CONVERSE ENVIRONMENTAL WEST

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December 30, 1989
88-44-359-01-351

Ms. Dyan Whyte
Water Resource Control Engineer
San Francisco Bay Regional Water Quality Control Board
1800 Harrison, Suite 700
Oakland, California 94607

Subject: Shell Oil Company - Quarterly Report
285 Hegenberger Road
Oakland, California

Dear Ms. Whyte:

Enclosed please find one copy of the Shell Oil Company Quarterly Report of Activities for Quarter 4, 1989 prepared by Converse Environmental West (CEW) - San Francisco.

Please call if you have any questions.

Very truly yours,

Converse Environmental West

Robin M. Breuer

Robin M. Breuer
Project Manager
DWC:fs
enclosure

cc: Ms. Diane Lundquist - Shell Oil Company - (w/encl.)
Ms. Wendy Howell - Shell Oil Company (w/encl.)
Mr. Rafat Shahid - Alameda County Health - (w/encl.)
Mr. Douglas W. Charlton - CEW - (w/o encl.)

HEGENBERGER\WHYTE.351

DOUGLAS W. CHARLTON
Principal Geologist

ACTIVE GASOLINE STATION

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

December 30, 1989

CEW Project No. 88-44-359-01

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Converse Environmental West

PROGRESS

REPORT OF ACTIVITIES

SHELL OIL COMPANY FACILITY
285 Hegenberger Road
Oakland, California

For Quarter 4, 1989
Submitted: December 30, 1989

RWQCB Representative:	Dyan Whyte Water Resource Control Engineer
LIA Representative:	Mr. Rafat Shahid Alameda County Health Care Services Agency
Shell Engineer:	Ms. Diane Lundquist Environmental Engineer
Converse Project Manager:	Ms. Robin Breuer, Project Manager 55 Hawthorne Street, Suite 500 San Francisco, California 94105 (415) 543-4200
Registered Geologist in Charge:	Douglas W. Charlton, Principal Geologist 55 Hawthorne Street, Suite 500 San Francisco, California 94105 (415) 543-4200
Site Owner:	Shell Oil Company

1. SITE DESCRIPTION

1.1 Location

The property is located south and west of Oakland, California near the Oakland Alameda Coliseum and the Oakland International Airport. The site is specifically located on Hegenberger Road, south of the Airport Channel of the San Leandro Bay (Drawing 1). Nearby businesses are chiefly light industrial and commercial operations constructed on reclaimed San Francisco Bay marsh (Drawing 1a).

1.2 Neighborhood Topography

The neighborhood is relatively flat and substantially paved. Most of the neighborhood appears to comprise reclaimed marshlands, including filled estuaries of the San Francisco Bay.

The site is roughly 235 feet long and 130 feet wide, and elongates along Hegenberger Road (Drawing 2). The site is an active Shell fuel dispensing station.

1.3 Primary Surface Waters Nearby

San Leandro Creek is approximately 150 feet west of the site. This creek connects with San Francisco Bay, which is less than one mile northwest of site.

1.4 Water Table Information

Q1/89: Water table elevation ranged between 2.80 and 2.34 feet MSL, with a gradient of 0.007 ft/ft. Highest high water by redox boundary in soil is ~4 feet mean sea level (MSL).

Q2/89: Water table elevation was approximately 2 feet MSL, with a gradient of .008 ft/ft. to the south.

Q3/89: Water table elevation was approximately 2 feet MSL, with a gradient of 0.013 to 0.03 ft/ft to the southwest.

Q4/89: Water table elevation was approximately 2 feet MSL, with a gradient of 0.013 ft/ft to the west-southwest. This gradient flattens to less than 0.008 ft/ft, on the part of the site near the bay waters of San Leandro Creek.

2. INVESTIGATION HISTORY

2.1 Soil Borings Drilled to Period Start

SB-1 through SB-11. (CEW, 1989)

2.2 Soil Borings Abandoned to Period Start

SB-1 through SB-11. (CEW, 1989)

2.3 Groundwater Wells Drilled to Period Start

MW-1 through MW-9. (CEW, 1989)

2.4 Groundwater Wells Abandoned to Period Start

None.

2.5 Investigative History Summary

Shell initiated a site investigation in 1989 after soil pollution was removed at the nearby Pacific Bell site. CEW proceeded to investigate site contamination conditions by serial, step-out boring and well installations. By the end of 1989, these explorations had characterized site soil and groundwater conditions. A detailed summary of environmental activities is presented in a site chronology included after the text of this report (Table 1).

3. WORK COMPLETED THIS PERIOD

3.1 Introduction

Work initiated and completed during this quarter followed the task descriptions and modifications of the site Work Plan dated February 10, 1989. The relative timing and schedule of these activities is shown in summary in the Revised Critical Path (May 24, 1989) for the project (Drawing 4).

Studies in Q4/89 essentially completed onsite characterization of soil and groundwater contamination. Consequently, next activities will be to: 1) investigate offsite extensions of groundwater contamination in directions of possible contributory sources (Tasks 13 and 14 of the Critical Path, Drawing 4); and 2) remediate onsite soil contamination that constitute probable sources of groundwater contamination (Task 3 and 4 of the Critical Path, Drawing 4).

3.2 Soil Boring Drilling/Sampling

In accordance with Task 1 of the site Work Plan and Q3/89 modifications, two soil borings (SB-12 and SB-13) were drilled, sampled, and abandoned following the protocols described in Appendices A and B. Soil cuttings were handled by CEW and Shell Oil Company, following task procedures described in Appendix G. Boring logs are enclosed as Attachment 1. A summary of CEW soil boring activities is presented in Table 2.

3.3 Well Installations

In accordance with Task 7 of the Work Plan, one groundwater monitoring well (MW-10) was installed, developed and sampled following the protocols in Appendices C, D and E. This well was installed as 4-inch diameter filter-packed PVC wells through hollow-stem auger drilling equipment. The MW-10 boring log and as-built well construction diagram are included as Attachment 1. A summary of CEW well installations to date is provided in Table 3.

3.4 Soil Analysis/Results

Soil samples were properly packaged and transferred to a California State-certified analytical laboratory under proper chain-of-custody and preservation (see Appendix E). The samples were analyzed for TPH (as gasoline and diesel) and BTEX using EPA Methods 3550, 5030, 8015 and 8020, and for Pb using EPA Methods 3050 and 7421. Analytical results are summarized in Table 4, and certified sheets from all analyses are enclosed as Attachment 2. Plots of soil contamination distribution are presented in Drawings 5 and 6.

3.5 Groundwater Analysis and Results

Groundwater samples were collected, properly packaged and transferred to a California State-certified analytical laboratory under proper chain-of-custody and preservation (see Appendix E). The samples were analyzed for TPH (as gasoline and diesel) and BTEX using EPA Methods 5030, 3510, 8015 and 602. Analytical results are summarized in Table 5, and certified sheets from all analyses are enclosed as Attachment 3. Plots of groundwater analytical results are presented in Drawings 7 and 8.

3.6 Physical Monitoring Results

Ten wells were physically monitored for depth to water table, and inspection for floating product once during the quarter. A summary of these results presented in Table 6.

3.7 Hydrologic Tests and Research

3.7.1 Slug Tests

Slug tests were performed on most wells using the following sequential steps for each well:

- The depth to water was measured;
- A pressure transducer was lowered into the well, connected to an electronic data logger, and monitored to assure equilibration;
- A 5 foot long, 3-1/2 inch diameter stainless steel slug was lowered into the well instantaneously and left in place as the test proceeded;

- The data logger recorded changes of the well water level at one second intervals as the water table dropped;

- After the well water level returned to static with the slug in place, (95% its original elevation), the slug was instantaneously withdrawn and a recovery test was started; and

- The data logger recorded well water level at one second intervals until the water level equilibrated as defined above.

The test data were plotted and analyzed automatically, using the STEP-MATCH computer program written by In-Situ (1988)[1]. STEP-MATCH was based on the analytical solution presented by Ramey et al. (1975)[2].

STEP-MATCH generated data plots for each slug or recovery test, produced a "best-fit" curve (where mathematically possible), and calculated hydraulic parameters. The parameters included storativity (S) and transmissivity (T). Computer generated data plots are included as Attachment 4.

Computer generated and hand calculated hydraulic parameters are summarized in Table 7.

3.7.2 Tidal Influence

A 12-hour antecedent groundwater level monitoring test was conducted at the site to assess whether the depth to the Q4/89 potentiometric surface in site wells varied with diurnal tides in the San Leandro estuary, located less than 150 feet west of the site. In the test, the depth to water in wells and to the free-surface of San Leandro Creek were measured every hour, on the hour.

These measurements were performed by first taking depth to water measurements from a datum on the bridge to San Leandro Creek. Following the surface water measurements, the depth to water in each monitoring well was measured from the top of the well casings. These data were then recorded and later used to determine if and to what extent tidal fluctuations affected antecedent groundwater levels across the site. The results of these tests and interpretations are discussed in Section 4.

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[1] In-Situ, 1988. STEP-MATCH, Step Test Automated Type Curve Match, Beta-Test Version 0.1, Laramie, Wyoming.

[2] Ramey, H.I., Jr., Agarwal, R.G. and Martin, I., 1975. "Analysis of 'Slug Test' or DST Flow Period Data", Journal of Canadian Petroleum Technology, July-September issue, p. 37.

4. REVIEW OF DATA AND INTERPRETATIONS

4.1 Geologic Cross Sections

- The site appears to be constructed on approximately 10 feet of fills overlying Bay Mud. Upper fill is chiefly clay and sand whereas lower fill is primarily soil and sand.

- The top of the upper saturated zone is slightly above mean sea level. The Bay Mud apparently forms the base of this saturated zone.

4.2 Distribution of MVF Contamination in Soil (Table 4, Drawings 12, 13 and 14)

- At 5 feet bgs, contaminated soil adjacent to the current tank backfill exceeds 1,000 ppm TPH-g. This contamination appears to be in direct contact with groundwater.

- Furthermore, soil at -5 feet bgs is contaminated with >100 ppm TPH-g (SB-13) in the west-centered part of the property, near the fill pumps.

- Soil TPH-g contamination may extend slightly offsite to the northeast of the Shell property.

- A "hot-spot" of TPH-g soil contamination (>31,000 ppm) exists at shallow depth in SB-5 in the east upgradient corner of the site. The source of this contamination is unknown.

4.3 Distribution of Dissolved MVF Contamination in Groundwater (Table 5, Drawings 7 and 8)

- TPH-g and BTEX concentration decreased from Q3/89 to Q4/89 in all wells except MW-7 and MW-9. MW-7 and MW-9 contained highest concentrations of TPH-g (100 and 88 ppm respectively) and BTEX of all wells at this property in Q4/89.

- Because MW-7 and MW-9 are upgradient wells, with one foot higher potentiometric surface than that at the Shell tank complex, the TPH-g and BTEX in groundwater at MW-7 and MW-9 is most likely not from the Shell tanks.

- Various amounts of TPH-d were reported in groundwater in all wells except MW-8, in concentrations which mimic TPH-g in groundwater. The possible sources for the TPH-d contamination are unknown, but probably not from the Shell tanks for the same argument as cited above for TPH-g.

- No floating product was observed in Q4/89.

7. Health and safety and QA/QC procedures; and
8. Project schedule and budget.

TABLE 1: Chronological Summary

Date	Description of Activity
1984	Underground storage tanks replaced with single-wall fiberglass tanks
01/1989	Shell transferred this case to CEW.
02/15/89	CEW drilled and sampled MW-1 to MW-3 and SB-1 and SB-2.
04/28/89	CEW installed MW-4 through MW-8.
05/26/89	CEW drilled and sampled SB-3, SB-4 and SB-5.
07/13/89	CEW drilled, sampled, and abandoned SB-6, SB-7, SB-8, SB-9, SB-10 and SB-11.
07/13/89	CEW installed, developed and sampled MW-9.
9/20-21/89	**CEW conducted a tidal influence test.**
10/17/89	**Loma Prieta Earthquake struck.**
10/26/89	**CEW performed slug tests on existing wells.**
11/16/89	**CEW drilled, sampled and abandoned SB-12 and SB-13.**
11/16/89	**CEW installed MW-10.**
12/15/89	**CEW developed M-W 10 and collected Q4/89 groundwater samples.**

TABLE 2: Summary of Soil Borings Drilled

Boring No.	Date	Diameter (inches)	T.D. (ft. bgs)	Unsaturated Soil Samples	Saturated Soil Samples
SB-1	02/89	4	6.5	4 ft.	None
SB-2	02/89	4	6.0	5 ft.	None
SB-3	5/24/89	4	5.0	2,4 ft.	None
SB-4	5/24/89	4	4.0	2,4 ft.	None
SB-5	5/24/89	4	5.0	2 ft.	None
SB-6	7/13/89	4	7.0	None*	**None**
SB-7	7/13/89	4	6.0	None*	None
SB-8	7/13/89	4	6.5	4 ft.	None
SB-9	7/13/89	4	7.0	4 ft.	None
SB-10	7/13/89	4	6.5	4 ft.	None
SB-11	7/13/89	4	6.5	4 ft.	None
SB-12	**11/16/89**	**4**	**9.0**	**5.7 ft.**	**None**
SB-13	**11/16/89**	**4**	**7.0**	**5 ft.**	**None**

* Sample not taken, in UST gravel backfill

TABLE 3: Summary of Groundwater Monitoring Well Installation

Well No.	Date Inst.	Diameter Well (in.)	Initial Water Table (ft. bgs)	Static Water Table (ft. bgs)	T.D. ft. bgs)	Screen (ft. bgs)	Bentonite Seal (ft. bgs)	Grout Seal (ft. bgs)
MW-1	2/14/89	4	~6.0	3.83	16.5	10-5.5	4.0-3.0	3.0-0
MW-2	2/15/89	4	~5.0	5.33	16.5	10-5.0	4.0-3.0	3.0-0
MW-3	2/15/89	4	~6.0	6.0	16.5	10-5.0	4.0-3.0	3.0-0
MW-4	4/28/89	4	7.5	9.60	14.0	10-5.0	5.0-4.0	4.0-0
MW-5	4/27/89	4	~7.0	5.47	14.0	10-4.5	4.5-3.5	3.5-0
MW-6	4/28/89	4	~6.0	6.47	12.0	11.0-5.0	5.0-4.0	4.0-0
MW-7	4/27/89	4	~6.0	5.48	14.0	10.0-5.0	5.0-4.0	4.0-0
MW-8	4/28/89	4	~7.0	8.62	12.0	10.0-5.0	5.0-4.0	4.0-0
MW-9	7/13/89	4	~6.0	5.33	10.5	10.0-5.0	4.5-3.5	3.5-0
MW-10	**11/16/89**	**4**	**6.5**	**6.33**	**13.0**	**10.0-5.0**	**4.5-4.0**	**4.0-0**

TABLE 4: Soil Analytical Results (ppm)

Boring No.	Depth (ft. bgs)	Moisture	TPH-g	TPH-d	Total Oil & Grease*	Benzene	Toluene	Ethyl-benzene	Xylene	Total Lead
SB-1	4.0	Damp	140	NA	NA	0.3	0.8	1.4	0.6	14.7
SB-2	5.0	Moist	3700	NA	NA	<8	120	110	530	9.17
SB-3	4.0	Wet	1300	180	89	0.54	8.4	18	24	0.2
SB-3	2,4**	Wet	250	100	67	<0.25	1.1	1.9	3.2	<0.2
SB-4	2,4**	Moist	1300	12	<10	0.54	0.4	18	24	
SB-4	4.0	V.Moist	50	20	13	0.12	0.43	0.45	0.18	<0.2
SB-5	2.0	Moist	31000	370	26	4.7	18	66	150	<0.2
SB-8	6.5	Wet	1900	360	<10	<0.025	<0.025	25	82	6.2
SB-9	5.0	Moist	<10	<10	<10	<0.025	<0.025	<0.075	<0.075	3.9
SB-10	4.5	Wet	550	75	<10	2.3	11	13	71	5.8
SB-11	5.0	Wet	190	440	<10	3.8	16	5.7	28	17
SB-12	**5.0**	**Moist**	**<1**	**1.4**	**NA**	**<0.0025**	**<0.0028**	**<0.0025**	**<0.0025**	**4.8**
SB-12	**7.0**	**Moist**	**<1**	**1.4**	**NA**	**0.0068**	**0.046**	**<0.0025**	**0.0098**	**4.6**
SB-13	**5.0**	**Moist**	**650**	**60**	**NA**	**1.4**	**5.2**	**6.0**	**25**	**5.5**
MW-1	5.5	Wet	1100	NA	NA	12	36	27	120	12.7
MW-2	6.0	Wet	2	NA	NA	0.1	<0.1	<0.1	<0.1	3.31
MW-3	5.0	Moist	3	NA	<30	<0.1	<0.1	<0.1	<0.1	1.42
MW-4	5.0	Moist	<10	<10	<10	<0.025	0.056	<0.075	<0.075	34
MW-4	10.0	Wet	<10	<10	<10	<0.025	0.052	<0.075	<0.075	2.3
MW-5	5.0	Damp	<10	<10	<10	<0.025	<0.025	<0.075	<0.075	5.3
MW-5	10.0	Moist	<10	<10	<10	<0.025	0.037	<0.075	<0.075	4.3
MW-6	5.0	Moist	<10	<10	<10	0.033	0.079	<0.075	<0.075	8.2
MW-6	10.0	Wet	<10	<10	<10	<0.025	0.12	<0.075	<0.075	7.0
MW-7	5.0	Moist	4100	84	<10	14	92	14	190	14
MW-7	10.0	Wet	<10	18	<10	0.11	0.045	<0.075	<0.075	14
MW-8	5.0	Moist	<10	<10	<10	<0.025	0.089	<0.075	<0.075	3.4
MW-8	10.0	Wet	<10	160	460	<0.025	0.087	<0.075	<0.075	22
MW-9	5.0	Moist	120	<10	<10	1.1	0.64	3.7	0.46	4.1
MW-10	**5.0**	**Moist**	**2.2**	**1.3**	**NA**	**0.23**	**0.22**	**0.21**	**0.61**	**3.6**

NOTE:

SB-6 and SB-7 were located in UST gravel backfill and not sampled.

* Extractable as motor oil.

** Composite soil sample from two depths (equal weight basis).

TABLE 5: Groundwater Analytical Results (ppm)

Well No.	Date Sampled	TPH-g	TPH-d	Benzene	Toluene	Ethyl-benzene	Xylene
MW-1	02/16/89	99	NA	20	23	5.7	23
MW-1	05/23/89	48	11	4.2	5.2	1.2	7.7
MW-1	08/04/89	63	11	5.5	5.5	3.2	9.5
MW-1	**12/15/89**	**30**	**11**	**<0.0005**	**<0.0005**	**<0.0005**	**<0.0005**
MW-2	02/16/89	20	NA	0.2	0.9	2.7	9.6
MW-2	05/23/89	1.5	1.6	0.0043	0.0029	0.011	0.15
MW-2	08/04/89	15	7.4	0.075	0.12	0.85	2.2
MW-2	**12/15/89**	**5.0**	**2.6**	**0.052**	**0.013**	**0.0041**	**0.29**
MW-3	02/16/89	60	NA	5.5	0.2	3.2	5.2
MW-3	05/23/89	<0.05	1.5	<0.0005	<0.0005	<0.0015	<0.0015
MW-3	08/04/89	2.0	1.2	0.12	0.012	<0.0015	0.086
MW-3	**12/15/89**	**5.2**	**1.7**	**0.38**	**0.047**	**0.017**	**0.410**
MW-4	05/23/89	<0.05	NA	<0.0005	<0.0005	<0.0015	<0.0015
MW-4*	08/04/89	<0.05	<0.05	<0.0005	<0.0005	<0.0015	<0.0015
MW-4	**12/15/89**	**<0.05**	**0.09**	**<0.0005**	**<0.0005**	**<0.0005**	**<0.0005**
MW-5	05/23/89	26	7.0	1.5	0.28	<0.0015	8.1
MW-5	08/04/89	12	8.7	0.86	0.094	<0.0015	2.6
MW-5	**12/15/89**	**1.0**	**0.71**	**0.022**	**0.035**	**0.018**	**0.044**
MW-6	05/23/89	22	7.0	0.016	0.0065	0.0066	3.4
MW-6	08/04/89	28	8.8	1.2	0.13	2.1	2.8
MW-6	**12/15/89**	**16**	**5.5**	**0.37**	**0.092**	**0.20**	**0.18**
MW-7	05/23/89	47	11	3.5	5.0	1.5	7.8
MW-7	08/04/89	68	22	6.2	6.6	3.6	8.8
MW-7	**12/15/89**	**100**	**12**	**4.5**	**5.3**	**1.3**	**5.3**
MW-8	05/23/89	<0.05	0.10	<0.0005	<0.0005	<0.0015	<0.0015
MW-8	08/04/89	<0.05	0.075	<0.0005	<0.0005	<0.0015	<0.0015
MW-8	**12/15/89**	**<0.05**	**<0.05**	**<0.0005**	**<0.0005**	**<0.0005**	**<0.0005**
MW-9	08/04/89	47	12	5.6	6.6	1.5	8.5
MW-9	**12/15/89**	**88**	**9.2**	**4.3**	**5.4**	**0.14**	**5.6**
MW-10	**12/15/89**	**<0.05**	**3.1**	**1.5**	**<0.0005**	**<0.0005**	**<0.0005**

*MW-4 Analysis 601 was ND for all compounds.
Note: Oil and grease (as motor oil) was <5 ppm for all samples taken 5/23/89.

TABLE 6: Physical Monitoring Results: Evidence of Contamination[1]

Well No.	Date	Depth to Water (ft.)	Petroleum Water Odor	Thickness Floating Product (inches)	Notes
MW-1	02/16/89	3.83	Slight	0	None
MW-1	05/23/89	3.59	Slight	0	No sheen
MW-1	08/03/89	4.04	Slight	0	None
MW-1	**12/15/89**	**4.22**	**Slight**	**0**	**None**
MW-2	02/16/89	5.33	Slight	0	None
MW-2	05/23/89	5.23	Slight	0	None
MW-2	08/03/89	6.03	Slight	0	None
MW-2	**12/15/89**	**6.43**	**Strong**	**0**	**None**
MW-3	02/16/89	5.17	None	0	None
MW-3	05/23/89	5.09	None	0	None
MW-3	08/03/89	5.34	Slight	0	None
MW-3	**12/15/89**	**6.02**	**None**	**0**	**None**
MW-4	05/23/89	9.60	None	0	None
MW-4	08/03/89	6.37	None	0	None
MW-4	**12/15/89**	**6.91**	**Slight**	**0**	**None**
MW-5	05/23/89	5.47	Moderate	0	No sheen
MW-5	08/03/89	5.94	None	0	None
MW-5	**12/15/89**	**6.75**	**None**	**0**	**None**
MW-6	05/23/89	5.47	Strong	0	Sheen
MW-6	08/03/89	5.91	None	0	None
MW-6	**12/15/89**	**5.98**	**Moderate**	**0**	**None**
MW-7	05/23/89	5.48	Moderate	0	Slight sheen
MW-7	08/03/89	4.22	None	0	None
MW-7	**12/15/89**	**4.58**	**Slight**	**0**	**None**
MW-8	05/23/89	8.62	None	0	None
MW-8	08/03/89	6.62	None	0	None
MW-8	**12/15/89**	**6.71**	**None**	**0**	**None**
MW-9	08/03/89	5.78	None	0	None
MW-9	**12/15/89**	**5.24**	**None**	**0**	**None**
MW-10	**12/15/89**	**6.33**	**None**	**0**	**None**

[1] Sheen; odor; FID; color; PID (opened/odor trapped in casing)

Table 7. Hydraulic Characteristics determined from Slug Test

	Transmissivity cm^2/sec	Storativity (dimensionless)	Hydraulic Conductivity cm/sec	Aquifer Thickness
MW-1A	6.90×10^{-1}	1×10^{-4}	5.04×10^{-3}	137
MW-1B	6.54×10^{-2}	1×10^{-3}	4.77×10^{-4}	137
MW-2A	2.75×10^{-2}	1×10^{-3}	2.01×10^{-4}	137
MW-2B	2.57×10^{-2}	1×10^{-3}	1.88×10^{-4}	137
MW-3A	1.14×10^{0}	1×10^{-5}	8.32×10^{-3}	137
MW-3B	5.50×10^{-1}	1×10^{-4}	4.01×10^{-3}	137
MW-4A	2.96×10^{-2}	1×10^{-4}	3.14×10^{-4}	94.2
MW-4B	2.00×10^{-1}	1×10^{-4}	2.12×10^{-3}	94.2
MW-5A	1.30×10^{-1}	1×-10^{-6}	1.23×10^{-3}	106
MW-5B	3.60×10^{-1}	1×10^{-4}	3.40×10^{-3}	106
MW-6A	1.20×10^{-1}	1×10^{-4}	8.76×10^{-4}	137
MW-6B	3.50×10^{-1}	1×10^{-4}	2.55×10^{-3}	137
MW-7A	2.00×10^{-1}	1×10^{-5}	1.64×10^{-3}	122
MW-7B	8.78×10^{-3}	1×10^{-3}	7.20×10^{-5}	122
MW-8A	1.02×10^{-2}	1×10^{-3}	2.23×10^{-4}	45.7
MW-8B	5.00×10^{-1}	1×10^{-2}	1.09×10^{-2}	45.7
MW-9A	1.30×10^{-1}	1×10^{-4}	8.97×10^{-4}	145
MW-9B	6.99×10^{-2}	1×10^{-3}	4.82×10^{-4}	145
Average =	2.56×10^{-1}	9.35×10^{-4}	2.39×10^{-3}	
Std Dev =	0.30	2.31×10^{-3}	3.03×10^{-3}	

TABLE 8: Depth to Water Table Variation with Time, (date), 1989
285 Hegenberger Road
Oakland, California

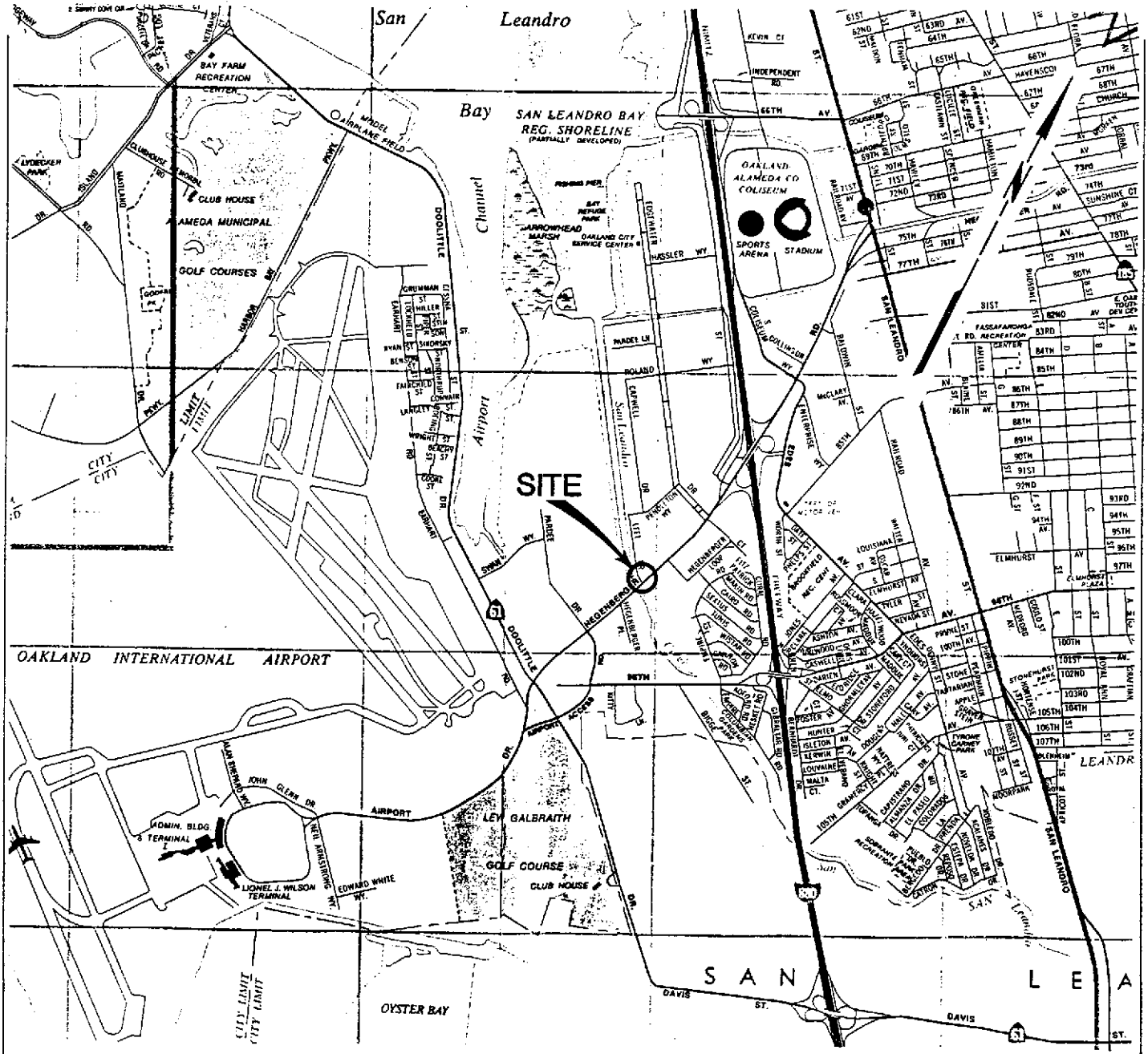
BRIDGE		MW-8*		MW-4		MW-3		MW-7		MW-5	
Time	H_2O	Time	H_2O	Time	H_2O	Time	H_2O	Time	H_2O	Time	H_2O
16:58	6.47	17:00	5.94	17:03	6.93	12:05	6.24	17:08	4.54[5]	17:10	6.41[5]
17:58	7.20	18:01	5.94[3]	18:03	6.93	18:04	6.24	18:08	4.54[5]	18:10	6.41
18:50	8.60	19:03	5.95	19:07	6.93	19:10	6.24	19:12	4.54[5]	19:15	6.41
19:55	9.92	20:01	5.97	20:03	6.93	20:04	6.24	20:05	4.54[5]	20:07	6.40
21:00	11.70	21:03	5.98	21:08	6.93	21:10	6.24	21:12	4.54[5]	21:15	6.40
22:00	NW	22:02	6.02	22:04	6.93	22:06	6.24	22:08	4.55	22:10	6.40
23:00	NW	23:02	6.02	23:04	6.93	23:06	6.24	23:08	4.55	23:10	6.40
24:00	NW	24:02	6.00	24:04	6.93	24:06	6.24	24:08	4.57	24:10	6.40
1:00	NW	1:02	6.02	1:04	6.93	1:06	6.24	1:08	4.57	1:10	6.40
2:00	NW	2:02	6.02	2:04	6.93	2:06	6.24	2:08	4.57	2:10	6.40
3:00	12.60	3:02	6.04	3:04	6.93	3:06	6.24	3:08	4.57	3:10	6.40
4:00	9.40	4:02	6.05	4:04	6.93	4:06	6.24	4:08	4.57	4:10	6.40
5:00	8.20	5:02	6.05	5:04	6.93	5:06	6.24	5:08	4.57	5:10	6.40
6:00	8.40	6:02	6.05	6:04	6.93	6:06	6.24	6:08	4.57	6:10	6.40
7:00	8.50	7:02	6.07	7:04	6.93	7:06	6.24	7:08	4.57	7:10	6.40
8:00	8.70	8:02	6.07	8:04	6.93	8:06	6.24	8:08	4.57	8:10	6.40
9:00	9.45	9:02	6.07	9:04	6.93	9:06	6.24	9:08	4.57	9:10	6.40
9:02	10.45	9:07	5.83	9:08	6.92	9:06	6.25	9:10	4.55	9:13	6.44
10:00	10.82	10:02	5.84	10:04	6.93	10:06	6.25	10:08	4.55	10:09	6.45
10:59	10.52	11:02	5.86	11:04	6.93	11:06	6.25[5]	11:08	4.55[5]	11:10	6.45
11:58	9.84	12:01	5.87	12:03	6.94	12:05	6.25	12:07	4.55	12:09	6.45
12:59	8.88	13:01	5.89	13:03	6.94	13:05	6.25	13:07	4.55[5]	13:09	6.45
13:59	7.65	14:01	5.90	14:03	6.93	14:05	6.24[5]	14:07	4.55[5]	14:09	6.44[5]
14:58	6.93	15:01	5.91	15:03	6.93	15:05	6.24	15:07	4.55	15:09	6.43
16:00	6.07	16:03	5.93	16:05	6.93	15:06	6.24	16:08	4.54[5]	16:10	6.42
16:58	6.47	17:00	5.94	17:03	6.93	17:05	6.24	17:08	4.54[5]	17:10	6.41[3]
17:58	7.20	18:01	5.94[5]	18:03	6.93	18:04	6.24	18:08	4.54[5]	18:10	6.41

NW No Water
* = ?

TABLE 8: Depth to Water Table Variation with Time (Cont.d)

MW-9		MW-2*	
Time	H_2O	Time	H_2O
17:12	5.58	17:15	6.45
18:12	5.58	18:14	6.47
19:17	5.58	19:20	6.47
20:09	5.58	20:00	6.47
21:17	5.58	21:20	6.47
22:12	5.58	22:14	6.47
23:12	5.58	23:14	6.47
24:12	5.58	24:14	6.47
1:12	5.58	1:14	6.47
2:12	5.58	2:14	6.41[5]
3:12	5.58	3:14	6.47
4:12	5.58	4:14	6.47
5:12	5.58	5:14	6.47
6:12	5.58	6:14	6.47
7:12	5.58	7:14	6.47
8:12	5.58	8:14	6.47
9:12	5.58	9:14	6.47
9:16	5.58	9:17	6.49
10:12	5.58[5]	10:15	6.50
11:12	5.58[5]	11:14	6.48
12:12	5.58[5]	12:13	6.47
13:12	5.58	12:13	6.45[5]
14:12	5.58	14:13	6.45
15:12	5.58	15:15	6.44[5]
16:12	5.58	16:15	6.45
17:12	5.58	17:15	6.45
18:12	5.58	18:14	6.47

NW No Water



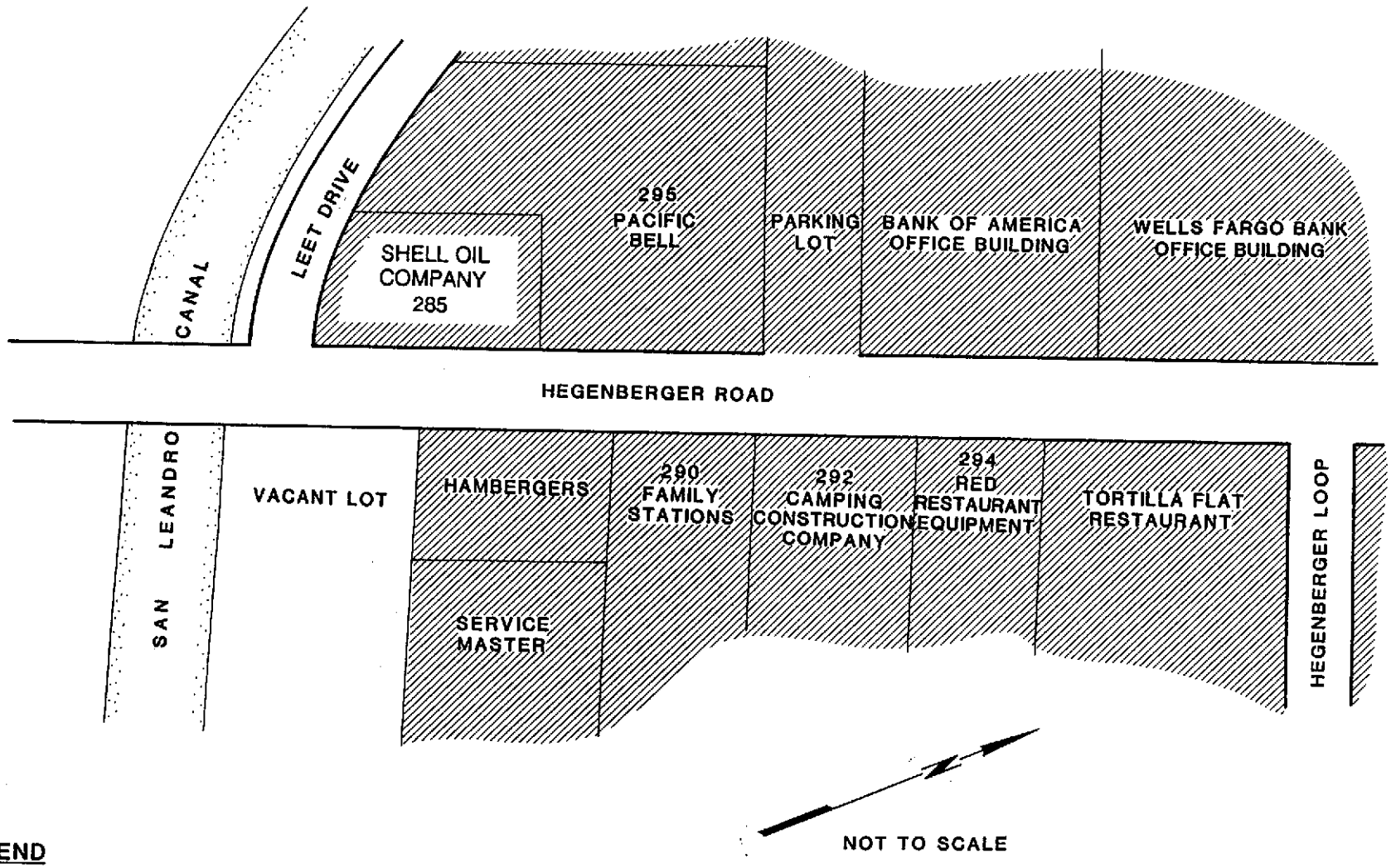
SOURCE: California State Automobile Association

SITE LOCATION

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale: AS SHOWN	Project No.: 88-44-359-01
Prepared by: KGC	Date: 3/21/89
Checked by: RMB	Drawing No.: 1
Approved by: DWC	



LEGEND

COMMERCIAL

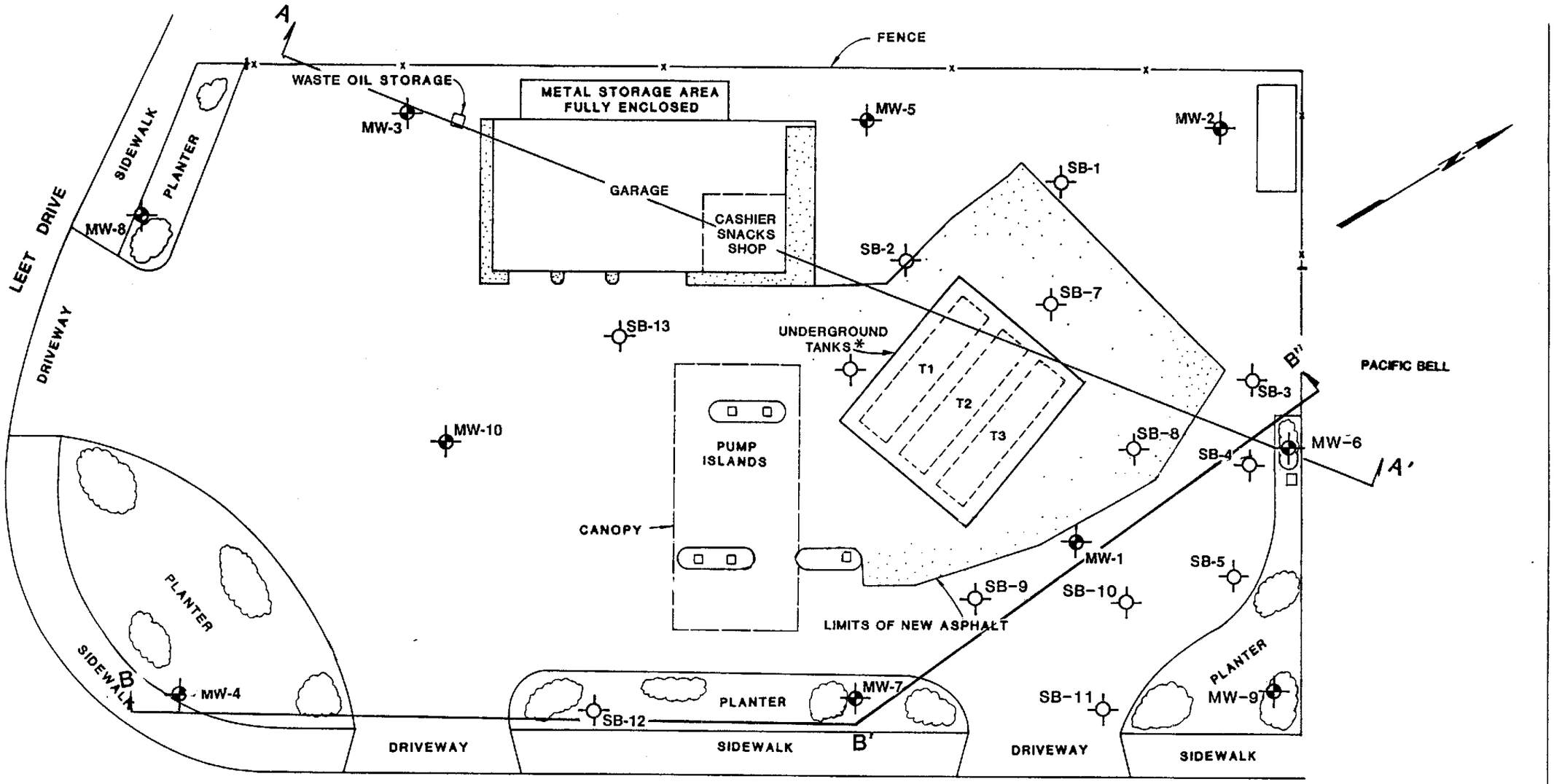
OPEN SPACE

AREA LAND USE

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	5/16/89
Prepared By	KGC
Checked By	RMB
Approved By	DWC
Project No.	88-44-359-01
Drawing No.	1a



LEGEND

SB-1 SOIL BORING

MW-1 GROUNDWATER MONITORING WELL

LINE OF GEOLOGIC CROSS SECTION

* T1 = REGULAR UNLEADED, 10,000 GALLONS

T2 = REGULAR LEADED, 10,000 GALLONS

T3 = SUPER UNLEADED, 100,000 GALLONS

0 20 40

SCALE FEET

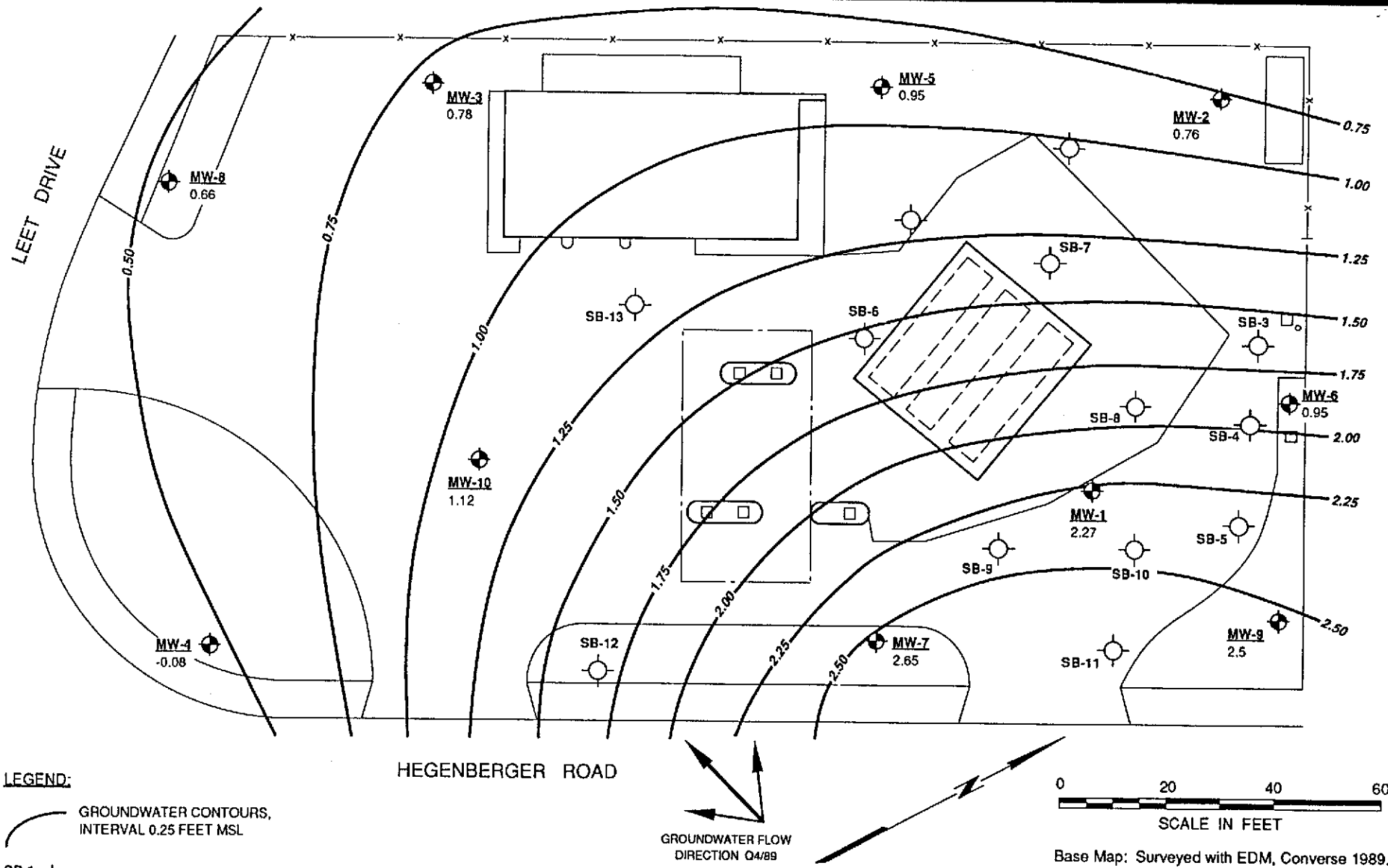
Base Map: Surveyed with EDM, Converse 1989.

PLOT PLAN

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	9/14/89
Prepared By	MLL
Checked By	RMB
Approved By	DWC
Project No.	88-44-359-02
Drawing No.	2



LEGEND:

GROUNDWATER CONTOURS, INTERVAL 0.25 FEET MSL

SB-1 SOIL BORING

MW-1 GROUNDWATER MONITORING WELL

NOTE: GROUNDWATER ELEVATIONS GIVEN IN FEET ABOVE MEAN SEA LEVEL

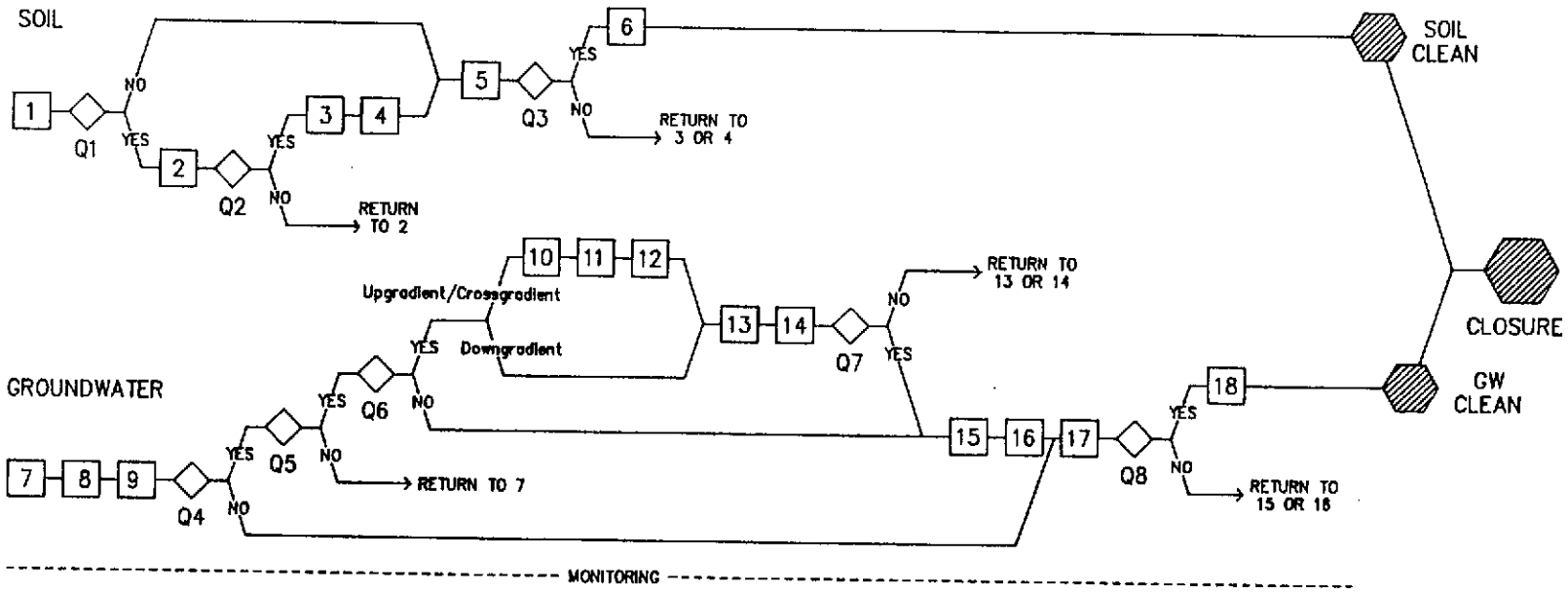
Base Map: Surveyed with EDM, Converse 1989.

POTENTIOMETRIC MAP Q4/89

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental West

Scale: AS SHOWN	Project No.: 88-44-359-01
Prepared by: LQL	Date: 12-30-89
Checked by: RMB	Drawing No.: 3
Approved by: DWC	



TASKS

Program 1: Onsite Soil Investigation/Remediation

Task 1 Drill and Sample Soil Borings
Task 2 Drill Step-Out Borings
Task 3 Prepare Soil Remedial Action Plan (if needed)
Task 4 Remediate Soil (if needed)
Task 5 Establish Clean Standards - Soil
Task 6 Confirm Remediated Soil

Program 2: Onsite Groundwater Investigation

Task 7 Install/Develop Groundwater Monitoring Wells
Task 8 Sample/Analyze Groundwater
Task 9 Conduct Hydrology Tests and Research

Program 3: Offsite Groundwater Investigation (if needed)

Task 10 Perform Neighborhood Assessment
Task 11 Refer to Legal Counsel
Task 12 Inform RWQCB
Task 13 Prepare Offsite Groundwater Investigation Plan
Task 14 Install Offsite Wells, Sample/Analyze

Program 4: Groundwater Remediation (if needed)

Task 15 Prepare Groundwater Remedial Action Plan
Task 16 Implement Remedial Action Plan
Task 17 Establish Cleanup Standards - Groundwater
Task 18 Confirm Groundwater Remediation

QUESTIONS

Q1: Are there concentrations of TPH greater than 100 ppm in any soil?

Q2: Is soil characterized?

Q3: Is the leaching potential acceptably low for contaminants proposed to be left in place?

Q4: Is groundwater actionable?

Q5: Is groundwater characterized onsite?

Q6: Does groundwater pollution extend offsite?

Q7: Is groundwater characterized offsite?

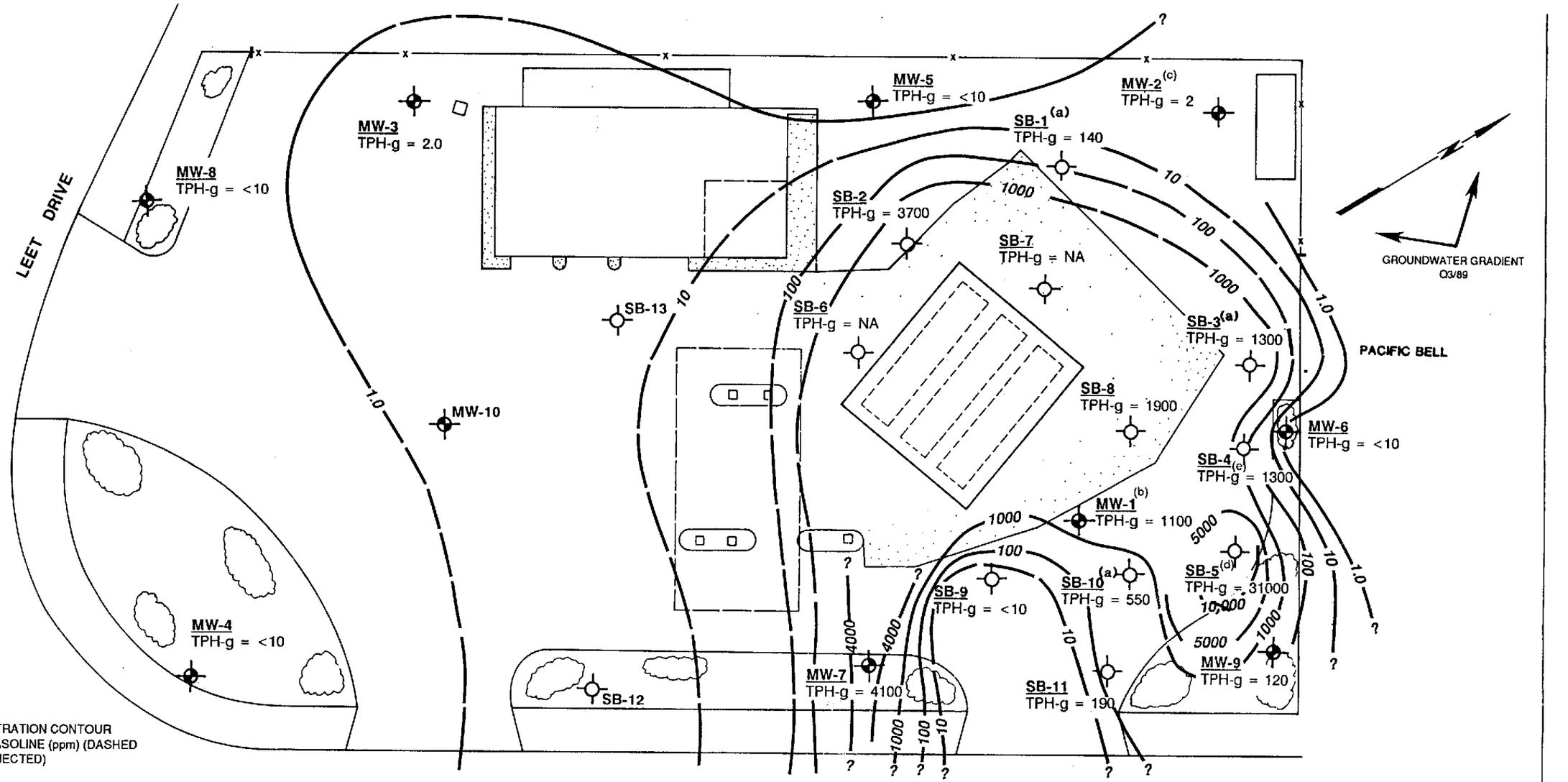
Q8: Is the environmental risk acceptably low for contaminants proposed to be left in groundwater?

SUMMARY OF PROGRESS - QUARTER 3, 1989

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale N/A
Date 5-24-89
Prepared By LQL
Checked By RMB
Approved By DWC
Project No 88-44-359-01
Drawing No



LEGEND

ISOCONCENTRATION CONTOUR SHOWING GASOLINE (ppm) (DASHED WHERE PROJECTED)

TPH-g = GASOLINE (ppm)

SB-1 SOIL BORING

MW-1 GROUNDWATER MONITORING WELL

NOTES:
(a) SAMPLE TAKEN AT -4' BGS
(b) SAMPLE TAKEN AT -5.5' BGS
(c) SAMPLE TAKEN AT -6' BGS
(d) SAMPLE TAKEN AT -2' BGS
(e) SAMPLE TAKEN AT -2', -4' BGS

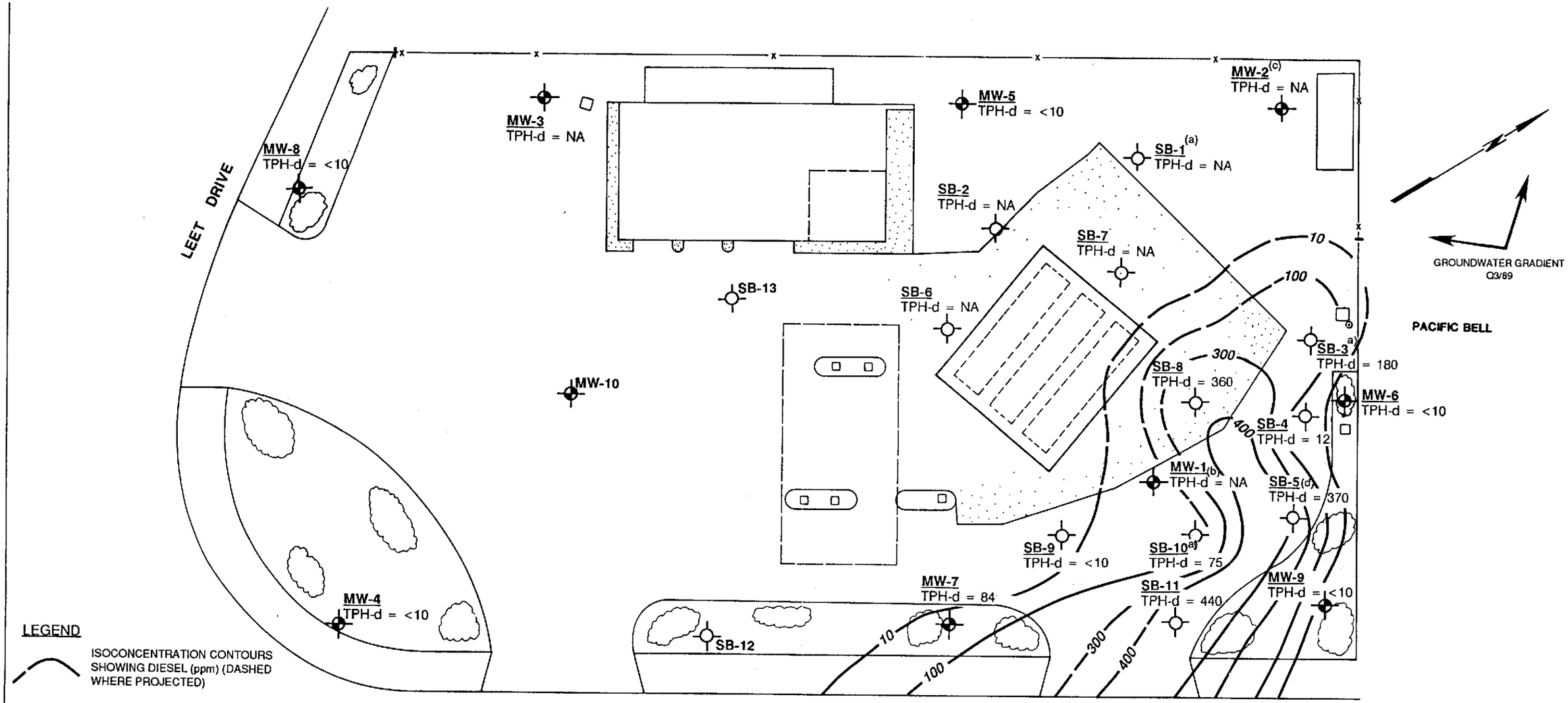
Base Map: Surveyed with EDM, Converse 1989.

PLAN: SOIL TPH-g AT 5' BGS Q4/89

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	9/14/89
Prepared By	MLL
Checked By	RMB
Approved By	
Project No.	88-44-359-01
Drawing No.	5



LEGEND

ISOCONCENTRATION CONTOURS SHOWING DIESEL (ppm) (DASHED WHERE PROJECTED)

TPH-d = DIESEL (ppm)

SB-1 SOIL BORING

MW-1 GROUNDWATER MONITORING WELL

NOTES:
(a) SAMPLE TAKEN AT -4' BGS
(b) SAMPLE TAKEN AT -5.5' BGS
(c) SAMPLE TAKEN AT -6' BGS
(d) SAMPLE TAKEN AT -2' BGS
(e) SAMPLE TAKEN AT -2', -4' BGS

Base Map: Surveyed with EDM, Converse 1989.

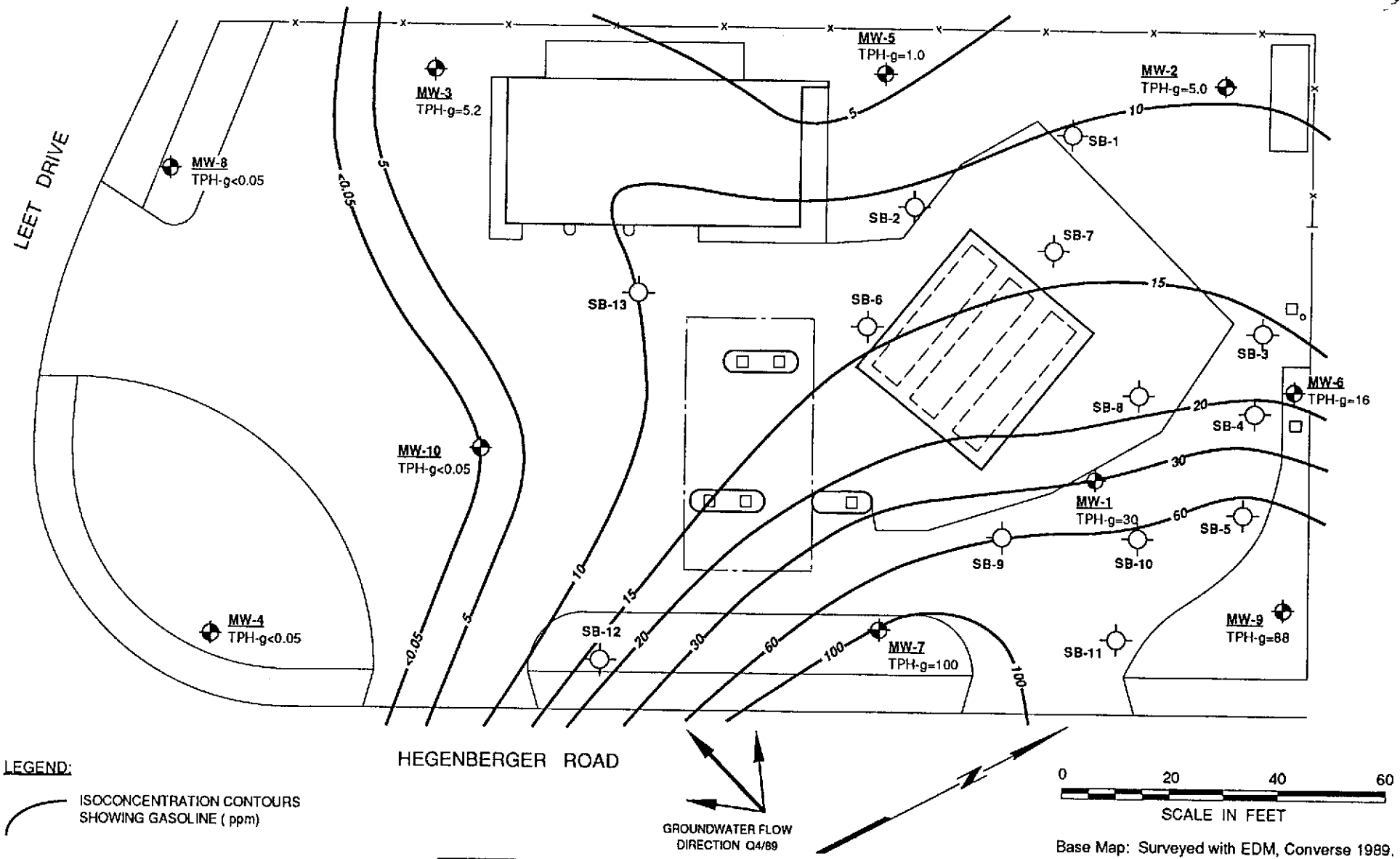
0 20 40
SCALE FEET

PLAN: SOIL TPH-d AT 5' BGS Q4/89

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	9/14/89
Prepared By	MLL
Checked By	RMB
Approved By	DWC
Project No.	88-44-359-01
Drawing No.	6



LEGEND:

ISOCONCENTRATION CONTOURS SHOWING GASOLINE (ppm)

TPH-g = GASOLINE (ppm)

SB-1 SOIL BORING

MW-1 GROUNDWATER MONITORING WELL

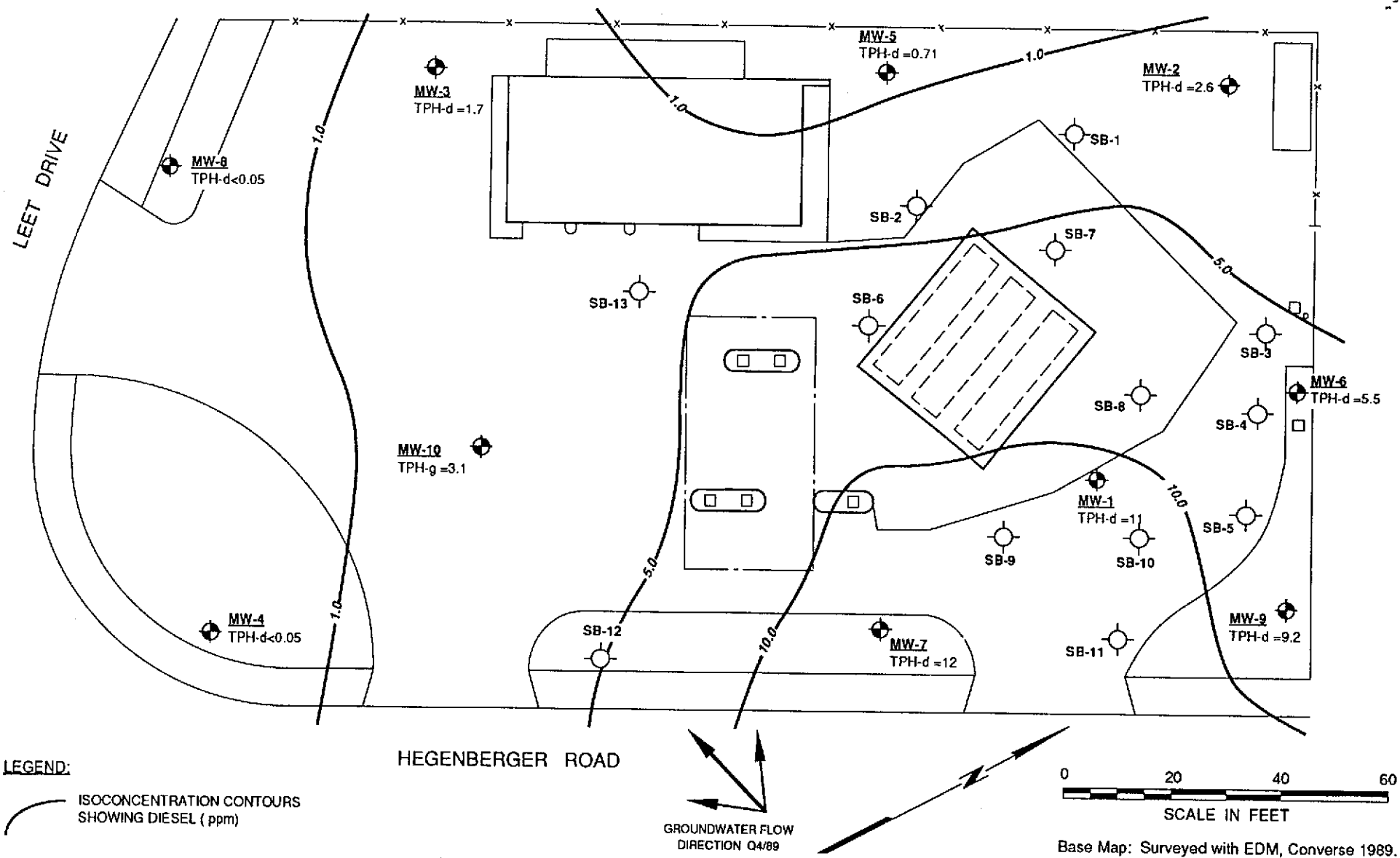
Base Map: Surveyed with EDM, Converse 1989.

PLAN: GROUNDWATER TPH-g Q4/89

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental West

Scale: AS SHOWN	Project No.: 88-44-359-01
Prepared by: LQL	Date: 12-30-89
Checked by: RMB	Drawing No.: 7
Approved by: DWC	



LEGEND:

ISOCONCENTRATION CONTOURS SHOWING DIESEL (ppm)

TPH-d = DIESEL (ppm)

SB-1 SOIL BORING

MW-1 GROUNDWATER MONITORING WELL

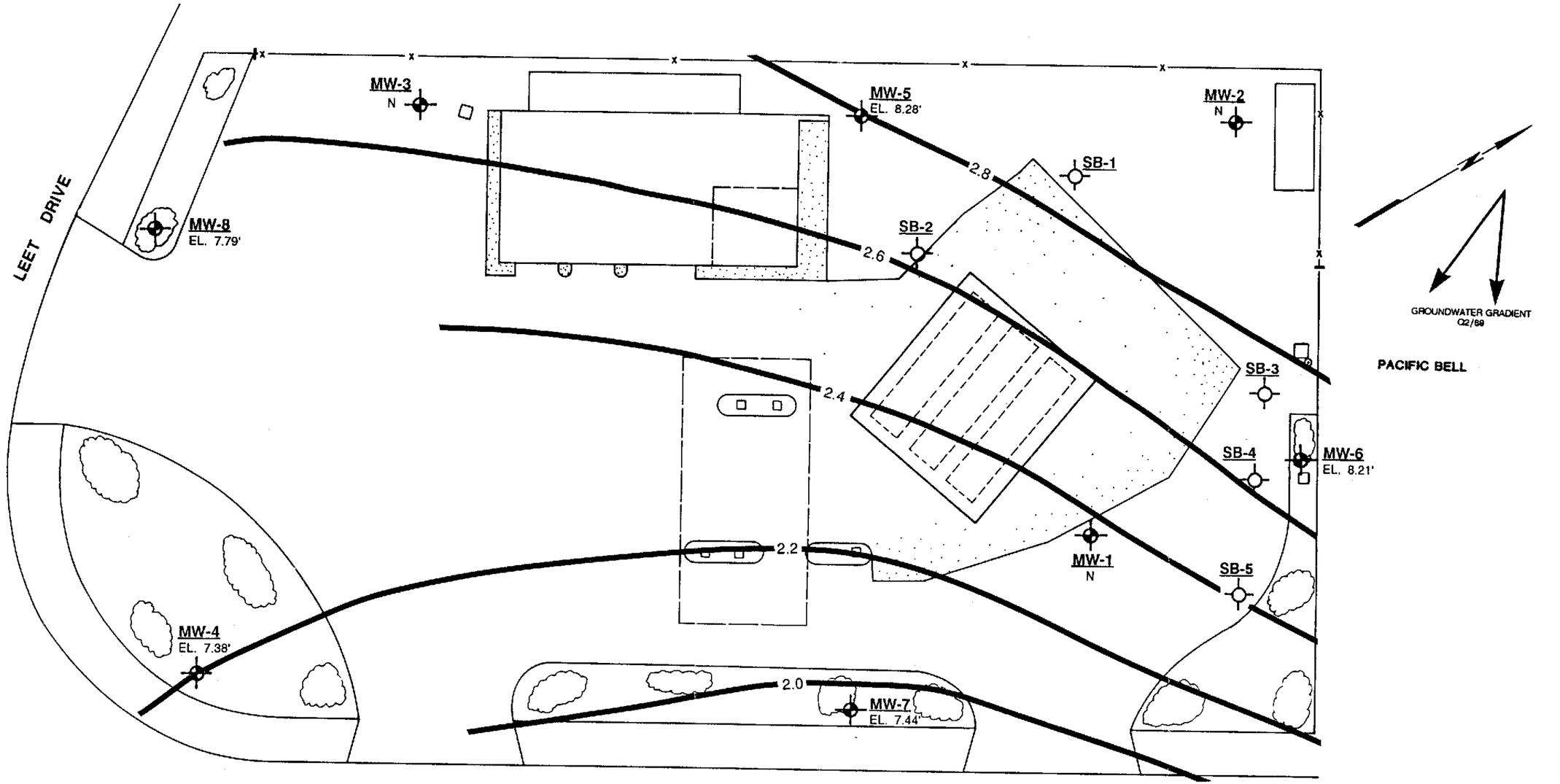
Base Map: Surveyed with EDM, Converse 1989.

PLAN: GROUNDWATER TPH-d Q4/89

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental West

Scale: AS SHOWN	Project No.: 88-44-359-01
Prepared by: LQL	Date: 12-30-89
Checked by: RMB	Drawing No.: 8
Approved by: DWC	



LEGEND

SB-1 — SOIL BORING

MW-1 — GROUNDWATER MONITORING WELL

NOTES: ELEVATION OF WATER TABLE IN FEET ABOVE MEAN SEA LEVEL.

N = NOT AVAILABLE. SUBJECT TO RESURVEY.

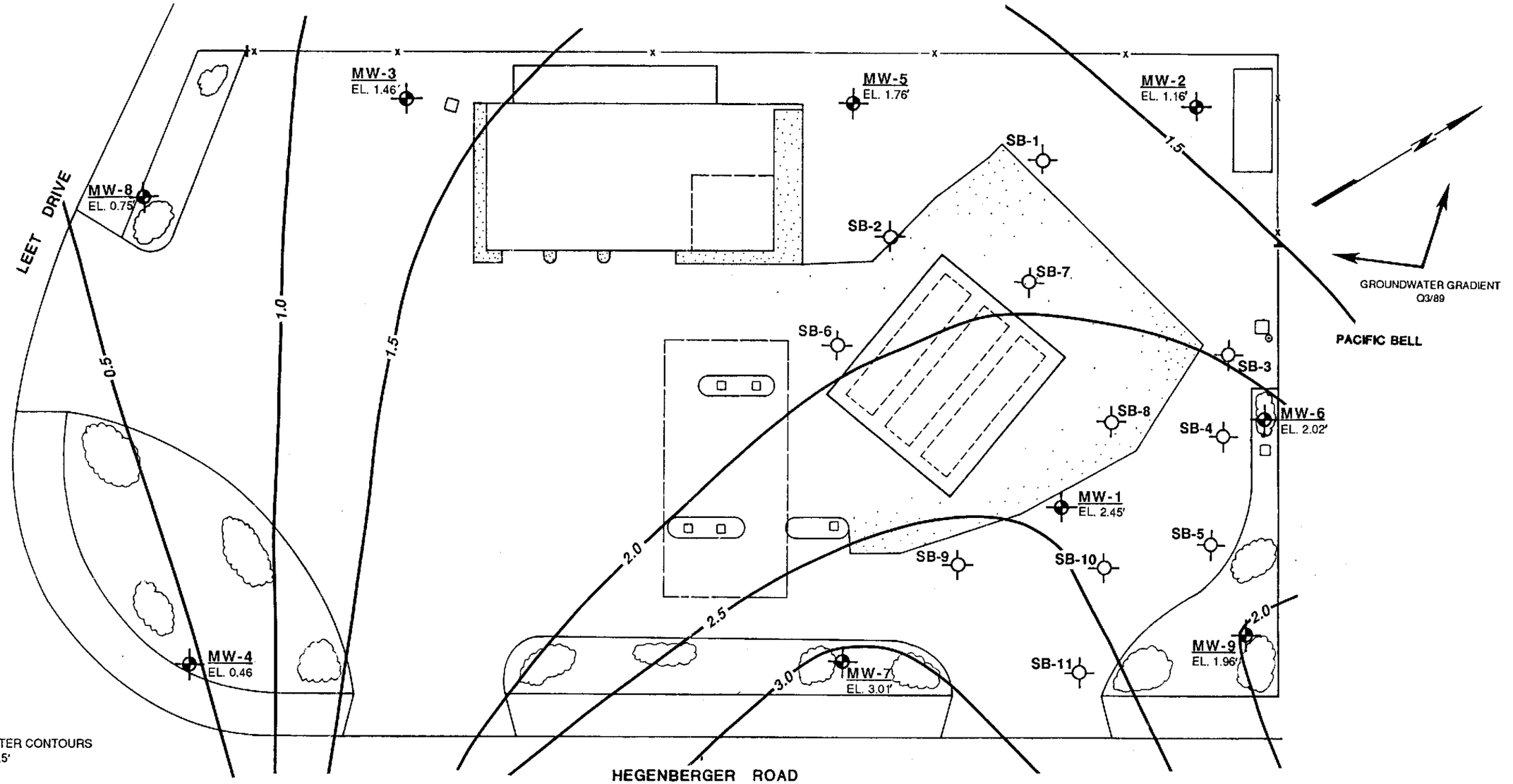
Base Map: Surveyed with EDM, Converse 1989.

GROUNDWATER GRADIENT Q2/89

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	6/23/89
Prepared By	KGC/CRB
Checked By	RMB
Approved By	DWC
Project No.	88-44-359-01
Drawing No.	9



LEGEND

GROUNDWATER CONTOURS INTERVAL 0.5'

SB-1 SOIL BORING

MW-1 GROUNDWATER MONITORING WELL

NOTES: WATER TABLE ELEVATIONS ARE IN FEET ABOVE MSL.

Base Map: Surveyed with EDM, Converse 1989.

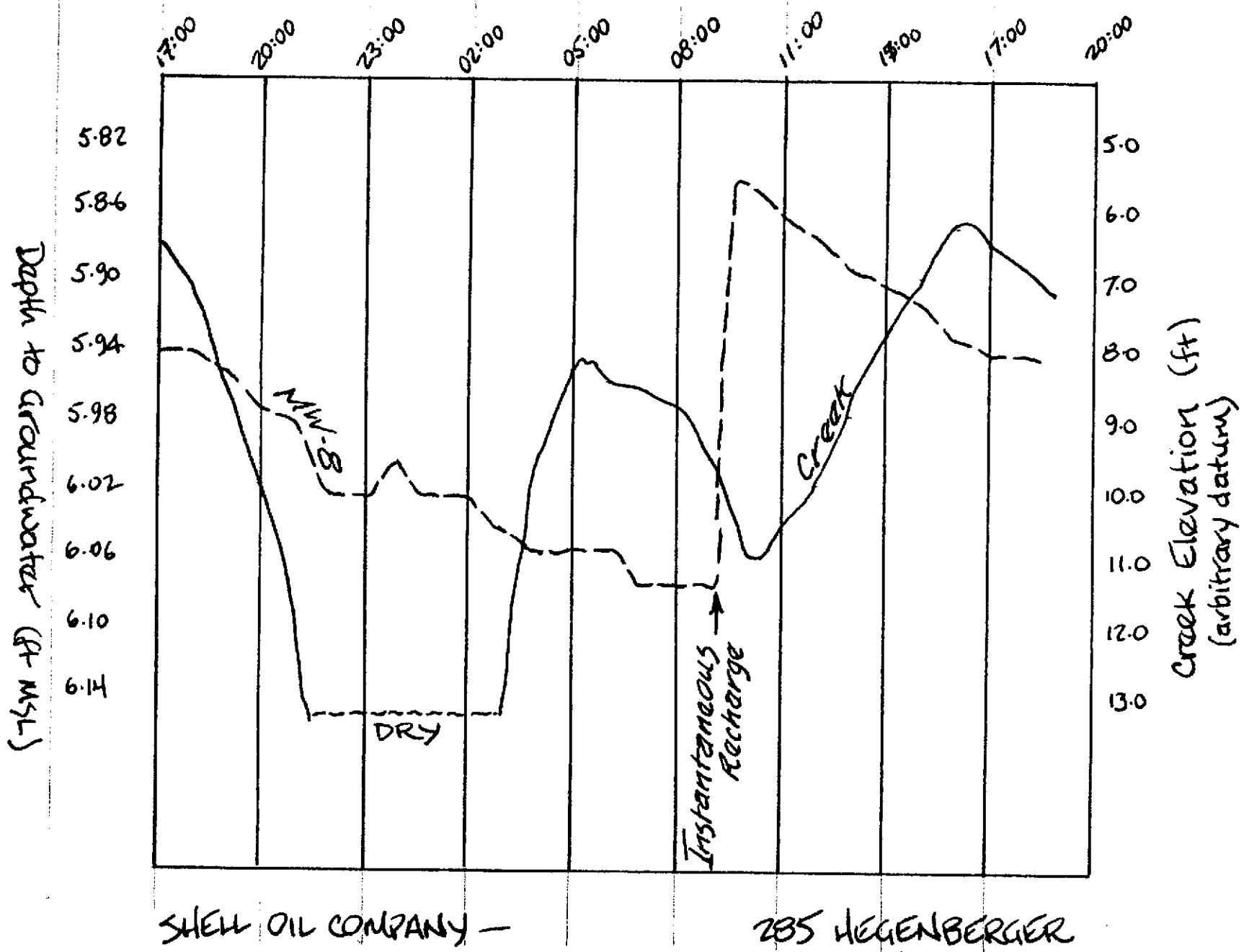
GROUNDWATER GRADIENT Q3/89

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

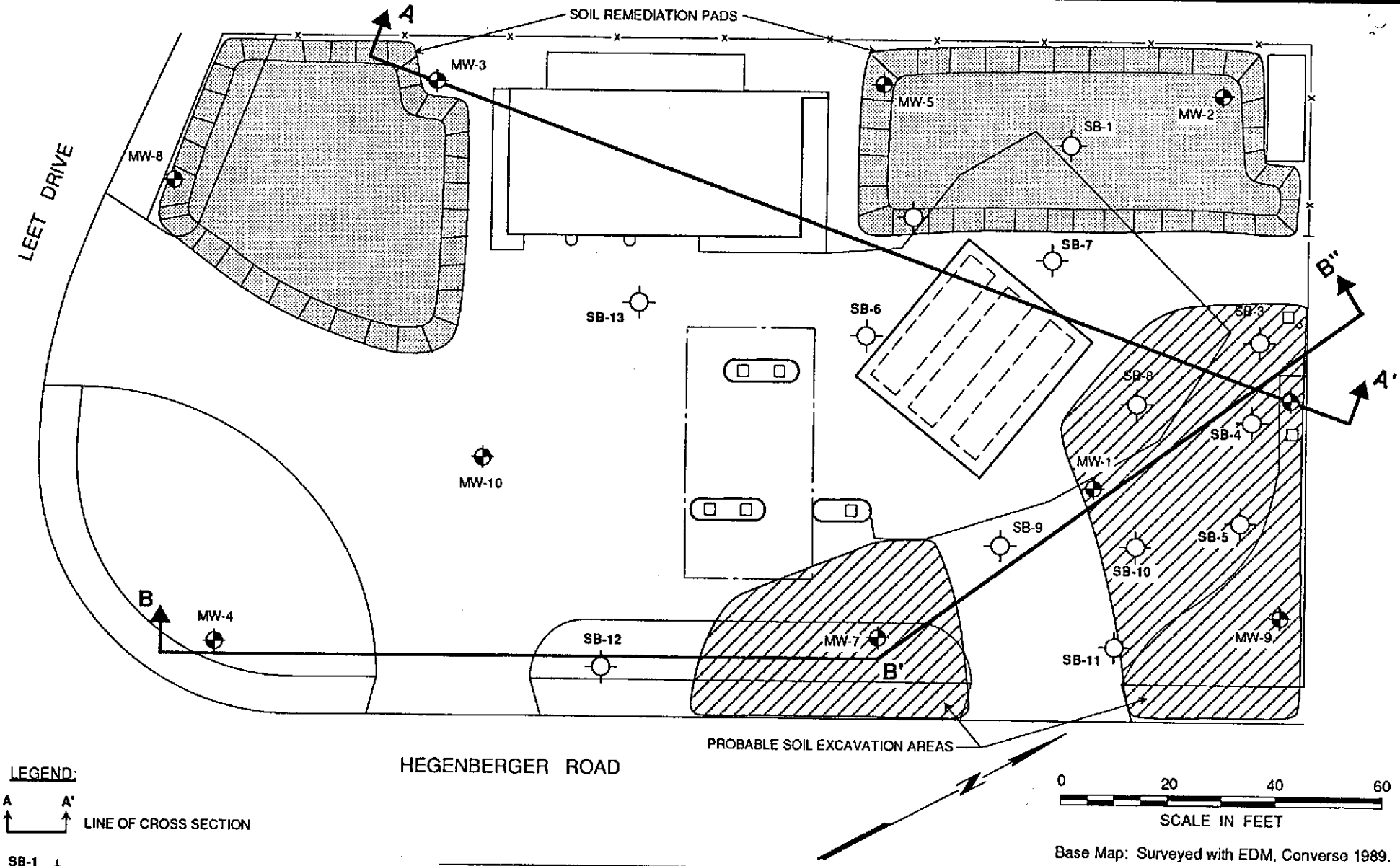
Scale	AS SHOWN
Date	9/11/89
Prepared By	KGC/CRB
Checked By	RMB
Approved By	
Project No.	88-44-359-01
Drawing No.	10

DRAWING 11: Time-variation of depth to groundwater in MW-8 and surface elevation of San Leandro Creek Q4/89



SHELL OIL COMPANY — 285 HEGENBERGER OAKLAND, CA

DRAWING 11



LEGEND:

A A' LINE OF CROSS SECTION

SB-1 SOIL BORING

MW-1 GROUNDWATER MONITORING WELL

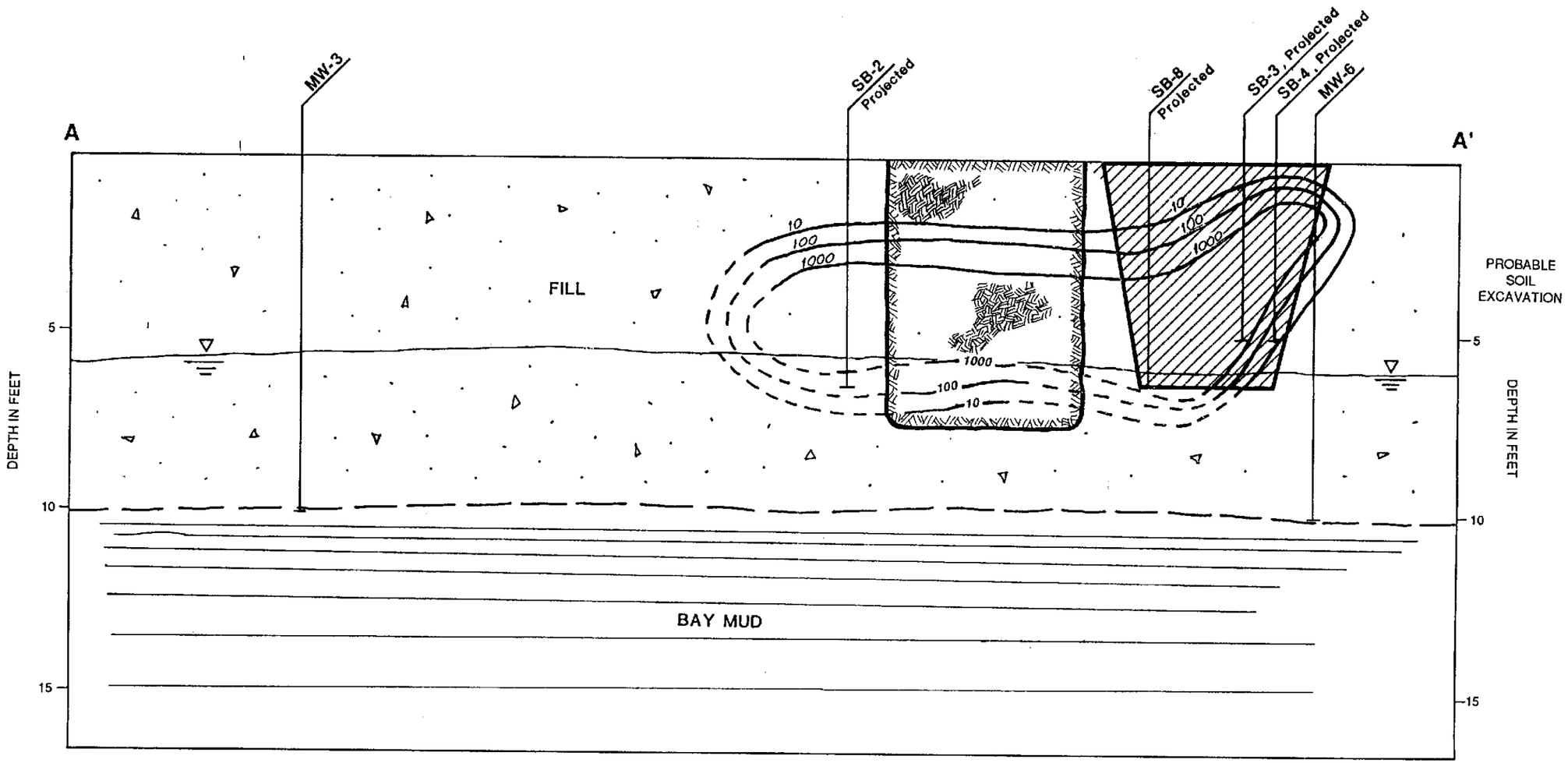
Base Map: Surveyed with EDM, Converse 1989.

PROPOSED SOIL EXCAVATION

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental West

Scale: AS SHOWN	Project No.: 88-44-359-01
Prepared by: LQL	Date: 12-30-89
Checked by: RMB	Drawing No.: 12
Approved by: DWC	



LEGEND:

10 — TPH-g ISOPLETH

VOLUME OF CONTAMINATED SOIL TO BE REMOVED, TREATED AND DISPOSED

0 20 40

SCALE

VERTICAL EXAGERATION X6

CROSS SECTION A-A' Q4/89

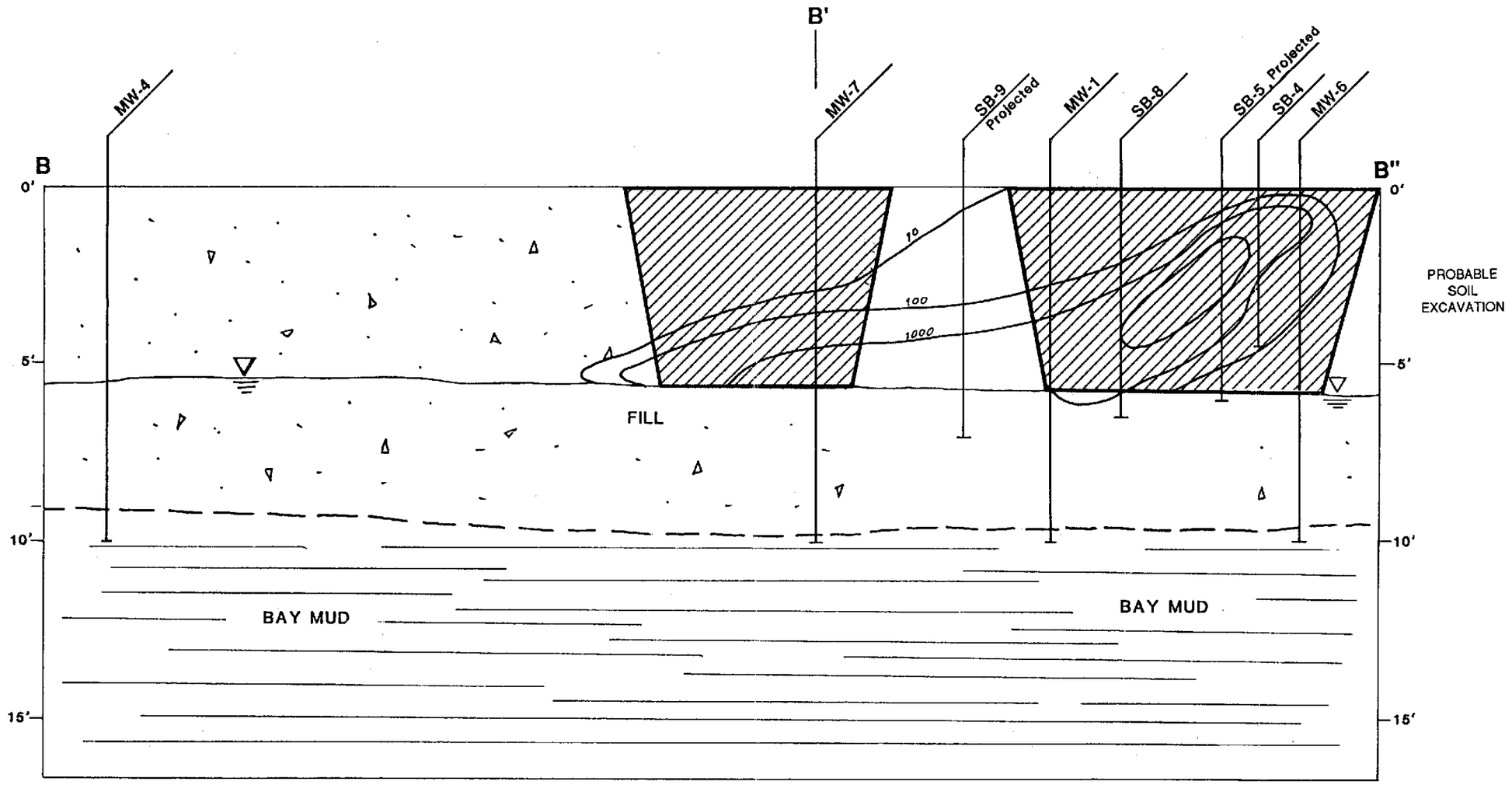
SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	12/30/89
Prepared By	ABC
Checked By	RMB
Approved By	DWC

Project No. 88-44-359-01

Drawing No. 13



LEGEND:

10 TPH-g ISOPLETH

VOLUME OF CONTAMINATED SOIL TO BE REMOVED, TREATED AND DISPOSED

0 20 40
SCALE FEET

CROSS SECTION B-B" Q4/89

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Converse Environmental Consultants California

Scale	AS SHOWN
Date	12/30/89
Prepared By	ABC/CRB
Checked By	RMB
Approved By	
Project No.	88-44-359-01
Drawing No.	14

LOG OF BORING NO. SB-12

DATE DRILLED: 11-16-89	ELEVATION:	WL TAKEN: n/a	EQUIPMENT: 3 3/4"x 8" Hollow-Stem Auger

DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	BLOWS/FT.	O.V.M. (ppm)	DRY DENSITY lb/ft3	TESTS
				very moist	soft	dark brown	Sandy SILT. (Topsoil) ML				
					soft	dark gray	Silty CLAY, trace Gravel. CL				
5	1				medium	dark gray	Silty CLAY, trace organics. Trace green staining.	10	0		
	2						Trace to little Sand.	12	0		
	3	▽		wet			Silty CLAY, little Sand.	13	0		
10							Total Depth of Boring: 9 ft Below Ground Surface.				
15											
20											

REGISTERED PROFESSIONAL GEOLOGIST
Douglas W. Charlton
No. 4110
STATE OF CALIFORNIA

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Project No.
88-44-359-01

Converse Environmental West

Drawing No.
A-2

LOG OF BORING NO. SB-13

DATE DRILLED: 11-16-89	ELEVATION:	WL TAKEN: n/a	EQUIPMENT: 3 3/4"x 8" Hollow-Stem Auger

DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION	BLOWS/FT.	O.V.M. (ppm)	DRY DENSITY lb/ft3	TESTS
				moist	medium dense	dark gray	Sandy GRAVEL. (sub-base) GP				
				very moist	medium	green	Sandy CLAY, some Cobble, little Rubble. (Fill) Gravelly lens 4". CL		0		
				wet	m dense						
				very moist	medium	black	Silty CLAY, increased Sand, trace Gravel. Slight odor. CL		0		
	1			moist		gray green	Gravelly rounded SAND. Strong odor. SP	40	215		
5				wet		dark gray					
	2	▽		wet	medium dense		Fine to medium SAND. SP	29	142		
							Total Depth of Boring: 7 ft Below Ground Surface.				
10											
15											
20											

REGISTERED PROFESSIONAL GEOLOGIST
Douglas W. Charlton
No. 4110
OF CALIFORNIA

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Project No.
88-44-359-01

Converse Environmental West

Drawing No.
A-3

LOG OF BORING NO. MW-10

DATE DRILLED: 11-16-89	ELEVATION:	WL TAKEN: n/a	EQUIPMENT: 3 3/4"x 8" Hollow-Stem Auger

DEPTH (ft)	SAMPLE	WATER LEVEL	SYMBOL	MOISTURE	CONSISTENCY	COLOR	DESCRIPTION		WELL CONSTRUCTION	BLOWS/FT.	O.V.M. (ppm)	T.P.H. (ppm)
				sl moist	m dense	gray	GRAVEL sub-base. (Fill)	GM				
				moist		yellow brown	Silty SAND. (Fill)	ML				
					medium	green	Sandy CLAY, trace Gravel.	SC			0	
						black	Silty CLAY, trace Gravel. (Fill) Odor.	CL			2	
								SM				
	1			very moist	medium dense	dark gray	Silty SAND, trace Clay.			6	35	
5					medium	gray	Silty CLAY, wet Sandy SP lenses. Green staining. Odor.	CL		11		
				wet	soft		Silty CLAY, trace brown organics.			11	50	
										5		
					soft	black	Silty CLAY, trace organincs. Bay Mud.	CH		7	3	
10										4		
						black mottled gray				4	0	
										4		
										7	0	
15							Total Depth of Boring: 13 ft Below Ground Surface.					
20												

REGISTERED PROFESSIONAL GEOLOGIST
Douglas W. Charlton
No. 4110

SHELL OIL COMPANY
285 Hegenberger Road
Oakland, California

Project No.
88-44-359-01

Converse Environmental West

Drawing No.
A-4

NATIONAL
ENVIRONMENTAL
TESTING, INC.

NET Pacific, Inc.
435 Tesconi Circle
Santa Rosa, CA 95401
Tel: (707) 526-7200
Fax: (707) 526-9623

Robin Breuer
Converse Consultants
55 Hawthorne St, Ste 500
San Francisco, CA 94105

12-06-89
NET Pacific Log No: 8674
Series No: 18.02
Client Ref: Proj#88-44-369-01-11

Subject: Analytical Results for "Shell-285 Heggenberger" Received 11-22-89.

Dear Ms. Breuer:

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Jules Skamarack
Laboratory Manager

/ma
Enc: Sample Custody Document

KEY TO ABBREVIATIONS and METHOD REFERENCES

<	:	Less than; When appearing in results column indicates analyte not detected at the value following, which supercedes the listed reporting limit.
mean	:	Average; sum of measurements divided by number of measurements.
mg/Kg (ppm)	:	Concentration in units of milligrams of analyte per kilogram of sample, wet-weight basis (parts per million).
mg/L	:	Concentration in units of milligrams of analyte per liter of sample.
mL/L/hr	:	Milliliters per liter per hour.
MPN/100 mL	:	Most probable number of bacteria per one hundred milliliters of sample.
N/A	:	Not applicable.
NA	:	Not analyzed.
ND	:	Not detected; the analyte concentration is less than applicable listed reporting limit.
NTU	:	Nephelometric turbidity units.
RPD	:	Relative percent difference, 100 [Value 1 - Value 2]/mean value.
SNA	:	Standard not available.
ug/Kg (ppb)	:	Concentration in units of micrograms of analyte per kilogram of sample, wet-weight basis (parts per billion).
ug/L	:	Concentration in units of micrograms of analyte per liter of sample.
umhos/cm	:	Micromhos per centimeter.

Method References

Methods 601 through 625: see "Guidelines Establishing Test Procedures for the Analysis of Pollutants" U.S. EPA, 40 CFR, Part 136, rev. 1988.

Methods 1000 through 9999: see "Test Methods for Evaluating Solid Waste", U.S. EPA SW-846, 3rd edition, 1986.

* Reporting Limits are a function of the dilution factor for any given sample. To obtain the actual reporting limits for this sample, multiply the stated reporting limits by the dilution factor.

Converse Consultants

AFE 988770
EXP 5441
8674

CHAIN OF CUSTODY RECORD

Project No.	Project Name
1844-369-01-11	285 Reggenberger

Samplers: (signature) D. Cory

Station No.	Date	Time	Comp.	Grab	Station Location	Number of Containers	TPH G	TPH D	BTXE	Pb			Remarks
MW10	11/16/89				Drive 1 @ 5	1	X	X	X	X			std TAT
SB12	"				Drive 1 @ 3	1	X	X	X	X			
"	"				2 @ 7	1	X	X	X	X			
SB12	"				3 @ 9	1							hold, saturated
SB13	"				Drive 1 @ 5	1	X	X	X	X			
SB13	"				2 @ 7	1							hold, saturated

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
D. Cory	11/20/89 11:21 12:30	Jeff Winkler	Jeff Winkler		
Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
Relinquished by Courier: (signature)	Date/Time	Received by Mobile Lab: (signature)	Relinquished by Mobile Lab: (signature)	Date/Time	Received by Courier: (signature)
Method of Shipment		Shipped by: (signature)	Courier from Airport: (signature) (VIA NCS)	Received for Laboratory: (signature)	Date/Time 11/22/89 0700

NATIONAL ENVIRONMENTAL TESTING, INC.

NET Pacific, Inc.
435 Tesconi Circle
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Robin Breuer
Converse Consultants
55 Hawthorne St, Ste 500
San Francisco, CA 94105

12-26-89
NET Pacific Log No: 8996
Series No: 18.02
Client Ref: Proj# 88-44-359-01

Subject: Analytical Results for "Shell-285 Hagenberger, Oakland" Received 12-15-89.

Dear Ms. Breuer:

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Jules Skamarack
Laboratory Manager

/ma
Enc: Sample Custody Document

KEY TO ABBREVIATIONS and METHOD REFERENCES

<	:	Less than; When appearing in results column indicates analyte not detected at the value following, which supercedes the listed reporting limit.
mean	:	Average; sum of measurements divided by number of measurements.
mg/Kg (ppm)	:	Concentration in units of milligrams of analyte per kilogram of sample, wet-weight basis (parts per million).
mg/L	:	Concentration in units of milligrams of analyte per liter of sample.
mL/L/hr	:	Milliliters per liter per hour.
MPN/100 mL	:	Most probable number of bacteria per one hundred milliliters of sample.
N/A	:	Not applicable.
NA	:	Not analyzed.
ND	:	Not detected; the analyte concentration is less than applicable listed reporting limit.
NTU	:	Nephelometric turbidity units.
RPD	:	Relative percent difference, 100 [Value 1 - Value 2]/mean value.
SNA	:	Standard not available.
ug/Kg (ppb)	:	Concentration in units of micrograms of analyte per kilogram of sample, wet-weight basis (parts per billion).
ug/L	:	Concentration in units of micrograms of analyte per liter of sample.
umhos/cm	:	Micromhos per centimeter.

Method References

Methods 601 through 625: see "Guidelines Establishing Test Procedures for the Analysis of Pollutants" U.S. EPA, 40 CFR, Part 136, rev. 1988.

Methods 1000 through 9999: see "Test Methods for Evaluating Solid Waste", U.S. EPA SW-846, 3rd edition, 1986.

* Reporting Limits are a function of the dilution factor for any given sample. To obtain the actual reporting limits for this sample, multiply the stated reporting limits by the dilution factor.

Parameter	Reporting Limit (ppm)	Descriptor, Lab No. and Results MW6 12-14-89 1600 (-42171)	MW2 12-14-89 1630 (-42172)
PETROLEUM HYDROCARBONS		--	--
VOLATILE (WATER)		--	--
DILUTION FACTOR *		10	5
DATE ANALYZED		12-22-89	12-22-89
METHOD GC FID/5030		--	--
as Gasoline	0.05	16	5.0
METHOD 602		--	--
Benzene	0.0005	0.37	0.052
Ethylbenzene	0.0005	0.20	0.0041
Toluene	0.0005	0.092	0.013
Xylenes, total	0.0005	0.18	0.29
PETROLEUM HYDROCARBONS		--	--
EXTRACTABLE (WATER)		--	--
DILUTION FACTOR *		1	1
DATE EXTRACTED		12-19-89	12-19-89
DATE ANALYZED		12-20-89	12-20-89
METHOD GC FID/3510		---	--
as Diesel	0.05	5.5	2.6
as Motor Oil	0.05	ND	ND

Converse Consultants

WIC # 204-5508-5504
AFE # 986696
Exp Code 5941
PM: Robin Brewer

CHAIN OF CUSTODY RECORD

Project No.	Project Name
88-94-359-01	285 Hagenberger, Oakland

Samplers: (signature) Gerald P Mansell

8996

Station No.	Date	Time	Comp.	Grab	Station Location	Number of Containers (8 VOAs, 5 Liters, 13 Total)	BTEX	TPH-gas	TPH-diesel				Remarks
MW 6	12/14/89	4:00		V	285 Hagenberger	7	X	X	X				STAT. 4 VOAs and 3 liters
MW 2	12/14	9:30		V	285 Hagenberger	6	X	X	X				STAT 4 VOAs and only 2 liters

Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
Gerald P Mansell	12/15/89 16:25	Jeff Winkler	Jeff Winkler		
Relinquished by: (signature)	Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
Relinquished by Courier: (signature)	Date/Time	Received by Mobile Lab: (signature)	Relinquished by Mobile Lab: (signature)	Date/Time	Received by Courier: (signature)
Method of Shipment		Shipped by: (signature)	Courier from Airport: (signature) (VIA NCS)	Received for Laboratory: (signature)	Date/Time 12/15/89 2230

NET NATIONAL ENVIRONMENTAL TESTING, INC.

NET Pacific, Inc.
435 Tesconi Circle
Santa Rosa, CA 95401
Tel: (707) 526-7200
Fax: (707) 526-9623

Formerly: ANATEC Labs, Inc.

Fax No:
Time Faxed:

FAX TRANMISSION SHEET

DATE: 12/27/89 TIME: 4:50 pm

TO: Robin Breuer

COMPANY: Conmar

SENDER: Gary Anderson

YOU SHOULD RECEIVE ____ PAGES - INCLUDING THIS COVER SHEET.

IF YOU DO NOT RECEIVE ALL PAGES, PLEASE NOTIFY THE SENDER IMMEDIATELY @ (707) 526-7200

OUR FAX MACHINE IS: GROUP 2 AND 3

OUR FAX NUMBER IS: (707) 526-9623

COMMENTS:

Re: 285 Hagemburger

Results follow - Watch It!

ppb → ppm conversions for BTEX not made.

L.....T.....T.....T.....T.....T.....T.....R

Robin Breuer
Converse Consultants
55 Hawthorne St, Ste 500
San Francisco, CA 94105

Date: 12-27-89
NET Client Acct. No: 18.02
NET Pacific Log No: 9006
Received: 12-19-89 0700

Client Reference Information

SHELL, 285 Hagenberger, Oakland

Dear Robin Breuer

Sample analysis in support of the project referenced above has been completed and results are presented on following pages. Please refer to the enclosed "Key to Abbreviations" for definition of terms. Should you have questions regarding procedures or results, please feel welcome to contact Client Services.

Approved by:

Jules Skamarack
Laboratory Manager

Enclosure(s)

Preliminary Report

Client: 18.02
NET Log No: 9006

Date: 12-27-89

SAMPLE DESCRIPTION: MW10 12-15-89 1645
LAB Job No: (-42302)

Parameter	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS		--	
VOLATILE (WATER)		--	
DILUTION FACTOR *		1	
DATE ANALYZED		12-22-89	
METHOD GC FID/5030		--	
as Gasoline	0.05	ND	mg/L
METHOD 602		--	
Benzene	0.5	1.5	ug/L
Ethylbenzene	0.5	ND	ug/L
Toluene	0.5	ND	ug/L
Xylenes, total	0.5	ND	ug/L
PETROLEUM HYDROCARBONS		--	
EXTRACTABLE (WATER)		--	
DILUTION FACTOR *		1	
DATE EXTRACTED		12-19-89	
DATE ANALYZED		12-22-89	
METHOD GC FID/3510		--	
as Diesel	0.05	3.1	mg/L
as Motor Oil	0.05	ND	mg/L

Client: 18.02
NET Log No: 9006

Date: 12-27-89

SAMPLE DESCRIPTION: MW 5 12-15-89 1515
LAB Job No: (-42303)

Parameter	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS		--	
VOLATILE (WATER)		--	
DILUTION FACTOR *		1	
DATE ANALYZED		12-22-89	
METHOD GC FID/5030		--	
as Gasoline	0.05	1.0	mg/L
METHOD 602		--	
Benzene	0.5	22	ug/L
Ethylbenzene	0.5	18	ug/L
Toluene	0.5	35	ug/L
Xylenes, total	0.5	44	ug/L
PETROLEUM HYDROCARBONS		--	
EXTRACTABLE (WATER)		--	
DILUTION FACTOR *		1	
DATE EXTRACTED		12-19-89	
DATE ANALYZED		12-22-89	
METHOD GC FID/3510		--	
as Diesel	0.05	0.71	mg/L
as Motor Oil	0.05	ND	mg/L

Client: 18.02
NET Log No: 9006

Date: 12-27-89

Page: 4

SAMPLE DESCRIPTION: MW 1 12-15-89 1335
LAB Job No: (-42304)

Parameter	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS		--	
VOLATILE (WATER)		--	
DILUTION FACTOR *		10	
DATE ANALYZED		12-22-89	
METHOD GC FID/5030		--	
as Gasoline	0.05	30	mg/L
METHOD 602		--	
Benzene	0.5	ND	ug/L
Ethylbenzene	0.5	ND	ug/L
Toluene	0.5	ND	ug/L
Xylenes, total	0.5	ND	ug/L
PETROLEUM HYDROCARBONS		--	
EXTRACTABLE (WATER)		--	
DILUTION FACTOR *		1	
DATE EXTRACTED		12-19-89	
DATE ANALYZED		12-22-89	
METHOD GC FID/3510		--	
as Diesel	0.05	11	mg/L
as Motor Oil	0.05	ND	mg/L

Client: 18.02
NET Log No: 9006

Date: 12-27-89

SAMPLE DESCRIPTION: MW 4 12-15-89 1700
LAB Job No: (-42306)

Parameter	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS		--	
VOLATILE (WATER)		--	
DILUTION FACTOR *		1	
DATE ANALYZED		12-26-89	
METHOD GC FID/5030		--	
as Gasoline	0.05	ND	mg/L
METHOD 602		--	
Benzene	0.5	ND	ug/L
Ethylbenzene	0.5	ND	ug/L
Toluene	0.5	ND	ug/L
Xylenes, total	0.5	ND	ug/L
PETROLEUM HYDROCARBONS		--	
EXTRACTABLE (WATER)		--	
DILUTION FACTOR *		1	
DATE EXTRACTED		12-19-89	
DATE ANALYZED		12-22-89	
METHOD GC FID/3510		--	
as Diesel	0.05	0.09	mg/L
as Motor Oil	0.05	ND	mg/L

Client: 18.02
NET Log No: 9006

Date: 12-27-89

Page: 7

SAMPLE DESCRIPTION: MW 7 12-15-89 1452
LAB Job No: (-42307)

Parameter	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS		--	
VOLATILE (WATER)		--	
DILUTION FACTOR *		100	
DATE ANALYZED		12-23-89	
METHOD GC FID/5030		--	
as Gasoline	0.05	100	mg/L
METHOD 602		--	
Benzene	0.5	4,500	ug/L
Ethylbenzene	0.5	1,300	ug/L
Toluene	0.5	5,300	ug/L
Xylenes, total	0.5	5,300	ug/L
PETROLEUM HYDROCARBONS		--	
EXTRACTABLE (WATER)		--	
DILUTION FACTOR *		1	
DATE EXTRACTED		12-19-89	
DATE ANALYZED		12-22-89	
METHOD GC FID/3510		--	
as Diesel	0.05	12	mg/L
as Motor Oil	0.05	ND	mg/L

Client: 18.02
NET Log No: 9006

Date: 12-27-89

Page: 8

SAMPLE DESCRIPTION: MW 9 12-15-89 1425
LAB Job No: (-42308)

Parameter	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS		--	
VOLATILE (WATER)		--	
DILUTION FACTOR *		100	
DATE ANALYZED		12-26-89	
METHOD GC FID/5030		--	
as Gasoline	0.05	88	mg/L
METHOD 602		--	
Benzene	0.5	4,300	ug/L
Ethylbenzene	0.5	140	ug/L
Toluene	0.5	5,400	ug/L
Xylenes, total	0.5	5,600	ug/L
PETROLEUM HYDROCARBONS		--	
EXTRACTABLE (WATER)		--	
DILUTION FACTOR *		1	
DATE EXTRACTED		12-19-89	
DATE ANALYZED		12-22-89	
METHOD GC FID/3510		--	
as Diesel	0.05	9.2	mg/L
as Motor Oil	0.05	ND	mg/L

Client: 18.02
NET Log No: 9006

Date: 12-27-89

Page: 9

SAMPLE DESCRIPTION: MW 8 12-15-89 1720
LAB Job No: (-42309)

Parameter	Reporting Limit	Results	Units
PETROLEUM HYDROCARBONS		--	
VOLATILE (WATER)		--	
DILUTION FACTOR *		1	
DATE ANALYZED		12-22-89	
METHOD GC FID/5030		--	
as Gasoline	0.05	ND	mg/L
METHOD 602		--	
Benzene	0.5	ND	ug/L
Ethylbenzene	0.5	ND	ug/L
Toluene	0.5	ND	ug/L
Xylenes, total	0.5	ND	ug/L
PETROLEUM HYDROCARBONS		--	
EXTRACTABLE (WATER)		--	
DILUTION FACTOR *		25	
DATE EXTRACTED		12-19-89	
DATE ANALYZED		12-22-89	
METHOD GC FID/3510		--	
as Diesel	0.05	ND	mg/L
as Motor Oil	0.05	ND	mg/L

APPENDIX A

Hollow-Stem Auger Drilling and Soil Sampling

HOLLOW-STEM AUGER DRILLING AND SOIL SAMPLING

Borings shall be drilled with a hollow-stem auger and sampled with a modified California-type split-spoon sampler. Soil samples shall be of sufficient volume to perform the analyses which may be required, including replicate analyses. Aside from deionized water or distilled water, no fluids will be used in drilling.

Undisturbed (intact) soil samples shall be recovered from soil borings without introducing liquids into the borings. Soil samples as core or cuttings shall be taken continuously from ground surface to termination depth (TD), or through the aquifer zone of interest for lithologic logging.

Soils from all borings shall be described in detail using the Unified Soil Classification System and shall be logged by a professional geologist, civil engineer, or engineering geologist who is registered or certified by the State of California and who is experienced in the use of the Unified Soil Classification System. A technician trained and experienced in the use of the Unified Soil Classification System who is working under the direct supervision of one of the aforementioned professionals shall be qualified to log borings, provided the aforementioned professional reviews the logs and assumes responsibility for the accuracy and completeness of the logs.

All wet zones above the free water zone shall be noted and accurately logged.

If evidence of contamination is detected by sight, smell, or other field analytical methods, drilling shall be halted until the responsible professional determines if drilling deeper is advisable.

All drilling tools shall be thoroughly decontaminated with trisodium phosphate (TSP) or steam cleaner immediately before starting each boring.

Soil samples shall be taken in decontaminated brass sampling tubes in the split-spoon. The brass sleeves will be cut apart using a clean knife. The ends of the tubes will be covered tightly with teflon wrap, capped with tight-fitting plastic caps, wrapped with plastic electricians' tape, and properly labeled.

APPENDIX B

Standards for Backfilling Borings and Sealing Wells

STANDARDS FOR BACKFILLING BORINGS AND SEALING WELLS

INTRODUCTION

As standard practice, all borings and observation and monitoring wells shall be backfilled or sealed with "relatively impervious" grout to prevent surface contamination or cross-contamination between aquifers. Borings will be sealed from termination depth to the surface and observation and monitoring wells shall be backfilled and sealed above the water table. This practice will reduce liability if it is determined and proven that groundwater contamination occurred along a "vertical pathway" in an improperly sealed or filled boring or well.

In hazardous and potentially hazardous waste sites where deep borings or wells are installed, appropriate geologic information will be reviewed to determine if multiple aquifer system(s) exist(s). If such system(s) exist(s), drilling and sealing techniques will be used to prevent contamination of a lower aquifer by upper, potentially contaminated aquifer(s). Grout seals will be installed according to the following techniques through all thicknesses of impermeable zones which separate aquifer.

Borehole grouting shall consist of backfilling with bentonite pellets, cement/bentonite grout, or a thick bentonite slurry, depending upon the depth of the boring, depth to ground water, and type of drilling equipment used. Details of currently acceptable sealing methods are outlined below.

GENERAL SPECIFICATIONS

- All grouting and well construction and sealing and abandonment of borings shall be consistent with local ordinances.

- Cement/bentonite grout used to seal wells will be of a hard consistency that can resist traffic loads, but not installed to create a "concrete pile" that will obstruct further earthwork. Bentonite slurry, which does not support surface loads, will not be used for sealing wells.

GROUTING/SEALING TECHNIQUES

Dry Holes and Borings Containing Less Than 5 Feet of Water

Option 1: Backfill boring with bentonite pellets or granules in about 2-foot lifts. Add a gallon of water to hole after each lift.

Option 2: Pour in a mixture of cement/bentonite group (9 parts cement, 1 part bentonite powder plus water as needed to make mixture consistency of pancake batter).

APPENDIX C

Groundwater Monitoring Well Construction

GROUNDWATER MONITORING WELL CONSTRUCTON

BOREHOLE DESIGN

Casing Diameter: The minimum diameter of well casings shall be 2 inches (nominal). Four-inch diameter well casings shall be preferred.

Borehole Diameter: The diameter of the borehole shall be a minimum of 4 inches and a maximum of 12 inches greater than the diameter of the well casing.

Shallow (Unconfined) Zone Wells: When groundwater is encountered or known to be within 45 feet of the ground surface, the borehole will be advanced through the aquifer to a competent aquitard. A competent aquitard is defined as being greater than 5 feet thick. To test the competency of the aquitard, the borehole will be drilled five feet into it. Once confirmed, the excess borehole shall be sealed with bentonite, concrete, or cement. The screened interval will begin 5 feet above the saturated zone and extend the full thickness of the aquifer or 20 feet into the saturated zone, whichever is reached first. The well screen will not extend into the aquitard, nor shall the screened interval exceed 25 feet in length.

If an aquitard is found to be less than 5 feet thick, it is assumed to represent a local lens. If the aquifer is greater than 20 feet thick and no competent aquitard is present, the well screen will be placed in the interval of 5 feet above and not more than 20 feet below the top of the saturated zone.

Deep (Confined) Zone Wells: Any monitoring well to be screened below the upper aquifer shall be installed as double-cased well. A steel conductor casing shall be placed through the upper water-bearing zone to prevent aquifer cross-contamination.

The conductor casing shall be installed in the following manner: a large diameter borehole (typically 18 inches) shall be drilled until it is determined that the first competent aquitard has been reached. A low carbon steel conductor casing shall be placed in the borehole to the depth drilled. Centralizers shall be used to center the casing in the borehole. The annular space between the conductor casing and the formation shall be cement-grouted from bottom to top by tremie pipe method. The grout shall be allowed to set for a minimum of 72 hours.

Drilling may continue inside the conductor casing, with a drill bit of smaller diameter than the conductor casing. If additional known aquifers are to be fully penetrated, the procedure can be repeated with successively small diameter conductor casings.

The bottom of the well screen in a confined aquifer shall be determined by presence or lack of a competent (5 foot) aquitard as described above. The screened interval in a confined zone shall extend across the entire saturated zone of the aquifer or to a length of 20 feet, which ever is less. The screened zone and filter pack shall not cross connect to another aquifer.

CONSTRUCTION MATERIALS

Casing Materials: Well casing shall be constructed of materials that have the least potential for affecting the quality of the sample, have sufficient strength, and resist rapid deterioration from corrosion. The most suitable material for a particular installation will depend upon the parameters to be monitored. Acceptable materials include PVC, stainless steel, or low carbon steel.

Casing Joints: Joints shall be connected by flush threaded couplers. Organic bonding compounds and solvents will not be used on joints.

Well Screen Slots: Well screen shall be factory slotted. The size of the slots shall be selected to allow sufficient groundwater flow to the well for sampling, minimize the passage of formation materials into the well, and ensure sufficient structural integrity to prevent the collapse of the intake structure.

Casing Bottom Plug: The bottom of the well casing will be permanently plugged, either by flush threaded screw-on or friction cap. Friction caps shall be secured with stainless steel set screws. No organic solvents or cements will be applied.

Filter Pack Material: Filter pack envelope materials shall be durable, waterworn, and washed clean of silt, dirt, and foreign matter. Sand size particles shall be screened silica sand. Particles shall be well rounded and graded to an appropriate size for retention of aquifer materials.

Bentonite Seal Material: Bentonite shall be pure and free of additives that may effect groundwater quality. Bentonite shall be hydrated with clean water.

Grout Seal Material: Cement grout shall consist of a proper mixture of Type I/II Portland cement, hydrated with clean water. Up to 3% bentonite may be added to the mixture to control shrinkage.

CONSTRUCTION PROCEDURES

Decontamination: All downhole tools, well casings, casing fittings, screens, and all other components that are installed in the well shall be thoroughly cleaned immediately before starting each well installation. When available, each component shall be cleaned with a high temperature, high pressure washer for a minimum of 5 minutes. When a washer is not available, components shall be cleaned with clean water and detergent or tri-sodium phosphate, rinsed in clean water, then rinsed in distilled water.

Soil and water sampling equipment and materials used to construct the wells shall not donate to, capture, mask, nor alter the chemical composition of the soils and ground water.

Drilling Methods: Acceptable drilling methods include solid and hollow stem auger, percussion, direct circulation (mud) rotary, and air circulation direct, and reverse rotary. The best alternative is that which minimizes the introduction of foreign materials or fluids.

If drilling mud is employed, drilling fluid additives shall be limited to inorganic and non-hazardous compounds. Compressed air introduced to the borehole shall be adequately filtered to remove oil and particulates.

Soil Sampling Methods: Soil sampling shall be recovered according to protocols described in CEW Standard Operating Procedure: Soil Sampling of Boreholes.

Casing Installation: The casing will be set under tension to ensure straightness. Centralizers should be used where necessary to avoid unnecessary curvature or stress to the casing.

Sand Pack Installation: The sand pack will be installed so as to avoid bridging and the creation of void spaces. The tremie pipe method will be used where installatoin conditions or local regulations require. Drilling mud, when used, must be thinned prior to pack placement. The sand pack shall cover the entire screened interval and rise a minimum of two feet above the highest perforation.

Bentonite Seal Placement: The bentonite seal will be placed by a method that prevents bridging. Bentonite pellets can be placed by free fall if proper sinking through annular water can be assured. Bentonite slurry will be placed by the tremie pipe method from the bottom upward. The bentonite seal should be not less than 1 foot in thickness above the sand pack.

Grout Seal Placement: The cement grout mixture shall be hydrated with clean water and thoroughly mixed prior to placement. If substantial groundwater exists in the borehole, the grout shall be placed by tremie pipe method from the bottom upward. In a dry borehole, the grout may be surface poured. Grout will be placed in one continuous lift and will extend to the surface or to the well vault if the wellhead is completed below grade. A minimum of 5 feet of grout seal will be installed, unless impractical due to the shallow nature of the well.

Surface Completion: The wellhead will be protected from fluid entry, accidental damage, unauthorized access, and vandalism. A watertight cap shall be installed on the top of the well casing. Access to the casing should be controlled by a keyed lock.

Wellheads completed below grade will be completed in a concrete and/or steel vault, installed to drain surface runoff away from the vault opening.

Well Identification: Each well will be identified by well number, owner, and type of installation. Construction data, including depth, hole and casing diameter and screened interval will be noted.

APPENDIX D

Well Development

WELL DEVELOPMENT

INTRODUCTION

Newly installed groundwater monitoring wells will be developed to restore natural hydraulic conductivity of the formation, remove sediments from the well casing and filter pack, stabilize the filter pack and aquifer material, and ensure turbidity-free groundwater samples.

Wells may be developed by bailing, mechanical pumping, air lift, pumping, surging, swabbing, or an effective combination of methods. Wells will be developed until the well is free of sand, silt, and turbidity.

In some cases where low permeability formations are involved or the drilling mud used fails to respond to cleanup, initial development pumping may immediately dewater the well casing and thereby inhibit development. When this occurs, clean, potable grade water may be introduced into the well, followed by surging of the introduced waters with a surge block. This operation will be followed by pumping. The procedure may be repeated as required to establish full development.

METHODOLOGY

Seal Stabilization: Cement and bentonite annular seals shall set and cure not less than 24 hours prior to well development.

Decontamination: All well development tools and equipment shall be thoroughly cleaned immediately before starting each well installation. When available, each component shall be cleaned with a high temperature, high pressure washer for a minimum of 5 minutes. When a washer is not available, components shall be cleaned with clean water and detergent or tri-sodium phosphate, rinsed with clean water, then rinsed with distilled water.

Development equipment shall not donate to, capture, mask, nor alter the chemical composition of the soils and ground water.

Introduction of Water: Initial development of wells in low permeability formations may de-water the casing and filter pack. When this occurs, clean, potable water can be introduced in to the well to enhance development.

Bailing: Development will begin by bailing to remove heavy sediments from the well casing. Care shall be taken to not damage the well bottom cap during lowering of the bailer.

Surging: Care shall be exercised when using surge block to avoid damaging the well screen and casing. When surging wells screened in coarse (sandy/gravelly) aquifers, the rate of surge block lifting shall be slow and constant. When surging wells screened in fine

(silty) aquifers, more vigorous lifting may be require. Between surging episodes, wells will be bailed to remove accumulated sediments.

Pumping: Development pumping rates shall be less than the recharge rate of the well in order to avoid de-watering.

Discharged Water Containment and Disposal: All water and sediment generated by well development shall be collected in 55-gallon steel drums. Development water will be temporarily contained onsite, pending sampling and laboratory analysis. All development water will be transported offsite by a licensed transporter to a licensed hazardous waste disposal or treatment facility. No development water shall be released to the environment.

MEASUREMENTS

Discharged Water Parameters: During development, discharged water shall be measured for the following parameters:

Parameter	Units of Measurement
pH	Units
Electrical Conductivity	umhos
Temperature	Degrees F or C
Turbidity	Nephelometric Turbidity Units (NTU's)
Sediment Production	_____
Depth to Water in Casing	Feet/Tenths
Volume of Water Discharged	Gallons

Sediment Production: Sediment production from the well shall be measured using Imhoff Cone.

Turbidity: The development water turbidity shall be measured using a nephelometer. Turbidity at the conclusion of development should be less than 5 NTU's.

Measurement Frequency: Parameters shall be measured not less than every 3 pre-development casing volumes of water discharged.

Samples to be shipped will be sealed locked so evidence of tampering may be readily detected.

LABORATORY CUSTODY PROCEDURES

Chain-of-custody procedures will be followed in the laboratory from the time of sample receipt to the time the sample is discarded.

The sample control officer (SCO) will be the designated custodian, and an alternate is designated to act as custodian in the custodian's absence. All incoming samples are received by the SCO, who shall indicate receipt by signing the accompanying custody forms and who shall retain the signed forms as permanent records.

The SCO will maintain a permanent log book to record, for each sample, the person delivering the sample, the person receiving the sample, date and time received, source of sample, sample identification or log number, how transmitted to the laboratory, and condition received (sealed, unsealed, broken container, or other pertinent remarks). A standardized format will be established for log book entries.

A clean, dry, isolated room, building, and/or refrigerated space that can be securely locked from the outside, will be designated as a "sample storage security area."

The SCO will ensure that heat-sensitive, light-sensitive samples, radioactive, or other sample materials having unusual physical characteristics, or requiring special handling, are properly stored and maintained prior to analysis.

Only the custodian will distribute samples to the section leaders who are responsible for the laboratory performing the analysis.

The laboratory area will be maintained as a secured area, restricted to authorized personnel only.

Laboratory personnel will be responsible for the care and custody of the sample once it is received by them. These personnel shall be prepared to testify that the sample was in their possession and view, or secured in the laboratory at all times, from the moment it was received from the SCO, until the time that the analyses are completed.

Once the sample analyses are completed, the unused portion of the sample, together with all identifying labels, will be returned to the SCO. The returned tagged sample will be retained in the custody room until permission to destroy the sample is received by the SCO.

Samples will be destroyed only upon the order of the Laboratory Director, in consultation with previously-designated Project Manager, and/or client, or when it is certain that the information is no longer required or the samples have deteriorated. The same procedure will apply to tags and laboratory records.

-Lead -Inorganic (soluble) Lead less than 5 ppm (STLC)
or less than 100 ppm (TTLC)
-Organic Lead less than 13 ppm (TTLC)

-Ignitable - If TPH < 1000 ppm do not conduct test

- Hazardous if any are true:

-TPH greater than 1000 ppm

-Lead -Inorganic (soluble) Lead greater than 5 ppm (STLC)
or greater than 1000 ppm (TTLC)
-Organic Lead greater than 13 PPM (TTLC)

-Ignitable -If TPH >1000 ppm, then conduct Bunsen Burner Test
-If soil burns vigorously and persistently, soils are RCRA D001

3. Responsibility for Disposal:

- Clean: Consultant/Contractor
- Non-Hazardous: Consultant/Contractor or Shell Hazardous Waste Coordinator
- Hazardous: Shell Hazardous Waste Coordinator

4. Types of Drums: DOT-17H for a solid, solidified, or sludge material.

5. Disposal Facility:

- Clean: Any local landfill
- Non-Hazardous: Class III landfill. If a Class III landfill will not accept, contact Shell Hazardous Waste Coordinator for assistance
- Hazardous: Class I landfill arranged by Shell Hazardous Waste Coordinator

WATER:

1. Test Requirements and Methods: Per Shell's site-specific test requirements.

- TPH: EPA Method 8015
- BTEX: EPA Method 602

2. Classification:

- Clean Water: TPH and BTEX non-detectable