

A Report Prepared for

Shell Oil Company
P. O. Box 4023
Concord, California 94524

QUARTERLY TECHNICAL REPORT
FOURTH QUARTER 1990
SHELL SERVICE STATION
6039 COLLEGE AVENUE
OAKLAND, CALIFORNIA

Jan 91

HLA Job No. 4022,233.03

by

Dorinda C. Holloway
Dorinda C. Holloway
Project Hydrogeologist

Donald G. Gray
Donald G. Gray
Geotechnical Engineer



Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660

January 9, 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 fourth quarter of 1990, along with anticipated activities for the first quarter of 1991.

HLA submitted a work plan (dated January 10, 1990) for a soil and groundwater investigation to the appropriate agencies. In addition quarterly technical reports have been issued on April 13, July 10, and October 12, 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.

Soil Investigation

In January 1990, six soil borings 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 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, as described below:

<u>Boring</u>	<u>Rationale</u>
B-1	Location of 1940 pump island
B-2	Location of 1940 and 1957 fuel tanks
B-3 and B-6	Location of former waste oil tank and present fuel tanks (near source)
B-4 and B-5	Location of 1957 pump islands and adjacent to present pump islands

The shallow subsurface materials encountered in our borings consist of sandy lean clays and silts, with occasional thin silty sand and gravel lenses. The sediments become saturated from 15 to 18 feet below land surface. The borings were grouted to the surface with a cement-bentonite grout.

Soil samples exhibiting the highest organic vapor readings were sealed and transported to an analytical laboratory, under chain-of-custody documentation, for analysis of BTEX and TPH as gasoline, using Environmental Protection Agency (EPA) Test Methods 8020 and 8015 (modified). Soil samples collected near the former waste oil tank were also analyzed for TPH as diesel fuel and motor oil (EPA Test Method 8015, modified); oil and grease (SM 503 D&E); halogenated volatile organic compounds (VOCs) (EPA Test Method 8010); and cadmium, chromium, zinc, and lead (EPA Test Methods 6010 and 7421). 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, and completed to a depth of 25 feet. The borehole for MW-1 was advanced to a depth of 50 feet to evaluate the deeper stratigraphy.

Soil samples were collected from the downgradient well borings (MW-2, -3, and -4) at depths of approximately 10, 15, and 20 feet. These samples were analyzed for BTEX (EPA Test Method 8020) and for TPH as gasoline, diesel fuel, and motor oil (EPA Test Method 8015, modified) to further delineate the lateral and vertical extent of petroleum hydrocarbons in soil. Soil samples collected from well borings near the former waste oil tank location (MW-3 and MW-4) were also analyzed for polychlorinated biphenyls (PCBs) (EPA Test Method 8080). Free-phase hydrocarbons were observed on the Sprague and Henwood (S&H) sampler at a depth of 20 feet during drilling of MW-4. Results of analyses on these soil samples are presented in Table 4.

Water levels in the wells were measured to the nearest 0.01 foot and the casing elevations were surveyed by HLA on February 15, 1990. Elevations are based on a temporary benchmark of 195.00 feet established at the Northwest corner of the building on site. Groundwater level elevations are presented in Table 5.

The wells were developed by removing approximately seven well volumes.

On February 13, 1990, water from the wells was sampled after purging three well volumes. Water samples were submitted for laboratory analysis of BTEX; TPH as gasoline, diesel fuel, and motor oil; organic lead (California LUFT Test Method*); and ethylene dibromide (EDB) (EPA Test Method 8010). A trip blank and a duplicate sample from MW-3 were also submitted for analyses. No free product was observed in the monitoring wells. The wells were also sampled in May 1990 and September 12, 1990. Results are presented in Table 6.

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

Based on the February 1990 groundwater levels (between 15 and 18 foot depths), the general groundwater flow direction was calculated to be south southwest.

Chemical Results

In soil samples from the borings, cumulative BTEX concentrations were either not detected or were present at less

* Organic lead test method specified in "Leaking Underground Fuel Tank Field Manual", October 1989.

than 15 parts per million (ppm) (Tables 3 and 4). In the samples from Borings B-3 and B-6, individual concentrations of TPH as gasoline, diesel fuel, and motor oil ranged between 71 and 110,000 ppm. Total oil and grease levels in those samples varied from 91 to 1,100 ppm. No halogenated VOCs or PCBs were detected. Metals tested were either not detected or appeared to be representative of naturally occurring background concentrations for typical soils*.

The soil samples from 15.5 feet in MW-3, and the samples from 15.5 and 20.5 feet in MW-4 contained considerable concentrations of TPH as gasoline, diesel fuel, and motor oil. Of the TPH range measured, motor oil registered highest in those two borings, varying from 1,800 ppm in MW-3 to 46,000 ppm in MW-4. Petroleum hydrocarbons were not detected in remaining soil samples or were below 30 ppm.

Neither organic lead nor EDB were detected in the February 1990 groundwater samples. Groundwater samples from MW-2 and MW-4 contained no detectable concentrations of BTEX but contained 560 parts per billion (ppb) TPH as motor oil and cumulative TPH of 4,200 ppb respectively. Water from MW-1 contained no benzene and less than 5 ppb of remaining BTEX compounds, but showed TPH concentrations ranging from 95 to 770 ppb. The MW-3 sample contained 320 ppb of benzene and concentrations of TPH ranging up to 10,800 ppb. Results of later sampling events were similar,

* Kabat-Pendias, A. and H. Pendias, 1984. Trace Elements in Soils and Plants. CRC Press, Inc., Boca Raton, Florida.

except that groundwater from MW-4 has consistently contained BTEX and TPH as gasoline and MW-2 has shown no detectable concentrations of BTEX or TPH.

ACCOMPLISHMENTS DURING THE FOURTH QUARTER, 1990

Water Level Measurements

Groundwater levels were measured to the nearest 0.01 foot on November 11, 1990. Groundwater was approximately 18 to 20 feet below ground surface. Water levels have dropped approximately 2.5 feet since February. A potentiometric surface map constructed using these data is shown in Plate 5. This map shows contours of equal groundwater elevation and the general groundwater flow direction estimated from the groundwater elevations in wells MW-1, MW-2, and MW-3 (these well locations form the largest well triangle on the site). The predominant groundwater flow direction appears to be southwest and is consistent with previous flow directions estimated during 1990.

Groundwater Sampling

Water from wells MW-2 through MW-4 was sampled on November 11, 1990, after purging three well volumes. Groundwater samples were submitted for laboratory analysis of BTEX and TPH as gasoline, diesel fuel and motor oil. Results are presented in Table 6. A thin layer of free product (approximately 1/4 inch) was observed in well MW-4. A sample could not be collected from

well MW-1 after purging because of the drop in the ground water level and a slow recharge rate.

Chemical Results

The sample from MW-2 contained no detectable concentrations of BTEX or TPH. The sample from MW-3 contained 18 ppb benzene and concentrations of TPH totaling 1,240 ppb. Groundwater from MW-4 contained 64 ppb benzene and 3,870 ppb TPH. The distribution of benzene and cumulative TPH in groundwater is shown on Plates 6 and 7, respectively. BTEX and TPH concentrations have decreased in groundwater from MW-3 since the previous quarter. TPH concentrations at MW-4 have increased slightly.

The TPH analysis for high boiling point hydrocarbons were quantified against a diesel and a motor oil standard. However, the laboratory has stated that the compound mixture present does not appear to be diesel or motor oil but may represent a degraded mixture of these compounds or some other substance. The presence of the heavier compounds may represent lubricants, grease, or oils that have become soluble in the presence of the lighter hydrocarbons.

ANTICIPATED ACTIVITIES FOR 1991

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

- Install three off-site monitoring wells (shown on Plate 4) to further evaluate the lateral and vertical extent of petroleum hydrocarbons in the soil and groundwater. Installation of the off-site wells is dependent on obtaining appropriate permits.
- Sample water from new and existing monitoring wells quarterly for BTEX; TPH as gasoline and diesel fuel; and total oil and grease.
- Purge free product from well MW-4 biweekly.
- Sample free product and submit it to the chemical testing laboratory to identify the type of fuel product.
- Conduct well hydraulic tests to further characterize the shallow saturated sediments.

HLA anticipates placing one well further downgradient of the former waste oil tank and the present fuel tank locations, one well to the southwest of the site, and one to the southeast. However, the well locations may be modified depending on site access and permit constraints.

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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	
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
 Shell 6039 College Avenue
 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
Parameter /Method											
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
/EPA 802											
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
/EPA 8015											
Oil and Grease	---	---	---	810	380	---	---	---	---	1100	91
/SM 503 D&E											
Halogenated VOCs	---	---	---	ND @ 0.5	ND @ 0.5	---	---	---	---	ND @ 0.05	ND @ 0.005
/EPA 8010				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
/EPA 6010											
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'
Approx. GW Depth	17'	17'	17'	16'	16'	16'	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
Parameter /Method									
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
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
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
Xylene /EPA 8020	ND @ 0.1	ND @ 0.1	ND @ 0.1	0.11	1.9	ND @ 0.1	ND @ 0.1	2.6	0.57
TPH as Gasoline	ND @ 1	ND @ 1	ND @ 1	12	230	28	ND @ 1	140	72
TPH as Motor Oil	ND @ 10	ND @ 1	ND @ 10	ND @ 10	1,800	ND @ 10	ND @ 1	6,400	46,000
TPH as Diesel /EPA 8015	ND @ 1	ND @ 1	1.1	4.4	200	9.9	1.2	61	2200
PCBs/EPA 8080	---	---	---	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05

--- = Analysis not performed on sample

ND = Not present above the stated detection limit

Table 5. Groundwater Elevations

Well	Top of Casing Elevations*	Depth to Groundwater (feet)						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>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>
MW-1	195.89	17.73	18.51	18.92	18.21	19.81	20.39	178.16	177.38	176.97	177.68	176.08	175.50
MW-2	194.27	16.90	17.69	18.01	17.39	19.00	19.44	177.37	176.58	176.26	176.88	175.27	174.83
MW-3	192.52	15.81	16.57	16.97	16.27	18.78	18.27	176.71	175.95	175.55	176.25	173.74	174.25
MW-4	193.37	16.73	17.48	17.88	17.18	17.85	19.16	176.65	175.89	175.49	176.19	175.52	174.21

* Based on an arbitrary benchmark of 195.00 feet

Table 6. Groundwater Analytical Results
 Shell 6039 College Avenue, Oakland
 Concentrations in Parts Per Billion (ppb)

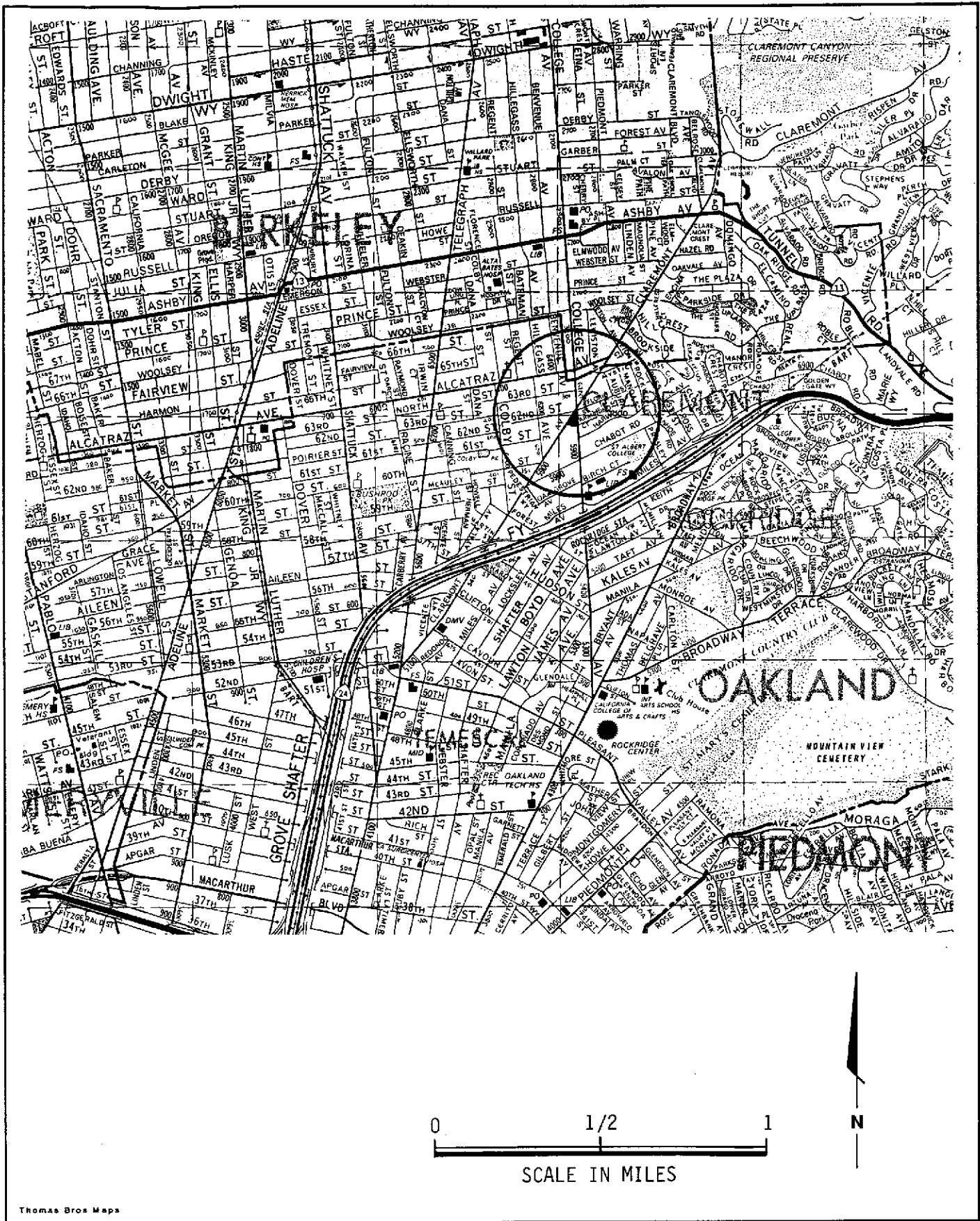
Sample No.	Sample Date	EPA 8020				EPA 8015 - Modified		
		Benzene	Toluene	Ethyl-Benzene	Xylene	Total Petroleum Hydrocarbons		
						Gasoline	Diesel	Motor Oil
MW-1	02/13/90	ND @ 0.3	0.67	0.37	3.2	95	650	770
	05/14/90	0.70	0.57	0.71	3.5	95	ND @ 50	770
	09/12/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	84	ND @ 50
	11/27/90	NS	NS	NS	NS	NS	NS	NS
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
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
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
MW-4-D	09/12/90	85	1.0	0.71	0.81	520	1,100	16,000
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	--	--

--- = Analysis not performed on sample

ND = Not present above the stated detection limit

-D = Duplicate sample

NS = Not sampled



Thomas Bros Maps



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

PLATE

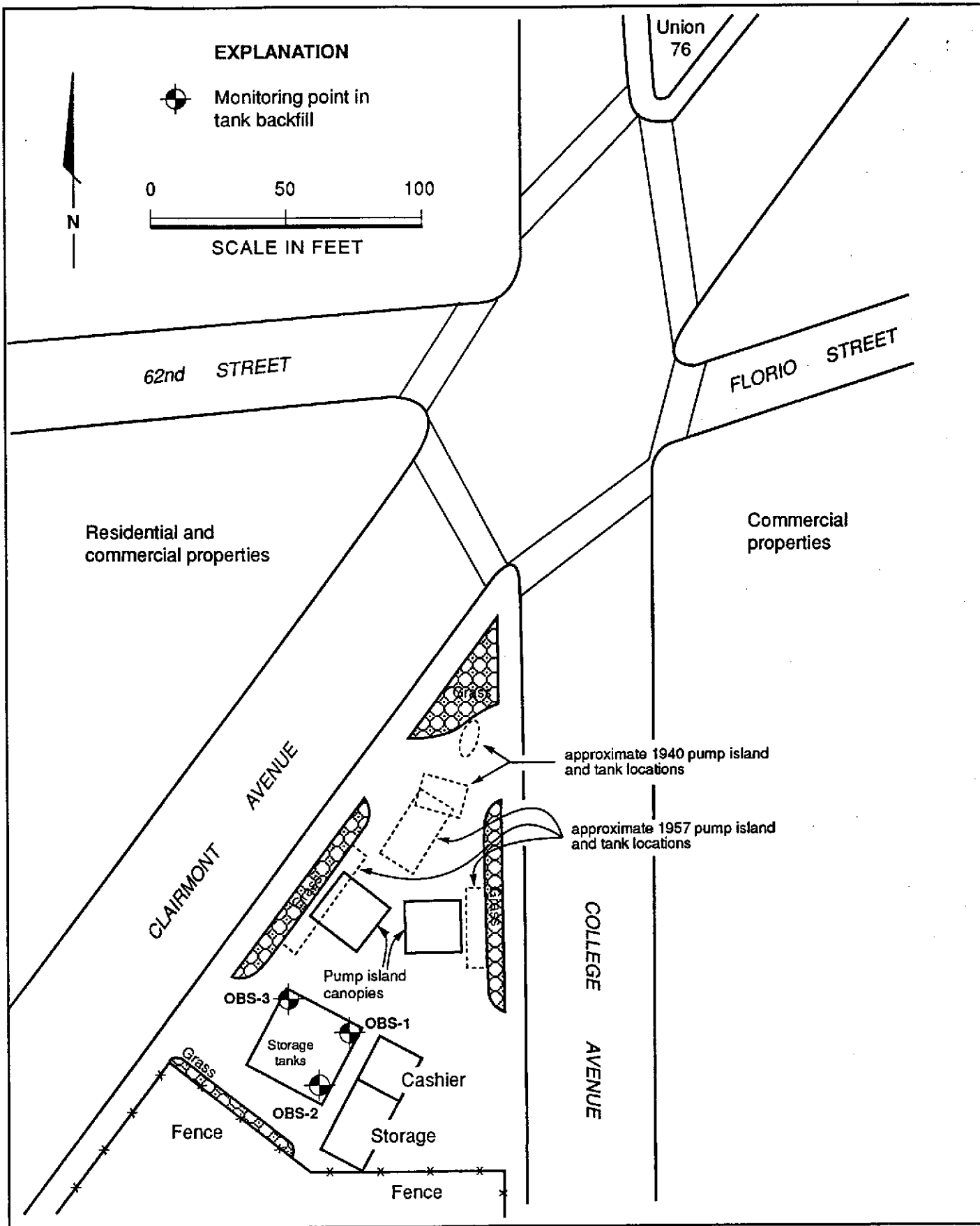
1

DRAWN S. Patel
 JOB NUMBER 4022,233.03

APPROVED *HLA*

DATE 11/89

REVISED DATE 01/04/91



Harding Lawson Associates
Engineering and Environmental Services

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

PLATE

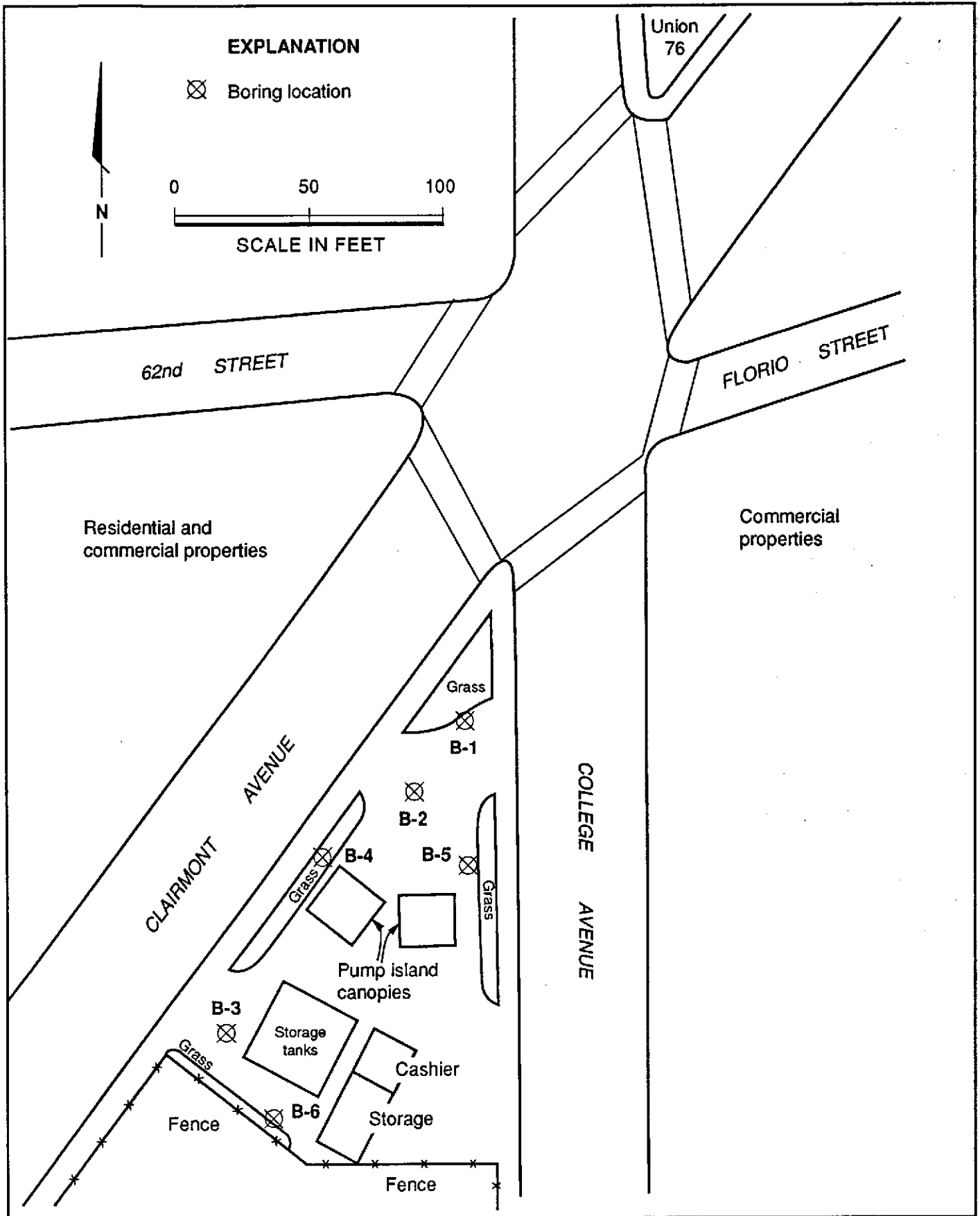
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DRAWN S. Patel
JOB NUMBER 4022,233.03

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DATE 11/89

REVISED DATE 01/04/91



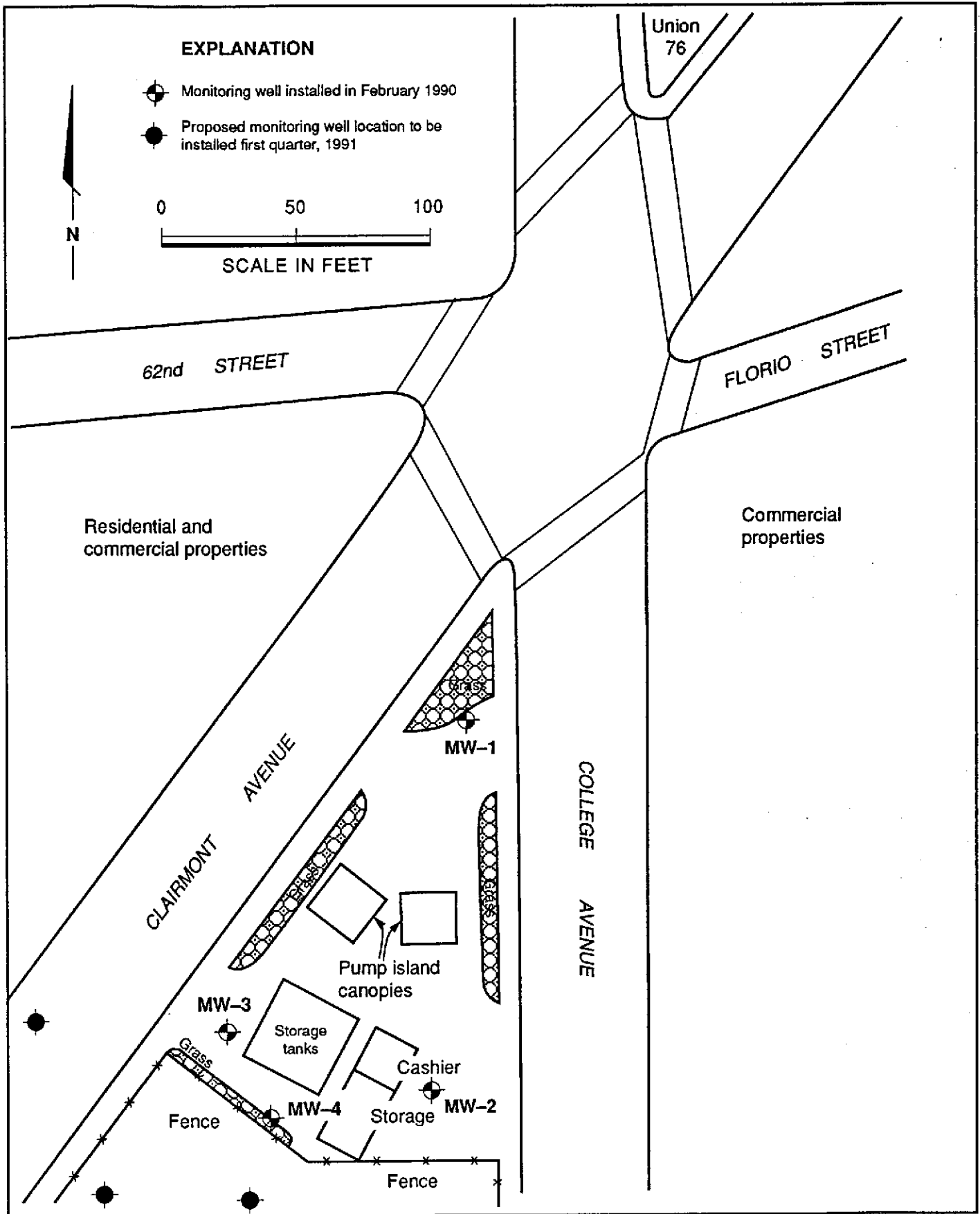
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Soil Boring Locations
Shell Service Station
6039 College Avenue
Oakland, California

PLATE

3

DRAWN S. Patel	JOB NUMBER 4022,233.03	APPROVED <i>[Signature]</i>	DATE 7/90	REVISED DATE 01/04/91
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Monitoring Well Locations

Shell Service Station
6039 College Avenue
Oakland, California

PLATE

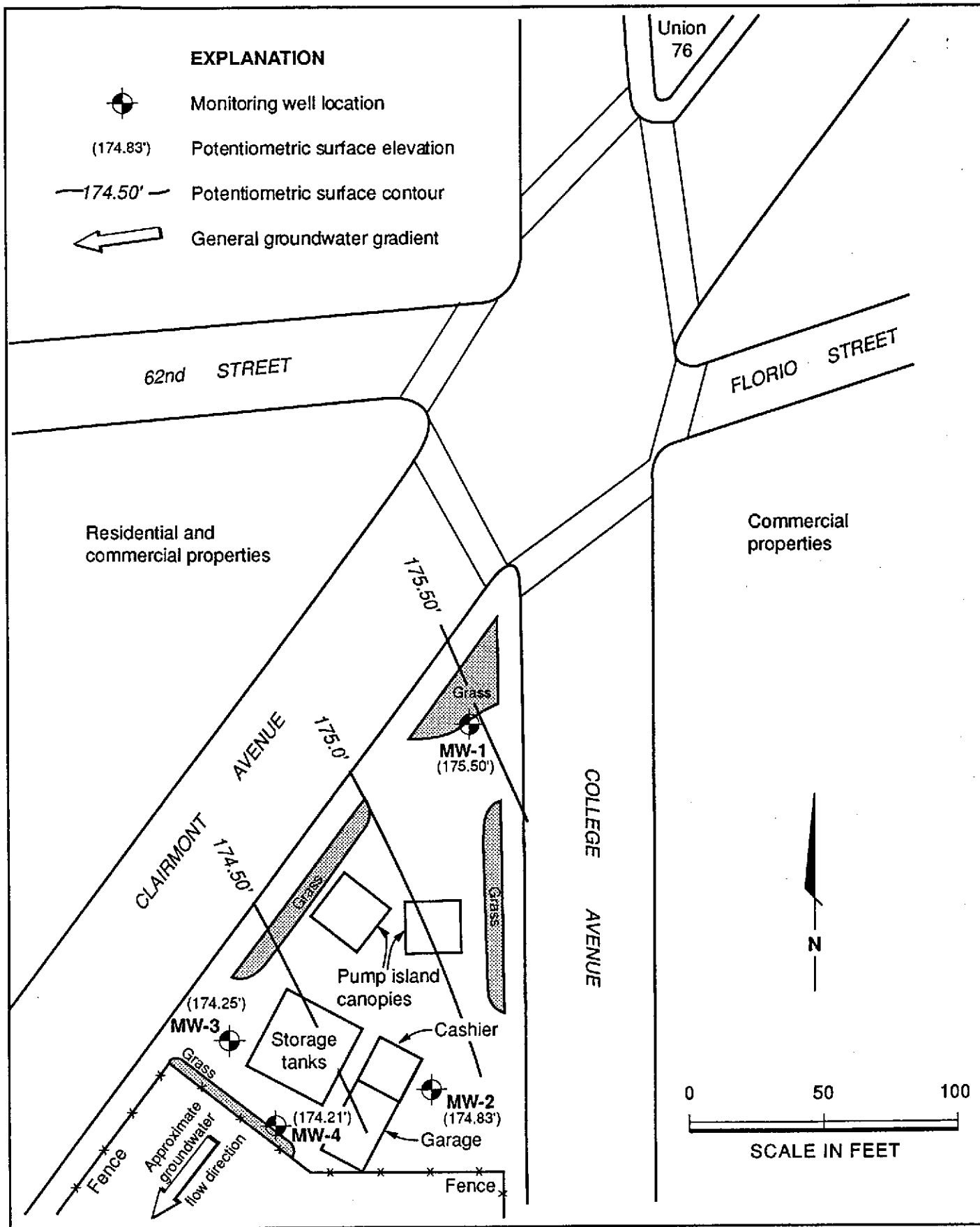
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DATE 11/89

REVISED DATE 01/04/91



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Potentiometric Surface Shallow Sediments
 November, 1990
 Shell Service Station
 6039 College Avenue
 Oakland, California

PLATE

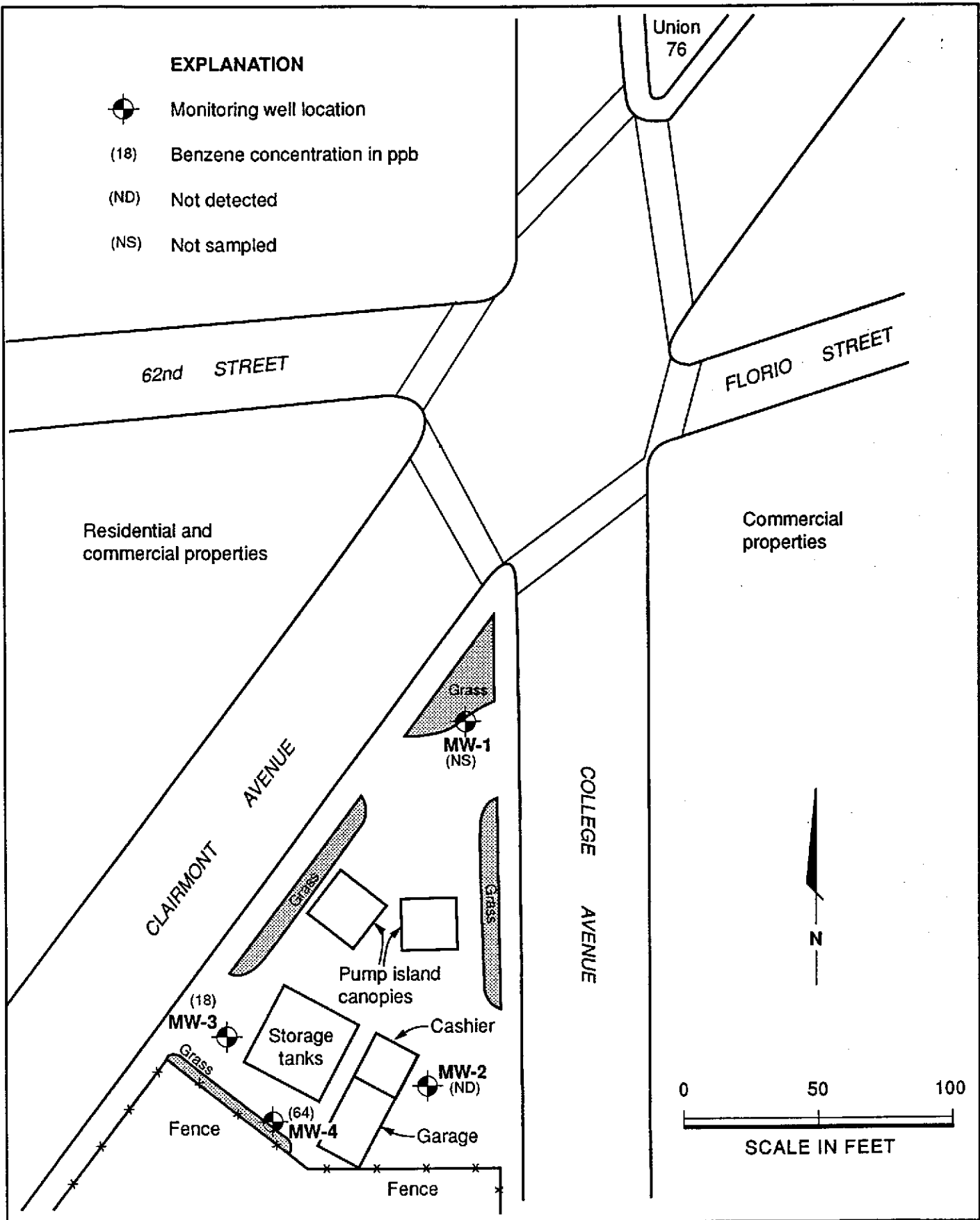
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DRAWN: RHC
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Distribution of Benzene In Groundwater
November, 1990
Shell Service Station
6039 College Avenue
Oakland, California

PLATE

6


DRAWN RHC
JOB NUMBER 4022,233.03

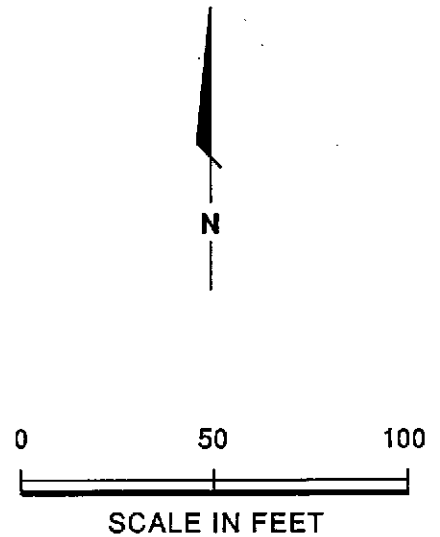
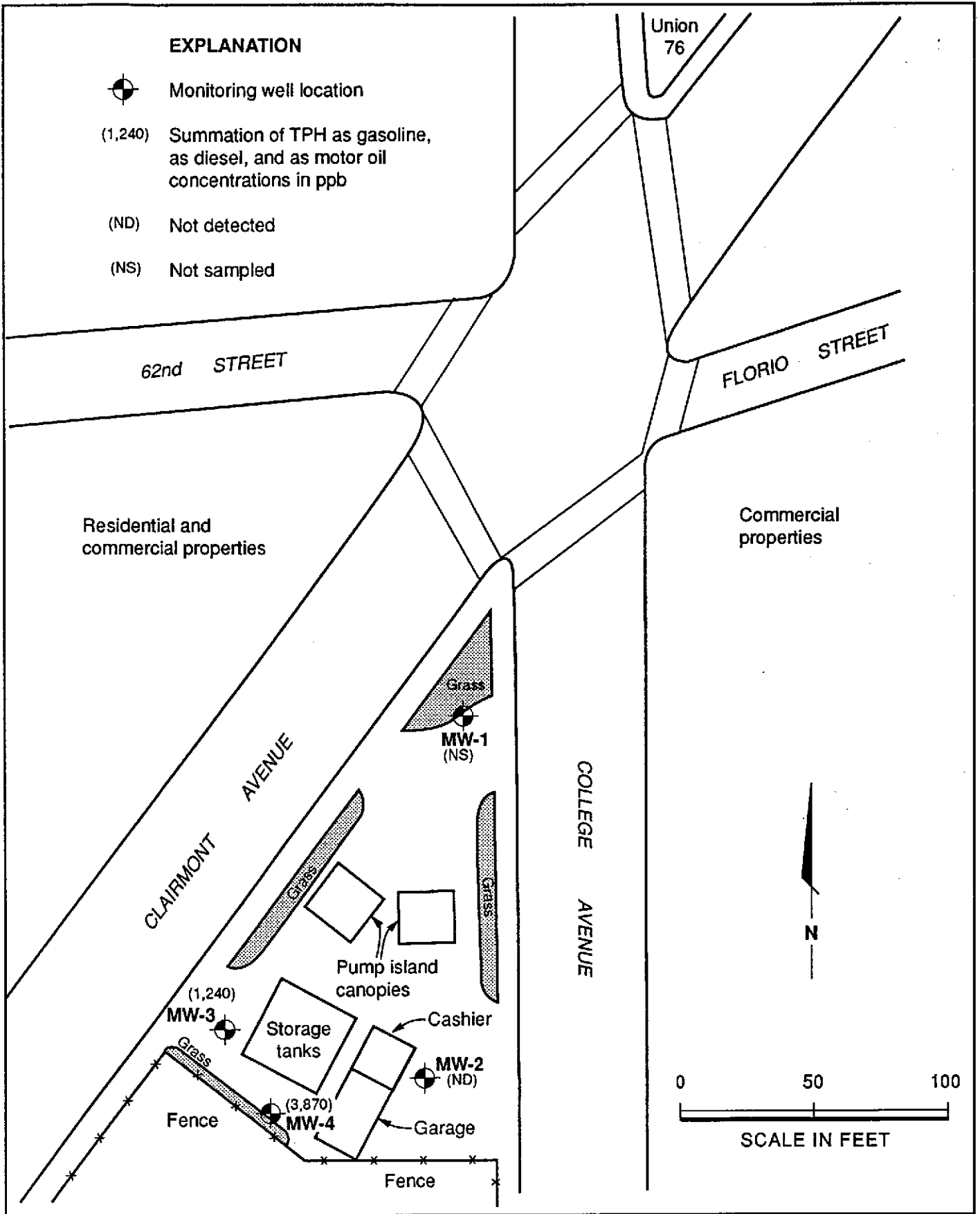
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DATE 12/90

REVISED DATE

EXPLANATION

-  Monitoring well location
- (1,240) Summation of TPH as gasoline, as diesel, and as motor oil concentrations in ppb
- (ND) Not detected
- (NS) Not sampled



Harding Lawson Associates
Engineering and Environmental Services

Distribution of TPH in Groundwater
November, 1990
Shell Service Station
6039 College Avenue
Oakland, California

PLATE

7

DRAWN: RHC
JOB NUMBER: 4022,233.03

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DATE: 12/90

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Concord, California 94520

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- 1 copy: San Francisco Bay
Regional Water Quality Control Board
1800 Harrison Street, Suite 700
Oakland, California 94607

Attention: Mr. Tom Callaghan
- 1 copy: Alameda County Environmental
Health Department
80 Swan Way, Room 200
Oakland, California 94621

Attention: Mr. Rafat Shahid

DCH/RS/pkp 031386B/R42

QUALITY CONTROL REVIEWER



Terence J. McManus
Associate Environmental Scientist