CONVERSE ENVIRONMENTAL WEST

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June 29, 1990
88-44-361-20-708

Ms. Dyan Whyte
Water Resources Control Engineer
Regional Water Quality Control Board
1800 Harrison, Room 700
Oakland, California 94612

Subject: Transmittal of Quarter 2, 1990 Progress Report
Shell Retail Service Station
500 40th Street
Oakland, California 94609

Dear Ms. Whyte:

Attached is a progress report describing the activities and findings for the Shell Oil Company site (Shell) located at 500 40th Street in Oakland, California, during Q2/90.

Please call if you have any questions.

Very truly yours,

Converse Environmental West

Bojan Gustincic
Project Geologist

BG:gts

cc: Ms. Diane Lundquist - Shell Oil Company (w/ encl.)
Mr. Rafat Shahid - Alameda County Health Department (w/ encl.)
Mr. Douglas Charlton - Converse Environmental West (w/o encl.)

500 40TH ST. 2\WHYTE.708

REPORT OF ACTIVITIES
QUARTER 2, 1990

SHELL OIL COMPANY FACILITY
500 40th STREET
OAKLAND, CALIFORNIA

Prepared for:

Shell Oil Company
1390 Willow Pass Road, Suite 900
Concord, California 94520

Prepared by:

Converse Environmental West
55 Hawthorne, Suite 500
San Francisco, California 94105

June 29, 1990

CEW Project No. 88-44-361-20

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SECTION 1

INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

This report presents the results of investigative activities conducted by Converse Environmental West (CEW) during Quarter 2, 1990 (Q2/90) for the former Shell Oil Company (Shell) station (site) located at 500 40th Street in Oakland, California (Drawing 1). This report is prepared to fulfill the quarterly reporting requirements (June 29, 1990) as specified in the Work Plan prepared by CEW (April, 1989) for achievement of environmental closure of the site. The Work Plan is on file with the regulatory agencies of jurisdiction.

The site is located on the northwest corner of 40th Street and Telegraph Avenue in Oakland, California (Drawing 2). The site location and setting are presented in Appendix A. The site was formerly operated as a retail motor vehicle fuel sales and automobile repair station. Presently, it is occupied by several non-industrial retail sale and service business. The site is approximately 145 feet long by 130 feet wide.

The purpose of the investigative activities is to provide additional data on subsurface conditions at the site in order to characterize the present lateral and vertical extent, and distribution, of existing petroleum hydrocarbon contamination resulting from the operation of underground automobile fuel storage tanks at the site, and to assess the feasibility of applicable remedial technologies.

1.2 SCOPE OF ACTIVITIES

The work initiated and completed by CEW during Q2/90 consisted of the following activities:

- Sampling each well and analyzing the groundwater for total petroleum hydrocarbons as gasoline (TPH-g) as diesel (TPH-d) and benzene, toluene, ethylbenzene and xylenes (BTEX).

- Installation of two on-site wells, one monitoring well and one extraction well.

- Evaluating the findings from the field activities and preparing this Quarterly Report.

The installation of three offsite groundwater monitoring wells has been delayed due to the recent changes in permitting requirements by the City of Oakland for groundwater monitoring well installation. The proposed onsite well installation was postponed because of delay in receiving the Right-of-Entry agreement from the property owners of 518 40th Street. The agreement was received on March 22, 1990 and the wells were installed on June 27 and 28, 1990.

As a consultant to Shell on this project, CEW is contracted to perform specific activities related to acquiring data and information which will lead to the ultimate successful closure of the facility under investigation. CEW's primary obligation is to collect information within proper standard of care and practice, and in accordance with protocols which have been created by CEW and which are on file with the regulatory agencies of jurisdiction. From time to time, because of site-specific conditions or limitations, CEW may find it necessary to deviate from these protocols. Under these conditions, CEW will describe in appropriate reports the rationale and necessities for the deviations which occurred, along with a statement of the possible impact these deviations may have on the database generated.

In compilation of its findings, CEW will follow the scientific method and develop multiple working hypotheses which explain site conditions and findings. CEW will not report and justify these multiple working hypotheses to the regulatory agencies for two principal reasons:

(1) The numerous assumptions and limitations that are part of the process would require substantial discussion and justification, and

(2) The multiple working hypothesis process is iterative to the time of closure, at which point a final, best hypothesis will be provided and fully explained to the regulatory agencies in closure documentation.

SECTION 2

WORK COMPLETED THIS QUARTER

Work initiated and completed during Q2/90 followed the task descriptions of the CEW Work Plan (April, 1989) and the CEW protocols on file with the regulatory agencies of jurisdiction. The site activity summary is presented in Table 1.

2.1.2 GROUNDWATER SAMPLING AND ANALYSES

Following CEW QA/QC protocols (Appendix E), groundwater samples were collected on May 31 and June 1, 1990 from 4 onsite and 3 offsite wells, and were submitted to NET Pacific, Inc., a California-certified laboratory located in Santa Rosa, California. Following the recommended analytical methods listed in Table 2, the samples were analyzed for TPH-g, TPH-d, and BTEX. Analytical data for the groundwater samples collected from the monitoring wells are summarized in Table 5. Analytical laboratory reports and chain-of-custody forms from this quarterly round of monitoring are provided in Appendix C.

2.2 FIELD GROUNDWATER MONITORING

During Q2/90, all wells were physically monitored for depth-to-water and observed for floating product and its thickness and odor, if any. A summary of groundwater monitoring information is presented in Table 4.

2.3 Groundwater Well Installation

An onsite groundwater monitoring well (MW-8) and 6-inch diameter extraction well (EW-1) were installed on June 27 and 28, 1990. The location of the wells are shown on Drawing 2. The wells will be completed to a total depth of approximately 30 feet below ground surface. Details of the wells construction and analytical results will be presented in the progress report for Quarter 3, 1990.

SECTION 3

FINDINGS AND DISCUSSION

3.1 SOIL

Available lithologic information indicate that the soil beneath the site and its vicinity consists of silty clay with local laterally discontinuous layers of silty gravel to the depth of approximately 23 feet below ground surface. The summary of soil analytical results is presented in Table 3.

3.2 GROUNDWATER

3.2.1 Physical Parameters

During Q2 onsite wells MW-2, MW-3, MW-4, MW-5, and offsite wells OMW-6, OMW-9 and OMW-10 were monitored for depth-to-water and presence of floating product. No floating product was detected in any of the wells. Petroleum odor was detected in one onsite (MW-2) and all three offsite wells (OMW-6, OMW-9, and MW-10).

3.2.2 Elevation and Gradient

Groundwater level measurements taken during Q2/90 indicate an upward trend in the groundwater elevation, as compared to Q1/90. The average increase is 0.07 feet. The onsite wells indicated an increase in groundwater surface elevation while the offsite wells indicate a decrease in water surface elevation. The trend is probably a result of the increased seasonal recharge due to rainfall. The groundwater gradient is non-linear with an apparent change in direction from southeast to southwest. The potentiometric surface is presented on Drawing 3. The summary of groundwater monitoring information is presented in Table 4.

3.2.3 Results of Chemical Analyses

Groundwater analytical results made available during Q2/90 indicate no significant changes in the onsite groundwater quality (Table 5). Onsite upgradient monitoring wells MW-4 and MW-5 contained no detectable chemical concentrations. Groundwater analytical results collected during Q2/90 have further confirmed the upgradient northeastern contaminant plume boundary, established in Q4/89.

In the offsite area, all monitoring wells showed chemical concentrations above detection levels. Water quality data from the offsite wells indicate that the contaminant plume is extended in the downgradient direction to the south. The highest concentration was detected in offsite well OMW-6, located approximately 30 feet offsite, indicating that the contaminant plume extends considerably across 40th Street in the downgradient direction. Based on the offsite soil and groundwater quality data, the possibility of offsite contamination source cannot presently be excluded. The groundwater chemical concentration contours for TPH-g and TPH-d are presented in Drawings 4 and 5.

SECTION 4

NEXT QUARTER ACTIVITIES

4.1 PROPOSED ACTIVITIES

During Q3/90, Shell plans to continue the investigation of the lateral extent of groundwater contamination in the downgradient direction to the west, along 40th Street. Three offsite groundwater monitoring wells will be installed on 40th Street when the permits for encroachment and excavation are granted by the City of Oakland, Department of Public Works. The location of proposed offsite wells is shown on Drawing 6. The monitoring well installation will be conducted in accordance with CEW standard operating procedures and revised Work Plan dated April 7, 1989.

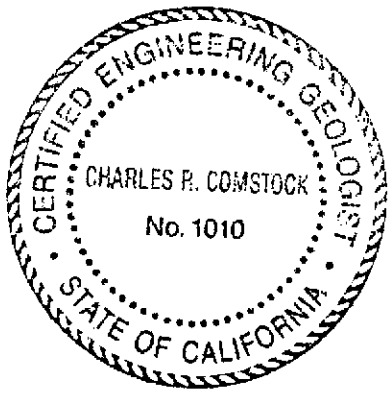
Groundwater from wells installed at the end of Q2/90 and during Q3/90 will be sampled and analyzed according to the quarterly groundwater monitoring schedule. Well construction details and groundwater analytical results will be presented in Quarter 3, 1990 progress report.

CERTIFICATION

This report of activities for the Shell Oil Company facility at 500 40th Street, Oakland, California has been prepared by the staff of **Converse Environmental West** under the professional supervision of the Engineer and/or Geologist whose seal(s) and signature(s) appear hereon.

The findings, recommendations, specifications or professional opinions are presented, within the limits prescribed by the Client, after being prepared in accordance with generally accepted professional engineering and geologic practice. We make no other warranty, either expressed or implied.

Respectfully submitted,



BOJAN GUSTINCIC
Project Geologist

CHARLES R. COMSTOCK
Technical Director

PRIMARY CONTACTS

Shell Oil Company Facility
500 40th Street
Oakland, California

Quarter 2, 1990

Regional Water Quality Control Board Representative:	Ms. Dyan Whyte San Francisco Bay Regional Water Quality Control Board 1800 Harrison Street, Room 700 Oakland, California 94612
LIA Representative:	Mr. Rafat Shahid Alameda County Department of Health Services 80 Swan Way Oakland, California 94621
Shell Engineer:	Ms. Diane Lundquist Shell Oil Company 1390 Willow Pass Road, Suite 900 Concord, California 94520
Converse Project Manager:	Mr. Bojan Gustincic Converse Environmental West 55 Hawthorne, Suite 500 San Francisco, California 94105
Registered Geologist in Charge:	Mr. Charles R. Comstock Converse Environmental West 55 Hawthorne Street, Suite 500 San Francisco, California 94105
Site Owner:	Shell Oil Company

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TABLE 1. ACTIVITY SUMMARY - QUARTER 2, 1990

Shell Oil Company Facility
500 40th Street
Oakland, California

	PERCENT COMPLETE			
	Quarter 2, 1990		Total to Date	
Activity	Onsite	Offsite	Onsite	Offsite
Soil Characterization	0	-----	30	5
Groundwater Characterization (Dissolved Product)	0	-----	25	10
Groundwater Characterization (Floating Product)	NA	NA	NA	NA
Soil Remediation	0	-----	0	-----
Groundwater Remediation (Dissolved Product)	0	-----	0	-----
Groundwater Remediation (Floating Product)	NA	NA	NA	NA

NOTE:

NA Not Applicable

TABLE 2. RECOMMENDED MIMIMUM VERIFICATION ANALYSES FOR UNDERGROUND TANK LEAKS

From: RWQCB Guidelines for Evaluation of Fuel Tank Leaks (Revised May 18, 1989)

HYDROCARBON LEAK	SOIL ANALYSIS				WATER ANALYSIS			
		Prep	Analysis	D.L. (mg/kg)		Prep	Analysis	D.L. (µg/l)
Unknown Fuel	TPH-g	5030	GCFID	1.0	TPH-g	5030	GCFID	50.0
	TPH-d	3550	GCFID	1.0	TPH-d	3510	GCFID	50.0
	BTEX	5030	8020/8240	0.005	BTEX	5030	602/624	0.50
Leaded Gas	TPH-g	5030	GCFID	1.0	TPH-g	5030	GCFID	50.0
	BTEX	5030	8020/8240	0.005	BTEX	5030	602/624	0.50
	TEL*	---	DHS-LUFT		TEL	---	DHS-LUFT	
	EDB*	---	DHS-AB1803		EDB	---	DHS-AB1803	
Unleaded Gas	TPH-g	5030	GCFID	1.0	TPH-g	5030	GCFID	50.0
	BTEX	5030	8020/8240	0.005	BTEX	5030	602/624	0.50
Diesel	TPH-d	3550	GCFID	1.0	TPH-d	3510	GCFID	50.0
	BTEX	5030	8020/8240	0.005	BTEX	5030	602/624	0.50
Waste Oil or Unknown	TPH-g	5030	GCFID	1.0	TPH-g	5030	GCFID	50.0
	TPH-d	3550	GCFID	1.0	TPH-d	3510	GCFID	50.0
	O&G	---	503D&E	50.0	O&G	---	503A&E	5000.0
	BTEX	5030	8020/8240	1.0	BTEX	5030	602/624	0.50
	CL HC	5030	8010/8240	1.0	CL HC	5030	601/624	0.50
	ICAP or AA for soil or water to detect metals: Cadmium, Chromium, Lead, Zinc							
	Method 8270 for soil or water to detect: PCB, PCP, PNA, Creosote							

NOTES:

*	Optional Analysis
RWQCB	Regional Water Quality Control Board
µg/l	microgram per liter
mg/kg	milligram per kilogram
D.L.	Detection Limit
TPH-g	Total Petroleum Hydrocarbons as Gasoline
TPH-d	Total Petroleum Hydrocarbons as Diesel
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
O & G	Oil and Grease
CL HC	Chlorinated Hydrocarbons
TEL	Tetra Ethyl Lead
EDB	Ethylene Dibromide

TABLE 3. Soil Analytical Results (ppm)

Shell Oil Company
500 40th Street
Oakland, California

Boring No.	Sample Depth (ft. bgs)	TPH-g	TPH-d	TPH-mo	Benzene	Toluene	Ethyl-Benzene	Xylene	Total Lead
MW-2	5,10,15	<10	<10	<10	<0.025	0.028	<0.075	<0.075	0.4
MW-2	10	<10	<10	<10	<0.025	<0.025	<0.075	<0.075	1.0
MW-3	5,10,15	28	<10	<10	0.054	0.032	<0.075	0.099	<0.2
MW-3	5,10,15	<10	<10	<10	<0.025	<0.025	<0.075	<0.075	<0.2
MW-4	10	<10	<10	<10	<0.025	<0.025	<0.075	<0.075	<0.2
MW-4	5,10	<10	<10	<10	<0.025	<0.025	<0.075	<0.075	<0.2
MW-5	4	<10	<10	<10	<0.025	<0.025	<0.075	<0.075	12
MW-5	8	<10	<10	27	<0.025	<0.025	<0.075	<0.075	5.3
MW-5	12	<10	<10	18	<0.025	<0.025	<0.075	<0.075	3.3
MW-5	16	<10	<10	<10	<0.025	<0.025	<0.075	<0.075	5.7
OMW-6	5	<10	1	<10	<0.025	<0.025	<0.075	<0.075	4.3
OMW-6	10	18	17	<10	0.028	0.040	0.10	0.45	3.2
OMW-6	15	<10	<1	<10	<0.025	<0.025	<0.075	<0.075	3.6
OMW-9	5	<10	<1.0	<10	<0.025	<0.025	<0.075	<0.075	3.1
OMW-9	10	210	40	<10	0.064	0.46	1.1	6.3	2.6
OMW-9	15	11	<1.0	<10	<0.025	<0.025	<0.075	<0.075	4.3
OMW-9	20	<10	<1.0	<10	<0.025	<0.025	<0.075	<0.075	3.1
OMW-10	5	<1.0	<1.0	<10	<2.5	<2.5	<2.5	<2.5	5.5
OMW-10	10	<1.0	<1.0	<10	20	4.4	8.4	24	4.3
OMW-10	15	<1.0	<1.0	<10	<2.5	<2.5	<2.5	<2.5	6.9

TABLE 4. GROUNDWATER MONITORING INFORMATION

Shell Oil Company Facility
500 40th Street
Oakland, California

Well No.	Date Monitored	Well Elevation (ft msl)	Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Petroleum Odor In Water	Floating Product Thickness (inches)	Comments
MW-2	6/19/89	80.80	11.91	68.89	No	0.0	
MW-2	7/18/89	80.80	11.98	68.82	No	0.0	
MW-2	8/08/89	80.80	12.00	68.80	Yes	0.0	
MW-2	9/11/89	80.80	12.00	68.80	No	0.0	
MW-2	10/10/89	80.80	12.05	68.75	Yes	0.0	
MW-2	1/05/90	80.80	10.95	69.85	No	0.0	
MW-2	3/02/90	80.80	11.54	69.26	Yes	0.0	
MW-2	5/31/90	80.80	11.08	69.72	Yes	0.0	
MW-3	6/19/89	79.60	10.99	68.61	No	0.0	
MW-3	7/18/89	79.60	11.05	68.55	Yes	0.0	
MW-3	8/08/89	79.60	11.07	68.53	Yes	0.0	
MW-3	9/11/89	79.60	11.02	68.58	Yes	0.0	
MW-3	10/10/89	79.60	11.08	68.52	Yes	0.0	
MW-3	1/05/90	79.60	10.97	68.63	No	0.0	
MW-3	3/02/90	79.60	10.91	68.69	Yes	0.0	
MW-3	5/31/90	79.60	10.23	69.37	No	0.0	
MW-4	6/19/89	81.00	12.18	68.82	No	0.0	
MW-4	7/18/89	81.00	12.21	68.79	No	0.0	
MW-4	8/08/89	81.00	12.23	68.77	No	0.0	
MW-4	9/11/89	81.00	12.26	68.74	No	0.0	
MW-4	10/10/89	81.00	12.28	68.72	No	0.0	
MW-4	1/05/90	81.00	12.25	68.50	No	0.0	
MW-4	3/02/90	81.00	11.63	69.37	No	0.0	
MW-4	5/31/90	81.00	11.52	69.48	No	0.0	
MW-5	10/10/89	81.50	11.08	70.42	No	0.0	
MW-5	1/05/90	81.50	12.96	68.54	No	0.0	
MW-5	3/02/90	81.50	12.66	68.84	No	0.0	
MW-5	5/31/90	81.50	12.39	69.11	No	0.0	
OMW-6	1/05/90	77.90	10.23	67.67	No	0.0	
OMW-6	3/02/90	77.90	9.40	68.50	No	0.0	
OMW-6	6/1/90	77.90	9.81	68.09	Yes	0.0	
OMW-9	1/05/90	77.71	9.90	67.81	No	0.0	
OMW-9	3/04/90	77.71	9.20	68.51	Yes	0.0	
OMW-9	6/1/90	77.71	9.50	68.21	Yes	0.0	

TABLE 4 (cont'd). GROUNDWATER MONITORING INFORMATION

Shell Oil Company Facility
500 40th Street
Oakland, California

Well No.	Date Monitored	Well Elevation (ft msl)	Depth to Water (ft bgs)	Water Table Elevation (ft msl)	Petroleum Odor In Water	Floating Product Thickness (inches)	Comments
OMW-10	1/05/90	77.91	9.92	67.99	No	0.0	
OMW-10	3/04/90	77.91	9.20	68.71	No	0.0	
OMW-10	**6/1/90**	**77.91**	**9.42**	**68.49**	**Yes**	**0.0**	

NOTES:

ft bgs feet below ground surface
NS none observed
Bold Boldface indicates work completed this quarter

TABLE 5. RESULTS OF GROUNDWATER CHEMICAL ANALYSES

Shell Oil Company Facility
500 40th Street
Oakland, California

Well No.	Sample Date	Concentration (mg/l) TPH-g	TPH-d	Benzene	Toluene	Ethyl-Benzene	Xylenes	Lead
MW-2	06/20/89	0.8	<0.01	0.046	0.0068	0.0027	0.056	NA
MW-2	07/18/89	1.4	0.4	0.033	0.0056	0.024	0.073	0.003
MW-2	08/08/89	0.230	0.50	0.0045	<0.0005	<0.0015	0.011	NA
MW-2	09/11/89	0.50	0.31	0.019	0.0023	<0.0015	0.010	NA
MW-2	10/10/89	2.0	0.81	0.077	0.0084	0.024	0.150	NA
MW-2	01/05/90	2.0	0.56	0.038	0.0056	0.030	0.059	NA
MW-2	03/02/90	1.9	0.58	0.095	0.0005	0.083	0.200	NA
MW-2	**05/31/90**	**4.1**	**0.57**	**0.170**	**<0.0005**	**0.100**	**0.33**	**NA**
MW-2[1]	**05/31/90**	**5.2**	**0.51**	**0.200**	**<0.0005**	**0.120**	**0.39**	**NA**
MW-3	06/20/89	2.3	<0.1	0.18	0.15	0.054	0.800	NA
MW-3	07/18/89	1.5	9.1	0.085	0.034	0.010	0.120	0.002
MW-3	08/08/89	2.5	0.71	0.13	0.073	0.0035	0.330	NA
MW-3	09/11/89	1.9	0.23	0.18	0.074	0.0037	0.110	NA
MW-3	10/10/89	2.6	1.2	0.069	0.055	0.0063	0.300	NA
MW-3	01/05/90	2.7	0.76	0.051	0.041	0.028	0.070	NA
MW-3	03/02/90	2.3	0.57	0.23	0.8	0.055	0.230	NA
MW-3[1]	03/02/90	2.3	0.56	0.22	0.8	0.53	0.230	NA
MW-3	**05/31/90**	**1.9**	**0.460**	**0.140**	**0.048**	**0.044**	**0.180**	**NA**
MW-4	06/20/89	<0.05	<0.01	<0.0005	<0.0015	<0.0015	<0.0015	NA
MW-4	07/18/89	<0.05	<0.05	<0.0005	<0.0015	<0.0015	<0.0015	**0.003**
MW-4	08/08/89	<0.05	<0.05	<0.0005	<0.0005	<0.0015	<0.0015	NA
MW-4	09/11/89	<0.05	<0.05	<0.0005	<0.0005	<0.0015	<0.0015	NA
MW-4	10/10/89	<0.05	<0.05	<0.0005	<0.0005	<0.0015	<0.0015	NA
MW-4	01/05/90	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	NA
MW-4	03/02/90	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	NA
MW-4	**05/31/90**	**<0.05**	**<0.05**	**<0.0005**	**<0.0005**	**<0.0005**	**<0.0005**	**NA**
MW-5	10/10/89	<0.05	<0.05	<0.0005	<0.0005	<0.0015	<0.0015	NA
MW-5	01/05/90	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	NA
MW-5	03/02/90	<0.05	0.11	<0.0005	<0.0005	<0.0005	<0.0005	NA
MW-5	**05/31/90**	**<0.05**	**<0.05**	**<0.0005**	**<0.0005**	**<0.0005**	**<0.005**	**NA**
OMW-6	01/05/90	22	6.5	1.4	1.8	0.56	1.500	NA
OMW-6	03/04/90	27	4.6	1.3	1.4	0.63	2.400	NA
OMW-6[1]	03/04/90	25	4.8	1.2	1.3	0.55	2.300	NA
OMW-6	**06/01/90**	**23**	**4.6**	**1.3**	**0.79**	**0.44**	**2.400**	**NA**
OMW-9	01/05/90	4.3	1.6	0.097	0.12	0.091	0.290	NA
OMW-9	03/04/90	2.6	1.0	0.058	0.024	0.0081	0.075	NA
OMW-9	**06/01/90**	**2.9**	**0.49**	**0.085**	**0.020**	**0.013**	**0.085**	**NA**

TABLE 5 (cont'd). RESULTS OF GROUNDWATER CHEMICAL ANALYSES

Shell Oil Company Facility
500 40th Street
Oakland, California

Well No.	Sample Date	Concentration (mg/l) TPH-g	TPH-d	Benzene	Toluene	Ethyl-benzene	Xylenes	Lead
OMW-10	1/05/90	<0.05	0.20	0.034	0.0011	0.0043	0.013	NA
OMW-10	3/04/90	0.29	0.39	0.053	0.0015	0.0043	0.015	NA
OMW-10	**6/1/90**	**0.73**	**0.30**	**0.100**	**0.0019**	**0.015**	**0.025**	**NA**

NOTES:

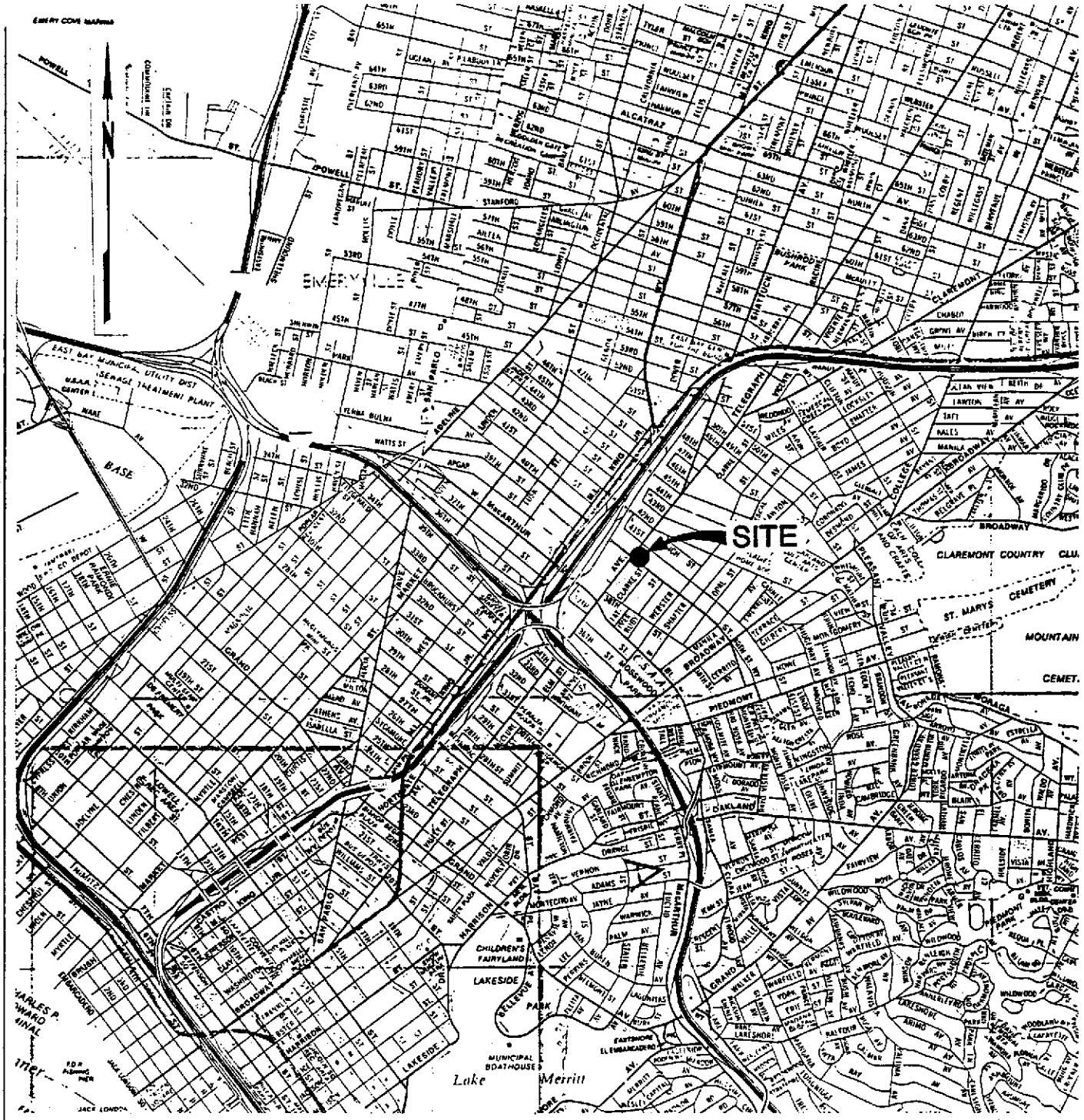
[1]	Duplicate sample
ppm	part per million
TPH-g	total petroleum hydrocarbons as gasoline (GCFID)
TPH-d	total petroleum hydrocarbons as diesel (GCFID)
TPH-mo	total petroleum hydrocarbons as motor oil (GCFID)
NA	not analyzed
Bold	Boldface indicates work completed this quarter.

TABLE 6. Summary of Groundwater Monitoring Well Installations

Shell Oil Company
500 50th Street
Oakland, California

Well No.	Date Installed	Diameter Well Bore (in.)	Initial Water Table (ft. bgs)	Static Water Table (ft. MSL)	T.D. (ft. bgs)	Screen (ft. bgs)	Bentonite Seal (ft. bgs)	Grout Seal (ft.bgs)
MW-2	5/22/89	12	15.5	NA*	25	20.0-9.0	9.0-7.0	7.0-0
MW-3	5/23/89	12	15.3	NA	21	19.0-9.5	9.5-8.0	8.0-0
MW-4	5/23/89	12	13.0	NA	20	15.5-9.5	9.5-7.5	7.5-0
MW-5	9/19/89	12	18.5	NA	20	20.0-10.0	9.0-8.0	8.0-0
OMW-6	10/16/89	12	16.0	NA	20	10.5-20.0	9.0-8.0	8.0-0
OMW-9	11/13/89	12	NA	NA	30	17.5-7.5	6.5-5.5	5.5-0
OMW-10	11/13/89	12	NA	NA	20	16.0-6.0	5.0-4.0	4.0-0

DRAWINGS



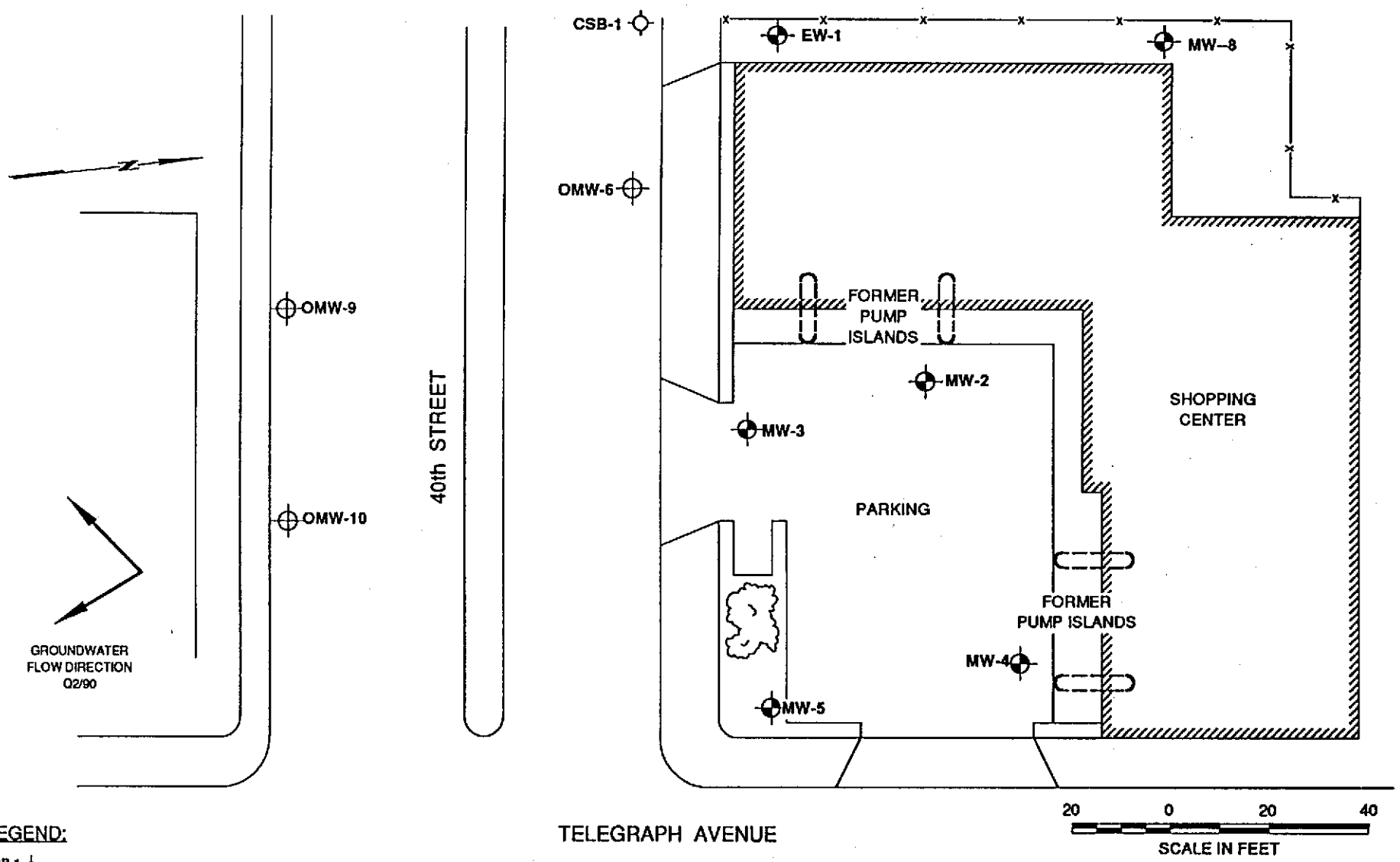
SOURCE: California State Automobile Association.

SITE LOCATION MAP

SHELL OIL COMPANY
500 40th Street
Oakland, California

Scale: AS SHOWN	Project No.: 88-44-361-20
Prepared by: KGC	Date: 4/4/89
Checked by: BG	Drawing No.: 1
Approved by: CRC	

Converse Environmental West



LEGEND:

- CSB-1 — SOIL BORING
- MW-1 — GROUNDWATER MONITORING WELL
- EW-1 — GROUNDWATER EXTRACTION WELL
- OMW-1 — OFFSITE GROUNDWATER MONITORING WELL

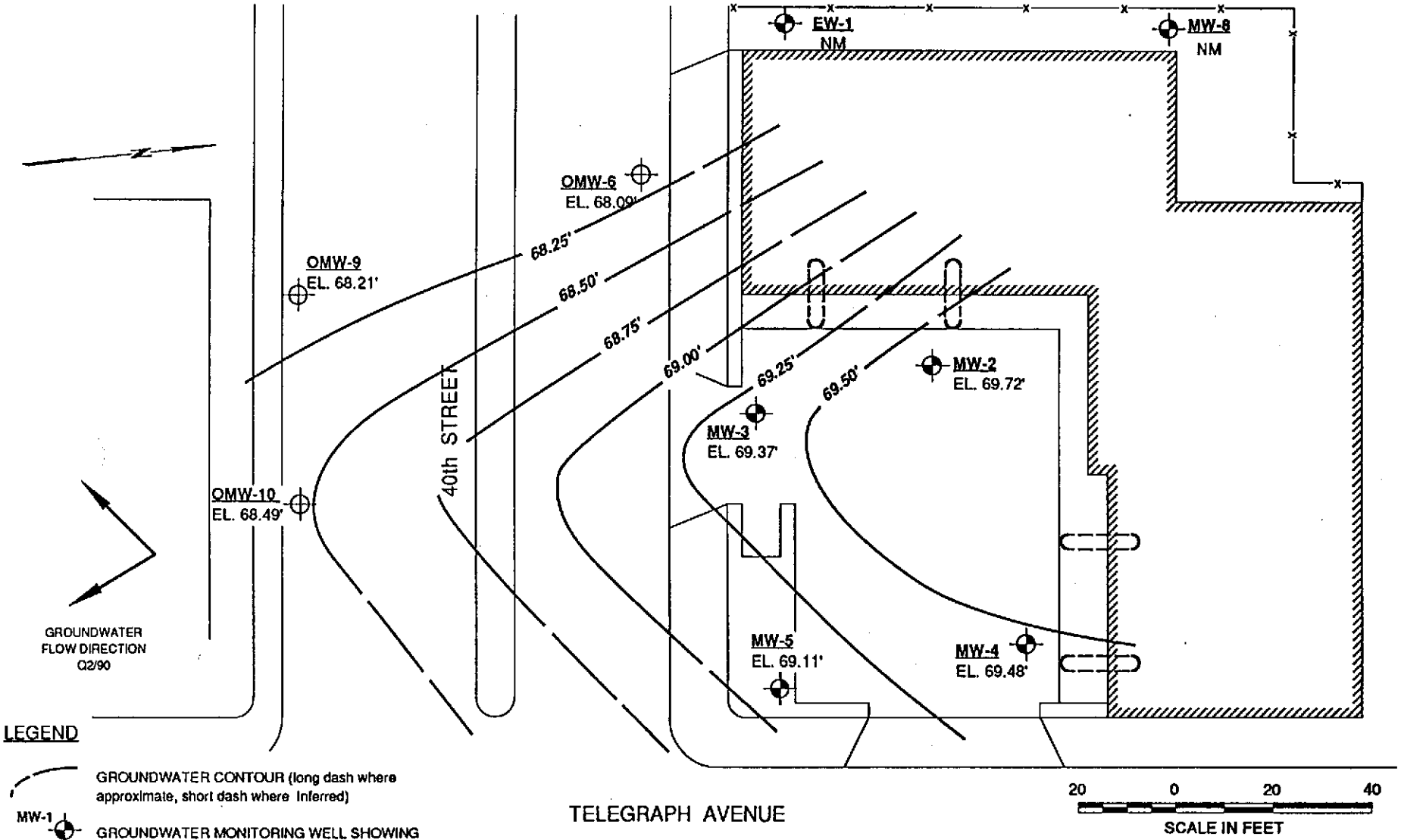
Base Map: Surveyed with Electronic Distance Meter by CEW, 1989

PLOT PLAN

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental West

Scale	AS SHOWN
Project No.	88-44-361-20
Prepared by	LQL
Date	12/29/89
Checked by	BG
Drawing No.	2
Approved by	CRC



Base Map: Surveyed with Electronic Distance Meter by CEW, 1989

LEGEND

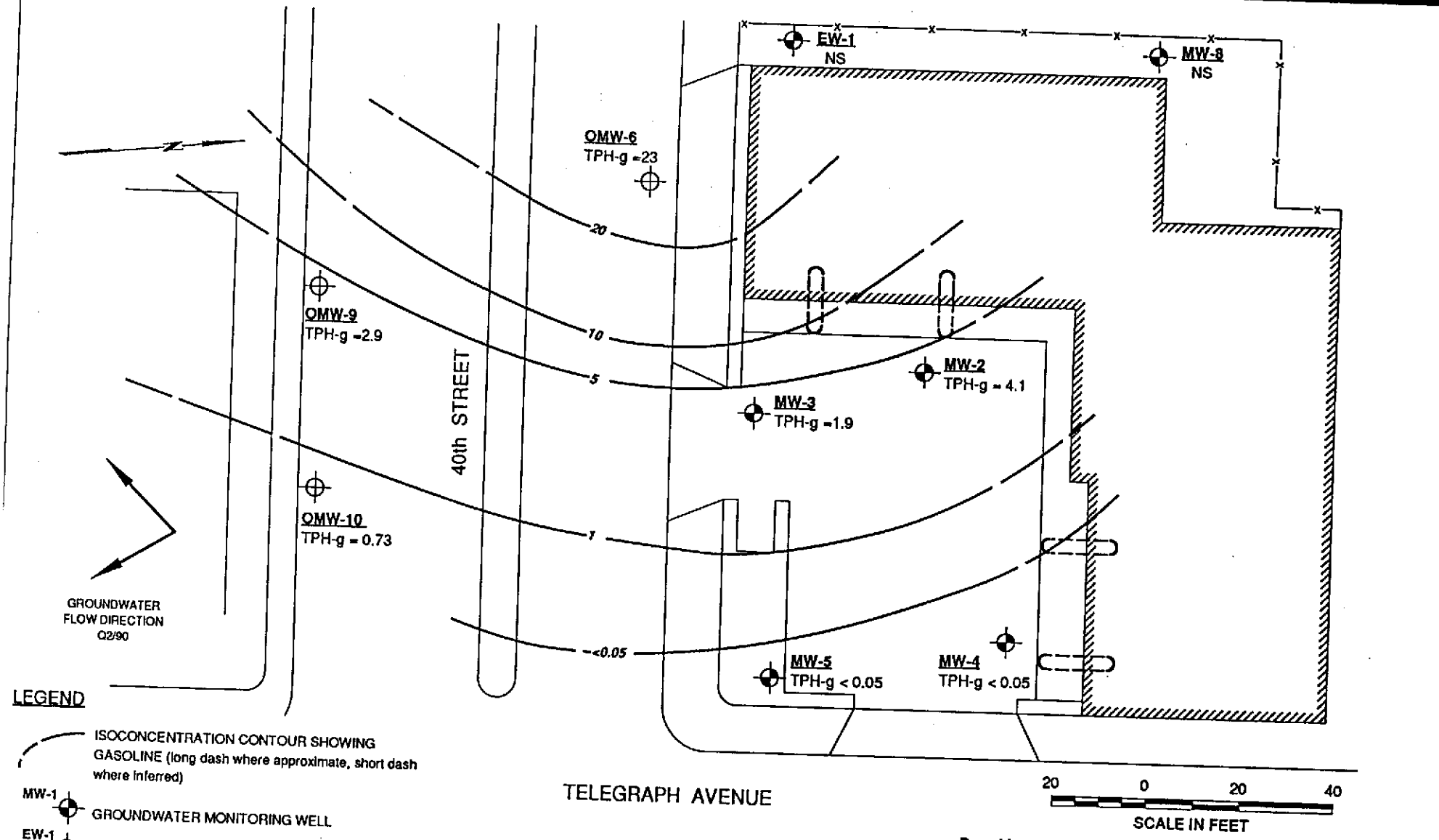
- GROUNDWATER CONTOUR (long dash where approximate, short dash where Inferred)
- MW-1 — GROUNDWATER MONITORING WELL SHOWING GROUNDWATER ELEVATION
- EW-1 — GROUNDWATER EXTRACTION WELL
- OMW-6 — OFFSITE GROUNDWATER MONITORING WELL
- NM = NOT MEASURED
- NOTE: GROUNDWATER ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

GROUNDWATER CONTOUR MAP Q2/90

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental West

Scale	AS SHOWN
Project No.	88-44-361-20
Prepared by	LQL
Date	6/21/90
Checked by	BG
Drawing No.	3
Approved by	CRC



LEGEND

- ISOCONCENTRATION CONTOUR SHOWING GASOLINE (long dash where approximate, short dash where inferred)
- MW-1 — GROUNDWATER MONITORING WELL
- EW-1 — GROUNDWATER EXTRACTION WELL
- OMW-6 — OFFSITE GROUNDWATER MONITORING WELL
- TPH-g = TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (in milligrams per liter)
- NS = NOT SAMPLED

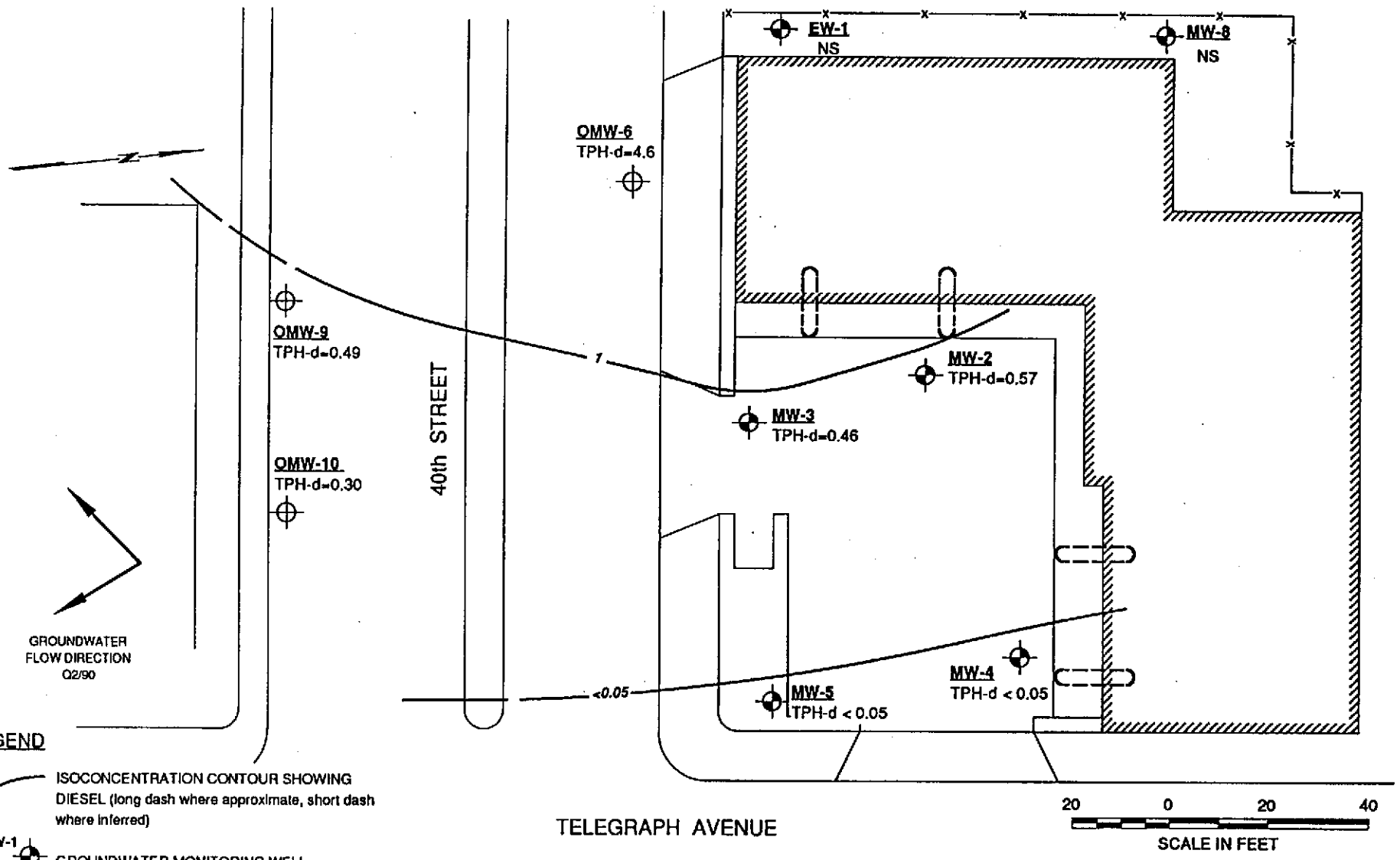
Base Map: Surveyed with Electronic Distance Meter by CEW, 1989

PLAN: GROUNDWATER TPH-g Q2/90

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental West

Scale	AS SHOWN
Project No.	88-44-361-20
Prepared by	LQL
Date	3/22/90
Checked by	BG
Drawing No.	4
Approved by	CRC



Base Map: Surveyed with Electronic Distance Meter by CEW, 1989

LEGEND

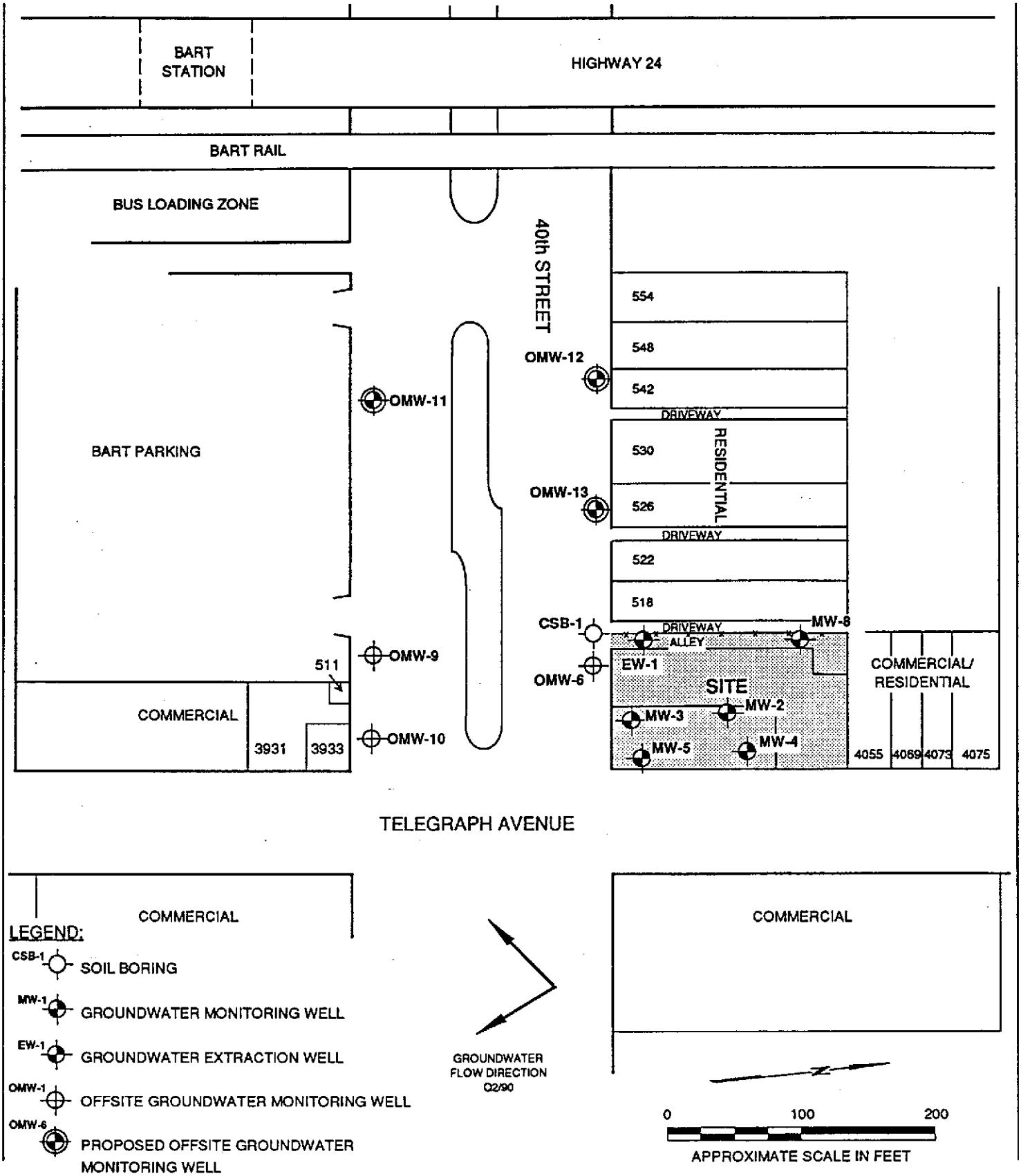
- ISOCONCENTRATION CONTOUR SHOWING DIESEL (long dash where approximate, short dash where inferred)
- MW-1 — GROUNDWATER MONITORING WELL
- EW-1 — GROUNDWATER EXTRACTION WELL
- OMW-6 — OFFSITE GROUNDWATER MONITORING WELL
- TPH-g = TOTAL PETROLEUM HYDROCARBONS AS DIESEL (in milligrams per liter)
- NS = NOT SAMPLED

PLAN: GROUNDWATER TPH-d Q2/90

SHELL OIL COMPANY
500 40th Street
Oakland, California

Converse Environmental West

Scale	AS SHOWN
Project No.	88-44-361-20
Prepared by	LQL
Date	1/25/90
Checked by	BG
Drawing No.	5
Approved by	CRC



PROPOSED GROUNDWATER MONITORING WELLS

SHELL OIL COMPANY
500 40th Street
Oakland, California

Scale	AS SHOWN
Project No.	88-44-361-20
Prepared by	KGC
Date	5/9/90
Checked by	BG
Figure	6
Approved by	CRC

Converse Environmental West

APPENDIX A

SITE DESCRIPTION

APPENDIX A

SITE DESCRIPTION

LOCATION

The Shell Oil Company (Shell) site is located at 500 40th Street in Oakland, California. The site is approximately 145 feet long by approximately 130 feet wide. The site was formerly operated as a retail motor vehicle fuel sales and automobile repair station. Presently, it is occupied by several non-industrial retail sales and services.

SETTING

The facility is located on the gently sloped alluvial fan between the base of the Oakland Hills to the east and the San Francisco Bay to the west. The major natural soils underlying the site consist of alluvial-fan deposits comprising interfingering lenses of clayey gravel, sandy silty clay and sand-clay-silt mixtures of Pleistocene Age, commonly known as the Temescal formation. A layer of gravel with cobbles is at the base of the formation. The gravel often grades upward into sand and then into clay. In general, the formation is thin near the Bay and thicker close to the Oakland Hills.

Underlying the Temescal Formation is the oldest of the post-Knoxville quaternary unconsolidated deposits, known as the Alameda Formation, formed during the Pleistocene Age. In its upper part it consists mainly of yellowish-gray to yellowish-brown sandy, silty clay containing a few pebbles. The lower part, consisting of clay, silt, sand and gravel, does not crop out. The upper clay crops out at the several locations within the area.

Bedrock below the Alameda formation is the Franciscan Complex, of Jurassic and Cretaceous Age. It consists of fine to very coarse-grained sandstone with some shale beds.

APPENDIX B

CHRONOLOGICAL SUMMARY

CHRONOLOGICAL SUMMARY

The following chronological summary is based on information provided to Converse Environmental West (CEW) by Shell Oil Company (Shell). CEW was not provided with certain information related to the construction, operational, and environmental history of the facility. According to Shell, the following information is not available in Shell files: volume of contaminated soil removed at the time of tank removal, geometry of the excavation created during tank removal, if any, and date and volume of any possible releases at the facility.

Date	Description of Activity
7/82	IT installed 8 six inch diameter groundwater monitoring wells to 30 feet below ground surface (bgs) onsite. The wells were screened from 5 to 30 feet bgs. Combustible vapors were detected in the storm sewer system in the BART Station across the street.
7/82	IT Progress Report 1: Well installations and constructions were reported, and free product was noted in wells B-7 and B-8. Groundwater gradient was shown to be westward, towards the BART Station.
11/82	IT Progress Report 6: Groundwater gradient still towards well B-3. From September 1 to November 19, 1982, IT removed 35 pints of product from B-4. Well tops of casings (TOCs) were re-surveyed and groundwater gradient was confirmed toward B-3. Maximum product thickness was in B-4, at several inches.
12/82	IT Progress Report 7: Product thickness increased in B-3 in apparent response to rising water table. Product in B-4 remained at several inches.
1/83	IT Progress Report 8: Product in B-4 had diminished to film thickness.
2/83	IT Progress Report 9: Rainfall records were researched, and the relationship between rainfall, water table and product removed was charted by graph. Amount of product in B-4 appeared to vary inversely with water table; as water table rose with winter rains, the amount product in B-4 dropped. IT proposed that product was displaced downgradient as water table rose.
3/83	IT Progress Report 10: Vapor concentrations of TPH (expressed as percent lower explosive limit) were rising in wells B-1, B-2, B-3 and B-7. No product was measurable in B-4.
6/83	Rapid reappearance of product in well B-4, from negligible in May to 4+ feet by June 30 and 6.34 feet on July 15. Increase was also measured B-3, to a thickness of 0.66 feet in July. IT concluded that a reservoir of product existed in the tank backfill, and that as water table dropped in summer time this reservoir was allowed to escape by way of gravel lenses which were saturated at high water table seasons.
7/83	IT installed 8 inch diameter monitoring wells B-9 and B-10 to 20 feet bgs in native soils next to the tank backfill.
8/83	IT Progress Report 11: IT repeated the concept that product was released in surges through gravel lenses exposed to the water table during summer.

CHRONOLOGICAL SUMMARY (continued)

Date	Description of Activity
8/83	IT installed groundwater monitoring well B-11 and sand backfill in the southwest corner of the tank bed. No free-flowing product was encountered in this well.
9/83	IT drilled two 18 inch diameter borings to 30 feet bgs and completed same as 12 inch diameter recovery wells with screen intervals from 5 to 30 feet bgs. These wells, R-1 and R-2, were located near wells B-3 and B-4, directly west of the tank backfill.
10/83	IT purged and developed wells R-1 and R-2, holding a strong depression on the water table for 2 hours.
11/83	According to IT reference, the tanks were removed and, as part of this excavation wells R-1 and R-2 were also removed. No information was provided on tank excavation or associated soils/groundwater testing and reporting to regulatory agencies.
1/84	IT Progress Report 13: Wells B-3 and B-4 continued to contain measurable product, to thicknesses of 2 feet. In general, product thicknesses decreased during December and January. Product thicknesses also decreased after tank removal. Groundwater piezometric map showed a westward-trending, low area encompassing wells R-1, R-2, B-3 and B-4. This extended offsite, suggesting a paleodrainage which controlled product collection and migration offsite.
5/84	IT Report: The thicknesses of product in B-3 and B-4 measured from several inches to one foot during the period January to May 1984.
7/84	IT Report: Product thicknesses increased starting in mid-May in response to lowering water tables. This pattern was similar to the pattern observed in 1983.
8/84	IT Report: The thickness of product in B-3 remained one foot, while the amount of product in B-4 decreased. IT recommended looking for possible upgradient offsite sources.
9/84	IT Report: The thickness of product in B-4 started to increase (still at less than one inch) while the thickness of product in B-3 decreased (still on the order of one foot).
10/84	IT Report: New construction was noted.
1/85	IT Report: The thickness of product of B-3 had decreased to several inches and B-4 contained negligible measurable product. This pattern of decreasing product in the winter (high water table) months was consistent with that observed in the winters of 1982-83, and 1983-84.
2/85	IT Report: Significant measurable gasoline (1.64 feet) was discovered in B-8. The gasoline appeared degraded and "old". IT concluded that this gasoline could be from the same source as that contributing to observed in wells B-3 and B-4.
6/85	IT Report: Product thicknesses in B-3, B-4 and B-8 decreased from January to mid-May, with a dramatic decrease in B-8. IT repeated its interpretation that product thickness decreased as water tables rose and increased as water tables fell. IT further proposed that the product was trapped in permeable lenses, and migrated to different geographic areas as the water tables rose and fell.

CHRONOLOGICAL SUMMARY (continued)

Date	Description of Activity
12/85	IT Report: The thickness of product in B-3 increased to approximately 2 feet during the summer, showing the seasonal increase of prior years period. Simultaneously, no product was measured in B-8 after June 3, and product reappeared in B-2 in September and October. Product thickness in B-4 fluctuated at less than one foot thick during this period. IT recommended installing a recovery extraction trench along the west boundary of the property.
5/86	IT Quarterly Report: Product thickness decreased in wells B-3 and B-4 in response to seasonal rise in the water table.
6/86	IT requested permission to abandon B-6.
7/86	IT stated that Shell planned to remove the underground storage tanks in the near future.
8/86	IT Quarterly Report: IT noted seasonal decline in water table and negligible measurable product in wells B-2 and B-4, with approximately 2 feet of floating product in B-3.
9/86	A groundwater sample from B-3 contained volatile organics: 0.90 ppm; benzene: 0.32 ppm; toluene: 0.23 ppm; xylene: 0.16 ppm.
1/04/87(?)	A commercial shopping center building was erected on the property, covering wells B-2, B-6, B-7, B-9 and B-10. Wells B-1, B-3, B-4, B-5 and B-8 were covered by site parking and a rear driveway.
1/89	Shell transfers project to CEW.
4/07/89	Revised Work Plan submitted to RWQCB.
5/23/89	Monitoring wells MW-2, MW-3 and MW-4 installed, soil sampled.
6/20/89	Groundwater sampled, wells MW-2 through MW-4.
7/07/89	CEW issued Quarterly Report.
7/19/89	Groundwater sampled, wells MW-2 through MW-4.
8/01/89	Right-of-Entry Agreement sent to property owners of 518 40th Street.
8/08/89	Groundwater was sampled, wells MW-2 through MW-4.
9/11/89	Groundwater was sampled, wells MW-2 through MW-4.
9/19/89	CEW installed well MW-5; soils were sampled and analyzed.
10/10/89	Groundwater was sampled MW-2 through MW-5.
10/16/89	CEW installed well OMW-6; soils were sampled and analyzed.
10/17/89	CEW installed boring SB-1; soils sampled and analyzed; and bored OMW-9. During well drilling, Loma Prieta Earthquake struck. Oakland municipal services were severely disrupted.

CHRONOLOGICAL SUMMARY (continued)

Date	Description of Activity
10/21/89	OMW-9 pilot boring was sealed.
11/13/89	OMW-9 boring was reamed and the well installed. OMW-10 installed; soils sampled and analyzed. Proposed well OMW-8 boring attempted and abandoned; location was in sewer main backfill.
11/17/89	Discharge permit application for interim groundwater treatment system submitted to EBMUD.
12/01/89	OMW-6 was developed.
12/10/89	OMW-10 and OMW-9 were developed.
1/5/90	CEW sampled groundwater wells MW-2, MW-3, MW-4, MW-5, OMW-6, OMW-9 and OMW-10.
8/89-3/90	Ongoing unsuccessful attempts to gain right-of-entry for installation of extraction wells EW-11 and EW-12, as the commencement of onsite groundwater remediation. This process has continued without resolution since August, 1989.
2/15-20/90	Conducted underground utilities location survey in the west alley behind the building; survey was needed for the proposed groundwater monitoring well location selection.
3/2-3/4/90	CEW sampled groundwater wells MW-2, MW-3, MW-4, MW-5, OMW-6, OMW-9 and OMW-10.
3/22/90	Shell obtained the right-of-entry agreement from the owners of 518 40th Street.
5/31-6/1/90	**CEW sampled groundwater wells MW-2, MW-3, MW-4, MW-5 OMW-6, OMW-9 and OMW-10.**
6/27-28/90	**CEW installed onsite wells MW-8 and EW-1.**

NOTE:

Bold indicates work completed this quarter.

APPENDIX C

ANALYTICAL LABORATORY REPORTS AND CHAIN-OF-CUSTODY FORMS

NET NATIONAL ENVIRONMENTAL TESTING, INC.

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

Bo Gustincic
Converse Consultants
55 Hawthorne St, Ste 500
San Francisco, CA 94105

Date: 06-14-90
NET Client Acct No: 18.02
NET Pacific Log No: 2250
Received: 06-01-90 0800

Client Reference Information

SHELL, 500 40th Street; Project: 88-44-361-20

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)

Client Acct: 18.02
Client Name: Converse Consultants
NET Log No: 2250

Date: 06-14-90
Page: 2

Ref: SHELL, 500 40th Street; Project: 88-44-361-20

Parameter	Reporting Limit	Descriptor, Lab No. and Results MW-3 05-31-90 0930 54477	 MW-2 05-31-90 1035 54478	 MW-2 dup 05-31-90 1035 54479	Units
PETROLEUM HYDROCARBONS		--	--	--	
VOLATILE (WATER)		--	--	--	
DILUTION FACTOR *		1	20	20	
DATE ANALYZED		06-05-90	06-05-90	06-04-90	
METHOD GC FID/5030		--	--	--	
as Gasoline	0.05	1.9	4.1	5.2	mg/L
METHOD 602		--	--	--	
DILUTION FACTOR *		20	20	20	
DATE ANALYZED		06-05-90	06-05-90	06-04-90	
Benzene	0.5	140	170	200	ug/L
Ethylbenzene	0.5	44	110	120	ug/L
Toluene	0.5	48	ND	ND	ug/L
Xylenes, total	0.5	180	330	390	ug/L
PETROLEUM HYDROCARBONS		--	--	--	
EXTRACTABLE (WATER)		--	--	--	
DILUTION FACTOR *		1	1	1	
DATE EXTRACTED		06-06-90	06-06-90	06-06-90	
DATE ANALYZED		06-07-90	06-07-90	06-07-90	
METHOD GC FID/3510		--	--	--	
as Diesel	0.05	0.46	0.57	0.51	mg/L
as Motor Oil	0.5	ND	ND	ND	mg/L

Client Acct: 18.02
Client Name: Converse Consultants
NET Log No: 2250

Date: 06-14-90
Page: 3

Ref: SHELL, 500 40th Street; Project: 88-44-361-20

Parameter	Reporting Limit	Descriptor, Lab No. and Results MW-4 05-31-90 1130 54480	 MW-5 05-31-90 1215 54481	 field blank 05-31-90 1100 54482	Units
PETROLEUM HYDROCARBONS		--	--	--	
VOLATILE (WATER)		--	--	--	
DILUTION FACTOR *		1	1	1	
DATE ANALYZED		06-04-90	06-04-90	06-04-90	
METHOD GC FID/5030		--	--	--	
as Gasoline	0.05	ND	ND	ND	mg/L
METHOD 602		--	--	--	
DILUTION FACTOR *		1	1	1	
DATE ANALYZED		06-04-90	06-04-90	06-04-90	
Benzene	0.5	ND	ND	ND	ug/L
Ethylbenzene	0.5	ND	ND	ND	ug/L
Toluene	0.5	ND	ND	0.6	ug/L
Xylenes, total	0.5	ND	ND	ND	ug/L
PETROLEUM HYDROCARBONS		--	--	--	
EXTRACTABLE (WATER)		--	--	--	
DILUTION FACTOR *		1	1	1	
DATE EXTRACTED		06-06-90	06-06-90	06-06-90	
DATE ANALYZED		06-07-90	06-07-90	06-07-90	
METHOD GC FID/3510		--	--	--	
as Diesel	0.05	ND	ND	ND	mg/L
as Motor Oil	0.5	ND	ND	ND	mg/L

Client Acct: 18.02
Client Name: Converse Consultants
NET Log No: 2250

Date: 06-14-90
Page: 4

Ref: SHELL, 500 40th Street; Project: 88-44-361-20

Parameter	Reporting Limit	Descriptor, Lab No. and Results trip blank 05-29-90 54483	Units
PETROLEUM HYDROCARBONS		--	
VOLATILE (WATER)		--	
DILUTION FACTOR *		1	
DATE ANALYZED		06-04-90	
METHOD GC FID/5030		--	
as Gasoline	0.05	ND	mg/L
METHOD 602		--	
DILUTION FACTOR *		1	
DATE ANALYZED		06-04-90	
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		06-05-90	
DATE ANALYZED		06-05-90	
METHOD GC FID/3510		--	
as Diesel	0.05	ND	mg/L
as Motor Oil	0.5	ND	mg/L

Ref: SHELL, 500 40th Street; Project: 88-44-361-20

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Diesel	0.05	mg/L	119	ND	79	80	1.3
Motor Oil	0.5	mg/L	106	ND	NA	NA	NA

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Diesel	0.05	mg/L	122	ND	73	79	7.9
Motor Oil	0.5	mg/L	128	ND	NA	NA	NA

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Gasoline	0.05	mg/L	113	ND	104	114	9.8
Benzene	0.5	ug/L	98	ND	89	94	6.3
Toluene	0.5	ug/L	106	ND	91	95	5.1

COMMENT: Blank Results were ND on other analytes tested.

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Gasoline	0.05	mg/L	99	ND	97	99	2.0
Benzene	0.5	ug/L	94	ND	97	100	3.5
Toluene	0.5	ug/L	98	ND	99	99	2.6

COMMENT: Blank Results were ND on other analytes tested.

KEY TO ABBREVIATIONS and METHOD REFERENCES

<	:	Less than; When appearing in results column indicates analyte not detected at the value following. This datum supercedes the listed Reporting Limit.
*	:	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 (but do not multiply reported values).
ICVS	:	Initial Calibration Verification Standard (External Standard).
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 100 through 493: see "Methods for Chemical Analysis of Water & Wastes", U.S. EPA, 600/4-79-020, rev. 1983.

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.

SM: see "Standard Methods for the Examination of Water & Wastewater, 16th Edition, APHA, 1985.

WIC 204-5508-410
AFE-986611
EXP-5440 (2250)

CONVERSE ENVIRONMENTAL WEST

CHAIN OF CUSTODY RECORD

P.M. Bo Gustincic

SHELL

PROJECT NO.: 88-44-361-20	PROJECT NAME / CROSS STREET: 500 40TH ST.
SAMPLERS: (Signature) Robert D. Roman	

STATION NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NUMBER OF CONTAINERS	ANALYSES: TPH-D	TPH-G	BTEX				REMARKS
													P. 1 of 2
MW-3	5/31/90	9:30		✓	AMBER LITRES	3.	✓						STANDARD TURN AROUND
MW-3	5/31/90	9:30		✓	VOA'S	4.		✓	✓				
MW-2	5/31	10:35		✓	LITRES	2.	✓						
MW-2	5/31	10:35		✓	LITRES DUPLICATES	2.	✓						
MW-2	5/31	10:35		✓	VOA'S	3.		✓	✓				
MW-2	5/31	10:35		✓	VOA'S DUPLICATES	3.		✓	✓				
MW-4	5/31	11:30		✓	LITRES	2.	✓						
MW-4	5/31	11:30		✓	VOA'S	3.		✓	✓				
MW-5	5/31	12:15		✓	LITRES	2.	✓						
MW-5	5/31	12:15		✓	VOA'S	3.		✓	✓				
TRIP BLANK	5/29			✓	LITRES	#1	✓						*CUSTODY SEAL APPLIED 5/31/90
TRIP BLANK	5/29			✓	VOA'S	1.		✓	✓				custody seal intact @ 6:11 7:30p.
FIELD BLANK	5/31	11:00		✓	LITRES	2.	✓						

RELINQUISHED BY: (Signature)	DATE: 5/31/90	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE:	RECEIVED BY: (Signature)
Robert D. Roman	TIME: 6:00p	Janice Green	Janice Green	TIME:	
RELINQUISHED BY: (Signature)	DATE:	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE:	RECEIVED BY: (Signature)
	TIME:			TIME:	
RELINQUISHED BY COURIER: (Sign.)	DATE:	RECEIVED BY MOBILE LAB: (Sign.)	RELINQ. BY MOBILE LAB: (Signature)	DATE:	RECEIVED BY COURIER: (Signature)
	TIME:			TIME:	
METHOD OF SHIPMENT: (VIA NCS)		SHIPPED BY: (Signature)	RECEIVED FOR LAB: (Signature)	DATE: 6-1-90	COURIER FROM AIRPORT: (Signature)
			Kyample	TIME: 0800	

WIC - 94-3500-4905
AFE - 98611
EXP - 5440
(2250)

CONVERSE ENVIRONMENTAL WEST

CHAIN OF CUSTODY RECORD

P.M. Bo Gustincic

SHELL

PROJECT NO.: 88-44-361-20	PROJECT NAME / CROSS STREET: 500 40TH ST.						ANALYSES						
SAMPLERS: (Signature) Robert A. Roman													REMARKS
STATION NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NUMBER OF CONTAINERS	TPH-6	BTEX					
FIELD BLANK	5/31/90	11:00		✓	VOA'S	2	✓	✓					STANDARD TURN AROUND
													* CUSTODY SEAL APPLIED 5/31/90
													custody seal intact @ 5/1 7:30p

RELINQUISHED BY: (Signature)	DATE: 5/31/90	RECEIVED BY: (Signartue)	RELINQUISHED BY: (Signature)	DATE:	RECEIVED BY: (Signature)
Robert A. Roman	TIME: 6:00p	Janice Green	Janice Green	TIME:	
RELINQUISHED BY: (Signature)	DATE:	RECEIVED BY: (Signartue)	RELINQUISHED BY: (Signature)	DATE:	RECEIVED BY: (Signature)
	TIME:			TIME:	
RELINQUISHED BY COURIER: (Sign.)	DATE:	RECEIVED BY MOBILE LAB: (Sign.)	RELINQ. BY MOBILE LAB: (Signatue)	DATE:	RECEIVED BY COURIER: (Signature)
	TIME:			TIME:	
METHOD OF SHIPMENT: LUIH NCSI		SHIPPED BY: (Signatue)	RECEIVED FOR LAB: (Signature)	DATE: 6-1-90	COURIER FROM AIRPORT: (Signature)
				TIME: 0800	

NATIONAL ENVIRONMENTAL TESTING, INC.

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

RECEIVED

JUN 20 1990

CONVERSE ENVIRONMENTAL

Bo Gustincic
Converse Consultants
55 Hawthorne St, Ste 500
San Francisco, CA 94105

Date: 06-14-90
NET Client Acct No: 18.02
NET Pacific Log No: 2294
Received: 06-05-90 0800

Client Reference Information

SHELL, 500 40th Street, Oakland; Project: 88-44-361-20

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)

Client Acct: 18.02
Client Name: Converse Consultants
NET Log No: 2294

Date: 06-14-90
Page: 2

Ref: SHELL, 500 40th Street, Oakland; Project: 88-44-361-20

Parameter	Reporting Limit	Descriptor, Lab No. and Results OMW-9 06-03-90 0945 54679	 OMW-10 06-03-90 1020 54680	Units
PETROLEUM HYDROCARBONS		--	--	
VOLATILE (WATER)		--	--	
DILUTION FACTOR *		1	1	
DATE ANALYZED		06-07-90	06-07-90	
METHOD GC FID/5030		--	--	
as Gasoline	0.05	2.9	0.73	mg/L
METHOD 602		--	--	
DILUTION FACTOR *		25	1	
DATE ANALYZED		06-08-90	06-07-90	
Benzene	0.5	85	100	ug/L
Ethylbenzene	0.5	13	15	ug/L
Toluene	0.5	20	1.9	ug/L
Xylenes, total	0.5	85	25	ug/L
PETROLEUM HYDROCARBONS		--	--	
EXTRACTABLE (WATER)		--	--	
DILUTION FACTOR *		1	1	
DATE EXTRACTED		06-08-90	06-08-90	
DATE ANALYZED		06-08-90	06-08-90	
METHOD GC FID/3510		--	--	
as Diesel	0.05	0.49	0.30	mg/L
as Motor Oil	0.5	ND	2.7	mg/L

Client Acct: 18.02
Client Name: Converse Consultants
NET Log No: 2294

Date: 06-14-90
Page: 3

Ref: SHELL, 500 40th Street, Oakland; Project: 88-44-361-20

		Descriptor, Lab No. and Results		
		OMW-6 06-03-90 1050	trip blank	
Parameter	Reporting Limit	54681	54682	Units
PETROLEUM HYDROCARBONS		--	--	
VOLATILE (WATER)		--	--	
DILUTION FACTOR *		50	1	
DATE ANALYZED		06-07-90	06-07-90	
METHOD GC FID/5030		--	--	
as Gasoline	0.05	23	ND	mg/L
METHOD 602		--	--	
DILUTION FACTOR *		50	1	
DATE ANALYZED		06-07-90	06-07-90	
Benzene	0.5	1,300	ND	ug/L
Ethylbenzene	0.5	440	ND	ug/L
Toluene	0.5	790	ND	ug/L
Xylenes, total	0.5	2,400	ND	ug/L
PETROLEUM HYDROCARBONS		--	--	
EXTRACTABLE (WATER)		--	--	
DILUTION FACTOR *		1	1	
DATE EXTRACTED		06-08-90	06-05-90	
DATE ANALYZED		06-08-90	06-05-90	
METHOD GC FID/3510		--	--	
as Diesel	0.05	4.6	ND	mg/L
as Motor Oil	0.5	ND	ND	mg/L

Ref: SHELL, 500 40th Street, Oakland; Project: 88-44-361-20

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Diesel	0.05	mg/L	90	ND	50	48	4.1
Motor Oil	0.5	mg/L	123	ND	NA	NA	NA

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Diesel	0.05	mg/L	101	ND	57	74	26
Motor Oil	0.5	mg/L	125	ND	NA	NA	NA

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Gasoline	0.05	mg/L	106	ND	94	105	11
Benzene	0.5	ug/L	94	ND	93	103	10
Toluene	0.5	ug/L	98	ND	92	100	8

COMMENT: Blank Results were ND on other analytes tested.

QUALITY CONTROL DATA

Parameter	Reporting Limits	Units	Cal Verf Stand % Recovery	Blank Data	Spike % Recovery	Duplicate Spike % Recovery	RPD
Gasoline	0.05	mg/L	109	ND	109	103	5.5
Benzene	0.5	ug/L	92	ND	103	103	< 1
Toluene	0.5	ug/L	96	ND	99	96	2.6

COMMENT: Blank Results were ND on other analytes tested.

KEY TO ABBREVIATIONS and METHOD REFERENCES

<	:	Less than; When appearing in results column indicates analyte not detected at the value following. This datum supercedes the listed Reporting Limit.
*	:	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 (but do not multiply reported values).
ICVS	:	Initial Calibration Verification Standard (External Standard).
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 100 through 493: see "Methods for Chemical Analysis of Water & Wastes", U.S. EPA, 600/4-79-020, rev. 1983.

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.

SM: see "Standard Methods for the Examination of Water & Wastewater, 16th Edition, APHA, 1985.

WIC# - 204-5500-9405
AFE# - 086610
EXPCODE - 9440
Proj Eng - DML (2294)
PM: BO GUSTINCIC

CONVERSE ENVIRONMENTAL WEST

CHAIN OF CUSTODY RECORD

PROJECT NO.: 88-44-361-20
SAMPLERS: (Signature) Robert A. Roman

PROJECT NAME / CROSS STREET: SHELL 500 40th St. @ Telegraph Oakland

STATION NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NUMBER OF CONTAINERS	ANALYSES: TPH-G	BTEX	TPH-D
OMW-9	6/3/90	9:45		X	40mL VOA's	3	X	X	
OMW-9	6/3/90	9:45		X	1 LITER AMBER	2			X
OMW-10	6/3/90	10:20		X	40mL VOA's	3	X	X	
OMW-10	6/3/90	10:20		X	1 LITER AMBER	2			X
OMW-6	6/3/90	10:50		X	40mL VOA's	3	X	X	
OMW-6	6/3/90	10:50		X	1 LITER AMBER	2			X
TRIP BLANK	5/29			X	AMBER LITRES	1			X
TRIP BLANK	5/30			X	VOA's	1	X	X	

SHELL

REMARKS: STANDARD TURN AROUND TIME

*CUSTODY SEAL APPLIED 6/4/90 6:30p
custody seal intact 6/5

RELINQUISHED BY: (Signature) Robert A. Roman	DATE: 6/4/90 TIME: 5:30p	RECEIVED BY: (Signature) James Green	RELINQUISHED BY: (Signature) James Green	DATE: TIME:	RECEIVED BY: (Signature)
RELINQUISHED BY: (Signature)	DATE: TIME:	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE: TIME:	RECEIVED BY: (Signature)
RELINQUISHED BY MOBILE LAB: (Sign.)	DATE: TIME:	RECEIVED BY MOBILE LAB: (Sign.)	RELINQ. BY MOBILE LAB: (Signature)	DATE: TIME:	RECEIVED BY COURIER: (Signature)
		SHIPPED BY: (Signature)	RECEIVED FOR LAB: (Signature)	DATE: 6-5-90 TIME: 0800	COURIER FROM AIRPORT: (Signature)

APPENDIX D

FIELD DATA

CONVERSE ENVIRONMENTAL WEST

Well Sampling Summary

Project Name: 500 40TH ST.
Project Number: 88-44-361-20
Date: 5/31/90
Inspector: R.R. + L.C.

Well Number	Time	Total Depth	Depth to Water	Comments
MW-3	08:52	18.73	10.23	
MW-2	08:54	19.54	11.08	
MW-4	08:55	14.95	11.52	
MW-5	08:57	20.22	12.39	

CONVERSE ENVIRONMENTAL WEST

Well Sampling Summary

Project Name: 500 40TH ST.
Project Number: 88-44-361-20
Date: 6/20/90
Inspector: R.R. + M.M.

Well Number	Time	Total Depth	Depth to Water	Comments
OMW-9	8:38	17.25	9.50 FT.	NO ODOR ON PROBE
OMW-10	8:41	16.50	9.42 FT.	NO ODOR ON PROBE
OMW-6	8:46	20.50	9.81 FT.	SLIGHT PETRO ODOR ON PROBE

CONVERSE ENVIRONMENTAL WEST
Water Sampling Form

Job # 88-44-361-20 Site 500 40TH Sampling Team R P + L C

Date 5/31/90 Well # MW-2 Sampling Method Centrifugal Pump / Disp Bailer

Field Conditions SUNNY, COOL

Describe Equipment D-Con Before Sampling This Well ALCONOX WASH, H2O RINSE, DI FINAL

Describe Meter Calibration LAB CALIBRATED BUFFER 7+9

Total Depth of Well 19.54 Time 8:54

Depth to Water Before Pumping 11.08 Product Present YES/(NO) (Circle) Thickness _____

Height of Water Column 8.46 2" 3" (4") * .16 .37 (.65) = Volume 5.50 Purge Multiple * X3 Volume to Purge = 17 GAL

Depth Purging From 19.54

Time Purging Begins 19:55 Notes on Initial Discharge CLEAR SLIGHT ODOR

Time	Volume Purged	pH	Conductivity X10	T	Notes	Time	Volume Purged	pH	Conductivity	T	pH	Notes
9:57	P.P.	6.21	20	20°C	CLEAR							
10:05	10	6.12	20	22°C	CLEAR SL/ODOR							
10:10	15	6.15	20	22°C								
10:15	17	6.05	20	23°C	CLEAR ODOR							

Pre-Sample Collection Volume Purged 17 ± Gal.

D.T.W AT 10:15 = 12.42
10:20 = 13.82

Time Sample Collection Begins 10:25 Time Sample Collection Ends 10:35

Total Volume Purged 17 ± Gal. Depth to Water After Sampling _____

Comments: D.T.W BEFORE SAMPLING = 11.95 80% RECHARGE = 12.78

D.O = 6.5

MM Hg = 761.

CONVERSE ENVIRONMENTAL WEST
Water Sampling Form

Job # 88-44-361.20 Site 500 40TH ST. Sampling Team R. R. + L. C.

Date 5/31/90 Well # MW-3 Sampling Method ~~CENT. PUMP~~ DISPOSABLE BAILERS
PURGE W/ CENT. PUMP

Field Conditions SUNNY, COOL

Describe Equipment D-Con Before Sampling This Well ALCONOX WASH, H2O RINSE, D. I. FINAL

Describe Meter Calibration LAB CALIBRATED/ BUFFER 7 + 4

Total Depth of Well 18.73 Time 8:52

Depth to Water Before Pumping 10.23 Product Present YES/NO (Circle) Thickness _____

Height of Water Column 18.50 2" 3" (4") * .16 .37 .65 = Volume 5.52 Purge Multiple * X3 Volume to Purge = 17 GAL.

Depth Purging From 18.73

Time Purging Begins 9:00 Notes on Initial Discharge CLEAR NO ODOR

Time	Volume Purged	pH	Conductivity X10	T	Notes	Time	Volume Purged	pH	Conductivity	T	pH	Notes
9:05	P.P.	6.01	30	20°C	CLEAR							
9:12	10	6.03	20	21°C	CLEAR							
9:15	15	6.15	20	21°C	CLEAR							
9:20	17	6.19	20	21°C	CLEAR							

Pre-Sample Collection Volume Purged 17± Gal.

Time Sample Collection Begins 9:25 Time Sample Collection Ends 9:30

Total Volume Purged 17± Gal. Depth to Water After Sampling _____

Comments: D.T.W BEFORE SAMPLING = 11.96 FT. 80% RECHARGE = 11.93 FT.
D.O. = 6.4
BAROMETER = 761 X 25.4
M.M. Hg = 761

CONVERSE ENVIRONMENTAL WEST
Water Sampling Form

Job # 88-44-361-20 Site 500 40th St Sampling Team RR & LC

Date 5-31-90 Well # MW-4 Sampling Method Centrifuge pump & bailer (DISPOSABLE)

Field Conditions Sunny Cool

Describe Equipment D-Con Before Sampling This Well ALCONOX Wash, H2O Rinse, DI Final

Describe Meter Calibration Lab Calibrated Buffer 7 & 4

Total Depth of Well 14.95 Time 0855

Depth to Water Before Pumping 11.52 Product Present YES (NO) (Circle) Thickness _____

Height of Water Column 3.40 2" 3" (4") * .16 .37 .65 = Volume 2.21 Purge Multiple * 3 = Volume to Purge 6.63 gal

Depth Purging From 14.95

Time Purging Begins 10:50 Notes on Initial Discharge CLEAR NO odor

Time	Volume Purged	pH	Conductivity X10	T	Notes
10:50	P.P.	6.11	10	22°C	clear
11:05	4	6.10	10	23°C	RUSTY
11:10	7	6.18	10	23°C	RUSTS

Time	Volume Purged	pH	Conductivity	T	pH	Notes

Pre-Sample Collection Volume Purged 7 Gal.

Time Sample Collection Begins 11:20 Time Sample Collection Ends 11:30

Total Volume Purged _____ Gal. Depth to Water After Sampling _____

Comments: D.T.W BEFORE SAMPLING = 11.60 FT. 80% RECHARGE = 12.23 FT.

D.O. = 6.8

MM Hg = 761

CONVERSE ENVIRONMENTAL WEST
Water Sampling Form

Job # 98-44-361-20 Site 500 40TH ST. Sampling Team RR & LC

Date 5/31/90 Well # MW-5 Sampling Method Centrifuge pump & bailer DISPOSABLE

Field Conditions Sunny Cool

Describe Equipment D-Con Before Sampling This Well Alconox Wash, Water rinsed . DI final

Describe Meter Calibration Lab Calibrated BUFFER 7 + 4

Total Depth of Well 20.22 Time 0857

Depth to Water Before Pumping 12.39 Product Present YES (NO) (Circle) Thickness _____

Height of Water Column 7.83 2" 3" (4") * .16 .37 (65) = Volume 5.09 * Purge Multiple 3 = Volume to Purge ~~15.27~~ gal

Depth Purging From 20.22

Time Purging Begins 11:45 Notes on Initial Discharge CLOUDY, NO ODOR

Time	Volume Purged	pH	Conductivity X10	T	Notes
11:45	P.P.	6.09	16	21°C	CLOUDY NO ODOR
11:50	10	6.13	20	22°C	CLOUDY
11:52	15	6.14	20	23°C	
—	16	—	—	—	—
—	—	—	—	—	—

Time	Volume Purged	pH	Conductivity	T	pH	Notes
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—
—	—	—	—	—	—	—

Pre-Sample Collection Volume Purged 16 Gal. Depth of Water at 11:55 15.22'

Time Sample Collection Begins 12:00 Time Sample Collection Ends 12:15

Total Volume Purged 16± Gal. Depth to Water After Sampling _____

Comments:

D.T.W BEFORE SAMPLING = 13.50 80% RECHARGE = 13.95

D.O. = 6.7

MM HG = 761

CONVERSE ENVI NMENTAL WEST
Water Sampling Form

Job # 88-44-361-20 Site 500 40th St. Sampling Team R.R./M.M.

Date 6/3/90 Well # OMW-6 Sampling Method centrifugal pump

Field Conditions Sunny, warm

Describe Equipment D-Con Before Sampling This Well Alconox Wash, H_2O Rinse, D.I. Final

Describe Meter Calibration Lab Calibrated

Total Depth of Well 20.50 FT. Time 8:46

Depth to Water Before Pumping 9.81 FT. Product Present YES (NO) (Circle) Thickness _____

Height of Water Column 10.69 2" 3" (4") * .16 .37 (.65) = Volume 6.95 Purge Multiple * 3 Volume to Purge = 21 GAL.

Depth Purging From 20.50

Time Purging Begins 10:09 Notes on Initial Discharge CLEAR, STRONG PETRO ODOR

Time	Volume Purged	pH	Conductivity X10	T	Notes	Time	Volume Purged	pH	Conductivity	T	pH	Notes
10:09	PP	6.30	050	19°C	CLEAR, STRONG PETRO ODOR							
10:16	7	6.35	050	21°C	CLOUDY, PETRO ODOR							
10:18	10	6.36	050	21°C	CLEAR, PETRO ODOR							
10:20	15	6.36	050	21°C	CLEAR, PETRO ODOR							
10:24	21	6.61	050	21°C	CLEAR, PETRO ODOR							

Pre-Sample Collection Volume Purged <1 Gal.

D.T.W. @ 10:26 = 17.56 FT.
D.T.W. @ 10:36 = 12.24 FT.

Time Sample Collection Begins 10:43 Time Sample Collection Ends 10:50

Total Volume Purged 21 Gal. Depth to Water After Sampling _____

Comments: D.T.W. Before Sampling = 11.60 FT. 80% RECHARGE = 11.95 FT.

D.O. = 7.4

mm Hg = 762

CONVERSE ENVIRONMENTAL WEST
Water Sampling Form

Job # 82-614-361.22 Site 500 40TH ST. Sampling Team K.R. + M.M.

Date 6/2/90 Well # OMW-9 Sampling Method GRAB PUMP

Field Conditions SUNNY, WARM

Describe Equipment D-Con Before Sampling This Well ALCONOX WASH, H2O RINSE, D.I. RINSE

Describe Meter Calibration LAB CALIBRATED

Total Depth of Well 17.25 Time 8:38

Depth to Water Before Pumping 9.50 Product Present YES / (NO) (Circle) Thickness _____

Height of Water Column 7.75 2" 3" (4") * .16 .37 (.65) = Volume 5.03 Purge Multiple * X 3 Volume to Purge = 16 gal

Depth Purging From 17.25

Time Purging Begins 8:50 Notes on Initial Discharge CLEAR, PETRO ODOR

Time	Volume Purged	pH	Conductivity x10	T	Notes	Time	Volume Purged	pH	Conductivity	T	pH	Notes
8:50	P.P	6.05	030	64°F	CLEAR PETRO ODOR							
9:00	5	6.26	030	65°F	CLEAR, PETRO ODOR							
9:04	10	6.34	030	65°F	CLEAR, PETRO ODOR							
9:12	16	6.31	30	65°F	PETRO ODOR							

Pre-Sample Collection Volume Purged 16 Gal. D.T.W. AT 9:15 = 11.90 D.T.W AT 9:30 = 13.01

Time Sample Collection Begins 9:40 Time Sample Collection Ends 9:45

Total Volume Purged 16 Gal. Depth to Water After Sampling _____

Comments: D.T.W BEFORE SAMPLING = 11.03 SUBTRACT FROM 16.5 FT. = 11.05 FT.

D.O = 8.4

M.M. Hg = 762

CONVERSE ENVIRONMENTAL WEST
Water Sampling Form

Job # 32-44-321.20 Site EON WEST Sampling Team P.P + M.M

Date 6/3/90 Well # OMW-10 Sampling Method CENT PUMP

Field Conditions SUNNY. WARM

Describe Equipment D-Con Before Sampling This Well ALCONOX WASH, H²O RINSE, D.I FINAL

Describe Meter Calibration LAB CALIBRATED

Total Depth of Well 16.50 Time 9:41

Depth to Water Before Pumping 9.42 Product Present YES/NO (Circle) Thickness _____

Height of Water Column 7.08 2" 3" (4") * .16 .37 .65 = Volume 4.60 Purge Multiple * X 3 = Volume to Purge 14 GAL.

Depth Purging From 16.50

Time Purging Begins 9:22 Notes on Initial Discharge CLOUDY BLACK COLOR. PETRO ODOR.

Time	Volume Purged	pH	Conductivity X10	T	Notes	Time	Volume Purged	pH	Conductivity	T	pH	Notes
9:22	P.P.	6.55	10	18°C	CLOUDY BLACK PETRO ODOR							
9:27	5	6.39	10	18°C	BLACK PETRO ODOR							
9:38	10	6.56	010	18°C	CLEARING SLIGHTLY CLOUDY PETRO ODOR							
9:51	14	6.66	020	18°C	SLIGHTLY CLOUDY PETRO ODOR							

Pre-Sample Collection Volume Purged 21 Gal. D.T.W.A.M 4:53 = 13.95

Time Sample Collection Begins 10:15 Time Sample Collection Ends 10:20

Total Volume Purged 14 Gal. Depth to Water After Sampling _____

Comments: D.T.W BEFORE SAMPLING - 10.60 @ 9:20 RECHARGE = 10.93

D.O = 8.4

M.M. H9 = 7.62

APPENDIX E

FIELD ACTIVITY STANDARD OPERATING PROCEDURES

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.

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).

Option 3: Pour in a thick mixture of bentonite and water. Soil cuttings can be used to bulk this mixture if soil is not contaminated and chunks are small and well-mixed in slurry.

Borings Containing More Than 5 Feet of Water

Option 1: Pump out water and use criteria for "dry hole."

Option 2: Pump cement/bentonite grout to bottom of hole or use tremie. Do not pour grout through water.

Option 3: Pump or tremie bentonite slurry. This alternative is particularly efficient if you are using rotary wash equipment since all you have to do is thicken the drilling mud and pump it through the drill rod.

Monitoring/Observation Well Sealing (Single Aquifer)

A. Place sand pack around well casing to about 2 feet above slotted interval. Anticipate fluctuation of water level so screened interval covers maximum water elevation.

B. Place 2-foot thick bentonite pellet seal above sand pack. Add a bucket of clean water to swell pellets.

C. Pour cement/bentonite grout or bentonite slurry above pellet seal to ground surface.

GROUNDWATER MONITORING WELL CONSTRUCTION

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 installation 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.

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.

Documentation: All parameter measurements shall be documented in writing on CEW Development Logs (example attached). Additional documentation shall include the well owners name, the well designation, the date of development, pre- and post-development depths to water, methods of development, general development and notes and comments.

GROUNDWATER SAMPLING

Groundwater samples shall be collected for laboratory analysis by the following procedures:

1. Before sampling or purging begins, all bailers, pumps, cables and lines will be steam-cleaned. An established and designated cleaning area will be kept clean by lining with visqueen or using a cleaning rack.

2. A pre-purge sample shall first be obtained with a bailer from as deep in the well as possible. Standard "Water Sampling Field Survey Forms" will be filled out for this and all future samples, to include the following information:

    - Depth to water and total depth of water column, measured and recorded before purging begins;

    - Conductivity, checked and recorded for every 5 gallons of purged water (for small volumes); and

    - Purged volume (as appropriate), with stabilized readings for pH, conductivity and temperature.

The well shall then be bailed or pumped to remove four to ten well volumes prior to sampling. The well will be purged until conductivity has been stabilized. "Stabilized" is defined as three consecutive readings within 15% of one another. A casing volume will be based on actual measurements made on the day of sampling, i.e., the total depth minus depth to water on day of sampling, time the cross-sectioned area of the casing.

If the well is emptied before four to ten well volumes are removed, the sample shall be taken when the water level in the well recovers to 80% of its initial water level or better.

Whenever possible, samples will be collected within 24 hours after purging; ideally, samples will be collected immediately after purging.

Following the required volume of evacuation from the well, the sample shall be obtained with a teflon or stainless steel bailer on a 60-pound monofilament or polypropylene (washed) line. Care will be taken to properly clean cables with braided stainless steel cable or plastic coverings, if used. Air lift sampling and bladder pumps shall not be used.

Unless specifically waived or changed by the local, prevailing regulatory agency, water samples shall be handled and preserved according to the latest EPA methods as described in the Federal Register (Volume 44, No. 233, Monday, December 3, 1979, Page 69544, Table II) for the type of analysis to be performed.

Purge water will be properly disposed of or temporarily contained in steel barrels pending chemical analysis to designate proper disposal procedure.

CHAIN-OF-CUSTODY

SAMPLE COLLECTION, HANDLING AND IDENTIFICATION

Sample collection, handling, and identification will follow the guidelines set by the California Department of Health Services. Field records will be completed when the sample is collected and will be signed or initialed, including the date and time, by the sample collector(s). Field records will contain the following information:

1. Unique sample or log number;
2. Date and time;
3. Source of sample (including name, location and sample type);
4. Preservative used;
5. Analyses required;
6. Name of collector(s);
7. Pertinent field data (pH, DO, C1, residual, etc.); and
8. Serial number on seals and transportation cases.

Each sample will be identified by affixing a pressure sensitive, gummed label, or standardized tag on the container(s). This label will contain the sample identification number, date and time of sample collection, source of sample preservative used, and the collector(s) initial(s). Analysis required will be identified. Where a label is not available, the same information will be affixed to the sample contained with an indelible, waterproof, marking pen.

The sample container will be placed in a transportation case along with the chain-of-custody record form, pertinent field records, and analyses request form. The transportation case will then be sealed and labeled. Records will be filled out legibly in pen.

TRANSFER OF CUSTODY AND SHIPMENT

When transferring the possession of the samples, the transferee will sign and record the date and time on the chain-of-custody record. Custody transfer, if made to a sample custodian in the field, will account for each individual sample, although samples may be transferred as a group.

The field custodian or field inspector will be responsible for properly packaging and dispatching samples to the appropriate laboratory for analysis. This responsibility includes filling out, dating, and signing the appropriate portion of the chain-of-custody record.

All packages sent to the laboratory will be accompanied by the chain-of-custody record and other pertinent forms. A copy of these forms will be retained by the originating office.

Mailed packages can be registered with return receipt requested. If packages are sent by common carrier, receipts should be retained as part of the permanent chain-of-custody documentation.

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.

DRUM HANDLING PROCEDURES

1. Complete drummed worksheets onsite, forward a copy to CLIENT.

2. Test material per CLIENT's site-specific test requirements.

3. Classify Material as: Clean/Non-Hazardous/Hazardous

4. Labeling of Drums

   - Pending Label: Used to describe material pending final analytical testing. Labels must be immediately affixed to drum during field work.

   - Non-Hazardous Label: Required within 48 hours after analytical results are received.

   - Hazardous Label: Required within 48 hours after analytical results are received.

   - For Pick-Up Label: Must be affixed to drum prior to CLIENT arranged pick-up date.

5. Remove within 14 days of date of generation. Empty drums, where material was disposed in bulk, must be removed the same day they are emptied.

6. Dispose of Material:

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

   Mail or FAX completed Hazardous Waste Pick-Up Forms to the CLIENT with a copy of the analytical results and worksheets.

7. Manifests may be signed by the onsite contractor or consultant, station dealer, or other authorized CLIENT representatives. The transporter CAN NOT sign the manifest.

IT IS THE RESPONSIBILITY OF THE CONTRACTOR/CONSULTANT TO ARRANGE FOR A PERSON TO SIGN THE MANIFEST ON THE DAY OF PICK-UP.

8. Reporting

All reports must be received by the CLIENT within 7 working days of disposal. Reports shall include the following:

- Completed drummed soil and water worksheets.
- Attach a copy of the analytical results.
- State how and where material was disposed.
- If drums are emptied and material was disposed in bulk, state how empty drums were handled.
- The signed blue and yellow copies of the hazardous waste manifest.

SOIL:

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

- TPH: EPA Method 8015
- BTEX: EPA Method 8020
- Lead:

  -One composite sample from each boring
  -See attached decision tree
  -Total Lead - EPA Method 7421
  -Inorganic (soluble) Lead - DOS Title 22, Waste Extraction Test, §22-66700

- Ignitable:

  -One composite sample from each boring
  -Bunsen Burner Test Flame Test

2. Classification:

- Clean: TPH, BTEX, and Lead non-detectable
- Non-Hazardous if any are true:

  -TPH less than 1000 ppm

-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 CLIENT
- Hazardous: CLIENT

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 CLIENT for assistance
- Hazardous: Class I landfill arranged by CLIENT

WATER:

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

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

2. Classification:

   - Clean Water: TPH and BTEX non-detectable

   - Non-Hazardous:

     -Water with dissolved product and detectable TPH and BTEX
     -Water with free product
     -Free product only

3. Responsibility for Disposal:

   - Clean: Consultant/Contractor

   - Non-Hazardous: Consultant/Contractor or CLIENT

4. Types of Drums: DOT-17C or DOT-17E for liquid or slurry

5. Disposal Facility:

   - Clean Water: Into dealer's sanitary sewer or with proper approval from Water Board to storm sewer

   - Non-Hazardous:

     Water with TPH and BTEX only -

     -Into dealer's sanitary sewer with approval from the POTW
     -Contact CLIENT to arrange disposal

     Water with free product -

     -Contact CLIENT to arrange disposal

   - Hazardous:

     Free product only -

     -Contact CLIENT to arrange disposal

MUD ROTARY DRILLING PROCEDURES

Mud rotary will be drilled according to the following procedures:

All drilling equipment (rig, drill bits, drill pipe, mud tub) shall be thoroughly cleaned before drilling begins.

A mud tub shall be set in place and a drilling fluid of bentonite mud or some similar material shall be circulated.

Drilling shall proceed with constant monitoring of drilling speeds (how hard the engine must work in order to turn the bit) and rate of drilling (how quickly the bit cuts through the material) in order to determine subsurface lithology. "Rig chatter" shall be used to determine size or quantity of gravel. Loss of drilling fluid shall be used to determine permeability, e.g., in a gravel layer, large loss of drilling fluid implies clean gravels.

Drilling mud shall be kept thick to minimize "trip time" of cuttings to the surface and allow coarser, representative material to be carried to the surface quickly.

In the event large losses of drilling fluid are encountered, the mud shall be thickened to facilitate building of mud cake on the borehole walls and reduce loss of drilling fluid into the formation.

Sampling may be accomplished by pulling up all drill pipe, removing the drill bit from the borehole and running a sampler (exactly like hollow-steam auger) down the hole.

Mud rotary drilling shall be used in environmental investigations with minimal cross-contamination of aquifers for at least two reasons: (1) the bend produced by the column of mud in the borehole shall cause flow of fluids in the borehole into the formation and not contaminants in the surrounding formation into the borehole; and (2) the mud cake on the borehole walls will reduce communication between the borehole and the surrounding formation.

Mud rotary has the advantage over hollow-steam auger drilling of: (1) being able to drill deeper; and (2) being able to drill larger diameter holes to allow setting of conductor casing.

SAMPLING FOR VOLATILE ORGANICS

In this sampling, it is especially important that the sample represent conditions existing in the aquifer, not in the well. Differences in water quality characteristics often exist between the water in the well and the surrounding aquifer, particularly in wells used intermittently or infrequently such as monitoring wells. To obtain a representative sample of the aquifer, the well is purged until selected water quality parameters stabilize. The parameters should include pH, electrical conductivity and temperature. Once consistent readings are obtained for the three parameters, the discharge should represent formation waters rather than potentially stagnant water in the well. The purge volume should amount to between three and five well volumes.

After the well is purged, the discharge shall be decreased to the slowest rate obtainable. The sampler shall be careful to not contaminate the sample. The following practices shall be followed:

1. Do not touch the lip of the bottles or insides of the septum.

2. Avoid touching the mouth of the discharge tap.

3. Do not splash or agitate the water while the bottle is being filled.

4. Do not smoke, eat or handle any objects not necessary for sampling.

5. Do not sample downwind of any potential volatile organic sources such as car exhausts, open fuel tanks, etc. Note any potential sources in the area if the are unavoidable.

6. Avoid handling the septum. If handling is necessary, use specially prepared and protected forceps or tweezers.

When taking the sample, first rinse the bottle two to three volumes with the well water. The bottle is then filled slowly to prevent entrapment of any air bubbles. The bottle is filled completely such that a meniscus form, essentially "piling up" the water into the bottle. Immediately place the cap on, turn the bottle upside down, tap it a few times and note whether there are any bubbles in the sample. If a bubble exists, discard the sample and repeat sampling including the triple rinse. If a bubble is found on the second attempt, do not repeat the procedure again, but note the bubbles existence on the sample label and also notify the laboratory when it is submitted.

Place the sample in a sealable plastic bag and then into a cooler/ refrigerator. The sample should be protected from any light sources as much as possible.

Deliver the sample to the laboratory as soon as possible. If it cannot be delivered to the lab the same day, store the sample in a refrigerator which maintains a constant temperature of 4°C. It is important that the sample be delivered as soon as possible since the samples must be analyzed within two weeks for the results to be valid. Therefore, the sooner the sample is given to the lab, the more time the lab has to analyze it.

SLUG TESTING PROCEDURES

PURPOSE

Slug testing of groundwater wells will be used to measure various hydraulic parameters of the groundwater aquifer in the vicinity of the well. The parameters measured will include transmissivity and may include storativity depending on aquifer conditions. From these basic parameters, aquifer and well behavior can be predicted.

PRELIMINARY ASSESSMENT

Prior to conducting a slug test each wells boring log, construction detail, development log, and groundwater sampling forms will be reviewed to determine whether slug testing is appropriate, and if so, what slug test methods will provide the most accurate results. A summary of previous groundwater chemical analyses will be reviewed to establish the order in which wells will be tested. Testing will proceed from the well exhibiting the lowest contaminant concentration progressively to the highest to reduce the risk of cross contamination among the wells.

DECONTAMINATION PROCEDURE

All down-well equipment will be decontaminated prior to insertion in the first well, between each successive well test, and after removal from the last well tested. When not in use, down-well equipment will be stored in disposable plastic coverings. Down-well equipment will be decontaminated by steam cleaning or by washing with a brush in a solution of clean water and tri-sodium phosphate detergent followed by a clean water rinse, then a final rinse with deionized water. All rinsate water will be contained and temporarily stored onsite in 55-gallon drums pending proper disposal.

TEST METHODS

A slug test is conducted by causing an "instantaneous" change in the water level within the well to be tested and monitoring the water levels in the well as they return to the static (pre-test) level. Several slug test methods can be used but all rely on causing an initial rise or an initial drop in the water level of the well. The selection of the most appropriate method depends on estimates of the hydraulic conditions within the aquifer such as permeability and confinement, and on the construction of the well. The selection of the method, or combination o methods, is made during the preliminary assessment of the well to be tested.

Slug - In Method: A stainless steel slug of known volume is quickly lowered into the well beneath the static water level and displaces the water level in the well upward. The progressive fall in water levels back tot he static conditions is measured and recorded.

Slug - Out Method: A stainless tell slug of known volume is placed in the well below the static water level and left in place until the water level returns to at least 95% of its original static water level. The slug is then quickly withdrawn from the well causing the water level to drop. The progressive recovery of the water level to the static condition is measured and recorded. This method is sometimes combined with the slug in method to verify results.

Water Slug - In Method: A known volume of deionized or distilled water is quickly poured into the well raising the water level. The progressive fall in water levels back to the static condition are measured and recorded.

Water Slug - Out Method: A known volume of water is quickly removed from the well using a bailer causing the water level to drop. The progressive recovery of water levels to the static condition is measured and recorded.

MONITORING OF WATER LEVELS

Prior to beginning a slug test, the well is opened to the atmosphere and allowed to equilibrate for a minimum of 15 minutes the fluid level in the well is measured. Initial measurement of depth to water and depth to product (if present) are made using an electronic water level probe or water/product interface probe. A pressure transducer (maximum 15 psi) is placed in the well 5 to 15 feet below the water surface. The transducer is connected to an electronic data logger and monitored to assure equilibration. The data logger is then automatically triggered by the change in water level as the slug is inserted or withdrawn from the well. Once triggered the data logger records water levels in the well at an initial rate of 4 per second with the rate decreasing according to a pre-programed schedule as the test progresses.

DATA ANALYSIS

Test data is directly transferred from the data logger to personal computer of data analysis. Data is generally analyzed using one of several available computer programs which calculate hydraulic parameter by fitting well function curves to computer generated data plots.