 Well Inventory

In mid-December 1988 an inventory of existing domestic and municipal wells near the site was initiated at the California Department of Water Resources (DWR) by a Delta representative. According to DWR records, 32 wells have been identified within a mile radius of the site. Table 3 presents pertinent information regarding the wells, and Figure 3 shows well locations.

2.6 Utilities

Prior to the commencement of work on site, Delta will research the location of all City utilities with the Oakland Public Works Department.

2.7 Regional Geology

Geologic units in the vicinity of the site can be classified into two general groups, consolidated and unconsolidated. The consolidated units consist primarily of highly compacted sandstone, shale, conglomerates, chert, various volcanic rocks, and serpentinite. These units range from Pliocene to Jurassic in age and are typically lumped together, for purposes of geologic mapping, as undivided bedrock units. The unconsolidated units include the older alluvium, Merritt Sand, bay mud, interfluvial basin deposits, fluvial deposits, and younger alluvium (Hickenbottom and Muir, 1988). The unconsolidated units range from Holocene to Pleistocene in age. Table 4 presents a generalized stratigraphic column in the vicinity of the site. Figure 4 presents the surficial geology in the area of the site.

2.8 Site Geology

The five test borings drilled by Ensco on August 8, 1988 (Appendix A), indicate that the site is underlain predominantly by sandy to silty clay to a depth of 20.5 feet, the maximum depth penetrated by the Ensco borings. The only sand encountered in the soil borings was found in Boring B-3 at a depth of 16.0 to 20.5 feet below grade.

2.9 Regional Hydrogeology

The site lies within the East Bay Plain ground water basin. The East Bay Plain basin covers an area of about 114 square miles in Western Alameda County, it extends from the city of Hayward on the south to Albany on the north. Unconsolidated deposits consisting of the older alluvium, Merritt Sand, bay mud, interfluvial basin deposits, fluvial deposits, and younger alluvium comprise the ground water reservoir (Hickenbottom and Muir, 1988). Maximum aggregate thickness of these deposits is about 1,100 feet. The undivided bedrock units form the bottom and eastern boundaries of the basin.

Ground water is found in all the units that make up the East Bay Plain basin; however, the older alluvium is the only unit that contains appreciable quantities of groundwater and is considered the principal water-bearing zone of the basin. Ground water is typically found within the older alluvium under confined conditions due to the presence of clay and other fine-grained material overlying more permeable sand and gravel units. The direction of ground water flow within the basin is toward the San Francisco Bay. The elevation of the potentiometric surface within the basin ranges from about 30 to -20 feet mean sea level (ft msl).

2.10 Site Hydrogeology

The borings drilled on site by Ensco encountered ground water at depths ranging from 8 to 19 feet below grade. This is in good agreement with data provided by the Alameda County Flood Control District (Hickenbottom and Muir, 1988) which indicate water levels from nearby monitoring wells ranges from six to ten feet below grade. It is anticipated that the direction of ground water flow within the uppermost water-bearing zone at the site will be in a westerly direction toward San Francisco Bay.

3.0 PROPOSED SOIL BORINGS AND MONITORING WELLS

Because of the potential impact of petroleum constituents on soils and ground water at the site, four soil borings will be drilled to further characterize the subsurface geology and to evaluate the presence

of petroleum constituents in the soils at the site. All of the soil borings will be completed within the uppermost water-bearing zone at the site. These wells will serve to establish the natural flow gradient, hydraulic characteristics of the water-bearing materials, and will provide information for determination of whether dissolved hydrocarbons and/or free product are present in/on the ground water at the site.

3.1 Borings/Monitoring Wells

Based on previous work at the site (Section 1.3), the area of the site most likely to have soils and/or ground water containing petroleum constituents, is expected be near the northern end of the tank excavation. Monitoring well MW-1 will be completed in this area, between previous soil borings B-1 and B-2 (Figure 5). The remaining monitoring wells will be completed at selected locations (Figure 5) across the site to provide information on subsurface materials and the hydraulic gradient across the site.

3.2 Soil Sample Collection and Screening

A California modified split-barrel sampler will be used to extract soil samples from the soil borings. Three six-inch-long brass tubes will be inserted into the California sampler to retain the soil sample. Upon retrieval, one brass tube will be capped, packaged, and preserved according to accepted EPA procedures for possible chemical analysis. One sample from each sampler will be extracted and placed in a sealed jar until completion of drilling activities. The head space of samples placed in jars will be screened for total organic vapors utilizing a portable photoionization detector. Appendix C, Section 1.3, describes the detailed soil-screening procedures. Based on this screening information, soil samples will be selected for chemical analysis to determine the vertical extent of the presence of petroleum constituents in the soil of each boring.

3.3 Monitoring Well Installations

The proposed monitoring well specifications are illustrated on Figure 6. The wells will be constructed of four-inch-diameter, Schedule 40 (flush-threaded) PVC material. The screened interval of each monitoring well will extend to approximately 10 feet below and 10 feet above the water table. Actual screened intervals and well depths will be determined in the field by a Delta geologist or engineer.

After installation, the monitoring wells will be developed by pumping or bailing using the methods described in Appendix C, Section 1.5. After development, water samples will be collected from each well using methods described in Section 1.6 of Appendix C.

3.4 Hydraulic Conductivity Testing

To determine the hydraulic conductivity of the water-bearing materials at the locations of the monitoring wells, slug tests will be performed at each well. Slug tests will be analyzed according to the procedures presented in *Bouwer and Rice, 1976*.

3.5 Chemical Analysis

3.5.1 Soil Chemical Analysis

Based on the results of soil sample screening, soil samples will be selected from each soil boring and sent to a state-certified laboratory for chemical analysis. The soil samples will be analyzed for BTEX, TPH, and total lead by EPA Methods 8020, 8015, and 7421. Organic lead will be by analyzed by (DHS) methodology.

These analyses will indicate whether petroleum constituents are present and will aid in characterization of the type of any petroleum present (gasoline or diesel fuel).

3.5.2 Ground Water Chemical Analyses

All ground water samples collected will be sent to a state-certified laboratory and analyzed for BTEX and TPH by EPA Methods 602 and 8015.

4.0 SCHEDULE

Delta will proceed with the work described in this plan as soon as approval is obtained. A drilling crew will be mobilized to drill the necessary soil borings and install the monitoring wells within two weeks of approval of this plan. Laboratory analysis generally requires three weeks. A report of the results, including information on subsurface geology, water-supply wells in the area, preliminary distribution of petroleum constituents (if any) in the soils and ground water at the site, monitoring well construction details, and recommendation for further assessment or remedial activities will be prepared within four weeks after laboratory results are received.

5.0 REMARKS/SIGNATURES

The recommendations contained in this report represent our professional opinions. These opinions are based on currently available information and are arrived 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 L. Nations
Senior Hydrogeologist/
Project Manager
Date: 1/12/89

This report was reviewed by: Chris W. Metzger
Senior Hydrogeologist
Date: January 23, 1989

This report was prepared under the supervision of a California Registered Geologist:

Brian L. Kregseng, P.E.
California Registered
Geologist #2302
Date: January 23, 1989

/cm

6.0 REFERENCES

Ensco Environmental Services, Inc. 1988, Soil and Ground-Water Investigation, 3420 San Pablo Avenue, Oakland, California.

Hickenbottom, Kevin, and Muir, Kenneth, (1988), Geohydrology and Groundwater-Quality Overview of the East Bay Plain Area, Alameda County California: Alameda County Flood Control and Water Conversation District, 83 p.

TABLE 1
Soil Chemical Analysis

Sample Number	Benzene	Toluene	Xylenes	Ethyl-benzene	TPHG
B-1-1	1.90	42.00	120.00	43.00	1400.00
B-1-1	NA	NA	NA	NA	80.00
B-1-3	NA	NA	NA	NA	NF
B-1-4	NA	NA	NA	NA	NF
B-2-1	1.50	16.0	33.00	35.0	550.00
B-2-2	0.70	3.30	48.00	7.80	580.00
B-3-1-2-3 (composite)	NA	NA	NA	NA	NF
B-4-1-2-3 (composite)	NA	NA	NA	NA	NF
B-5-1-2-3 (composite)	NA	NA	NA	NA	NF

Note: All concentrations in parts per million (ppm)
NA = Not Analyzed
NF = Not Found

TABLE 2
Tank Information

Size (Gallons)	Product Stored	Age (Years)	Status
10,000	Regular Gasoline	3	Operating
10,000	Unleaded Gasoline	3	Operating
10,000	Super Unleaded Gasoline	3	Operating
550	Waste Oil	3	Operating

TABLE 3

Domestic Well Inventory

Property Owner	Well Location	Year Drilled	Well Use
P G & E	1S,4W-23D	1973	Industrial
P G & E	1S,4W-23F	1974	Industrial
Arco	1S,4W-23K	1988	Monitoring
Sherwin Williams Co.	1S,4W-22C	1925	Industrial
Presto-Lite Co.	1S,4W-22	1908	Industrial
AC Transit	1S,4W-22A	1987	Industrial
City of Emeryville	1S,4W-22B	1987	Municipal
Del Monte Corp.	1S,4W-22H	1986	Monitoring
P G & E	1S,4W-22Q	1975	Industrial
Yosemite Laundry Co.	1S,4W-23A	Unknown	Industrial
Toscani Bakery	1S,4W-23E	1928	Industrial
American Creamery Co.	1S,4W-23	Unknown	Industrial
California Linen Supply Co.	1S,4W-23	1926	Industrial
City of Paris Laundry	1S,4W-23M	1927	Industrial
Arco	1S,4W-23M	1986	Monitoring
Providence Hospital	1S,4W-26A	Unknown	Municipal
P G & E	1S,4W-26B	1974	Industrial
Oakland School District	1S,4W-26C	Unknown	Municipal
Providence Hospital	1S,4W-26G	Unknown	Municipal
Chevron Corp.	1S,4W,-26	1984	Monitoring
Anheuser-Busch Co.	1S,4W,-27C	1987	Monitoring
Joseph Kelly	1S,4W-27	Unknown	Domestic
John Moore	1S,4W-27	Unknown	Domestic
P G & E	1S,4W-27F	1974	Industrial
City of Oakland	1S,4W-27K	1927	Municipal
P G & E	1S,4W-24D	1976	Industrial
Chevron Corp.	1S,4W-24N	1988	Monitoring
August Santos	1S,4W-14L	1977	Domestic
P G & E	1S,4W-P	1974	Industrial
Shell Development Corp.	1S,4W-15Q	1934	Industrial
Cetus Corp.	1S,4W-15Q	1986	Industrial
East Bay D.M.V.	1S,4W-15Q	1987	Monitoring

TABLE 4

GEOLOGIC UNITS OF THE EAST BAY PLAIN AREA

Period	Epoch	Geologic unit	Thickness	General Character	Water-bearing Properties
Quartemary	Holocene	Younger alluvium (Qal)	Ranges from less than 10 feet to as much as 50 feet.	Unconsolidated, moderately sorted, sand and silt; coarse sand and gravel toward alluvial fan heads and in narrow canyons.	Moderately permeable. Most of deposit lies above zone of saturation, so yields small quantities of groundwater to wells.
		Fluvial deposits (Qf)	Generally less than 15 feet	Unconsolidated, moderately sorted, fine sand, silt, and clayey silt, with occasional thin beds of coarse sand. Well bedded.	Moderately permeable. A thin surficial deposit. Yields small quatities of groundwater to wells.
		Interfluvial basin deposits (Qb)	Generally less than 10 feet	Unconsolidated, plastic, moderately to poorly sorted silt and clay, rich in organic material.	Low permeability. Seasonally saturated. Yields small quantities of groundwater to wells.
		Bay mud (Qbm)	Ranges from less than 1 foot to as much as 120 feet beneath the bay.	Unconsolidated, dark plastic clay and silty clay rich in organic material. Some lenses of silt and sand.	Low permeability. Water saturated; mostly with salt water. Yields a small quantity groundwater to wells.
	Pleistocene	Merritt Sand (Qm)	A maximum of about 65 feet	Loose, well-sorted, fine to medium grained sand; silty, clayey, with lenses of sandy clay and clay.	Permeable. Permeability decreases with depth as deposit becomes more consolidated. Yields small quantities of groundwater to wells.
		Older alluvium (Qoa)	A maximum of about 1100 feet	Layers of poorly consolidated to unconsolidated clay, silt, sand and gravel.	Permeable, but water-yielding ability varies throughout area. Yields large to small quantities of water to wells. The major groundwater reservoir in the East Bay Plain Area.
Tertiary, Cretaceous, and Jurassic	Pliocene and Older	Undivided bedrock units (TKJu)	Probably more than 10,000 feet	Mostly consolidated or highly compacted sandstone, shale, and chert; some volcanic rock, serpentine, and conglomerates.	Low permeability. Locally yields small quantities of water to wells from fractures, and the sandstone and conglomerate units.

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.

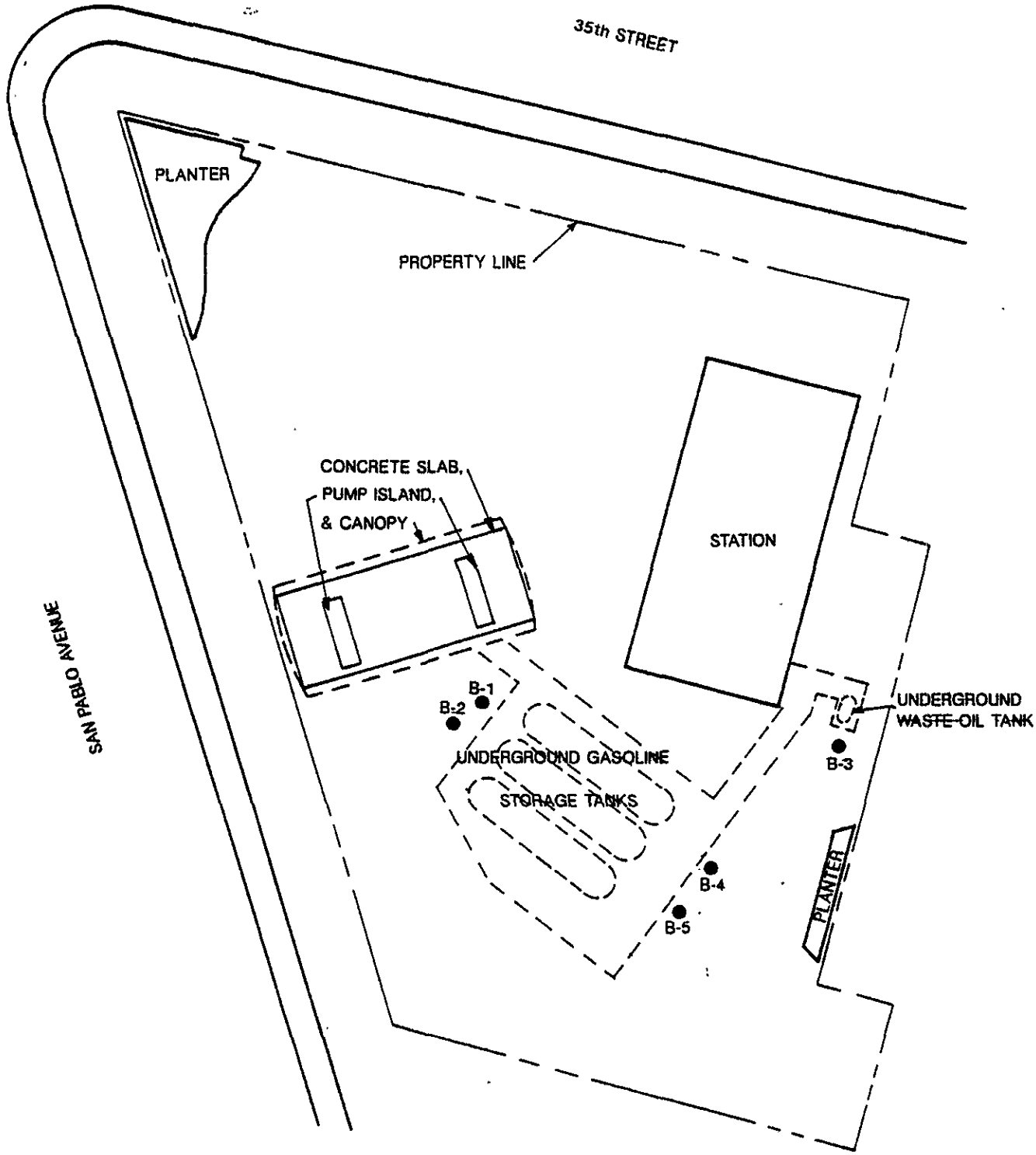
FIGURE 1

SITE LOCATION MAP

3420 SAN PABLO AVENUE
OAKLAND, CA.

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

120888



LEGEND:

● B-1 SOIL BORING LOCATION

N

0 30'

SCALE

Delta
Environmental
Consultants, Inc.

FIGURE 2
SITE MAP
3420 SAN PABLO AVENUE
OAKLAND, CA.

	DRAWN BY: BHL 1-5-89
JOB NO. 40-88-666	CHK. BY:

LEGEND:

(7) APPOXIMATE WELL LOCATIONS

Domestic Well Inventory

Well Property Owner	Well Use
1. PG&E	Industrial
2. PG&E	Industrial
3. Arco	Monitoring
4. Sherwin Williams Co.	Industrial
5. Presto-Lite Co.	Industrial
6. AC Transit	Industrial
7. City of Emeryville	Municipal
8. Del Monte Corp.	Monitoring
9. PG&E	Industrial
10. Yosemite Laundry Co.	Industrial
11. Toscani Bakery	Industrial
12. American Creamery Co.	Industrial
13. California Linen Supply Co.	Industrial
14. City of Paris Laundry	Industrial
15. Arco	Monitoring
16. Providence Hospital	Municipal
17. PG&E	Industrial
18. Oakland School District	Municipal
19. Providence Hospital	Municipal
20. Chevron Corp.	Monitoring
21. Anheuser-Busch Co.	Monitoring
22. Joseph Kelly	Domestic
23. John Moore	Domestic
24. PG&E	Industrial
25. City of Oakland	Municipal
26. PG&E	Industrial
27. Chevron	Monitoring
28. August Santos	Domestic
29. PG&E	Industrial
30. Shell Development Corp.	Industrial
31. Cetus Corp.	Industrial
32. East Bay D.M.V.	Monitoring

GENERAL NOTES

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

CALIF

QUADRANGLE LOCATION

N

0 1,650'

SCALE
(APPROXIMATE)

Delta
Environmental
Consultants, Inc.

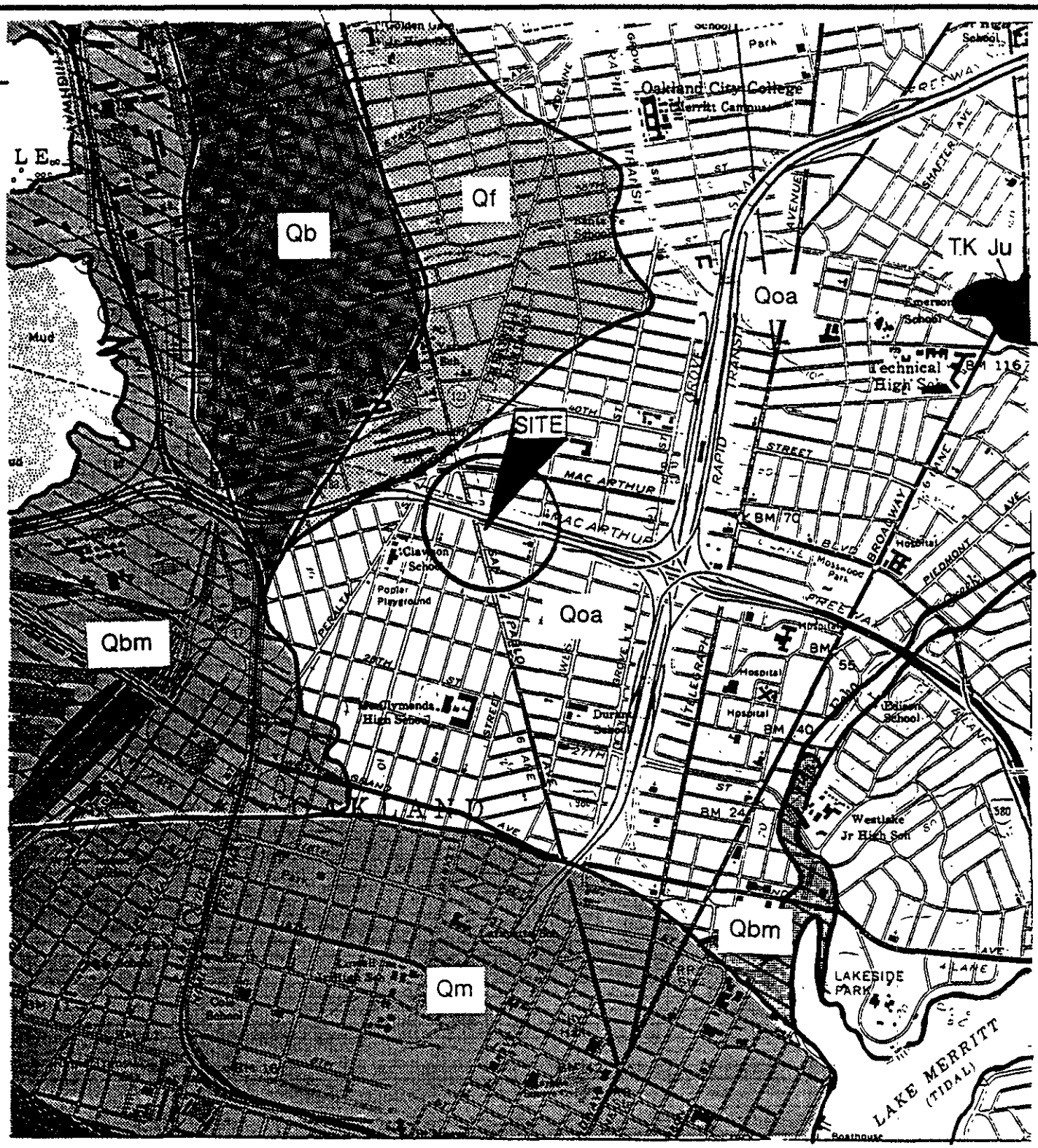
FIGURE 3

DOMESTIC WELL LOCATION MAP

3420 SAN PABLO AVENUE
OAKLAND, CA.

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

120166



GENERAL NOTES:

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

GEOLOGY FROM HELLEY, LAJOIE AND BUNKE('72) AND HELLEY LAJOIE('79) WITH MODIFICATIONS BY K.S.MUIR. ('86)

LEGEND:

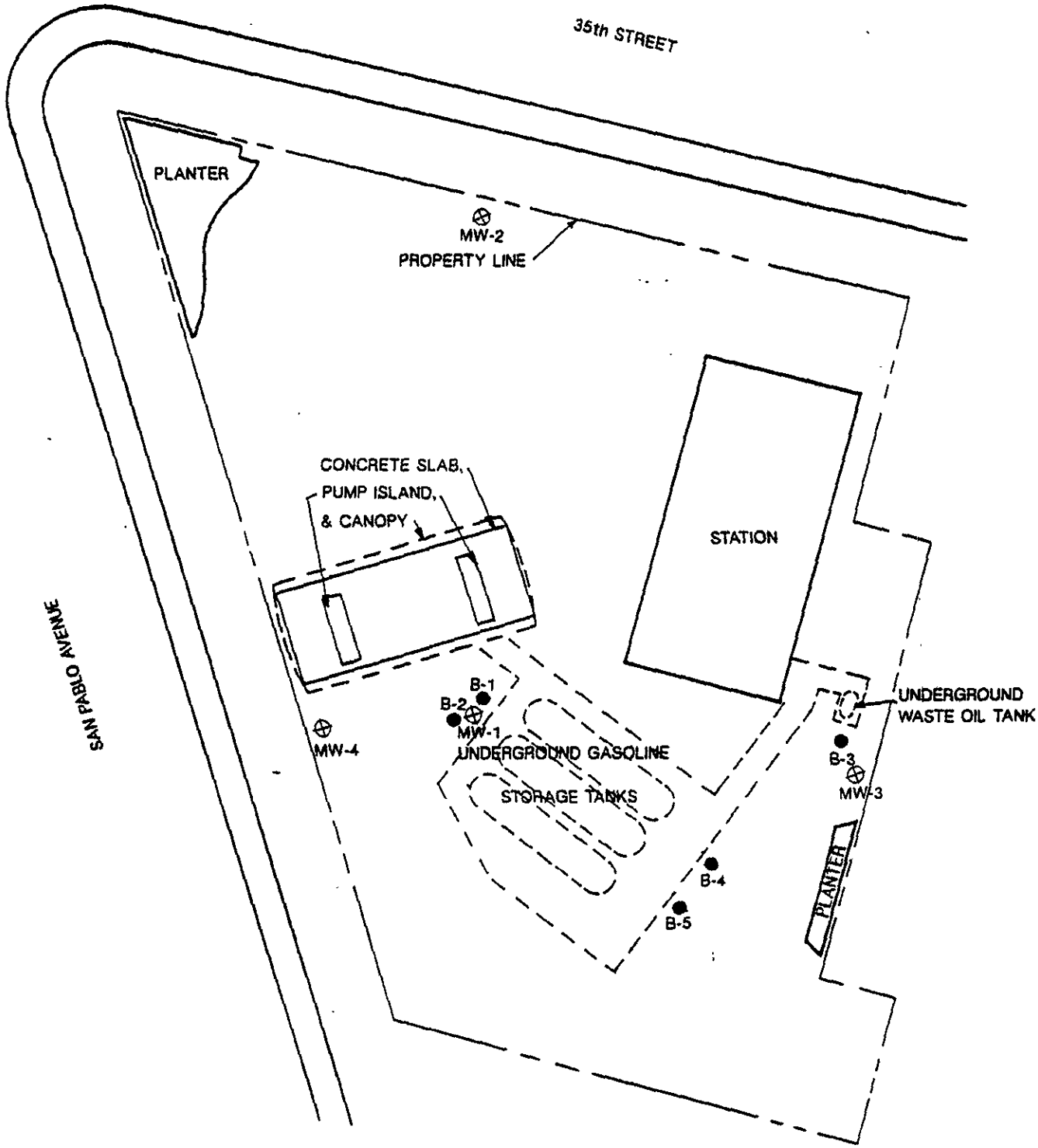
- Qoa-OLDER ALLUVIUM
- Qm-MERRITT SAND
- Qb-INTERFLUVIAL BASIN DEPOSITS
- Qf-FLUVIAL DEPOSITS
- Qbm-BAY MUD
- TK Ju-UNDIVIDED BEDROCK UNITS

Delta Environmental Consultants, Inc.

FIGURE 4
GENERALIZED GEOLOGIC MAP
OF OAKLAND AREA
3420 SAN PABLO AVENUE
OAKLAND, CA.

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

120866



LEGEND:

- ● B-1 SOIL BORING LOCATION
- ⊕ MW-1 PROPOSED MONITORING WELL

N

0 30'

SCALE

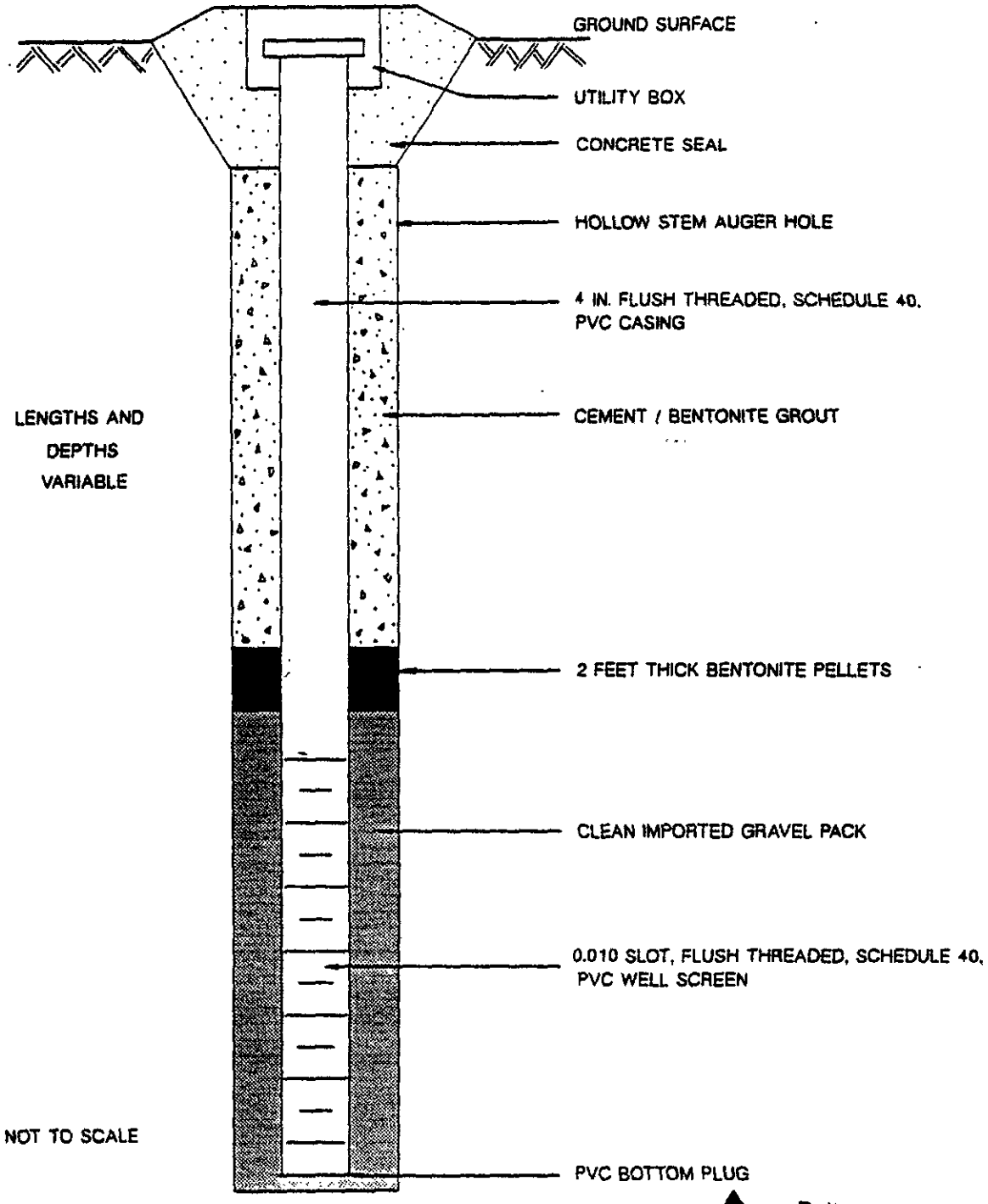
Delta
Environmental
Consultants, inc.

FIGURE 5

PROPOSED MONITORING WELL LOCATIONS

3420 SAN PABLO AVENUE
OAKLAND, CA.

	DRAWN BY: BHL 1-5-89
JOB NO. 40-88-666	CHK. BY:

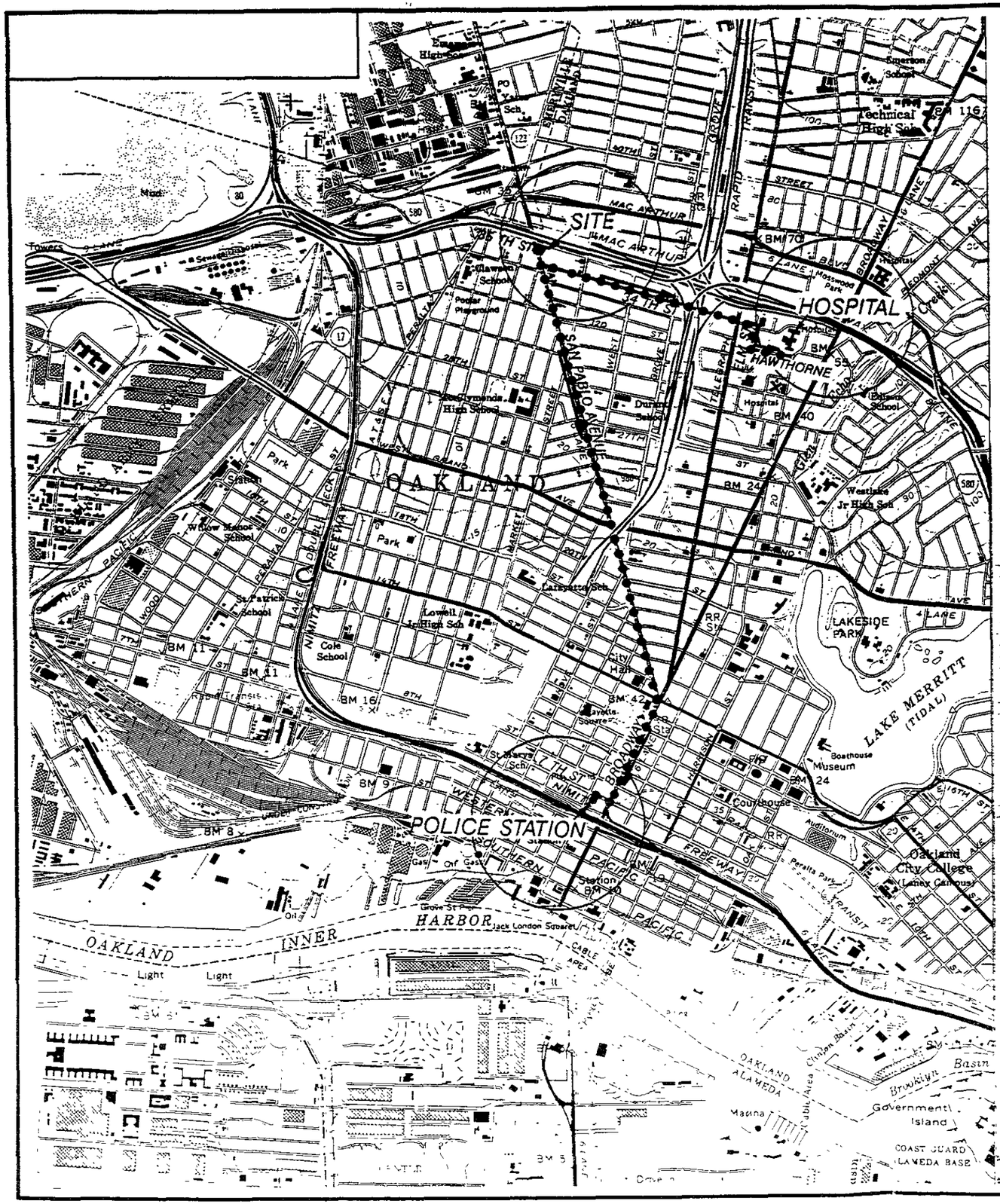


Delta Environmental Consultants, Inc.

FIGURE 6

TYPICAL MONITORING WELL CONSTRUCTION SPECIFICATIONS
3420 SAN PABLO AVENUE
OAKLAND, CA.

	DRAWN BY: GPM 1-5-89
JOB NO. 40-88-666	CHK BY.



North

EMERGENCY SERVICES - DIRECTIONS FROM SITE

HOSPITAL

SOUTH ON SAN PABLO AVENUE 1 BLOCK. TURN LEFT ON 34 TH STREET.
EAST ON 34 TH STREET 3/4 MILE. TURN RIGTH ON ELM STREET.
SOUTH ON ELM STREET 1 BLOCK. TURN LEFT ON HAWTHORNE.
EAST ON HAWTHORNE 1/10 MILE. HOSPITAL ON THE LEFT.

POLICE STATION

SOUTH ON SAN PABLO AVENUE 1 1/2 MILES TO ITS TERMINATION AT BROADWAY AND 14 TH STREET.
CONTINUE SOUTH ON BROADWAY 3/8 MILE. TURN RIGTH ON 7 TH STREET.
STATION IS ON THE FIRST BLOCK ON THE LEFT.

GENERAL NOTES:

BASE MAP FROM U.S.G.S.
OAKLAND WEST, CA.
7.5 MINUTE TOPOGRAPHIC

QUADRANGLE LOCATION

0 2000 FT

SCALE 1 : 24,000

Delta Environmental Consultants, Inc.

FIGURE D-1
EMERGENCY SERVICES LOCATION MAP
3420 SAN PABLO AVENUE
OAKLAND, CA

	DRAWN BY. 1/18/89
JOB NO. 40-88-666	CHK BY. 1/23/89

APPENDIX A

Boring Logs

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.

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.

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			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		
19				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.

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
6-8						
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.

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		
5-8	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
9-13	B-5-2	38	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		0
14-18	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
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.

APPENDIX B

Laboratory Reports

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

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

Sample I.D.	: 1859 B-1-1	Anametrix I.D.	: 8808061-01
Matrix	: SOIL	Analyst	: ml
Date sampled	: 08-08-88	Supervisor	: [illegible]
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)
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.

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

Sample I.D.	: 1859 B-1-2	Anametrix I.D.	: 8808061-02
Matrix	: SOIL	Analyst	: mh
Date sampled	: 08-08-88	Supervisor	: FWS
Date anl. TVH	: 08-11-88	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	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.

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

Sample I.D.	: 1859 B-1-3	Anametrix I.D.	: 8808061-03
Matrix	: SOIL	Analyst	: mk
Date sampled	: 08-08-88	Supervisor	: RS
Date anl. TVH	: 08-08-88	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.

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

Sample I.D.	: 1859 B-1-4	Anametrix I.D.	: 8808061-04
Matrix	: SOIL	Analyst	: ml
Date sampled	: 08-08-88	Supervisor	: RS
Date anl. TVH	: 08-08-88	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.

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

Sample I.D.	: 1859 B-2-1	Anametrix I.D.	: 8808061-05
Matrix	: SOIL	Analyst	: aw
Date sampled	: 08-08-88	Supervisor	: JS
Date anl. TVH	: 08-11-88	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)
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.

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

Sample I.D.	: 1859 B-2-2	Anametrix I.D.	: 8808061-06
Matrix	: SOIL	Analyst	: mh
Date sampled	: 08-08-88	Supervisor	: RHS
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)
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.

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	: SHS
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.

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	: RS
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.

ANAMETRIX, INC.
LABORATORY SERVICES
ENVIRONMENTAL • ANALYTICAL CHE[illegible]
1961 CONCOURSE DR. SUITE E • SAN JOSE [illegible]5131
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

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

Sample I.D.	: 1859 B-5-(1-3)COMP.	Anametrix I.D.	: 8808086-01
Matrix	: SOIL	Analyst	: mk
Date sampled	: 08-09-88	Supervisor	: SMS
Date anl. TVH:	08-15-88	Date released	: 08-18-88
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.

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 : JHS
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.

APPENDIX C

Methods, Analytical Procedures, and Quality Assurance Plan

1.0 METHODS

1.1 Soil Sampling and Contamination Reduction

Soil borings and soil sampling will be performed under the direction of a Delta engineer or geologist. The soil borings will be advanced using a truck-mounted hollow-stem auger drill rig.

To reduce the chances of cross-contamination between boreholes, all downhole drilling equipment will be steamed cleaned between each boring. To reduce cross-contamination between samples, the split-barrel sampler will be washed in a soap solution and doubled-rinsed between each sampling event.

Soil sampling will be done in accordance with ASTM 1586-84. Using this procedure, a two-inch O.D. split-barrel sampler or a two-inch I.D. California-type sampler is driven into the soil by a 140-pound weight falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler an additional 12 inches is known as penetration resistance, or the "N" value. The N value is used as an empirical measure of the relative density of cohesionless soils and the consistency of cohesive soils.

Upon recovery, a portion of the soil sample will be placed into a glass jar and sealed for later screening with a photoionization detector. Another portion of the soil sample will be used for classification and description. That part of the soil sample collected in brass tubes within the California-type sampler will be stored at approximately 4°C for transport to the laboratory.

1.2 Soil Classification

As the samples are obtained in the field, they will be classified by the crew chief/geologist in accordance with the United Soil Classification System (USCS). Representative portions of the samples will then be returned to the laboratory for further examination and for verification of the field classification. Logs of the borings indicating the depth and identification of the various strata, the N value, and pertinent information regarding the method of maintaining and advancing the borehole will be made.

1.3 Soil Sample Screening/hNu Portable Photoionization Detector Method

After soil sample jars have been brought to ambient temperature, the head space vapors of the soil sample jars will be screened with a portable photoionization detector equipped with a 10.2 eV lamp calibrated to benzene for direct reading in ppm. The sample jar lid will be opened and the detector probe immediately placed within the head space of the jar. The highest observed reading will be recorded.

1.4 Monitoring Well Gravel Pack and Slot Size Selection

The size of the gravel pack that will be placed adjacent to the well screen will be determined by the project manager based on an estimation of the distribution of grain size in the formation which is likely to be encountered within the uppermost saturated zone at the site. Available geologic information will be utilized in the selection of this grain size. The gravel pack will be selected such that it will permit the development of a zone of higher hydraulic conductivity adjacent to the well screen but will not allow piping of the finer-grained formation into the well bore. The slot size of the well screen will be selected such that it will retain a minimum of 95% of the gravel pack material.

1.5 Monitoring Well Development

If monitoring wells are installed, each monitoring well will be developed after construction with a 1.75-inch-diameter manual pump or by bailing until the water produced is relatively sediment-free or until measurements of ph, specific conductance, and temperature stabilize. If the well is pumped dry during the development process, recharge rates will be recorded. No water or chemicals will be introduced into the monitoring wells during well development. All developed water will be placed in drums on-site for later disposal.

1.6 Ground Water Sampling

A minimum of 24 hours following well development, and after water levels have been allowed to stabilize in the well, three to five wetted casing volumes of liquid will be removed from each well by bailing with a laboratory-cleaned teflon bailer. Measurements of pH, specific conductance, and temperature will be made at regular intervals during this procedure. Removal of liquid from each well will continue until the measurement of pH, specific conductance, and temperature have stabilized. A liquid sample will then be collected from each well with a laboratory-cleaned, dedicated teflon bailer. Each sample will be appropriately labeled and stored on ice from the time of collection through the time of delivery to the laboratory. Ground water samples will be transported to the laboratory and analyzed within the EPA-specified holding times for the requested analyses.

1.7 Petroleum Product

If free petroleum product is present in a well, the thickness of the product layer will be measured by application of a water-finding paste to a water level indicator tape. A sample of the product will be collected with a laboratory-cleaned teflon bailer and transferred to an appropriate sample container and subsequently submitted to a California-certified laboratory for fuel fingerprint analysis.

2.0 ANALYTICAL PROCEDURES

All soil samples submitted to the laboratory will be analyzed for BTEX, TPH, and total lead using EPA Methods 8020, 8015, and 6010, respectively. Ground water samples submitted to the laboratory will be analyzed for the same constituents as the soil samples using EPA Methods 602, 8015, and 6010, respectively.

3.0 QUALITY ASSURANCE PLAN

This item describes the field and analytical procedures to be followed throughout the investigation.

3.1 General Sample Collection and Handling Procedures

Proper collection and handling are essential to ensure the quality of a sample. Each sample will be collected in a suitable container, preserved correctly for the intended analyses, and stored prior to analysis for no longer than the maximum allowable holding time. Details on the procedure for collection and handling of soil samples to be used on this project can be found in Section 1.0 (Methods).

3.2 Sample Identification and Chain-of-Custody Procedures

Sample identification and chain-of-custody procedures ensure sample integrity and document sample possession from the time of collection to its ultimate disposal. Each sample container submitted for analysis will have a label affixed to identify the job number, sampler, date, and time of sample collection, and a sample number unique to that sample. This information, in addition to a description of the sample, field measurements made, sampling methodology, names of on-site personnel, and any other pertinent field observations will be recorded on the borehole log or in the field records. All samples will be analyzed by a certified laboratory.

A chain-of-custody form will be used to record possession of the sample from time of collection to its arrival at the laboratory. When the samples are shipped, the person in custody of them will relinquish the samples by signing the chain-of-custody form and noting the time. The sample-control officer at the laboratory will verify sample integrity and confirm that it was collected in the proper container, preserved correctly, and that there is an adequate volume for analysis.

If these conditions are met, the sample will be assigned a unique log number for identification throughout analysis and reporting. The log number will be recorded on the chain-of-custody form and in the legally-required log book maintained by the laboratory in the laboratory. The sample description, date received, client's name, and any other relevant information will also be recorded.

3.3 Analytical Quality Assurance

In addition to routine calibration of the analytical instruments with standards and blanks, the analyst is required to run duplicates and spikes on 10 percent of the analyses to insure an added measure of precision and accuracy. Accuracy is also verified through the following:

1. U.S. Environmental Protection Agency (EPA) and State certification programs.

2. Participation in an interlaboratory or "round-robin" quality assurance program.

3. Verification of results with an alternative method. For example, calcium may be determined by atomic absorption, ion chromatography, or titrimetric methods. Volatile organics may be determined through either purge and trap or liquid-liquid extraction methods.

3.4 Miscellaneous Checks of Accuracy

Where trace analysis is involved, purity of the solvents, reagents, and gases employed is of great concern. The laboratory maintains a service contract on all major instrumentation; gas chromatograph, atomic absorption, ion chromatography, and total organic carbon analyzers are all serviced and maintained regularly.

The above program is more than sufficient for most needs. Additional quality assurance, such as spikes and duplicates on all analyses, will be provided if requested.

APPENDIX D
Site Safety Plan

E. EMERGENCY INFORMATION

LOCAL TELEPHONE NUMBERS (provide area codes):

Ambulance	911
Hospital Emergency Room	(415) 420-6080
Poison Control Center	(415) 476-2845
Fire Department	911
Airport	911
Explosives Unit	911

Note: If you list 911, check to be sure it is activated in the site area, and determine whether or not it is enhanced.

SITE RESOURCES:

Water supply available on site:	Yes _X_	No ____
Telephone available on site:	Yes _X_	No ____
Bathrooms available on site:	Yes _X_	No ____
Other resources available on site:	Yes _X_	No ____

If yes, identify: Electricity

If you answered "no" to any of the above questions, identify the closest available facility, and provide directions.

EMERGENCY CONTACTS		PHONE NO. (provide area codes) Work	Home
1. Project Manager:	Darrell Nations	(916) 638-2085	
2. Regional Manager:	Tod Christenson	(916) 638-2085	(916) 721-5914
3. Health and Safety Officer:	Robert Warner	(916) 638-2085	
4. Site Contact:			
5. Regulatory Contact:			
6.			
7.			
8.			
9.			
10.			

POST ON-SITE

FIELD INVESTIGATION TEAM
SITE HEALTH AND SAFETY PLAN
PETROLEUM SITES

A. GENERAL INFORMATION

Client:	Shell Oil Company	**Delta Project Number:**	40-88-666
Site Name:	Oakland Shell	**Client Claim/P.O. Number:**	N/A
Street Address:	3420 San Pablo Avenue Sacramento, California		
Plan Prepared by:	Erin Golz	**Date:**	1-12-88
Approved by:	Darrell Nations	**Date:**	1-13-88
Revised by:		**Date:**	
Revision Approved by:		**Date:**	

Objectives: Investigate the extent of on-site soil and ground water contamination and take necessary cleanup action.

Phase I - Soil borings and monitoring wells

Phase II - Additional monitoring wells and soil borings, as needed.

Phase III - Site remediation, if needed.

Proposed Date of Investigation: Ongoing.

Hazard Summary/Level of Protection:

A:_____ B:_____ C:_____ D:__X__ (with modifications - see Section D.1)

B. SITE/WASTE CHARACTERISTICS

Waste/Contaminant Type(s): Liquid __X__ Soil __X__ Solid _____ Sludge _____ Gas _____

Characteristic(s):

Corrosive _____	Ignitable __X__	Radioactive __X__
Volatile __X__	Toxic __X__	Reactive _____
Unknown _____	Other (Name) _____	

Facility Description: Gasoline service station.

Contaminant Source (type and location):

Possible underground storage tank leaks and spills of gasoline hydrocarbons.

Surrounding Features (residences, power lines, terrain, surface water bodies, etc.):

All City utilities, above and below ground.

Status (active, inactive, unknown):

Active

History (worker or non-worker injury; complaints from public; previous agency action):

None Known.

C. HAZARD EVALUATION

Have all contaminants been identified that may be present on site? Yes_____ No ___X____

List all chemicals below that have been identified or are suspected on site and their maximum concentrations in soil/water. Information on hazardous properties are listed in the appendix. For chemicals not shown in the appendix, enter the hazardous property information in the spaces provided.

Chemical Name	Maximum Concentration in Soil	Maximum Concentration in Water
Gasoline (total HC)	Unknown	Unknown
Benzene	Unknown	Unknown
Total Lead	Unknown	Unknown
Ethylbenzene	Unknown	Unknown
Toluene	Unknown	Unknown
Xylene	Unknown	Unknown

Free product present? Yes _____ No _____ Unknown __X__

Type of product present: Leaded _____ Unleaded _____ Diesel _____ Unknown __X__

D. SITE SAFETY WORK PLAN

PERSONNEL:

Team Members (list)	Responsibility
Darrell Nations	Project Manager
Robert Warner	Site Safety Officer
Tod Christenson	Public Information
Robert Warner	Field Team Leader

PERIMETER ESTABLISHMENT:

Map/Sketch Attached? Yes_X_ No____ Site Secured? Yes_X_ No____

Perimeter Identified? Yes_X_ No____ Zone(s) of Contamination Identified? Yes____ No_X_

Free Product? Yes____ No____ Unknown_X_ Dissolved? Yes____ No____ Unknown_X_

INVESTIGATION-DERIVED MATERIAL DISPOSAL:

Soil cuttings and water are containerized and are the responsiblity of Delta following Shell Oil Company's specified disposal procedures; see project manager.

D1. PERSONAL SAFETY

SITE ENTRY PROCEDURES:

PERSONNEL PROTECTION:

Level of Protection: A ____ B ____ C ____ D _X_

Modifications:

1. All personnel must wear hardhat, safety shoes, safety glasses and/or face shield.
2. Neoprene gloves and tyvek/saranax suit should be worn if contact with contaminated water or soil is likely.
3. Hearing protection must be worn if noise levels prevent normal conversation at a distance of three feet. No smoking, eating, or drinking is allowed on site.
4. No personnel are to enter or approach any excavation area where there is a danger of wall collapse or confined space entry.
5. Respiratory protection is dependent on conditions listed in next section.

Surveillance Equipment and Materials:

Instrumentation	Action Level	Action
photoionization detector (hNu)	5 units or 5 times background (breathing zone)	use half-mask respirator with organic vapor cartridges
	1000 ppm	eliminate all ignition sources, leave site until levels are reduced
oxygen meter	< 19.5 % oxygen	do not enter area or confined space
explosimeter	> 10 % LEL	eliminate all ignition sources and
	> 20 % LEL	reduce levels immediately or leave site

First Aid Equipment: Standard first aid kit, portable eye wash

First Aid Procedures:

Ingestion: DO NOT induce vomiting, summon medical help
Inhalation: Move victim to fresh air, seek medical attention if needed
Dermal Exposure: Remove contaminated clothing, flush with water

D.1 Personal Safety (Continued)

DECONTAMINATION PROCEDURE:

Personnel: Flush exposed skin with soap and water.

WORK LIMITATIONS: (time of day, weather, heat/cold stress):

In high ambient temperatures, follow heat-stress precautions: Provide plenty of cool water and electrolytes (e.g. Gatorade), remove protective clothing during breaks; check resting pulse and increase number of breaks if pulse does not return to normal during work breaks.

In cold ambient temperatures (< 0 F.), follow hypothermia precautions.
Work may only progress during daylight hours or under conditions of adequate lighting.

ELECTRICAL HAZARDS:

Utilities located by USA prior to drilling.

Maintain at least 10 feet clearance from overhead power lines. If unavoidably close to overhead or buried power lines, turn power off and lockout circuit breaker. Avoid standing in water when operating electrical equipment.

CONFINED SPACES:

Monitor organic vapors and oxygen before entering. If following values are exceeded, do not enter:

- Oxygen <20.0%
- Total hydrocarbons >5 ppm above background, if all air contaminants have not been identified.
- Concentrations of specific air contaminants exceeding action level in Section D, if all air contaminants have been identified.

If entering a confined space, monitor oxygen and organic vapors continuously.

E. EMERGENCY INFORMATION

LOCAL TELEPHONE NUMBERS (provide area codes):

Ambulance	911
Hospital Emergency Room	(415) 420-6080
Poison Control Center	(415) 476-2845
Fire Department	911
Airport	911
Explosives Unit	911

Note: If you list 911, check to be sure it is activated in the site area, and determine whether or not it is enhanced.

SITE RESOURCES:

Water supply available on site:	Yes _X_	No ____
Telephone available on site:	Yes _X_	No ____
Bathrooms available on site:	Yes _X_	No ____
Other resources available on site:	Yes _X_	No ____

If yes, identify: Electricity

If you answered "no" to any of the above questions, identify the closest available facility, and provide directions.

EMERGENCY CONTACTS		PHONE NO. (provide area codes) Work	Home
1. Project Manager:	Darrell Nations	(916) 638-2085	
2. Regional Manager:	Tod Christenson	(916) 638-2085	(916) 721-5914
3. Health and Safety Officer:	Robert Warner	(916) 638-2085	
4. Site Contact:			
5. Regulatory Contact:			
6.			
7.			
8.			
9.			
10.			

F. EMERGENCY ROUTES

(Give name, address, telephone number, directions, distance and time estimate, and map.)

HOSPITAL: South on San Pablo to 34th Street. East on 34th to Elm Street, south on Elm to Hawthorn. East on Hawthorn to Merrit Hospital. Map attached.

OTHER: Police Station: 455 7th Street (near Broadway) (415) 273-3481. South on San Pablo Avenue to Broadway.South on Broadway to 7th Street. West on 7th to 455 7th Street.

2. Systemic Potency

E - slight hazard - LD50 = 500 - 15,000 mg/kg
Lethal dose for 70 kg man = 1 pint-1 quart
F - moderate hazard - LD_{50} = 50 - 15,000 mg/kg
Lethal dose for 70 kg man = 1 ounce-1 pint
G - extreme hazard - LD_{50} = 50 - 15,000 mg/kg
Lethal dose for 70 kg man = drops to 20 ml

3. Local Potency

H - slight - reddening of skin
I - moderate - irritation/inflammation of skin
J - extreme - tissue destruction/necrosis

L. Acute Exposure Symptoms

A - abdominal pain
B - central nervous system depression
C - comatose
D - convulsions
E - confusion
F - dizziness
G - diarrhea
H - drowsiness
I - eye irritation
J - fever
K - headache
L - nausea
M - respiratory system irritation
N - skin irritation
O - tremors
P - unconsciousness
Q - vomiting
R - weakness

HAZARDOUS PROPERTY INFORMATION

Explanations and Footnotes

Water solubility is expressed in different terms in different references. Many references use the term "insoluble" for materials that will not readily mix with water, such as gasoline. However, most of these materials are water soluble at the part per million or part per billion level. Gasoline, for example, is insoluble in the gross sense, and will be found as a discreet layer on top of the ground water. But certain gasoline constituents, such as benzene, toluene, and xylene will also be found in solution in the ground water at the part per million or part per billion level.

A. Water solubility expressed as 0.2g means 0.2 grams per 100 grams water at 20°C.

B. Solubility of metals depends on the compound in which they are present.

C. Several chlorinated hydrocarbons exhibit no flash point in conventional sense, but will burn in presence of high energy ignition source or will form explosive mixtures at temperatures above 200°F.

D. Practically non-flammable under standard conditions.

E. Expressed as mm Hg under standard conditions

F. Explosive concentrations of airborne dust can occur in confined areas.

G. Values for Threshold Limit Value - Time Weighted Average (TLV-TWA) are OSHA Permissible Exposure Limits except where noted in H and I.

H. TLV-TWA adopted by the American Conference of Governmental Industrial Hygienists, which is lower than the OSHA PEL.

I. TLV-TWA recommended by the National Institute for Occupational Safety and Health (NIOSH). A TLV or PEL has not been adopted by the ACGIH or OSHA.

J.
A - Corrosive
B - Flammable
C - Toxic
D - Volatile
E - Reactive
F - Radioactive
G - Carcinogen
H - Infectious

K. Dermal Toxicity data is summarized in the following three categories:

1. Skin penetration
   - \- A - negligible penetration (solid-polar)
   - \+ B - slight penetration (solid-nonpolar)
   - ++ C - moderate penetration (liquid/solid-nonpolar)
   - +++ D - high penetration (gas/liquid nonpolar)