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October 25, 1991

4022,233.03

Alameda County Environmental  
Health Department  
80 Swan Way, Room 200  
Oakland, California 94621

Attention: Mr. Ed Howell

Gentlemen:

QUARTERLY TECHNICAL REPORT  
THIRD QUARTER 1991  
SHELL SERVICE STATION  
6039 COLLEGE AVENUE  
OAKLAND, CALIFORNIA  
SHELL WIC NO. 204-5508-330

Transmitted herewith is one revised copy of our Quarterly Technical Report (dated October 10, 1991, revised October 22, 1991) for the subject property. The benzene concentrations listed on Plate 6 for MW-2 and MW-4 were in error in our initial report.

Why?  
How??

The benzene concentration in MW-2 initially shown at 64 parts per billion (ppb) has been changed to non-detectable (ND); MW-4 has been changed from 240 ppb to 64 ppb. The benzene concentrations were correctly listed in Table 6. No other revisions have been made. This report should replace our Quarterly Technical Report dated October 10, 1991.

We trust that this provides the information required at this time. If you have any questions, please call.

Yours very truly,

HARDING LAWSON ASSOCIATES

A handwritten signature in black ink, appearing to read 'Michael J. Brink', written over a horizontal line.

Michael J. Brink  
Staff Engineer

MJB:mlr 032636P/R49

Harding Lawson Associates

91 OCT 15 11 03 30



October 11, 1991

Alameda County Environmental Health Department  
80 Swan Way, Room 200  
Oakland, California 94621

Attention: Mr. Ed Howell

Gentlemen:

Quarterly Technical Reports  
Third Quarter 1991  
Three Shell Oil Company Sites  
East Bay Retail District

Enclosed are copies of quarterly technical reports for three Shell Oil Company sites in Alameda County on which Shell service stations are/or were located. These reports are issued to you on behalf of Shell Oil Company.

The sites for which reports are enclosed are specifically:

- 5755 Broadway, Oakland
- 6039 College Avenue, Oakland
- 2996 Shattuck Avenue, Berkeley

We trust that this provides the information required at this time. Please call if you have questions.

Yours very truly,

HARDING LAWSON ASSOCIATES

A handwritten signature in cursive script that reads 'Terence J. McManus'.

Terence J. McManus  
Associate Environmental Scientist

TJM/tls 011/TJM1

cc: Shell Oil Company (without enclosure)  
Environmental Engineering  
P.O. Box 5278  
Concord, California 94520  
Attention: Mr. Jack Brastad

A Report Prepared for

Shell Oil Company  
Environmental Engineering  
P. O. Box 5278  
Concord, California 94520

QUARTERLY TECHNICAL REPORT  
THIRD QUARTER 1991  
SHELL SERVICE STATION  
6039 COLLEGE AVENUE  
OAKLAND, CALIFORNIA  
SHELL WIC NO. 204-5508-330

Oct 22 '91

HLA Job No. 4022,233.03

by



Michael J. Brink  
Staff Engineer



Donald G. Gray  
Geotechnical Engineer



Harding Lawson Associates  
1355 Willow Way, Suite 109  
Concord, California 94520  
510/687-9660

October 10, 1991  
Revised October 22, 1991

## INTRODUCTION

This Quarterly Technical Report by Harding Lawson Associates (HLA) presents results of our continuing environmental investigation at and near the Shell Oil Company (Shell) service station at 6039 College Avenue in Oakland, California. The site location is shown on Plate 1. This report discusses the site history and investigation progress through the third quarter of 1991, along with anticipated activities for the fourth quarter of 1991.

HLA submitted to the appropriate agencies a work plan (dated January 10, 1990) for a soil and groundwater investigation. In addition, quarterly technical reports have been issued since April, 1990.

## SUMMARY OF PREVIOUS WORK

### Preliminary Site Assessment

A Shell service station has occupied this property since 1940. As shown on Plate 2, underground fuel tanks have existed at different locations across the site. Table 1 summarizes the dates of tank installation and removal, and the types of fuel products held in the tanks.

Shell retained HLA to perform a site assessment after an unauthorized release from an underground storage tank (UST). According to the report filed with the Alameda County Department of Environmental Health on September 6, 1989, the source of the

release was a slight weep noted at the piping connection to the submersible pump for the tank holding premium gasoline.

We gathered information on site history from construction plot plans dated 1940, 1957, and 1978 provided by Shell. The station had a full service garage from 1940 to 1978. Plot plans indicate that until 1957, a waste oil tank was located adjacent to the old building, in the present location of the fuel tanks. The 1957 construction plot plan indicates an intent to replace the old waste oil tank with a larger tank, previously used to store fuel; however, no new location is indicated on the plan. The tank was most likely placed in the old excavation near the building, and removed when the present tanks were installed.

Three UST sites within 1/4 mile of the Shell station are listed in the San Francisco Regional Water Quality Control Board (SFRWQCB) Hazardous Substances Container Information Program. The tank locations and contents are listed in Table 2. Additional information on site history was presented in previous reports. Results of our previous soil and groundwater investigation activities are summarized below.

#### Soil Investigation

In January 1990, six soil borings (B-1 through B-6) were advanced to depths of 25 feet, or the top of the saturated zone, at locations shown in Plate 3. The soil borings were drilled and soil samples taken in accordance with the procedures summarized in Appendix A. The purpose of these borings was to evaluate

lithologies in the vadose zone and near the groundwater surface, and to evaluate the presence and limits of detectable concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) and total petroleum hydrocarbons (TPH) in the soil. The borings were located in areas that were potential sources of hydrocarbons identified during our preliminary site assessment. Boring logs are presented in Appendix B.

Soil samples exhibiting the highest organic vapor readings were sealed and transported to an analytical laboratory, under chain-of-custody documentation, for chemical analysis. Results of analyses are presented in Table 3.

#### Groundwater Investigation

Because the results of soil analyses indicated detectable concentrations of petroleum hydrocarbons in soils near the groundwater surface, a groundwater investigation was implemented in early February 1990. Four monitoring wells (MW-1 through MW-4) were installed at locations shown on Plate 4 in accordance with the procedures presented in Appendix A. Free-phase hydrocarbons were observed on the soil sampler at a depth of 20 feet during drilling of MW-4. Boring logs are in Appendix B and well completion details are presented in Appendix C.

Selected soil samples from each well boring were delivered to a state-certified laboratory and chemically analyzed to further delineate the lateral and vertical extent of petroleum hydrocarbons in soil. Results are summarized in Table 4.

Since February 1990, HLA has measured water levels in the wells to the nearest 0.01 foot on a quarterly basis. Casing elevations were surveyed by HLA on February 15, 1990, on the basis of a temporary benchmark of 195.00 feet established at the northwest corner of the cashier's booth on site. Quarterly water level data are summarized in Table 5.

On February 13, 1990, the wells were developed and sampled as described in Appendix A. HLA has sampled water from the wells on a quarterly basis. Results of chemical analysis are presented in Table 6. Data indicate that low to non-detectable concentrations of petroleum hydrocarbons have been found in water samples from MW-1 and/or MW-2; results for MW-3 and MW-4 indicate higher concentrations of hydrocarbons.

Approximately one-half inch of separate-phase floating hydrocarbon product was found in MW-4 in November 1990. This product was removed biweekly from MW-4 by bailing until March 1991. Since that time, only a product sheen has been observed.

Hydrogeology

The shallow lithology at the site is summarized below:

<u>Soil</u>	<u>Approximate Depth (ft)</u>
Sandy silt	0 to 10
Sandy clay	10 to 15
Sandy silt	15 to 25
Interbedded clays, silts, and sand	25 to 50

Depth to groundwater at the site ranges from 16 to 20 feet (Table 5). Groundwater elevation data for the site indicate that the general groundwater flow direction is to the south-southwest.

#### ACCOMPLISHMENTS DURING THE THIRD QUARTER, 1991

HLA performed the following tasks during the third quarter of 1991:

1. Drilled and sampled one soil boring, and converted the boring to a groundwater monitoring well (MW-5);
2. Developed, purged and sampled water from MW-5;
3. Purged and sampled water from MW-1 through MW-4;
4. Measured depth to groundwater and in MW-1 through MW-5;
5. Submitted soil and groundwater samples for chemical analysis.

#### Monitoring Well Installation

On August 24, 1991, an additional monitoring well (MW-5) was installed off site and hydraulically downgradient of the Shell



station (Plate 4) to further define the extent of hydrocarbons in the groundwater. This well was installed on the property of Claremont Sheet Metal in accordance with a right-of-entry agreement between Shell and the property owner. Drilling and sampling procedures are described in Appendix A. A slight petroleum odor was noted in a soil sample from 16 feet. Soil samples from depths of 6, 16, and 21 feet were selected for chemical analysis and delivered to the International Technology Corporation (IT), a state-certified laboratory in San Jose, California, under chain-of-custody procedures. Soil samples were analyzed for TPH as gasoline, diesel fuel, and motor oil (EPA Test Method 8015, modified), BTEX (EPA Test Method 8020), and total oil and grease (Standard Method 503E). The boring log for MW-5 is presented in Appendix B; well completion details are presented in Appendix C.

#### Monitoring Well Development and Groundwater Sampling

MW-5 was developed and water from wells MW-1 through MW-5 was sampled on August 30, 1991, using methods described in Appendix A. A thin film of separate-phase product was observed in MW-4, and was removed prior to purging and sampling. Groundwater samples were submitted under chain-of-custody procedures to IT for laboratory analysis. Water samples were analyzed for TPH as gasoline, diesel fuel, and motor oil, and for BTEX content.

### Water Level Measurements

On August 30, 1991, prior to purging and sampling, groundwater levels were measured in all wells to the nearest 0.01 foot. Groundwater was approximately 16 to 20 feet below ground surface (Table 5). Groundwater elevations have dropped by approximately 2 feet in the last quarter. A potentiometric surface map constructed using current data is shown in Plate 5. This map shows contours of equal groundwater elevation and the general groundwater flow direction. The predominant groundwater flow direction appears to be southwest and is consistent with previous flow directions estimated since February, 1990.

### Results of Soil Analyses

Results of chemical analysis on soil samples from MW-5 are presented in Table 4. The laboratory reports and chain-of-custody are in Appendix D. Concentrations of the compounds tested for were below the analytical detection limits in the soil samples from 6 and 21 feet. TPH as gasoline, diesel fuel, and motor oil were detected at 23, 7 and 13 parts per million (ppm), respectively, in the sample from 16 feet. Due to the proximity of the sample to the groundwater table (approximately 17 feet), it is likely that the hydrocarbons detected in the soil at 16 feet were a result of contact with groundwater containing dissolved petroleum constituents.

MW-5  
soil

Results of Groundwater Analyses

Results of groundwater analyses are summarized in Table 6. Laboratory reports and chains-of-custody are in Appendix E. The distribution of benzene and TPH as gasoline in groundwater is shown on Plates 6 and 7, respectively. The groundwater samples from MW-1 and MW-2 continued to show no detectable concentrations of BTEX or TPH, with the exception of 520 parts per billion (ppb) TPH as diesel in MW-1. The sample from MW-3 contained 44 ppb benzene and cumulative concentrations of TPH totaling 1,740 ppb. Groundwater from MW-4 contained 64 ppb benzene and 2,840 ppb cumulative TPH, along with low levels of toluene, ethylbenzene and xylenes. BTEX and TPH concentrations in groundwater from MW-3 and MW-4 have decreased since the previous quarter. MW-5 contained 80 ppb TPH as diesel fuel; all other compounds tested for were below the analytical detection limits.

As indicated in the laboratory analysis report, petroleum hydrocarbons detected in water from MW-3 appear to be characteristic of weathered gasoline. Data suggest that the hydrocarbons found in water from MW-4 and MW-5 are a mixture of gasoline and a heavier petroleum product such as diesel fuel.

## ANTICIPATED ACTIVITIES FOR THE FOURTH QUARTER, 1991

During the fourth quarter of 1991, HLA intends to perform the following activities at the subject Shell service station:

1. Measure water levels in MW-1 through MW-5 and check for the presence of separate-phase product;

2. Install a passive hydrocarbon skimmer in MW-4 where separate-phase product has been found in the past;
3. Sample water MW-1 through MW-5 and submit the samples for analysis of BTEX, TPH as gasoline, diesel fuel, and motor oil.

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Table 1. Site History and Tank Inventory

<u>Year Constructed/ Removed</u>	<u>Underground* Tanks</u>	<u>Contents</u>	<u>Structures</u>
1940/1957	3 1,000-gallon 1 550-gallon 1 110-gallon	Leaded gasoline Leaded gasoline Waste oil	Full service garage and one pump island
1957/1978	3 5,000-gallon 1 1,000-gallon	Leaded gasoline Waste oil	Full service garage and two pump islands with canopies
Unknown, but between 1957 and 1978/1978	1 8,000-gallon	Leaded or Unleaded gasoline	Same as above
1978/NR	3 10,000-gallon fiberglass	Unleaded gasoline	Cashier counter and Mini-* Mart, two pump islands with canopies

\* Approximate locations shown on Plate 2  
NR Not removed, currently in operation

Table 2. Underground Storage Tanks  
within 1/4 Mile of  
6039 College Avenue Shell

<u>Location</u>	<u>Number of Tanks</u>	<u>Material in Tanks</u>
1. Union 76 6201 Claremont Avenue	4	Unleaded and Premium unleaded Gasoline Waste oil Oil/water Mix
2. Chevron 5800 College Avenue	4	Unknown
3. Dreyers Grand Ice Cream 5929 College Avenue	1	Diesel fuel

Table 3. Soil Analytical Results - Borings  
Concentrations in Parts Per Million (ppm)

Sample Depth	B-1-22.5'	B-2-18'	B-2-24'	B-3-19'	B-3-21'	B-4-18.5'	B-4-25'	B-5-22'	B-5-23'	B-6-19.5'	B-6-22.5'
Approx. GW Depth	21'	22'	22'	18'	18'	20'	20'	19'	19'	18'	18'
Sample Date	01/04/90	01/05/90	01/05/90	01/05/90	01/05/90	01/04/90	01/04/90	01/04/90	01/04/90	01/05/90	01/05/90
<b>Parameter /Method</b>											
Benzene	ND @ 0.05	0.62	ND @ 0.05	0.24	0.19	0.57	ND @ 0.05	ND @ 0.05	ND @ 0.05	0.28	ND @ 0.05
Toluene	ND @ 0.1	ND @ 0.1	ND @ 0.1	0.18	ND @ 0.1	0.11	ND @ 0.1	ND @ 0.1	ND @ 0.1	ND @ 0.1	ND @ 0.1
Ethylbenzene	ND @ 0.1	0.48	ND @ 0.1	4.1	0.53	0.65	ND @ 0.1	ND @ 0.1	ND @ 0.1	1.3	ND @ 0.1
Xylenes	ND @ 0.1	1.2	ND @ 0.1	9.8	0.68	1.3	ND @ 0.1	ND @ 0.1	ND @ 0.1	2.1	ND @ 0.1
<b>/EPA 8020</b>											
TPH as Gasoline	8.1	130	1.8	610	71	170	ND @ 1	ND @ 1	4.4	260	ND @ 1
TPH as Motor Oil	---	---	---	110000	14000	---	---	---	---	12000	320
TPH as Diesel	---	---	---	5900	750	---	---	---	---	600	16
<b>/EPA 8015</b>											
Oil and Grease	---	---	---	810	380	---	---	---	---	1100	91
<b>/SM 503 D&amp;E</b>											
Halogenated VOCs	---	---	---	ND @ 0.5	ND @ 0.5	---	---	---	---	ND @ 0.05	ND @ 0.005
<b>/EPA 8010</b>				to 2.5	to 0.25					to 0.25	to 0.025
Cadmium	---	---	---	ND @ 0.5	ND @ 0.5	---	---	---	---	ND @ 0.5	ND @ 0.5
Chromium	---	---	---	48	61	---	---	---	---	86	73
Zinc	---	---	---	51	54	---	---	---	---	52	60
<b>/EPA 6010</b>											
Lead/EPA 7241	---	---	---	13	7.6	---	---	---	---	8.1	9.2

--- = Analysis not performed on sample

ND = Not present above the stated detection limit



Table 4. Soil Analytical Results - Well Borings  
 Shell 6039 College Avenue, Oakland  
 Concentrations in parts per million (ppm)

Sample/Depth	MW-2-11'	MW-2-15.5'	MW-2-20.5'	MW-3-10'	MW-3-15.5'	MW-3-20.5'	MW-4-10.5'	MW-4-15.5'	MW-4-20.5'	MW-5-6'	MW-5-16'	MW-5-21'
Approx. GW Depth	17'	17'	17'	16'	16'	16'	17'	17'	17'	17"	17'	17'
Sample Date	2/08/90	2/08/90	2/08/90	2/07/90	2/07/90	2/07/90	2/07/90	2/07/90	2/07/90	8/24/91	8/24/91	08/24/91
<b>Parameter</b>												
<b>/Method</b>												
Benzene	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	1.1	ND @ 0.05	ND @ 0.05	0.31	0.06	ND @ 0.005	ND @ 0.005	ND @ 0.005
Toluene	ND @ 0.1	ND @ 0.1	ND @ 0.1	ND @ 0.1	0.7	ND @ 0.1	ND @ 0.11	0.34	ND @ 0.1	ND @ 0.005	ND @ 0.005	ND @ 0.005
Ethylbenzene	ND @ 0.1	ND @ 0.1	ND @ 0.1	ND @ 0.1	3.1	ND @ 0.1	ND @ 0.1	0.92	0.46	ND @ 0.005	0.028	ND @ 0.005
Xylenes	ND @ 0.1	ND @ 0.1	ND @ 0.1	0.11	1.9	ND @ 0.1	ND @ 0.1	2.6	0.57	ND @ 0.005	0.10	ND @ 0.005
<b>/EPA 8020</b>												
TPH as Gasoline	ND @ 1	ND @ 1	ND @ 1	12	230	28	ND @ 1	140	72	ND @ 1	23*	ND @ 1
TPH as Motor Oil	ND @ 10	ND @ 1	ND @ 10	ND @ 10	1,800	ND @ 10	ND @ 1	6,400	46,000	ND @ 12	13	ND @ 12
TPH as Diesel	ND @ 1	ND @ 1	1.1	4.4	200	9.9	1.2	61	2200	ND @ 1.2	7**	ND @ 1.2
<b>/EPA 8015</b>												
PCBs/EPA 8080	---	---	---	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	---	---	---
TOG /503E	---	---	---	---	---	---	---	---	---	ND @ 50	ND @ 50	ND @ 50

--- = Analysis not performed on sample

ND = Not present above the stated detection limit

TPH = Total petroleum hydrocarbons

PCBs = Polychlorinated biphenyls

TOG = Total oil and grease

\* = Compounds detected are due to petroleum mixture other than gasoline

\*\* = Not characteristic of standard diesel pattern

\*\*\* = Results include compounds apparently due to gasoline as well as those due to diesel.

Table 5. Groundwater Elevations

Well	Top of Casing Elevations <sup>1</sup>	Depth to Groundwater (feet)								
		<u>2/15/90</u>	<u>4/19/90</u>	<u>5/14/90</u>	<u>6/21/90</u>	<u>9/12/90</u>	<u>11/27/90</u>	<u>03/08/91</u>	<u>06/03/91</u>	<u>08/30/91</u>
MW-1	195.89	17.73	18.51	18.92	18.21	19.81	20.39	16.85	17.82	19.87
MW-2	194.27	16.90	17.69	18.01	17.39	19.00	19.44	15.96	17.00	18.95
MW-3	192.52	15.81	16.57	16.97	16.27	18.78	18.27	14.86	15.84	17.79
MW-4	193.37	16.73	17.48	17.88	17.18	17.85	19.16	15.77	16.77	18.71
MW-5	190.35	--	--	--	--	--	--	--	--	16.74

Well	Casing Elevations <sup>1</sup>	Groundwater Elevations								
		<u>2/15/90</u>	<u>4/19/90</u>	<u>5/14/90</u>	<u>6/21/90</u>	<u>9/12/90</u>	<u>11/27/90</u>	<u>03/08/91</u>	<u>06/03/91</u>	<u>08/30/91</u>
MW-1	195.89	178.16	177.38	176.97	177.68	176.08	175.50	179.04	178.07	176.02
MW-2	194.27	177.37	176.58	176.26	176.88	175.27	174.83	178.31	177.27	175.32
MW-3	192.52	176.71	175.95	175.55	176.25	173.74	174.25	177.66	176.68	174.73
MW-4	193.37	176.65	175.89	175.49	176.19	175.52	174.21	177.60	176.60	174.66
MW-5	190.35	--	--	--	--	--	--	--	--	173.61

<sup>1</sup> Based on a temporary benchmark of 195.00 feet established at the northwest corner of the cashier's booth

-- No measurements; well constructed on 08/24/91

Table 6. Groundwater Analytical Results  
Concentrations in Parts Per Billion (ppb)

Sample No.	Sample Date	EPA 8020				EPA 8015 - Modified		
		Benzene	Toluene	Ethyl-Benzene	Xylenes	Total Petroleum Hydrocarbons		
						Gasoline	Diesel	Motor Oil
MW-1	02/13/90	ND @ 0.3	0.67	0.37	3.2	95	650	770
	05/14/90	0.70	0.57	0.71	3.5	95	ND @ 50	770
	09/12/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	84	ND @ 50
	11/27/90	NS	NS	NS	NS	NS	NS	NS
	03/08/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	50	ND @ 50
	06/03/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 50	ND @ 500
	08/30/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ .05	520	ND @ 500
MW-2	02/13/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	560	ND @ 50
	05/14/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	ND @ 50	ND @ 50
	09/12/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	ND @ 50	ND @ 50
	11/27/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	ND @ 50	ND @ 50
	03/08/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 50	ND @ 500
	06/03/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 50	ND @ 500
	08/30/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 500
MW-3	02/13/90	320	29	110	33	4,700	3,100	3,000
	05/14/90	130	8.6	40	17	1,400	620	40,000
	09/12/90	58	5.8	16	15	2,000	1,500	19,000
	11/27/90	18	1.5	8.7	2.5	540	240	460
	03/08/91	630	33	270	18	3,400	2,100	ND @ 500
	06/03/91	260	13	98	24	1,700	690*	ND @ 500
	08/30/91	44	6.1	10	2.9	870	370**	500

--- = Analysis not performed on sample

ND = Not present above the stated detection limit

-D = Duplicate sample

NS = Not sampled

\* = Laboratory reports that these compounds appear to be the less volatile constituents of gasoline.

\*\* = Compounds are within the chromatographic range for gasoline but are not characteristic of the standard gasoline pattern.

Table 6. (Continued)

Sample No.	Sample Date	EPA 8020				EPA 8015 - Modified		
		Benzene	Toluene	Ethyl-Benzene	Xylenes	Total Petroleum Hydrocarbons		
						Gasoline	Diesel	Motor Oil
MW-3-D	02/13/90	380	8.6	160	57	4,600	4,500	8,300
	05/14/90	120	31	38	13	820	660	10,000
MW-4	02/13/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	1,200	3,000
	05/14/90	160	7	1.9	3.1	650	350	12,000
	09/12/90	91	1.1	0.75	0.79	440	260	2,600
	11/27/90	64	1.2	0.80	2.7	470	2,400	1,000
	03/08/91	330	3.5	88	5.8	1,100	2,600	15,000
	06/03/91	240	2.3	1.6	2.3	670**	1,100***	ND @ 500
	08/30/91	64	1.8	0.9	0.9	570	280***	2,000
MW-4-D	09/12/90	85	1.0	0.71	0.81	520	1,100	16,000
MW-5	08/30/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	80***	ND @ 500
Trip Blank	02/13/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	--	--
	05/14/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	--	--
	09/12/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	--	--
	03/08/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	--	--
	08/30/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	--	--

--- = Analysis not performed on sample

ND = Not present above the stated detection limit

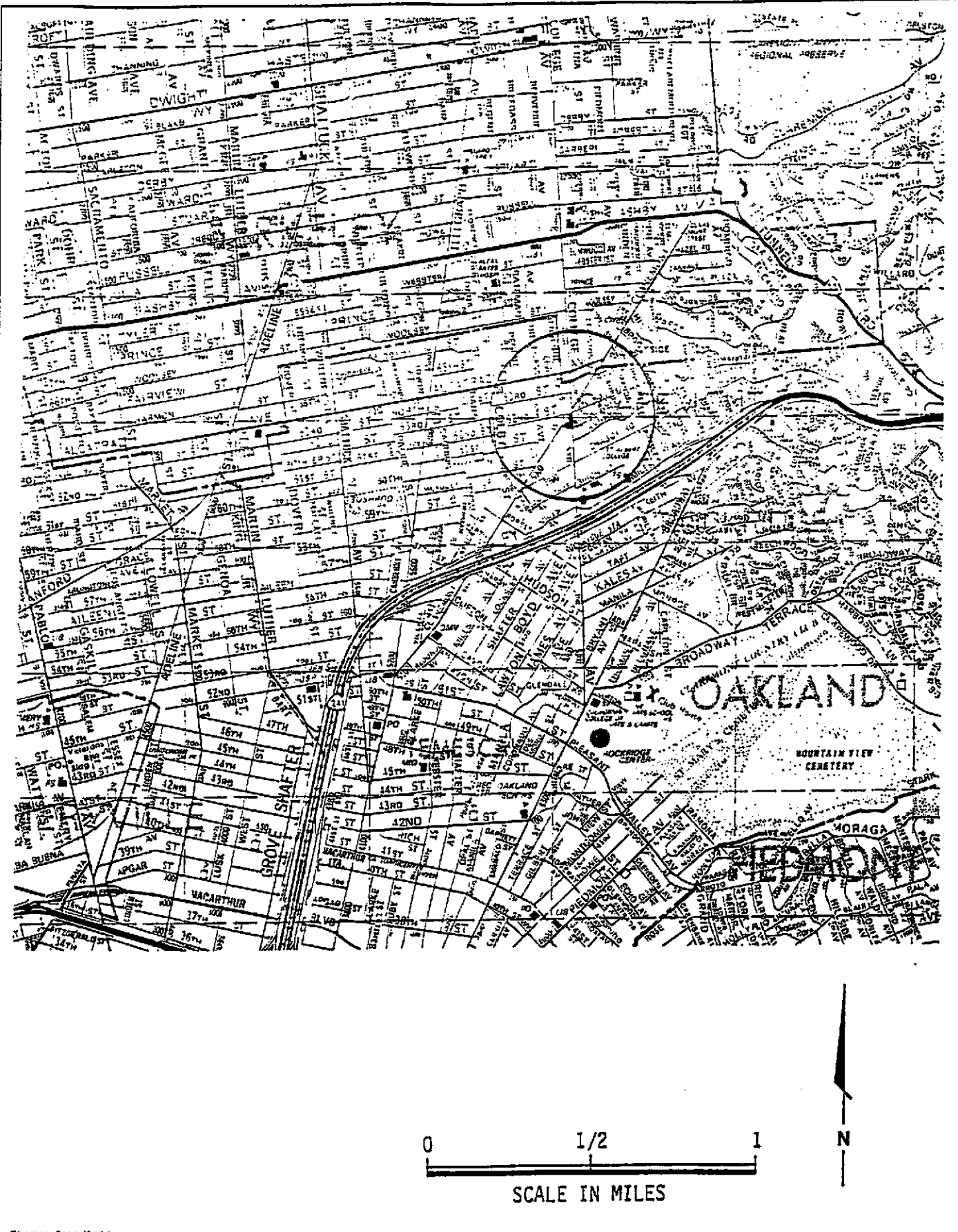
-D = Duplicate sample

NS = Not sampled

\* = Laboratory reports that these compounds appear to be the less volatile constituents of gasoline.

\*\* = Compounds are within the chromatographic range for gasoline but are not characteristic of the standard gasoline pattern.

\*\*\* = Results include compounds apparently due to gasoline as well as those due to diesel.



Thomas Bros Maps



**Harding Lawson Associates**  
 Engineering and  
 Environmental Services

**Site Location Map**  
 Shell Service Station  
 6039 College Avenue  
 Oakland, California

PLATE

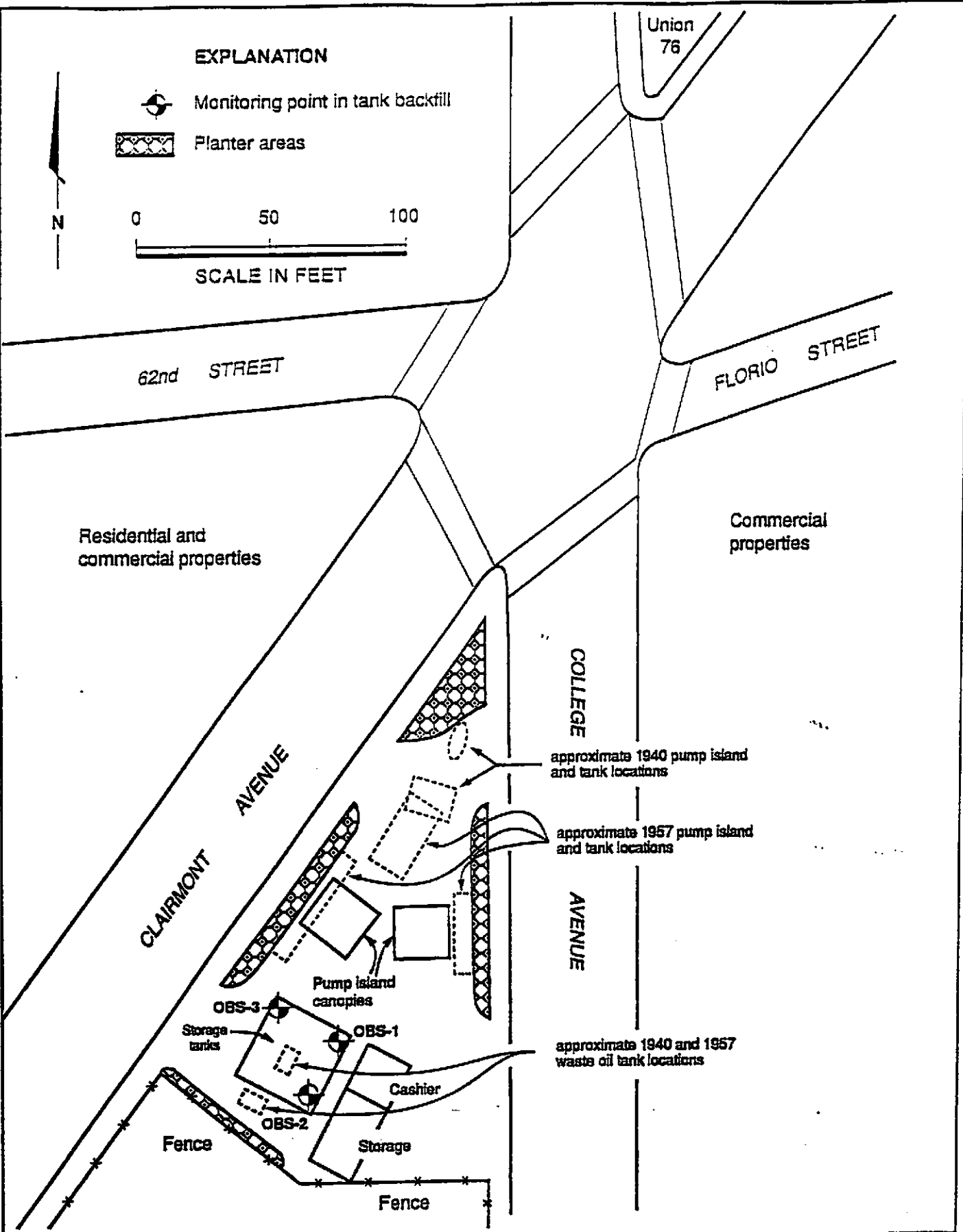
**1**

DRAWN S. Patel  
 JOB NUMBER 4022,233.03



APPROVED  
*[Signature]*

DATE 11/89

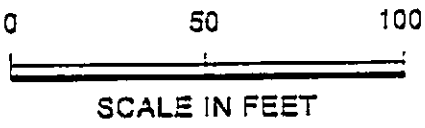
REVISED DATE 01/04/91



**EXPLANATION**

-  Monitoring point in tank backfill
-  Planter areas

N



Union  
76

62nd STREET

FLORIO STREET

Residential and  
commercial properties

Commercial  
properties

CLAIRMONT AVENUE

COLLEGE

AVENUE

approximate 1940 pump island  
and tank locations

approximate 1957 pump island  
and tank locations

approximate 1940 and 1957  
waste oil tank locations

Pump island  
canopies

OBS-3

Storage  
tanks

OBS-1

Cashier

OBS-2

Storage

Fence

Fence



**Harding Lawson Associates**  
Engineering and  
Environmental Services

**Site Plan**  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

**2**

DRAWN  
S. Patel

JOB NUMBER  
4022,233.03

APPROVED  
MJB

DATE  
10/03/91

REVISED DATE

**EXPLANATION**

⊗ Boring location

▨ Planter area

0 50 100

SCALE IN FEET

N

Union  
76

62nd STREET

FLORIO STREET

Residential and  
commercial properties

Commercial  
properties

CLAIRMONT AVENUE

COLLEGE AVENUE

B-1

⊗  
B-2

B-4

⊗  
B-5

Pump island  
canopies

B-3

⊗

Storage  
tanks

Cashier

Fence

B-6

Storage

Fence



**Harding Lawson Associates**  
Engineering and  
Environmental Services

**Soil Boring Locations**  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

**3**

DRAWN  
S. Patel

JOB NUMBER  
4022,233.03

APPROVED  
*MJB*

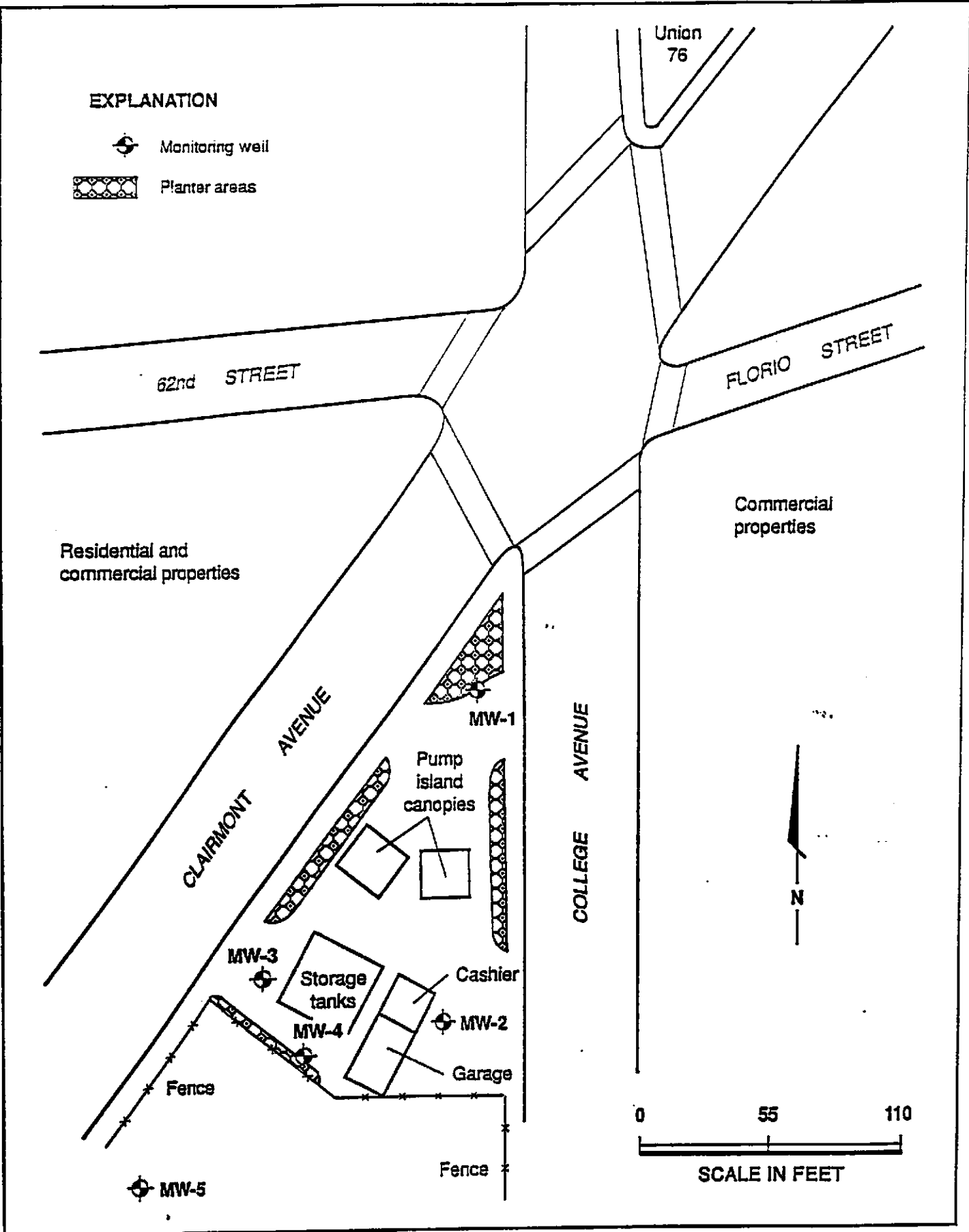
DATE  
10/03/91

REVISED DATE

**EXPLANATION**

 Monitoring well

 Planter areas



**Harding Lawson Associates**  
Engineering and  
Environmental Services

**Monitoring Well Locations**  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE  
**4**

DRAWN  
S. Patel

JOB NUMBER  
4022,233.03

APPROVED  
*MJB*

DATE  
10/03/91

REVISED DATE



**EXPLANATION**



Monitoring well

(176.02) Potentiometric surface elevation (ft.)

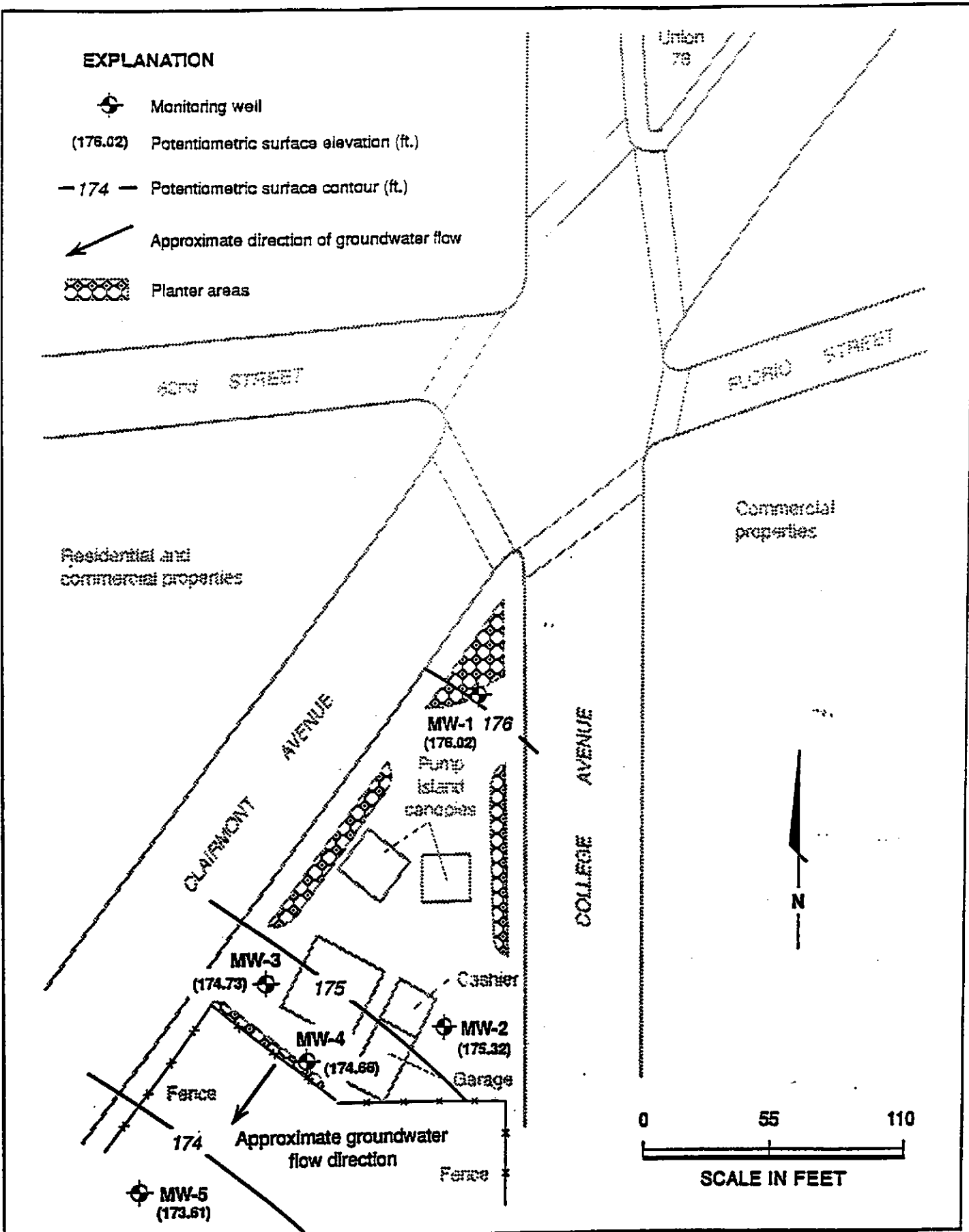
— 174 — Potentiometric surface contour (ft.)



Approximate direction of groundwater flow



Planter areas



Potentiometric Surface - August 1991

PLATE

Shell Service Station  
6039 College Avenue  
Oakland, California

**5**



Harding Lawson Associates  
Engineering and  
Environmental Services

DRAWN  
S. Patel



JOB NUMBER  
4022,233.03

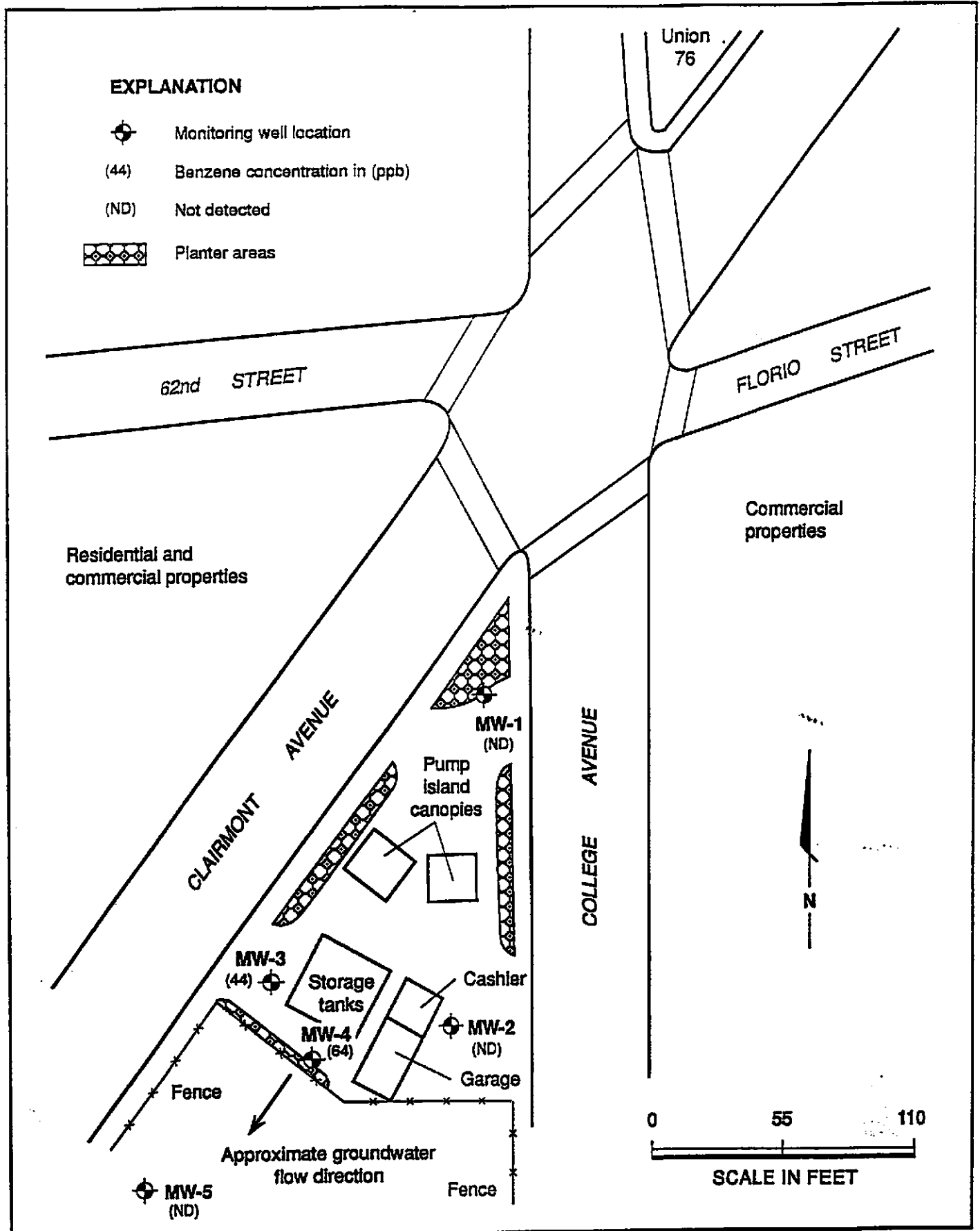
APPROVED  
MSB

DATE  
10/03/91

REVISED DATE

**EXPLANATION**

-  Monitoring well location
- (44) Benzene concentration in (ppb)
- (ND) Not detected
-  Planter areas



**Harding Lawson Associates**  
 Engineering and  
 Environmental Services

**Distribution of Benzene in Groundwater August, 1991** PLATE  
 Shell Service Station  
 6039 College Avenue  
 Oakland, California

**6**

DRAWN  
 S. Patel



JOB NUMBER  
 4022,233.03

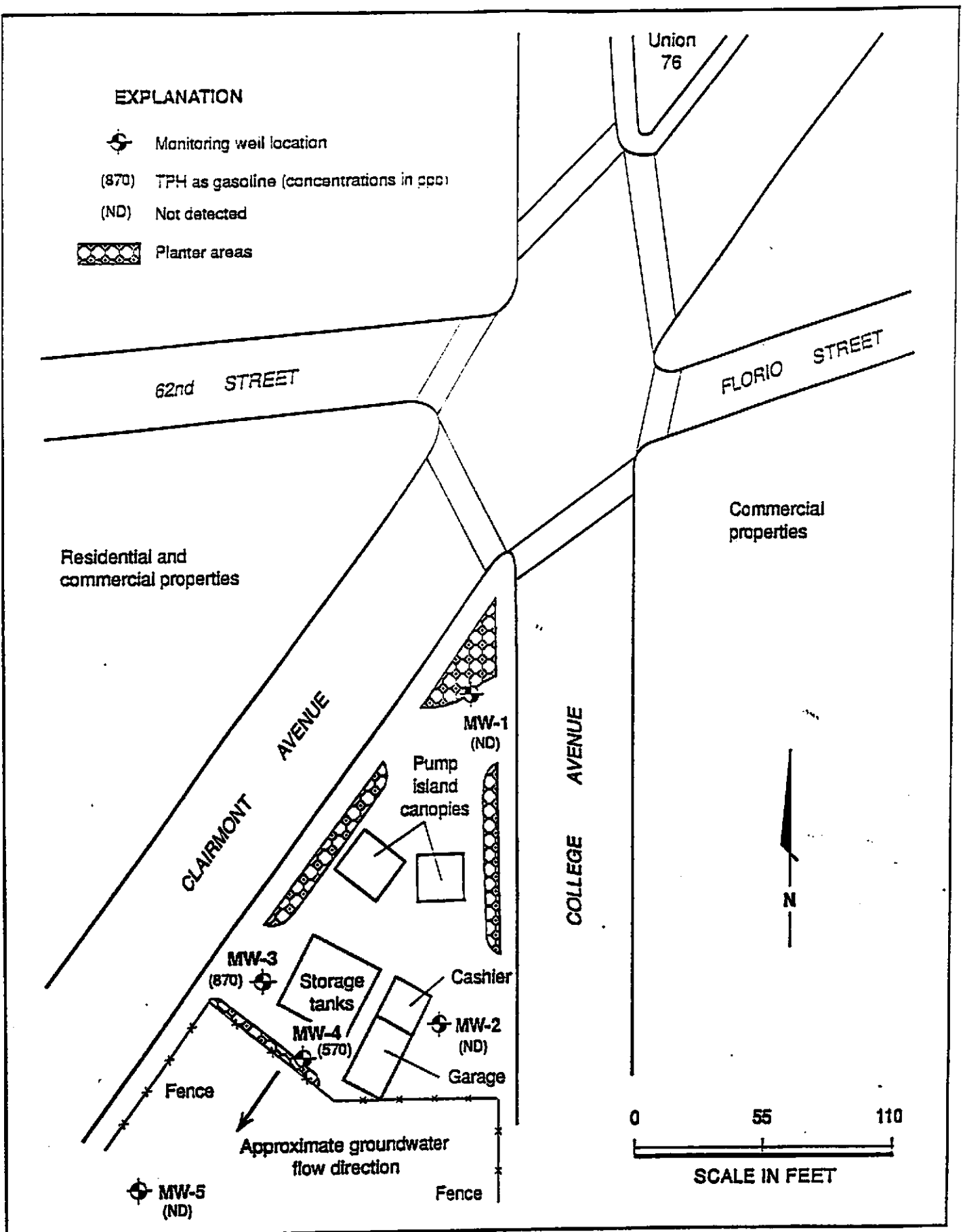
APPROVED  
*MJB*

DATE  
 10/03/91

REVISED DATE  
 10/22/91

**EXPLANATION**

-  Monitoring well location
- (870) TPH as gasoline (concentrations in ppm)
- (ND) Not detected
-  Planter areas



**Harding Lawson Associates**  
 Engineering and  
 Environmental Services

Distribution of TPH as Gasoline in Groundwater August, 1991 **PLATE**  
 Shell Service Station  
 6039 College Avenue  
 Oakland, California **7**

DRAWN  
 S. Patel

JOB NUMBER  
 4022,233.03

APPROVED  
*MJB*

DATE  
 10/03/91

REVISED DATE

APPENDIX A  
DRILLING AND SAMPLING METHODOLOGY

APPENDIX A

DRILLING AND SAMPLING METHODOLOGY

Soil borings were advanced using truck-mounted, 12-inch-diameter, hollow-stem auger drilling equipment, and sampled using a 2-1/2 inch (inside diameter), 6-inch long split-barrel sampler lined with 6-inch-long stainless steel tubes. Drilling was performed under the direction of an HLA geologist, who logged the borings in accordance with the Unified Soil Classification System.

Soil samples were collected at three to five foot intervals and screened in the field with a photoionization detector (PID). The PID detects the presence of some organic compounds. PID readings obtained are listed on the boring logs. All soil samples retained for chemical analysis were sealed with aluminum foil, plastic end caps, and electrical tape and stored in a cooled ice chest until delivery to a state-certified laboratory under chain-of-custody procedures.

Soil sampling equipment was cleaned with an Alconox and water solution and rinsed with deionized water between sampling intervals. Drilling augers were steam cleaned between borings. Soil cuttings generated during drilling were stored on-site until analytical results were received and then off-hauled to an appropriate land disposal facility.

All borings not converted to wells were backfilled with a cement/bentonite grout from the bottom of the boring to ground

surface. Groundwater monitoring wells were constructed in the other borings using 4-inch-diameter, Schedule 40, PVC casing with flush-mounted, threaded joints. The wells consist of 10 or 15 feet of slotted casing (0.02-inch slot widths) installed at the bottom of the boring and an appropriate amount of solid PVC casing to the surface. The bottom of the casings were capped with a threaded end cap. The annular space between the casing and the boring was backfilled with No. 3 Monterey sand to approximately two feet above the screened casing. A two foot layer of bentonite pellets was placed on top of the sand pack and hydrated. The remainder of the boring was backfilled with a cement/bentonite sanitary seal. The tops of the casings were secured with water-tight, locking expansion caps. The wells were housed in water-tight, traffic-rated boxes.

After the cement/bentonite grout was allowed to set for at least 24 hours, each well was developed by bailing, in an attempt to obtain a groundwater sample that was visually clear and free of sediment. During development, we monitored turbidity, temperature, pH, and conductivity. Approximately 10 well volumes were removed from each well during development. Groundwater removed from the wells was stored on site in 55-gallon drums pending analytical results. The groundwater was then hauled to Shell's refinery in Martinez, California.

Prior to each water sampling event, wells were purged of at least three well volumes while monitoring the above aquifer

parameters. After purging, water from the wells was sampled with a clean stainless steel bailer, and samples were decanted into laboratory prepared containers. All sampling and purging equipment was decontaminated between wells in an Alconox solution and rinsed with deionized water. All groundwater samples were placed in cooled ice chests and delivered to a state-certified chemical testing laboratory under chain-of-custody procedures.

Water level measurements were initially obtained after the wells were developed and the water levels equilibrated to establish the hydraulic gradient at the site. Subsequent water level measurements were taken each quarter prior to purging and sampling the wells. Water levels were taken with a chalked steel tape to the nearest hundredth of a foot. The presence of separate-phase floating hydrocarbon product was measured using an electric oil/water interface probe.

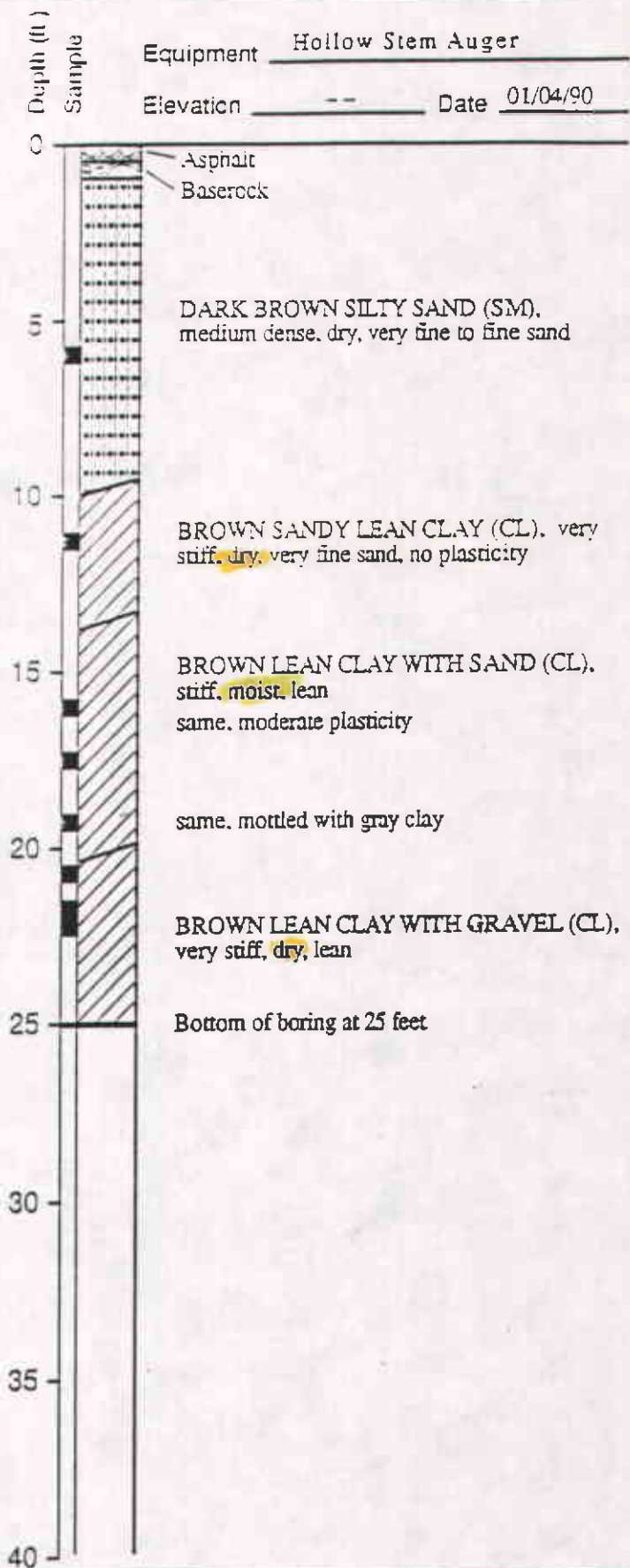
APPENDIX B  
BORINGS LOGS (PLATES B-1 THROUGH B-11)



Blows/foot \*  
 Photo Ionization Detector (ppm) H1Nu  
 Gasoline Odor

Equipment Hollow Stem Auger

Elevation -- Date 01/04/90



\* Blows converted to Standard Penetration Test



**Harding Lawson Associates**  
 Engineering and  
 Environmental Services

**Log of Boring B-1**  
 Shell Service Station  
 6093 College Avenue  
 Oakland, California

PLATE

**B-1**

DRAWN S. Patel JOB NUMBER 4022.233.03

APPROVED MJB

DATE 10/10/91

REVISED DATE

Blows/foot*	Photo Ionization Detector (ppm)	Petroleum Hydrocarbon Odor	Depth (ft)	Equipment	Elevation	Date
				Hollow Stem Auger	--	01/05/90
			0	Asphalt		
				Baselrock		
21	0	None	9	No recovery, brown loose sandy material and asphalt in bottom of split barrel		
35	3.4	Slight	10	BROWN-GRAY MOTTLED SANDY LEAN CLAY (CL), medium dense, moist, fine to coarse sand		
16	6.3	Slight	15	GRAY SANDY SILT (ML), medium dense, moist, very fine sand		
9	720	Strong	16	GREEN-GRAY MOTTLED SANDY SILT (ML), dense, wet, very fine sand		
28	134	Strong	19	BROWN-GRAY MOTTLED SILT WITH SAND (ML), dense, dry, very fine sand		
48	4.0	Slight	20	BROWN-GRAY SAND AND GRAVEL WITH SILT (GM), dense, moist, fine to medium gravel -25%		
	140	Strong	21	BROWN SILTY SAND WITH GRAVEL (SP), medium dense, saturated at 22.5 to 23 feet, gravel absent at 23.5 feet		
20	0.5	None	24	Bottom of boring at 24 feet		

\* Blows converted to Standard Penetration Test

**HLA** Harding Lawson Associates  
Engineers and Geoscientists

**Log of Boring B-2**  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE  
**B-2**

Blows/foot*	Photo Ionization Detector (ppm)	Petroleum Hydrocarbon Odor	Depth (ft)	Sample	Equipment <u>Hollow Stem Auger</u>	Elevation <u>---</u>	Date <u>01/05/90</u>
					Asphalt Basereck		
10	0	None	0		DARK BROWN SANDY SILT (ML), medium dense, moist, very fine sand		
43	56	Strong	10		BROWN-GRAY MOTTLED SANDY CLAY (CL), hard, moist, very fine sand, occasional gravel		
14	95	Strong	15		GREEN-GRAY SANDY SILT WITH CLAY (ML), very stiff, moist, very fine sand, slight plasticity		
12	240	Strong	18		GRAY SANDY SILT (ML), medium dense, dry, very fine sand, non- plastic		
8	220	Strong	20		GRAY SANDY SILT (ML), medium dense, wet, very fine sand		
28	170	Strong	22		BROWN SANDY SILT (ML), dense, saturated, very fine sand, some clay		
29	18	Slight	22.5		Bottom of boring at 22.5 feet		
			25				
			30				
			35				
			40				

\* Blows converted to Standard Penetration Test



**Harding Lawson Associates**  
Engineers and Geoscientists

**Log of Boring B-3**  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

**B-3**

DRAWN  
YC

JOB NUMBER  
4022,233.03

APPROVED  
*[Signature]*

DATE  
10/10/91

REVISED

DATE

Blows/foot*	Photo Ionization Detector (ppm)	Petroleum Hydrocarbon Odor	Depth (ft)	Sample	Equipment <u>Hollow Stem Auger</u>	Elevation <u>---</u>	Date <u>1/4/90</u>
					Asphalt Basereck		
24	0	None	13		BROWN SILTY SAND (SM), medium dense, dry, some gravel		
26	0	None			DARK BROWN SANDY SILT (ML), dense, dry, some gravel		
27	1.1	None			BROWN SANDY SILT WITH CLAY (ML), stiff, dry, no plasticity		
25	1	None	13		GRAY-BROWN MOTTLED CLAY (CL), stiff, dry, some sand, slight plasticity		
34	0	None			BROWN SANDY SILT (ML), stiff, dry, no plasticity		
25	1	None			BROWN-GRAY MOTTLED SANDY LEAN CLAY (CL), stiff, dry, slight plasticity, very fine sand		
15	8	Slight	15		BROWN-GRAY SAND WITH CLAY (SC), dense, dry, some fine gravel, fine sand stringers		
25	25	Strong			GRAY SILT (ML), stiff, moist, some fine sand, slight plasticity, claystone fragments		
16	230	Strong			GRAY SILTY SAND WITH GRAVEL (SP), medium dense, moist, multi-color gravel, green sand, claystone fragments		
24	270	Strong	20		GREEN-GRAY LEAN CLAY (CL), medium stiff, moist, some fine sand, medium plasticity		
51	23	Strong			BROWN SANDY LEAN CLAY (CL), hard, dry, fine sand and occasional fine gravel		
51	3	Slight			Bottom of boring at 25 feet		
48	0	None					
29	0	None	25				

\* Blows converted to Standard Penetration Test



**Harding Lawson Associates**  
Engineers and Geoscientists

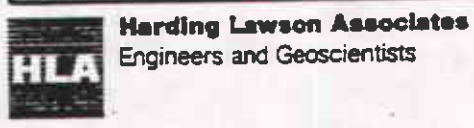
**Log of Boring B-4**  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

**B-4**

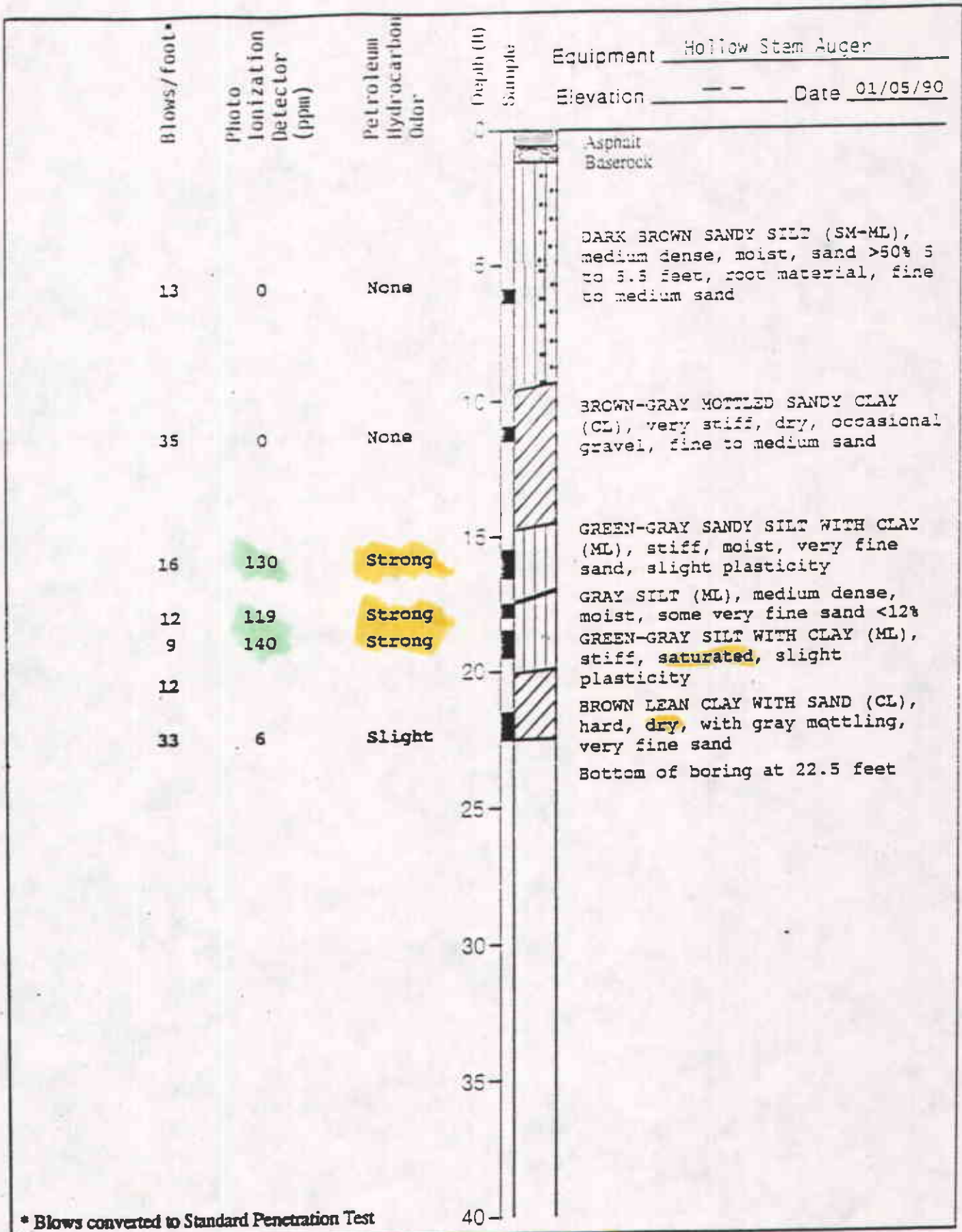
Blows/foot*	Photo Ionization Detector (ppm)	Petroleum Hydrocarbon Odor	Depth (ft)	Equipment	Elevation	Date
			0	Hollow Stem Auger	--	01/04/90
			0	Asphalt		
			0	Baselock		
20	0	None	5	DARK BROWN SILTY SAND (SM), medium dense, dry, occasional fine gravel, orange mottling		
27	0	None	10	BROWN SANDY SILT WITH CLAY (ML), very stiff, dry, very fine sand, no plasticity		
12	3	None	15	BROWN-GRAY SILT WITH SAND (ML), very stiff, dry, very fine sand, no plasticity		
28	9	Slight	20	BROWN-GRAY MOTTLED SANDY LEAN CLAY (CL), very stiff, dry, very fine sand, no plasticity		
19	1	None	21.5 to 21.7	BROWN SANDY LEAN CLAY (CL), stiff, saturated from 21.5 to 21.7 feet, moist at 22 feet		
			23	Bottom of boring at 23 feet		

\* Blows converted to Standard Penetration Test

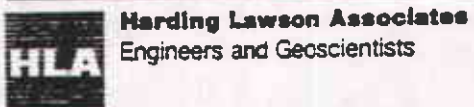


**Log of Boring B-5**  
 Shell Service Station  
 6039 College Avenue  
 Oakland, California

PLATE  
**B-5**



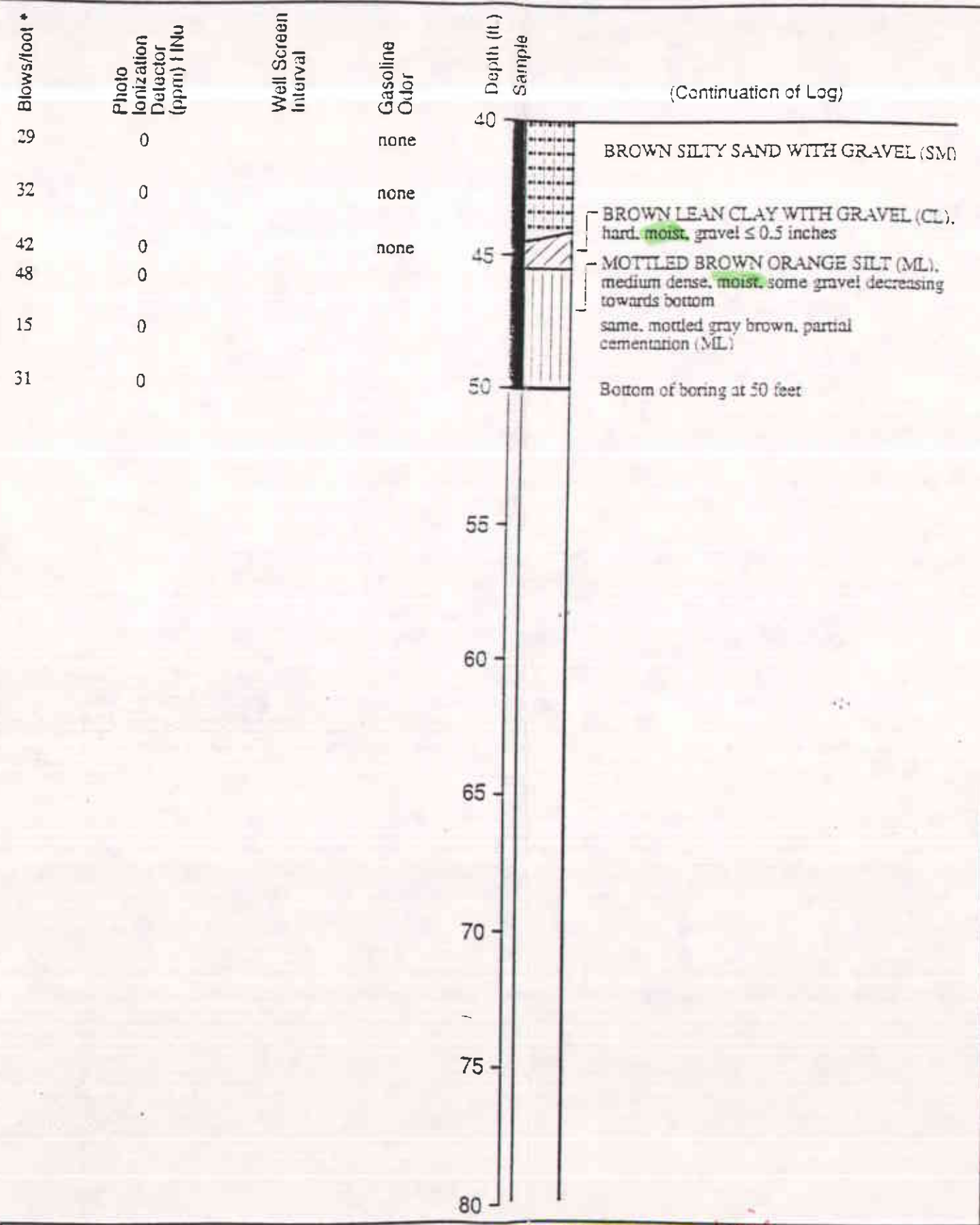
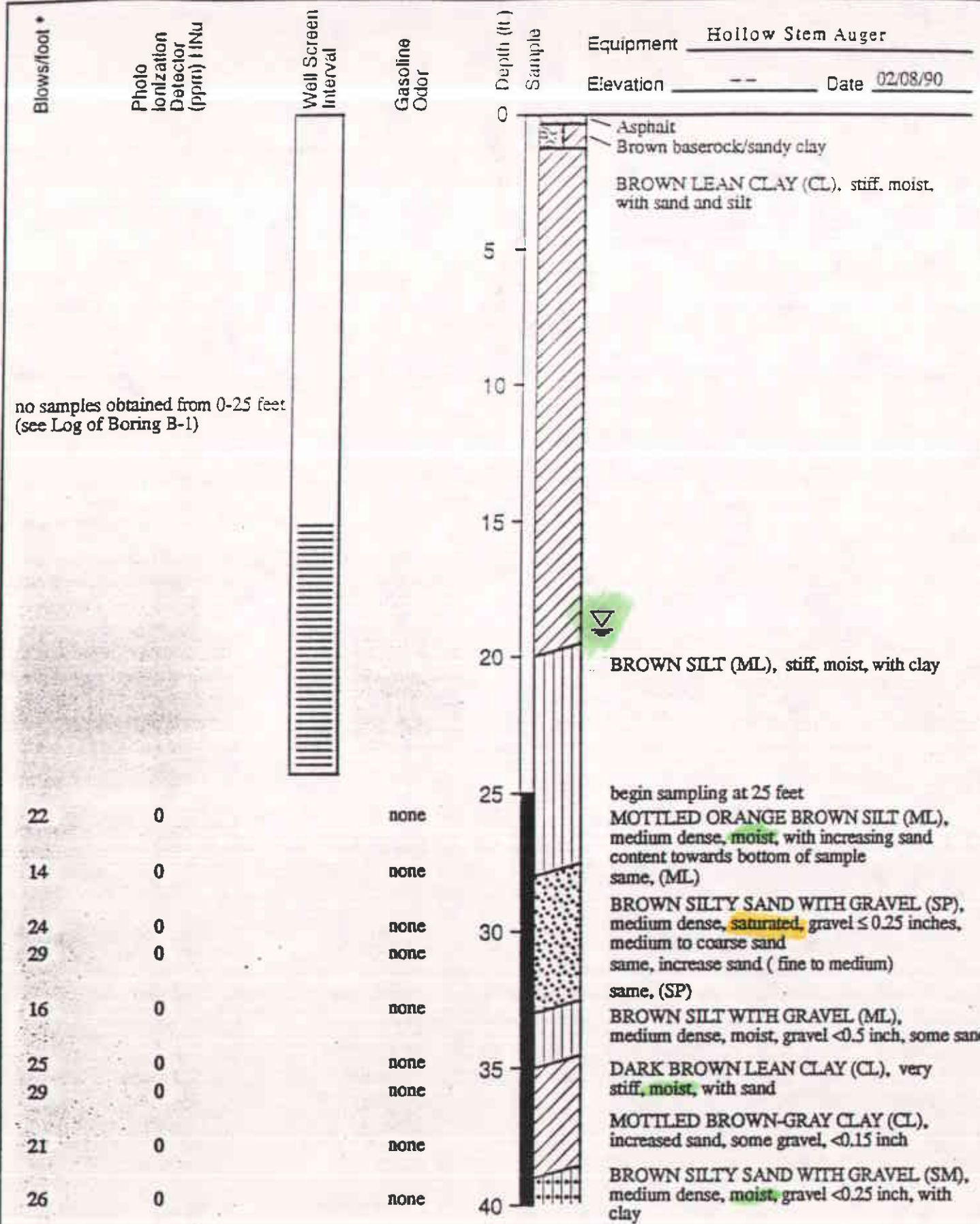
\* Blows converted to Standard Penetration Test



Harding Lawson Associates  
Engineers and Geoscientists

Log of Boring B-6  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE  
**B-6**



\* Blows converted to Standard Penetration Test

	<b>Harding Lawson Associates</b> Engineering and Environmental Services	<b>Log of Boring MW-1</b> Shell Service Station 6039 College Avenue Oakland, California	PLATE <b>B-7</b>
	DRAWN S. Patel	JOB NUMBER 4022.233.03	APPROVED 
		DATE 10/10/91	REVISED DATE

Blows/foot\*

Photo Ionization Detector (ppm)

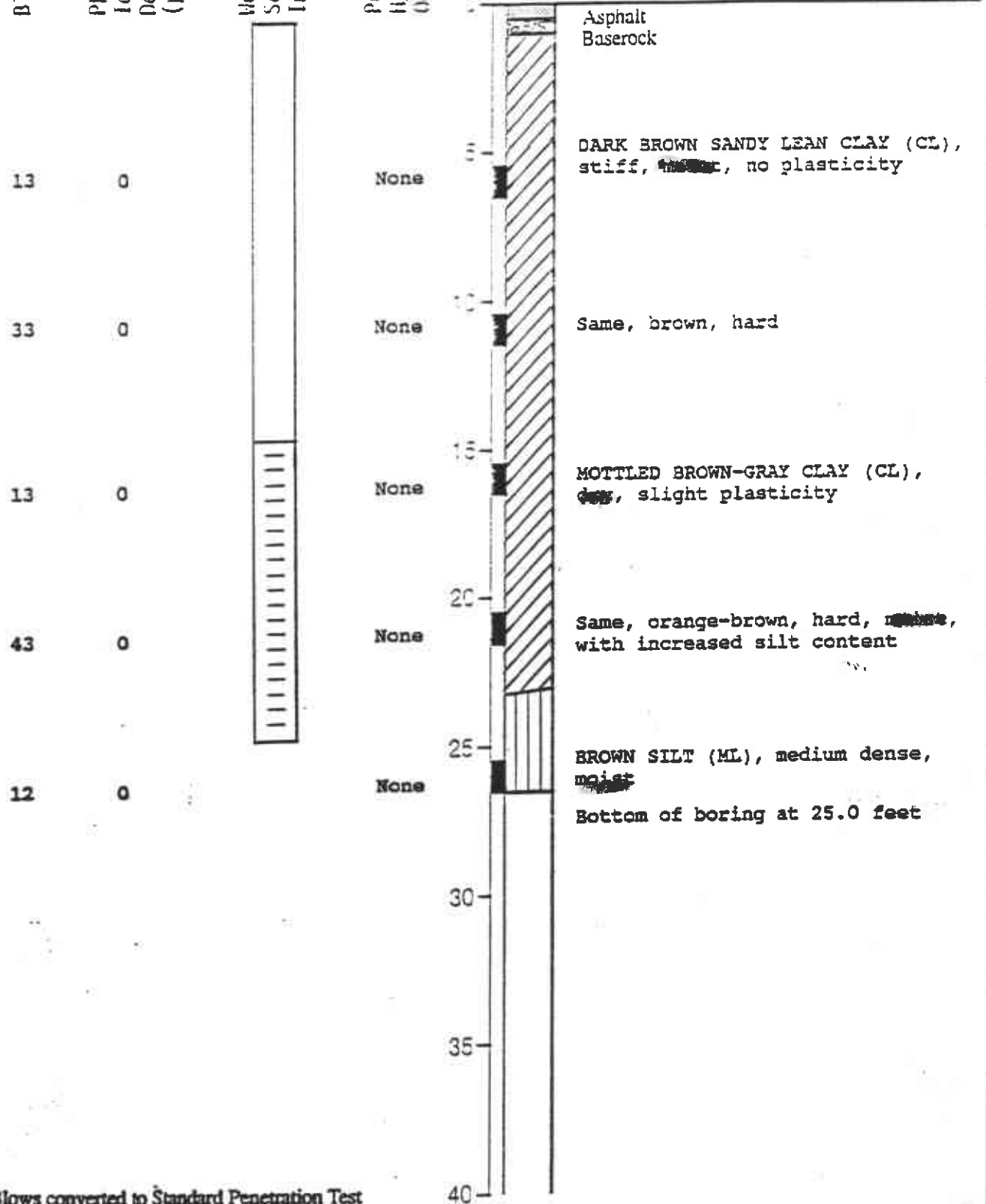
Well Screen Interval

Petroleum Hydrocarbon Odor

Depth (ft) Sample

Equipment Hollow Stem Auger

Elevation --- Date 02/08/90



\* Blows converted to Standard Penetration Test



Harding Lawson Associates  
Engineers and Geoscientists

Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

**B-8**

DRAWN  
YC

JOB NUMBER  
4022,233.03

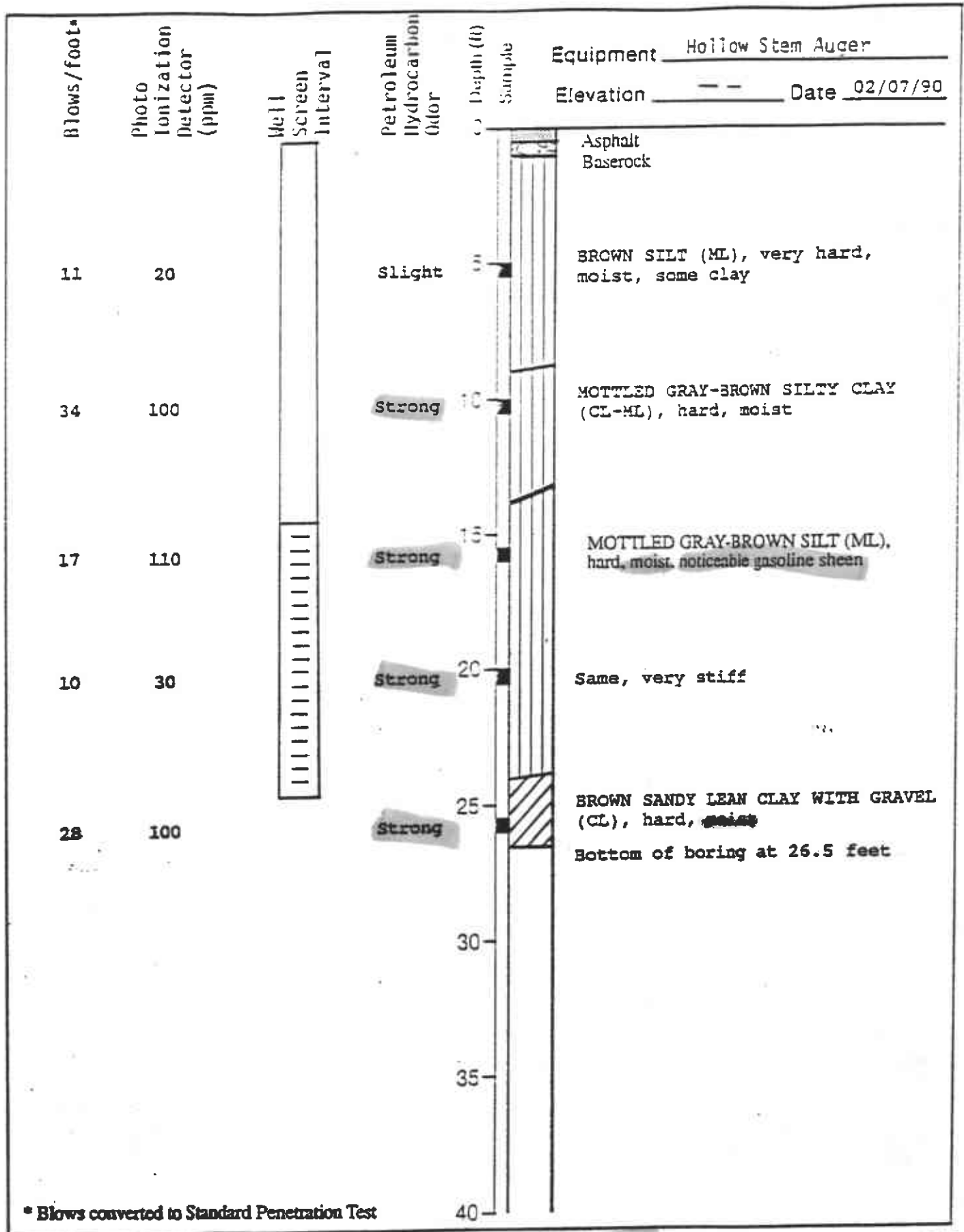
APPROVED  
*[Signature]*

DATE  
10/10/91

REVISED

DATE





\* Blows converted to Standard Penetration Test



Harding Lawson Associates  
Engineers and Geoscientists

Log of Boring MW-3  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

B-9

Blows/foot\*

Photo Ionization Detector (ppm)

Well Screen Interval

Petroleum Hydrocarbon Odor

Depth (ft)

Equipment Hollow Stem Auger

Elevation --- Date 02/07/90

33

0

None

0

BROWN SILT WITH GRAVEL (ML), hard, dry, gravel to 1.5-inch diameter

44

0

None

10

BROWN LEAN CLAY (CL), hard, moist, some black mottling, some silt

14

150



15

GREENISH-BROWN SILT (ML), hard, moist, slight plasticity

69

200



20

GRAY SILT (ML), stiff, saturated, noticeable separate phase product  
BROWN LEAN CLAY (CL), hard, moist

23

10

Slight

25

Same, some gravel to 1.5-inch  
Bottom of boring at 26.5 feet

30

35

40

\* Blows converted to Standard Penetration Test



Harding Lawson Associates  
Engineers and Geoscientists

Log of Boring MW-4  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

B-10

DRAWN  
YC

JOB NUMBER  
4022,233.03

APPROVED

DATE  
10/10/91

REVISED

DATE

Blows/foot*	Photo Ionization Detector (ppm)	Well Screen Interval	Petroleum Hydrocarbon Odor	Depth (ft)	Sample	Equipment	Elevation	Date
						Hollow Stem Auger		8/26/91
						Asphalt Baserock to 6 inches		
6	not measured		none	6		DARK BROWN LEAN CLAY (CL), moist		
						Rig chatter		
						BROWN LEAN CLAY WITH SAND AND GRAVEL (CL), medium stiff, moist, gravel less than 1 inch		
16	0		none	10		MOTTLED BROWN LEAN CLAY (CL), very stiff, moist		
13	2		faint	15		MOTTLED GRAY-BROWN SILT (ML), stiff, moist		
22	0		none	20		MOTTLED BROWN LEAN CLAY (CL), very stiff, <del>moist</del>		
10	0		none	25		Same, stiff		
20	0		none	30		MOTTLED BROWN SILT WITH SAND (ML), very stiff, <del>moist</del>		
						Bottom of boring at 31.5 feet		

\* Blows converted to Standard Penetration Test

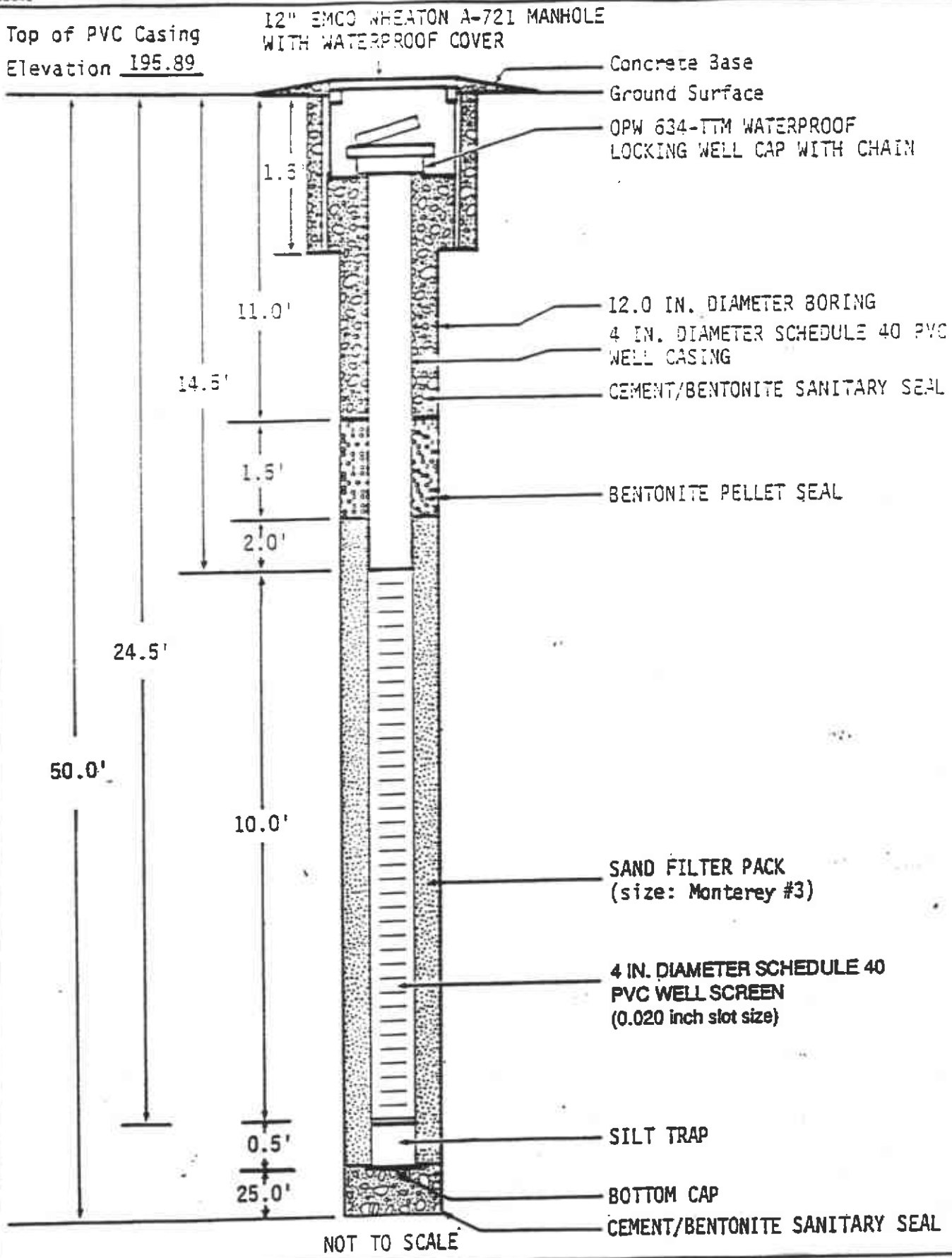


Log of Boring MW-5  
 Shell Service Station  
 6039 College Avenue  
 Oakland, California

PLATE  
**B-11**

APPENDIX C

WELL COMPLETION DETAILS (PLATES C-1 THROUGH C-5)

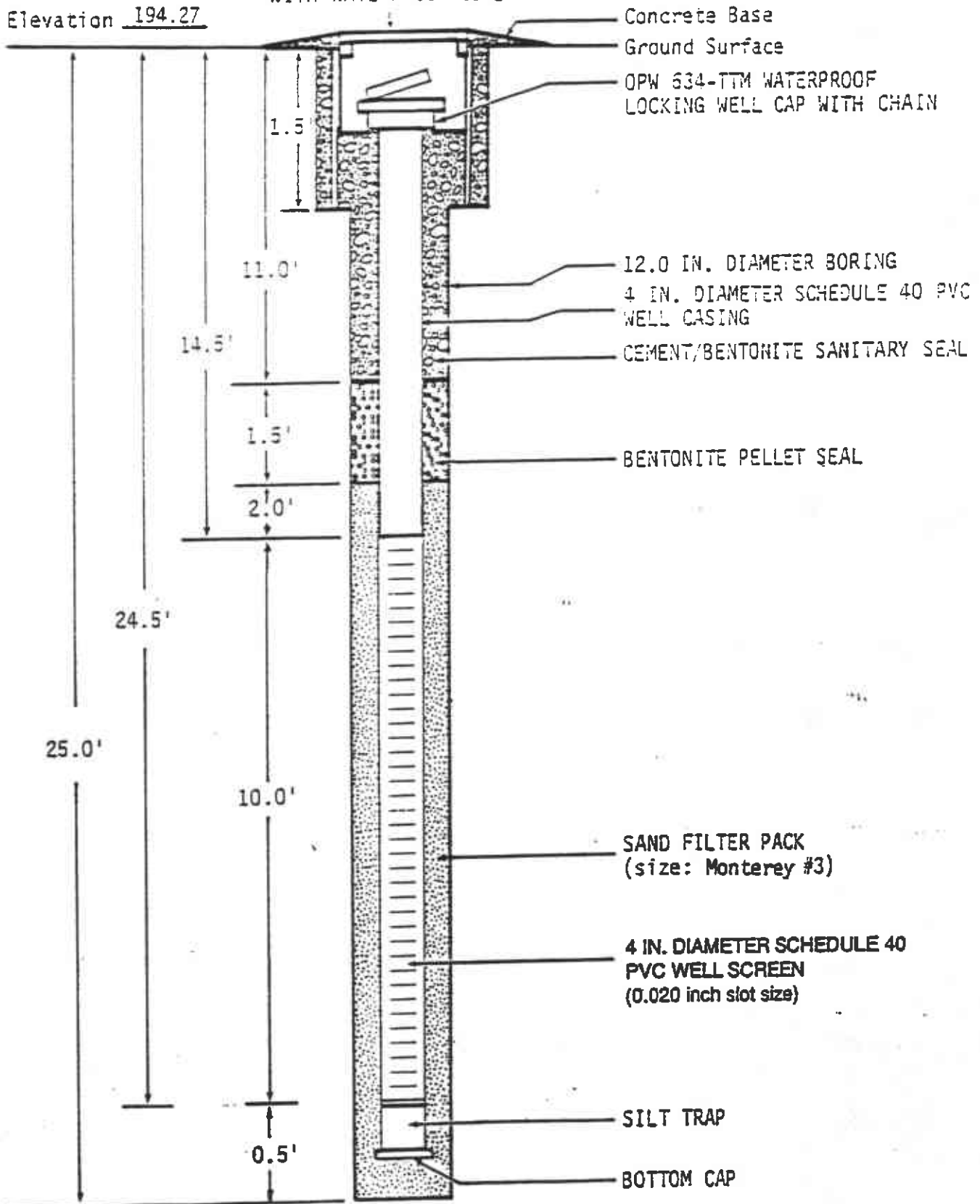


**HLA** **Harding Lawson Associates**  
Engineers and Geoscientists

**Well Completion Diagram MW-1** PLATE  
Shell Service Station  
6039 College Avenue  
Oakland, California **C-1**

Top of PVC Casing  
Elevation 194.27

12" EMCO WHEATON A-721 MANHOLE  
WITH WATERPROOF COVER



NOT TO SCALE



Harding Lawson Associates  
Engineers and Geoscientists

Well Completion Diagram MW-2  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

C-2

DRAWN  
YC

JOB NUMBER  
4022,233.03

APPROVED  
*UC#*

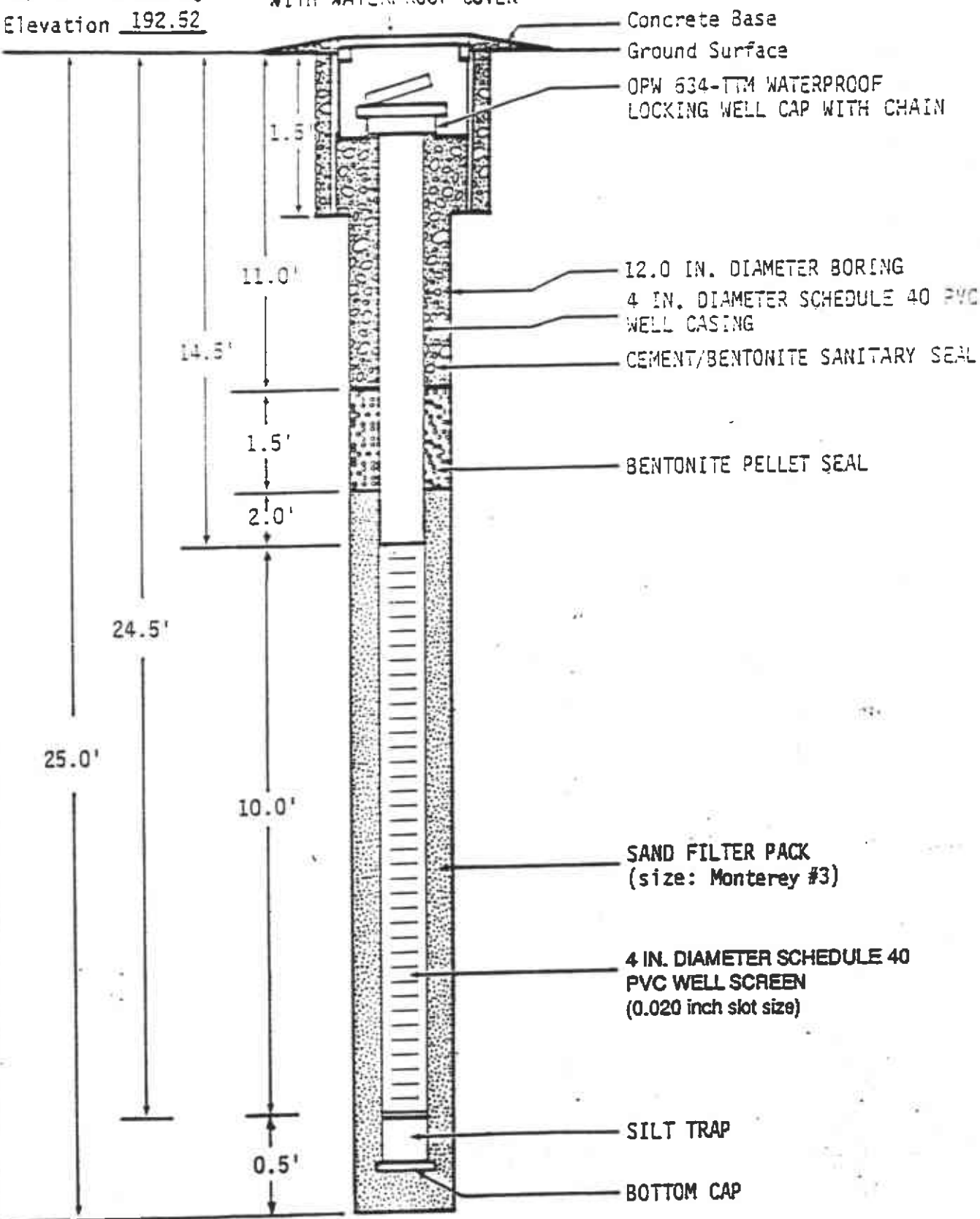
DATE  
10/03/91

REVISED

DATE

Top of PVC Casing  
Elevation 192.52

12" EMCO WHEATON A-721 MANHOLE  
WITH WATERPROOF COVER



NOT TO SCALE



Harding Lawson Associates  
Engineers and Geoscientists

Well Completion Diagram MW-3  
Shell Service Station  
6039 College Avenue  
Oakland, California

PLATE

C-3

DRAWN  
YC

JOB NUMBER  
4022,233.03

APPROVED  
*[Signature]*

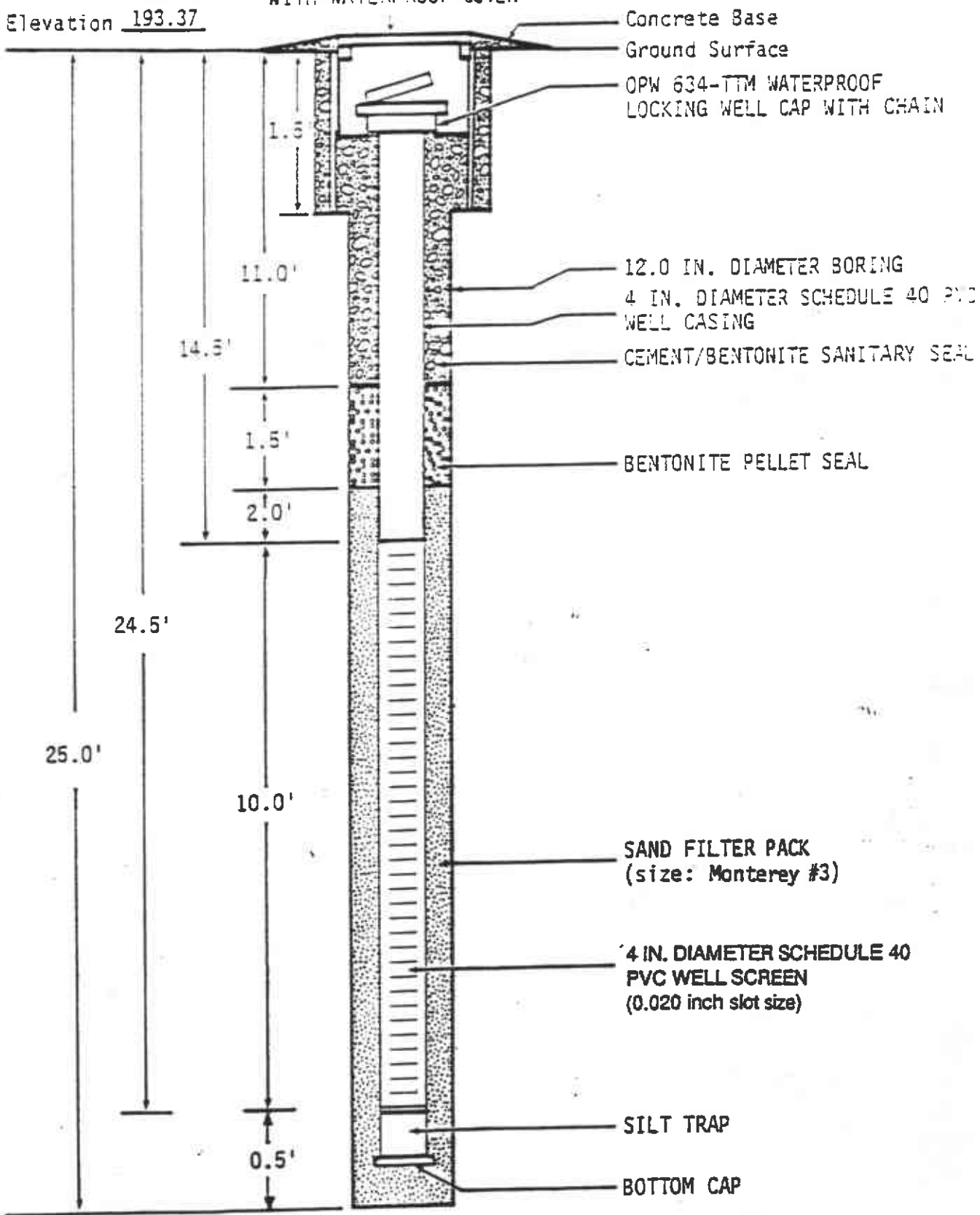
DATE  
10/03/91

REVISED

DATE

Top of PVC Casing  
Elevation 193.37

12" EMCO WHEATON A-721 MANHOLE  
WITH WATERPROOF COVER



NOT TO SCALE

**HLA** Harding Lawson Associates  
Engineers and Geoscientists

**Well Completion Diagram MW-4**  
Sewer Service Station  
6039 College Avenue  
Oakland, California

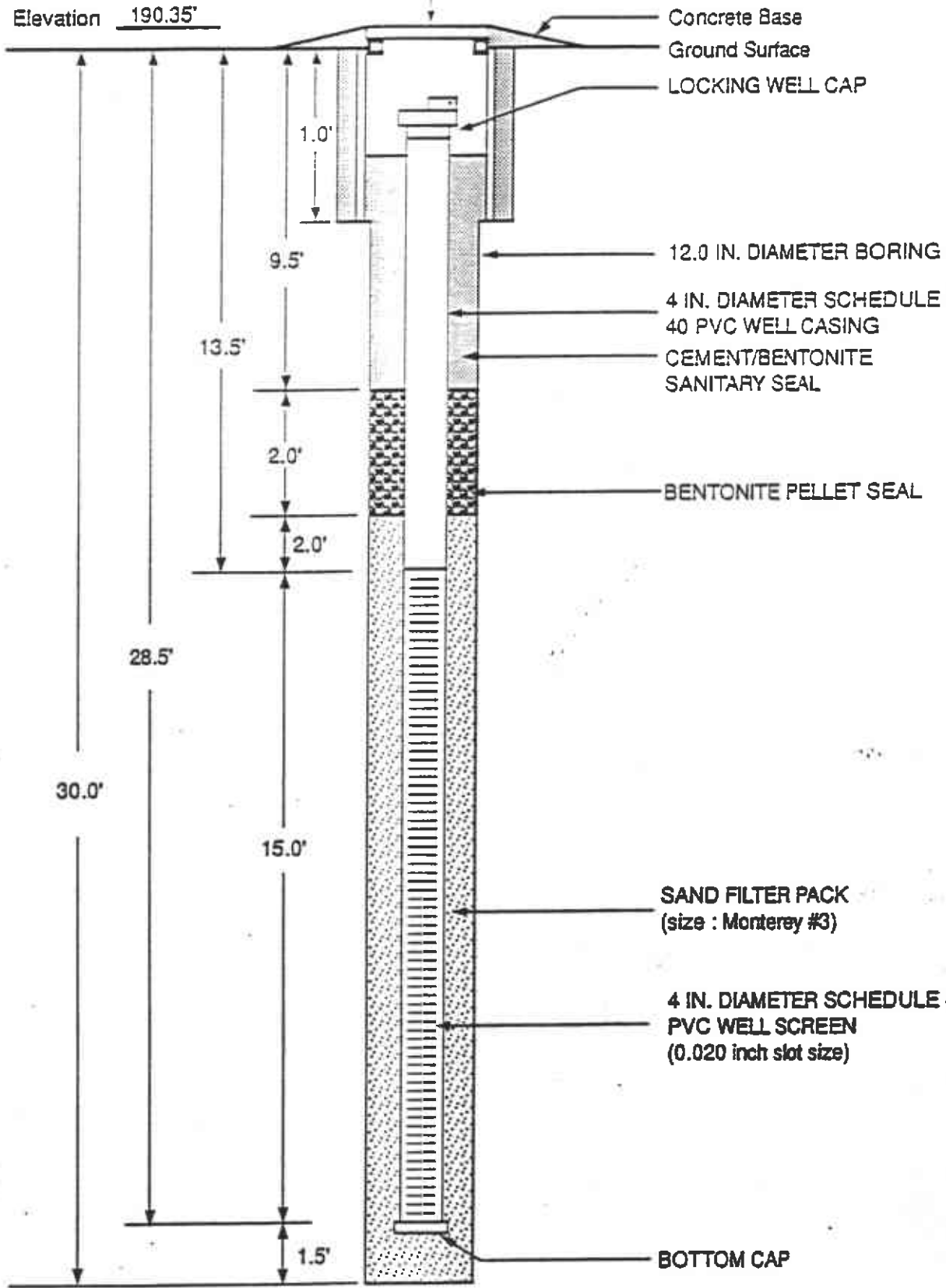
PLATE

**C-4**



Top of PVC Casing  
Elevation 190.35'

12" EMCO WHEATON A-721 MANHOLE  
WITH WATERPROOF COVER



NOT TO SCALE



Harding Lawson Associates  
Engineering and  
Environmental Services

Well Completion Detail - MW-5  
6039 Shell College Avenue  
Oakland, California

PLATE

C-5

DRAWN  
RHC

JOB NUMBER  
4022,233.03

APPROVED  
*Moz*

DATE  
10/10/91

REVISED DATE

APPENDIX D  
LABORATORY REPORTS - SOIL ANALYSIS



INTERNATIONAL  
TECHNOLOGY  
CORPORATION

# ANALYTICAL SERVICES

HARDING ASSOC.  
MJB  
SEP 16 1991

## CERTIFICATE OF ANALYSIS

Shell Oil Company  
Harding Lawson Associates  
1355 Willow Way, Suite 109  
Concord, CA 94520  
Michael Brink

Date: 09/13/91

Work Order: T1-08-312

P.O. Number: MOH 880-021 Vendor #I0002402

This is the Certificate of Analysis for the following samples:

Client Work ID: 4022233.03/6039College Av.Oak  
Date Received: 08/26/91  
Number of Samples: 3  
Sample Type: solid

### TABLE OF CONTENTS FOR ANALYTICAL RESULTS

<u>PAGES</u>	<u>LABORATORY #</u>	<u>SAMPLE IDENTIFICATION</u>
3	T1-08-312-01	MW-5-6'
6	T1-08-312-02	MW-5-16'
8	T1-08-312-03	MW-5-21'
11	T1-08-312-04	Quality Control

Reviewed and Approved:

  
Suzanne Veandry  
Project Manager

American Council of Independent Laboratories  
International Association of Environmental Testing Laboratories  
American Association for Laboratory Accreditation

Company: Shell Oil Company  
 Date: 09/13/91  
 Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: TI-08-312

TEST NAME: Oil & Grease

SAMPLE ID: MW-5-6'  
 SAMPLE DATE: 08/24/91  
 LAB SAMPLE ID: T108312-01  
 SAMPLE MATRIX: solid  
 RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	<u>METHOD</u>	<u>EXTRACTION DATE</u>	<u>ANALYSIS DATE</u>
Oil and Grease	503E	09/10/91	09/11/91

<u>PARAMETER</u>	<u>DETECTION LIMIT</u>	<u>DETECTED</u>
Oil and Grease	50.	None

Company: Shell Oil Company  
 Date: 09/13/91  
 Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: T1-08-312

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: MW-5-6'  
 SAMPLE DATE: 08/24/91  
 LAB SAMPLE ID: T108312-01  
 SAMPLE MATRIX: solid  
 RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020	08/30/91	09/03/91
Low Boiling Hydrocarbons	Mod.8015	08/30/91	09/03/91
High Boiling Hydrocarbons	Mod.8015	09/10/91	09/11/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	1.	None
BTEX		
Benzene	0.005	None
Toluene	0.005	None
Ethylbenzene	0.005	None
Xylenes (total)	0.005	None
High Boiling Hydrocarbons calculated as Diesel	1.2	None
calculated as Oil	12.	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	112.
1,3-Dichlorobenzene (BTEX)	111.
nC32 (Diesel)	74.

Company: Shell Oil Company

Date: 09/13/91

Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
SAN JOSE, CA

Work Order: T1-08-312

TEST NAME: Oil & Grease

SAMPLE ID: MW-5-16'

SAMPLE DATE: 08/24/91

LAB SAMPLE ID: T108312-02

SAMPLE MATRIX: solid

RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	<u>METHOD</u>	<u>EXTRACTION DATE</u>	<u>ANALYSIS DATE</u>
Oil and Grease	503E	09/10/91	09/11/91

<u>PARAMETER</u>	<u>DETECTION LIMIT</u>	<u>DETECTED</u>
Oil and Grease	50.	None

Company: Shell Oil Company  
 Date: 09/13/91  
 Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: T1-08-312

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: MW-5-16'  
 SAMPLE DATE: 08/24/91  
 LAB SAMPLE ID: T108312-02  
 SAMPLE MATRIX: solid  
 RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020	08/30/91	09/03/91
Low Boiling Hydrocarbons	Mod.8015	08/30/91	09/03/91
High Boiling Hydrocarbons	Mod.8015	09/10/91	09/11/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	2.5	23.
BTEX		
Benzene	0.025	None
Toluene	0.025	None
Ethylbenzene	0.025	0.028
Xylenes (total)	0.025	0.10
High Boiling Hydrocarbons calculated as Diesel	1.2	7.0 &
calculated as Oil	12.	13.

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	509.*
1,3-Dichlorobenzene (BTEX)	130.*
nC32 (Diesel)	100.*

Comments:

- ^ Compounds detected and calculated as low boiling hydrocarbons are due to a petroleum mixture other than gasoline.
- & Compounds detected and calculated as high boiling hydrocarbons consist of compounds eluting within the chromatographic range of diesel, but are not characteristic of the standard diesel standard pattern.
- \* Surrogate elevated due to hydrocarbon interference.

Company: Shell Oil Company  
Date: 09/13/91  
Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
SAN JOSE, CA

Work Order: T1-08-312

TEST NAME: Oil & Grease

SAMPLE ID: MW-5-21'  
SAMPLE DATE: 08/24/91  
LAB SAMPLE ID: T108312-03  
SAMPLE MATRIX: solid  
RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	<u>METHOD</u>	<u>EXTRACTION DATE</u>	<u>ANALYSIS DATE</u>
Oil and Grease	503E	09/10/91	09/11/91

<u>PARAMETER</u>	<u>DETECTION LIMIT</u>	<u>DETECTED</u>
Oil and Grease	50.	None



Company: Shell Oil Company  
 Date: 09/13/91  
 Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: T1-08-312

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: MW-5-21'  
 SAMPLE DATE: 08/24/91  
 LAB SAMPLE ID: T108312-03  
 SAMPLE MATRIX: solid  
 RECEIPT CONDITION: Cool

RESULTS in Milligrams per Kilogram:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020	08/30/91	09/03/91
Low Boiling Hydrocarbons	Mod.8015	08/30/91	09/03/91
High Boiling Hydrocarbons	Mod.8015	09/10/91	09/11/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	1.	None
BTEX		
Benzene	0.005	None
Toluene	0.005	None
Ethylbenzene	0.005	None
Xylenes (total)	0.005	None
High Boiling Hydrocarbons calculated as Diesel	1.2	None
calculated as Oil	12.	None

SURROGATES	REC
1,3-Dichlorobenzene (Gasoline)	111.
1,3-Dichlorobenzene (BTEX)	109.
nC32 (Diesel)	91.

Company: Shell Oil Company  
 Date: 09/13/91  
 Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: T1-08-312

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control  
 SAMPLE DATE: not spec  
 LAB SAMPLE ID: T108312-04A  
 EXTRACTION DATE: 09/10/91  
 ANALYSIS DATE: 09/10/91  
 ANALYSIS METHOD: Mod.8015

QUALITY CONTROL REPORT

Laboratory Spike(LS) and Laboratory Spike Duplicate(LSD) Analyses

RESULTS in Milligrams per Kilogram

PARAMETER	Sample Amt	Spike Amt	LS Result	LSD Result	LS %Rec	LSD %Rec	RPD
Diesel	None	25.	21.3	N/A	85.	N/A	N/A
<b>SURROGATES</b>					<b>LS %Rec</b>	<b>LSD %Rec</b>	
nc32					90.	N/A	

IT ANALYTICAL SERVICES  
SAN JOSE, CA

Company: Shell Oil Company

Date: 09/13/91

Client Work ID: 4022233.03/6039College Av.Oak

Work Order: T1-08-312

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control

SAMPLE DATE: not spec

LAB SAMPLE ID: T108312-04A

EXTRACTION DATE: 09/10/91

ANALYSIS DATE: 09/11/91

ANALYSIS METHOD: 503E

## QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Milligrams per Kilogram

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Oil & Grease	None	1667.	1443.	1482.	86.	89.	3.

Company: Shell Oil Company  
 Date: 09/13/91  
 Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: T1-08-312

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control  
 SAMPLE DATE: not spec  
 LAB SAMPLE ID: T108312-04B  
 EXTRACTION DATE: 08/30/91  
 ANALYSIS DATE: 09/03/91  
 ANALYSIS METHOD: 8020

QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Milligrams per Kilogram

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Benzene (MSD)	None	0.372, 0.380	0.399	0.401	107.	106.	1.
Toluene (MSD)	None	0.372, 0.380	0.443	0.444	119.	117.	2.
Ethyl benzene (MSD)	None	0.372, 0.380	0.443	0.446	119.	117.	2.
Xylenes (MSD)	None	1.12, 1.14	1.329	1.340	119.	118.	1.
					MS %Rec	MSD %Rec	
SURROGATES					110.	110.	
1,3-Dichlorobenzene					110.	110.	

Company: Shell Oil Company  
Date: 09/13/91  
Client Work ID: 4022233.03/6039College Av.Oak

IT ANALYTICAL SERVICES  
SAN JOSE, CA

Work Order: T1-08-312

TEST CODE ONGES TEST NAME EPA 503E in Soil

The method of analysis for oil and grease is taken from Standard Methods for the Examination of Water and Wastewater, Section 503E. Samples are extracted with repeated portions of solvent and the extract is treated with silica gel to remove polar compounds. The extract is evaporated and oil and grease is determined gravimetrically.

TEST CODE TPHN TEST NAME TPH High Boiling by 8015

The method of analysis for high boiling hydrocarbons is taken from the LUFT field manual. Samples are extracted with solvent and examined by gas chromatography using a flame ionization detector. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.

TEST CODE TPHEVB TEST NAME TPH Gas, BTEX by 8015/8020

The method of analysis for low boiling hydrocarbons is taken from EPA Methods modified 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography using a flame ionization detector in series with a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.



**Holding Lawson Associates**  
 1356 Willow Way, Suite 109  
 Concord, California 94520  
 415/687-9660  
 Telecopy: 415/687-9673

# CHAIN OF CUSTODY FORM

Lab: IT SEP 23 1991

Job Number: 4022233.03  
 Name/Location: SHELL COLLEGE AIC  
 Project Manager: MICHAEL BRINK

Samplers: MIKE BRINK  
 Recorder: [Signature]  
 (Signature Required)

ANALYSIS REQUESTED										
EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	ICP METALS	EPA 8015M/TPH	BTX	TPH-GAS	TPH-OLEFEN	TPH-METH. P.L.	
						XXX	XXX	XXX	XXX	XXX

SOURCE CODE	MATRIX				#CONTAINERS & PRESERV.			SAMPLE NUMBER OR LAB NUMBER			DATE				STATION DESCRIPTION/NOTES
	Water	Sediment	Soil	Oil	Unpres.	H <sub>2</sub> SO <sub>4</sub>	HNO <sub>3</sub>	Yr	Wk	Seq	Yr	Mo	Dy	Time	
50			X		1			MW	5	6	9	10	24	Normal Turn around COOL	
50			X		1			MW	5	16					
50			X		1			MW	5	21					

WIC #  
204-5508-330  
SHELL  
6039 COLLEGE AIC  
OAKLAND, 94618

LAB NUMBER			DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
Yr	Wk	Seq				

CHAIN OF CUSTODY RECORD		
RELINQUISHED BY: (Signature) <u>[Signature]</u>	RECEIVED BY: (Signature) <u>[Signature]</u>	DATE/TIME 8/20/91 1410
RELINQUISHED BY: (Signature) <u>[Signature]</u>	RECEIVED BY: (Signature) <u>[Signature]</u>	DATE/TIME 8-20-91 1410
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature)	DATE/TIME	RECEIVED FOR LAB BY: (Signature) <u>[Signature]</u>
METHOD OF SHIPMENT <u>BY COURIER</u>		

APPENDIX E  
LABORATORY REPORTS - GROUNDWATER ANALYSIS



INTERNATIONAL  
TECHNOLOGY  
CORPORATION

# ANALYTICAL SERVICES

HARDING ASSOC.  
MFB  
SEP 13 1991

## CERTIFICATE OF ANALYSIS

Shell Oil Company  
Harding Lawson Associates  
1355 Willow Way, Suite 109  
Concord, CA 94520  
Mike Brink

Date: 09/12/91

Work Order: T1-08-394

P.O. Number: MOH 880-021 Vendor #I0002402

This is the Certificate of Analysis for the following samples:

Client Work ID: 4022-233.03/6039CollegeAvClar  
Date Received: 08/30/91  
Number of Samples: 6  
Sample Type: aqueous

### TABLE OF CONTENTS FOR ANALYTICAL RESULTS

<u>PAGES</u>	<u>LABORATORY #</u>	<u>SAMPLE IDENTIFICATION</u>
2	T1-08-394-01	MW-1
3	T1-08-394-02	MW-2
4	T1-08-394-03	MW-3
7	T1-08-394-04	MW-4
8	T1-08-394-05	MW-5
9	T1-08-394-06	TRIP BLANK
10	T1-08-394-07	Quality Control
11	T1-08-394-07	T108394-LS

Reviewed and Approved:

  
Suzanne Veandry  
Project Manager

American Council of Independent Laboratories  
International Association of Environmental Testing Laboratories  
American Association for Laboratory Accreditation



Company: Shell Oil Company  
 Date: 09/12/91  
 Client Work ID: 4022-233.03/6039CollegeAvClar

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: T1-08-394

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: MW-1  
 SAMPLE DATE: 08/30/91  
 LAB SAMPLE ID: T108394-01  
 SAMPLE MATRIX: aqueous  
 RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/05/91
Low Boiling Hydrocarbons	Mod.8015		09/05/91
High Boiling Hydrocarbons	Mod.8015	09/04/91	09/09/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None
High Boiling Hydrocarbons calculated as Diesel	0.05	0.52 @
calculated as Oil	0.50	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	92.
1,3-Dichlorobenzene (BTEX)	94.
nC32 (Diesel)	97.

Comments:

@ Compounds detected and calculated as high boiling hydrocarbons consist of compounds eluting within the chromatographic range of diesel, but are not characteristic of the standard diesel standard pattern.

Company: Shell Oil Company

Date: 09/12/91

Client Work ID: 4022-233.03/6039CollegeAvClar

Work Order: T1-08-394

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: MW-2

SAMPLE DATE: 08/30/91

LAB SAMPLE ID: T108394-02

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH &lt; 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/05/91
Low Boiling Hydrocarbons	Mod.8015		09/05/91
High Boiling Hydrocarbons	Mod.8015	09/04/91	09/09/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None
High Boiling Hydrocarbons calculated as Diesel.	0.05	None
calculated as Oil	0.50	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	91.
1,3-Dichlorobenzene (BTEX)	93.
nC32 (Diesel)	25.

Company: Shell Oil Company

Date: 09/12/91

Client Work ID: 4022-233.03/6039CollegeAvClar

Work Order: TI-08-394

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: MW-3

SAMPLE DATE: 08/30/91

LAB SAMPLE ID: T108394-03

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH &lt; 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/06/91
Low Boiling Hydrocarbons	Mod.8015		09/06/91
High Boiling Hydrocarbons	Mod.8015	09/04/91	09/06/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	0.87
BTEX		
Benzene	0.0005	0.044
Toluene	0.0005	0.0061
Ethylbenzene	0.0005	0.010
Xylenes (total)	0.0005	0.0029
High Boiling Hydrocarbons calculated as Diesel	0.05	0.37 ‡
calculated as Oil	0.50	0.50

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	*109.
1,3-Dichlorobenzene (BTEX)	100.
nC32 (Diesel)	80.

## Comments:

‡ Compounds detected and calculated as diesel appear to be the less volatile constituents of gasoline.

\*Surrogate elevated due to hydrocarbon interferences.

Company: Shell Oil Company  
 Date: 09/12/91  
 Client Work ID: 4022-233.03/6039CollegeAvClar

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: T1-08-394

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: MW-4  
 SAMPLE DATE: 08/30/91  
 LAB SAMPLE ID: T108394-04M  
 EXTRACTION DATE: 09/04/91  
 ANALYSIS DATE: 09/09/91  
 ANALYSIS METHOD: Mod.8015

QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Diesel	282.	1000.	1595.	1400.	131.	112.	16.
SURROGATES					MS %Rec	MSD %Rec	
nC32					97.	91.	

IT ANALYTICAL SERVICES  
SAN JOSE, CA

Company: Shell Oil Company

Date: 09/12/91

Client Work ID: 4022-233.03/6039CollegeAvClar

Work Order: T1-08-394

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: MW-4

SAMPLE DATE: 08/30/91

LAB SAMPLE ID: T108394-04N

EXTRACTION DATE:

ANALYSIS DATE: 09/05/91

ANALYSIS METHOD: Mod. 8015

## QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Gasoline	226.	2500.	2360.	2115.	85.	76.	11.
<b>SURROGATES</b>					<b>MS %Rec</b>	<b>MSD %Rec</b>	
1,3-Dichlorobenzene					97.	96.	

Company: Shell Oil Company

Date: 09/12/91

Client Work ID: 4022-233.03/6039CollegeAvClar

Work Order: T1-08-394

## TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: MW-4

SAMPLE DATE: 08/30/91

LAB SAMPLE ID: T108394-04

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH &lt; 2

## RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/06/91
Low Boiling Hydrocarbons	Mod.8015		09/06/91
High Boiling Hydrocarbons	Mod.8015	09/04/91	09/07/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	0.57
BTEX		
Benzene	0.0005	0.064
Toluene	0.0005	0.0018
Ethylbenzene	0.0005	0.0009
Xylenes (total)	0.0005	0.0009
High Boiling Hydrocarbons calculated as Diesel	0.05	0.28 @
calculated as Oil	0.50	2.0

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	111.
1,3-Dichlorobenzene (BTEX)	96.
nC32 (Diesel)	77.

## Comments:

@ Compounds detected and calculated as high boiling hydrocarbons consist of compounds eluting within the chromatographic range of diesel, but are not characteristic of the standard diesel standard pattern.

IT ANALYTICAL SERVICES  
SAN JOSE, CA

Company: Shell Oil Company

Date: 09/12/91

Client Work ID: 4022-233.03/6039CollegeAvClar

Work Order: T1-08-394

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: MW-5

SAMPLE DATE: 08/30/91

LAB SAMPLE ID: T108394-05

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH &lt; 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/05/91
Low Boiling Hydrocarbons	Mod.8015		09/05/91
High Boiling Hydrocarbons	Mod.8015	09/04/91	09/07/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None
High Boiling Hydrocarbons calculated as Diesel	0.05	0.08 @
calculated as Oil	0.50	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	88.
1,3-Dichlorobenzene (BTEX)	92.
nC32 (Diesel)	13.

## Comments:

@ Compounds detected and calculated as high boiling hydrocarbons consist of compounds eluting within the chromatographic range of diesel, but are not characteristic of the standard diesel standard pattern.

IT ANALYTICAL SERVICES  
SAN JOSE, CA

Company: Shell Oil Company

Date: 09/12/91

Client Work ID: 4022-233.03/6039CollegeAvClar

Work Order: T1-08-394

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: TRIP BLANK

SAMPLE DATE: not spec

LAB SAMPLE ID: T108394-06

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH &lt; 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		09/09/91
Low Boiling Hydrocarbons	Mod.8015		09/09/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	108.
1,3-Dichlorobenzene (BTEX)	96.



IT ANALYTICAL SERVICES  
SAN JOSE, CA

Company: Shell Oil Company

Date: 09/12/91

Client Work ID: 4022-233.03/6039CollegeAvClar

Work Order: T1-08-394

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control

SAMPLE DATE: not spec

LAB SAMPLE ID: T108394-07B

EXTRACTION DATE:

ANALYSIS DATE: 09/05/91

ANALYSIS METHOD: 8020

## QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Benzene	ND<0.5	50.0	54.3	54.8	109.	110.	1.
Toluene	ND<0.5	50.0	55.5	55.4	111.	111.	0
Ethyl benzene	ND<0.5	50.0	53.0	52.4	106.	105.	1.
Xylenes	ND<0.5	150.	117.	113.	78.	75.	3.

SURROGATES	MS %Rec	MSD %Rec
1,3-Dichlorobenzene	92.	92.

Company: Shell Oil Company  
 Date: 09/12/91  
 Client Work ID: 4022-233.03/6039CollegeAvClar

IT ANALYTICAL SERVICES  
 SAN JOSE, CA

Work Order: T1-08-394

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: T108394-LS  
 SAMPLE DATE: not spec  
 LAB SAMPLE ID: T108394-07A  
 EXTRACTION DATE: 09/04/91  
 ANALYSIS DATE: 09/06/91  
 ANALYSIS METHOD: Mod.8015

QUALITY CONTROL REPORT

Laboratory Spike(LS) and Laboratory Spike Duplicate(LSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	LS Result	LSD Result	LS %Rec	LSD %Rec	RPD
Diesel	None	1000.	936.	N/A	94.	N/A	N/A

SURROGATES	LS %Rec	LSD %Rec
nC32	58.	N/A

Company: Shell Oil Company

Date: 09/12/91

Client Work ID: 4022-233.03/6039CollegeAvClar

IT ANALYTICAL SERVICES

SAN JOSE, CA

Work Order: T1-08-394

## TEST CODE TPHN TEST NAME TPH High Boiling by 8015

The method of analysis for high boiling hydrocarbons is taken from the LUFT field manual. Samples are extracted with solvent and examined by gas chromatography using a flame ionization detector. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.

Sample T1-08-394-04 (MW-4) was re-extracted and re-analyzed because of variable results for motor oil in the matrix spike and matrix spike. The re-extraction was done on a different fraction, once again having varying results this indicates that the variability maybe due to a sampling or field related problem. The detected results for oil in the matrix and matrix spike duplicate are 5.19 ppm and 3.04 ppm, respectively.

## TEST CODE TPHVB TEST NAME TPH Gas, BTEX by 8015/8020

The method of analysis for low boiling hydrocarbons is taken from EPA Methods modified 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography using a flame ionization detector in series with a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.

Company: Shell Oil Company  
Date: 09/12/91  
Client Work ID: 4022-233.03/6039CollegeAvClar

IT ANALYTICAL SERVICES  
SAN JOSE, CA  
Work Order: TI-08-394

TEST CODE TPHN TEST NAME TPH High Boiling by 8015

The method of analysis for high boiling hydrocarbons is taken from the LUFT field manual. Samples are extracted with solvent and examined by gas chromatography using a flame ionization detector. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.

Sample TI-08-394-04 (MW-4) was re-extracted and re-analyzed because of variable results for motor oil in the matrix spike and matrix spike duplicate. The re-extraction was done on a different fraction, once again having varying results this indicates that the variability maybe due to a sampling or a field related problem. The detected results for oil in the matrix and matrix spike duplicate are 5.19 ppm and 3.04 ppm, respectively.

TEST CODE TPHVB TEST NAME TPH Gas, BTEX by 8015/8020

The method of analysis for low boiling hydrocarbons is taken from EPA Methods modified 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography using a flame ionization detector in series with a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.



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Terence J. McManus  
Associate Environmental Scientist