5/5/89

ALAMEDA COUNTY
DEPT. OF ENVIRONMENTAL HEALTH
HAZARDOUS MATERIALS

Harding Lawson Associates

Transmittal/Memorandum

HLA

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

Attention: Mr. Lowell Miller

From: David Leland DL
Date: May 4, 1989
Subject: March 1989 PRP Soil Treatment System Monitoring Report
Job No.: 09382,040.02

Remarks: Please find attached a copy of the "*Report of System Monitoring: March 1989, Soil Treatment System, Pacific Renaissance Plaza, Oakland, California*", describing the operations and monitoring of the in situ soil treatment system located at the Pacific Renaissance Plaza site in Oakland.

DL:cb/c9a/038

cc:

A Report Prepared for

California Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street, Room 6000
Oakland, California 94607

REPORT OF SYSTEM MONITORING: MARCH 1989 SOIL TREATMENT SYSTEM PACIFIC RENAISSANCE PLAZA OAKLAND, CALIFORNIA

HLA Job No. 9382,040.02

Submitted on behalf of:

City of Oakland Redevelopment Agency
The City Hall Plaza
Oakland, California 94612

by

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May 3, 1989

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1.0 INTRODUCTION

This report discusses the installation, operation, and monitoring of the in situ soil treatment system at the Pacific Renaissance Plaza (PRP) site in Oakland, California, from January 1 to April 5, 1989. The PRP site is bounded by 9th, Franklin, and Webster streets and the East Bay Municipal Utilities District (EBMUD) property line approximately 100 feet north of the centerline of 10th Street (Plate 1). The site is part of the Oakland Chinatown Redevelopment Project Area. The soil treatment system is designed to remove petroleum hydrocarbons from soil within site boundaries before it is excavated during construction of the Pacific Renaissance Plaza complex. Construction is scheduled to begin in September 1989.

This report was prepared by Harding Lawson Associates (HLA) on behalf of the City of Oakland Redevelopment Agency (Agency) and is submitted in accordance with monitoring and reporting requirements set forth by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), in a letter to the City of Oakland dated February 22, 1989, as amended by a letter dated March 17, 1989, from HLA to the RWQCB, that clarified several outstanding items, including reporting periods and submittal report dates.

1.1 Previous Reports

Site history and characterization activities completed by HLA in 1988 are reported in *Site Characterization, Pacific Renaissance Plaza, Chinatown Redevelopment Project Area, Oakland, California (HLA, 1988)*. The site characterization report also presents a preliminary screening of soil treatment alternatives and an evaluation of the potential for biodegradation to effectively remove hydrocarbons from soil at the site. *The Report of Waste Discharge, Pacific Renaissance Plaza, Chinatown Redevelopment*

Project Area, Oakland, California (HLA, 1989) discusses the soil treatment design and presents the results of the biodegradation treatability study and the proposed operations and monitoring plan for the system. Site background, environmental setting, and previous investigations are also discussed in the report.

1.2 Objective of the Treatment System

A portion of the soil at the PRP site contains elevated levels of petroleum hydrocarbons (identified as gasoline) and benzene, toluene, ethylbenzene and xylenes (BTEX). Guidance used by the RWQCB classifies soil with TPH values exceeding 1,000 parts per million (ppm) as hazardous waste *(Leaking Underground Fuel Tank Task Force, 1987)* and soil with TPH values between 100 and 1,000 ppm as designated waste. Soil at this site falls into both categories and would require landfill disposal at Class I (hazardous waste), Class II (designated waste), or Class III facilities.

The Agency wishes to treat soils in place prior to excavation to reduce concentrations to levels acceptable for Class III disposal (i.e., less than 100 ppm TPH). In situ biological treatment using a system of injection and extraction wells was the treatment method selected to accomplish this objective. Ground water produced in conjunction with soil treatment will be treated using the carbon adsorption system that was in place at the site prior to the start of soil treatment.

1.3 Treatment System Description

The treatment process consists of circulating nutrient- and oxygen-enriched water through the contaminated soil to enhance the growth of microorganisms existing in soils at the site. These microorganisms utilize hydrocarbons as an energy source, producing carbon dioxide and water as by-products. This process reduces the concentration of petroleum hydrocarbons in the subsurface.

The treatment system consists of:

- A 3,000-gallon mixing tank and appurtenances for addition of nutrients and hydrogen peroxide to water to stimulate indigenous microorganisms capable of degrading petroleum hydrocarbons.
- Eleven injection wells, to introduce the nutrient-enriched and oxygenated water to the contaminated zone, and 22 extraction wells, to collect and hydraulically contain ground water after it passes through the contaminated zone.
- Associated piping and controls.
- The existing carbon treatment system, which is used to treat extracted ground water to reduce petroleum hydrocarbons and other organic compounds to discharge limits specified in the Agency's existing NPDES permit. The treated ground water will either be pumped to the nutrient mixing tank to be used for reinjection or be discharged to the storm drain.

The nutrients and hydrogen peroxide are stored in separate 300-gallon tanks adjacent to the mixing tank, and are injected into the influent water stream as necessary to achieve target concentrations in injection water.

Water from the mixing tank is pumped to the injection wells for introduction to the subsurface. Injected water travels from the injection wells to the extraction wells through the soil. Extracted water is then pumped to the first of five 21,000-gallon storage tanks in place at the site, filtered to remove fine sediments, and treated to reduce hydrocarbon concentrations to NPDES permit limits. In the first month of operation, the treated effluent was discharged to the storm drain.

2.0 TREATMENT SYSTEM INSTALLATION

2.1 Drilling Activities

Between January 16 and February 9, 1989, thirty-seven borings were drilled to depths ranging from 38.0 to 42.5 feet below ground surface and completed as Extraction Wells EW-1 through EW-21, Injection Wells IW-1 through IW-11, and Monitoring Wells MW-13 through MW-17. Well EW-22 was installed in 1988 in conjunction with EBMUD construction activities. A single boring (B-25) was drilled for soil sample collection and grout-sealed for abandonment. Boring B-25 was drilled to provide further definition of hydrocarbon concentrations and distribution in the vicinity of the former location of the gas station. Drilling was performed by Layne Environmental Services of Fontana, California, using a dual-wall percussion hammer rig.

Monitoring Wells MW-12 and MW-18 were installed on February 10 and February 11, 1989, respectively. The boreholes were drilled to depths of 42.5 and 40.0 feet using a CME-55 hollow-stem auger rig by Spectrum Drilling Inc. of Stockton, California. A borehole for Monitoring Well MW-19, located on the south side of 9th Street approximately 200 feet from Franklin Street, was drilled on February 11, 1989 by Spectrum. At this location, auger refusal was encountered at 9 feet below grade. The borehole was subsequently abandoned by grouting.

An HLA geologist supervised the drilling and well installation and collected soil samples for chemical analysis. Locations of the wells are shown on Plate 1. Borings were logged using the Unified Soil Classification System (USCS) and the Munsell Color Index Chart (Plate A1).

To further define hydrocarbon distribution, soil samples were collected from Boring B-25 and the borings for Extraction Wells EW-6 and EW-7 and Monitoring Wells MW-12 and MW-18. Samples were collected with a Modified California split-barrel sampler lined with three 2.5-inch-diameter stainless steel tubes. At each sample

depth, the bottommost tube was sealed with foil-lined end caps taped to the tube and stored on ice; the soil sample from a second tube was screened for the presence of volatile organic compounds using an organic vapor analyzer (OVA). Soil samples collected for chemical analyses were submitted under chain of custody to Pace Laboratories, a state-certified laboratory in Novato, California. All samples were analyzed for total petroleum hydrocarbons (TPH) as gasoline by EPA Test Methods 3550/8015. Selected samples were also analyzed for volatile organic compounds by EPA Test Methods 8010 and 8020.

Drilling and soil sampling equipment was decontaminated prior to and after use according to standard HLA protocol. HLA employees performing field work were safety trained and used Level D protective equipment. Soil cuttings were placed in 20-cubic yard bins, tested, and disposed off-site at Redwood Sanitary Landfill, Novato, California.

2.2 Well Installation

The injection wells were constructed of 4-inch-diameter stainless steel casing with 20 feet of 0.020-inch slot continuous-slot screen. Screened intervals are generally between 10 and 35 feet below grade. Injection Wells IW-1 through IW-9 were completed approximately 5 feet above grade. Wells IW-10 and IW-11, located in or adjacent to 10th Street, a high construction traffic area, were completed in concrete vaults below grade. The extraction wells and monitoring wells were constructed of 4-inch-diameter Schedule 40 PVC casing with 20 feet of slotted screen. Extraction wells are screened with 0.030-inch slotted screen, and monitoring well screens are 0.020-inch slot. Wells EW-1 through EW-20 were completed approximately 1 foot above grade. Well EW-21, located in 10th Street, was completed below grade within a concrete vault.

See Appendix A for examples of construction details for injection, extraction, and monitoring wells.

Wells MW-12 and MW-18 were developed by bailing and surging until the discharged water was clear. Wells IW-1 through IW-11 were developed by surging and air lift techniques until the discharged water was clear. The extraction wells and Monitoring Wells MW-13 through MW-17 were not developed. All development water was discharged into a Baker tank. The water was subsequently processed by the carbon treatment system before it was discharged to the storm drain under authority of an NPDES permit.

KCA Engineers, Inc. (KCA), of San Francisco, California, surveyed horizontal coordinates, top-of-casing, and ground surface elevations for each well in March 1989.

2.3 Collection and Control System Installation

Construction of the aboveground portions of the mixing, injection, and extraction systems began on February 8, 1989. Construction and installation of the open-loop portion of the system, described in Section 3.0, was completed on March 3.

Flow control and monitoring equipment (electrical) was provided by Loprest Company of Rodeo, California. The PG&E hookup was completed by Del Monte Electric. All remaining materials and installation were provided by Layne Western of Woodland, California.

3.0 TREATMENT SYSTEM OPERATIONS

The bioremediation system at the Pacific Renaissance Plaza (PRP) performs two basic functions: mixing and injection of treatment water, and extraction of ground water.

In the start-up operational mode, the PRP biotreatment system operates in an "open loop". The source of fresh water to the system is an EBMUD fire hydrant located at 10th and Webster streets. The water supply is piped through a backflow preventer and a water meter to the mixing tank. Separate solutions of nutrients (nitrate, ammonia, and phosphates) and hydrogen peroxide are injected in measured quantities into the water as it enters a mixing tank.

A pump delivers the water, nutrients, and hydrogen-peroxide solution from the mixing tank to the injection wells. A solenoid valve at each wellhead is controlled by liquid level probes in the well and regulates the flow of water into the well. The flow within the well itself is by gravity; once water is inside the well casing, it is no longer under pressure from the pump.

Submersible pumps in the extraction wells surrounding the injection wells on the site are also controlled by liquid level probes. All extracted water is collected and delivered to the carbon treatment system. In the "open loop" mode of operation used during March, treated water is discharged to the storm drain.

The long-term mode of system operation is to return water treated by the carbon adsorption system to the mixing/injection system. Recycling ground water in this manner enhances the potential for growth of microbial populations and reduces the quantity of potable water required for operation. This mode, "closed loop" operation, is planned for start-up during April.

The system was tested on March 3 and became operational on March 4, with the exception of Wells IW-10, IW-11, EW-21, and EW-22 (located in and adjacent to 10th

Street). The wells located north of 10th Street became operational on March 14. As part of start-up operations, the subsurface was conditioned through phased introduction of nutrients and hydrogen peroxide. During the first week of operation, from March 4 to March 13, only fresh water from the hydrant was delivered to the injection wells. Beginning March 13, nutrients were added to the mixing tank at a rate calculated to provide approximately 200 ppm of nutrients in the water to the injection wells; this was the target concentration of nutrients for the remainder of the month. Starting on March 20, hydrogen peroxide solution was also added to the mixing tank to deliver 50 ppm of hydrogen peroxide to the injection system. This concentration was increased to 100 ppm on March 27.

4.0 TREATMENT SYSTEM MONITORING

4.1 Flow and Water-Level Monitoring

Each extraction well (EW series) and injection well (IW series) except EW-22 is equipped with a Neptune totalizer flowmeter to monitor water volume extracted or injected. Meter accuracy is reported by the manufacturer to be within plus/minus 1-1/2 percent down to flows of 1/4 gallon per minute (gpm). Totalizer meter readings in gallons, along with time in minutes, are recorded daily by an HLA engineering technician on a Daily Maintenance Data Sheet (DMDS). The previous totalizer reading, the elapsed time between readings, and the calculated daily average flow rate (gpm) for each well are also recorded on the DMDS.

Depths to water are measured daily at Monitoring Wells MW-15, MW-16, and MW-17 and weekly at the other monitoring wells on site and in the vicinity of the site (Plate 1). Depth to water is measured using a graduated steel tape and repeated until two measurements with a difference of no more than 0.02 feet are obtained. Water elevations are calculated using depth-to-water data and surveyed top-of-casing elevations.

4.2 Sample Collection and Analysis

Water samples are collected from selected extraction wells, injection wells, and monitoring wells and analyzed for inorganic and organic constituents and microbial populations. For each well, the frequency of sampling during the reporting period, analytical parameters, and EPA Test Methods (for organic constituents) are presented in Table 1. Samples are collected from extraction wells using the sampling port at each wellhead. Representative samples of the water distributed to the injection wells are collected from the nutrient and hydrogen peroxide mixing tank on a weekly basis.

For wells from which a water sample is collected for analysis, the following procedure is used. After water levels are measured, each well is purged using a submersible pump placed near the bottom of the well or by bailing with a stainless steel bailer. During purging, a volume of water equal to at least three times the static-water volume in the casing is removed. Water produced during well purging is collected and stored on site in a Baker tank prior to its treatment by the carbon treatment system. Ground-water samples are collected using a clean stainless steel bailer. Samples for TPH analyses are transferred to clean 1-liter amber glass bottles. Samples for purgeable aromatics and purgeable halocarbons analyses are transferred to 40-milliliter glass volatile organic analysis (VOA) vials. All ground-water samples are stored on blue ice and submitted under chain of custody to Pace Laboratories of Novato, California, for organic analysis, or to HLA's microbiological laboratory for inorganic parameter analyses and microbial evaluations.

The sampling schedule presented in Table 1 differs somewhat from the sampling schedule proposed in Table 1 of the *Report of Waste Discharge* (*HLA, 1989*), as noted below.

- At individual injection and extraction wells, total flow was recorded and flow rates calculated daily throughout the period.
- A composite sample of injection well water was collected and analyzed for inorganic parameters biweekly during this reporting period. No organic analyses of injection water were performed because only potable water from the EBMUD system was used for injection during this period.
- Dissolved iron has been added as an analyte.
- For the extraction wells, samples of composite extracted ground water were collected monthly and analyzed for organic constituents by EPA Test Methods 8010, 8015, and 8020. Samples for inorganic analysis were collected weekly from selected extraction wells. Specific wells were selected for sampling at locations near monitoring wells and at other locations to provide a representative subset of the extraction wells in the ring.

- Extraction Wells EW-1, EW-4, EW-8, EW-12, and EW-16 are sampled weekly and analyzed for nitrate, ammonia, phosphate, and dissolved iron. Additional extraction wells are sampled on an occasional basis, as listed in Table 1, to check measurements and observations at the regularly sampled extraction wells.

- The frequency of measurement and analytical parameters at monitoring wells have been increased compared to the schedule presented in the *Report of Waste Discharge* (*HLA, 1989*). First, water levels are measured daily at the three transect wells, MW-15, MW-16, and MW-17. Second, samples are collected and analyzed weekly for nitrate, ammonia, and phosphate, and biweekly for dissolved iron. Dissolved oxygen has been measured approximately monthly during this period. Samples were analyzed monthly for EPA Test Method 8015 and 8020 constituents, as proposed in the treatment system plan.

The sampling schedule may be modified in subsequent months in response to the operation of the system and the need for monitoring data.

4.3 Numerical Modeling of Ground-Water Flow

A numerical model of ground-water flow at the site, developed during the design phase of the project, is described in the *Report of Waste Discharge*, (*HLA, 1989*). The model was used to calculate ground-water elevation contours for March 18 and April 14, 14 and 31 days, respectively, after system start-up. Model geometry was adjusted to account for actual locations of injection and extraction wells. Injection and pumping rates used as input to the model were based on totalizer readings from individual injection and extraction wells, averaged over the time periods from March 4 to March 18 and March 18 to April 4.

5.0 RESULTS

5.1 Soil Contamination Characterization

Results of laboratory analysis of soil samples collected during system installation activities are presented in Table 2. Laboratory data sheets are presented in Appendix B. These results provide additional characterization of the lateral and vertical distribution of petroleum hydrocarbons (as gasoline) within site boundaries and in the vicinity of the site. Laboratory analyses of samples collected at depths of 25 feet from the borings for Extraction Wells EW-6 and EW-7 did not detect TPH (gasoline), which suggests that gasoline contamination of soil at this depth does not extend off site below Webster Street at concentrations of concern. TPH concentrations in samples collected from the borings for Monitoring Wells MW-12 and MW-18 were below detection limits. At these locations, samples showing highest OVA readings were selected for analysis. Therefore it is likely that TPH values for other samples at these boring locations are also low or nondetectable. Contours of TPH values as a function of depth are presented on Plate 2. This plate is modified from Plate 2 of the *Report of Waste Discharge* (*HLA, 1989*). The results of the additional analyses reported in Table 3 were included in updating the contours presented on Plate 2.

5.2 Flow and Ground-Water Elevations

Average injection and extraction rates for the reporting period are presented in Tables 3 and 4. From March 4 to April 4, the average total flow rate for all injection wells was 24.41 gallons per minute (gpm). The flow rate for Wells IW-1 to IW-9 was 22.47 gallons per minute (gpm). During the same period, the average total flow rate for Extraction Wells EW-1 to EW-20 was 15.79 gpm. Extraction Well EW-21 did not operate during this period because water levels did not rise high enough to activate the upper liquid-level probe in the well. Extraction Well EW-22 was operational, but is not

equipped with a separate totalizing flowmeter. All flow rates were calculated based on readings from the flowmeters on the wellheads.

Measurements of depth to water and calculated water-level elevations from January 3 to April 4, 1989 are presented in Table 5. Ground-water elevations for February 25, March 18, and April 4, 1989 are presented on Plates 3, 4, and 5. February 25 elevations describe a condition prior to activation of system wells. March 18 and April 4 elevations describe conditions approximately 14 and 31 days after start-up, respectively.

Contours of ground-water elevations calculated using the numerical model are presented on Plates 4 and 5. In some cases, locations of injection and extraction points used in the model differ slightly from actual well locations because of the nature of discretization of the modeled area. In general, the calculated contours show good agreement with elevations measured at monitoring wells. Differences between observed and calculated values are generally less than one foot for wells located outside of the treatment area. For wells within the treatment area, differences are generally less than two feet for the March 18, measurements and less than one foot for April 4 data. A preliminary assessment of results for the two dates indicates that hydraulic control was in the process of being established during this period.

5.3 Distribution of Inorganic Constituents and Microbial Populations in Ground Water

Tables 6 and 7 present the inorganic chemical and microbiological results for the bioremediation treatment system from start-up through April 5, 1989. Nitrate and phosphate concentrations in ground water at the site for the March 3 and April 4-5 sampling rounds are presented on Plates 6 through 9. These preliminary results indicate that the injected nutrients are being disseminated throughout the subsurface within the treatment area. The average nitrate concentration within the treatment zone is

approximately two to three times higher than outside the treatment zone. The average phosphate concentration within the treatment zone is approximately four to five times higher than outside the treatment zone. Microbial populations within the treatment area have increased slightly during the injection period. There is commonly a lag period following injection of nutrients before a significant increase in the microbial population occurs. These results indicate that subsurface conditions have been enhanced to facilitate the growth of hydrocarbon-utilizing microbes.

5.4 Distribution of Petroleum Hydrocarbons in Ground Water

Results of laboratory analysis of ground-water samples for organic parameters are presented in Table 8. Laboratory data sheets are presented in Appendix C. TPH values for the March and April sampling rounds are presented on Plates 10 and 11.

The concentrations of petroleum hydrocarbons in the ground-water samples from the monitoring wells remained generally stable, with minor increases and decreases, from March 3 to April 4-5, 1989. Ground-water samples from Extraction Wells EW-16 and EW-17 and Monitoring Well MW-11 at the west end of the treatment system show the highest measured TPH values (8.9 to 15.0 mg/l). Petroleum hydrocarbons as TPH were not detected in samples from Monitoring Wells MW-7, MW-12, and MW-18 located west of the treatment system wells. In general, the highest TPH values are within the treatment area. A preliminary assessment of distribution of hydrocarbons indicates good hydraulic control of the injected treatment system water.

In future months, further increases in TPH values for wells within the treatment area are expected to occur in conjunction with anticipated increases in microbial populations.

6.0 ACTIVITIES PLANNED: APRIL 1989

The injection/extraction water recirculation system will be installed to create a "closed-loop" treatment system. This will allow extraction water treated using the carbon adsorption system to be used as injection water.

Injection wells will be redeveloped to improve the injection rate efficiency. Wells will be swabbed over the entire screen interval to remove silt from the slotted sections. The wells will be bailed to remove the silt and then pumped until the water is clear.

The concentration of hydrogen peroxide will be increased to a concentration of 300 ppm.

Adjustments to the sampling schedule presented in Table 1 will be made as follows:

a) Dissolved oxygen readings will be collected in the field weekly from monitoring wells within the treatment area and from extraction wells EW-1, EW-4, EW-8, EW-12, and EW-16.

b) A composite sample of extraction well water will be collected weekly and analyzed for inorganic parameters.

7.0 REFERENCES

Harding Lawson Associates, 1988. *Site Characterization, Pacific Renaissance Plaza, Chinatown Redevelopment Project Area, Oakland, California.* December.

Harding Lawson Associates, 1989. *Report of Waste Discharge, Pacific Renaissance Plaza, Chinatown Redevelopment Area, Oakland, California.* February.

Leaking Underground Fuel Tank Task Force, 1987. *Leaking Underground Fuel Tank Field Manual: Guidelines for Site Assessment, Cleanup, and Underground Storage Tank Closure.* December.

Table 1. Schedule for Sampling, Measurement, and Analysis
Soil Treatment System
Pacific Renaissance Plaza

Harding Lawson Associates

Sampling Station	Flow/Water Levels	Measurement/Analysis: Nitrate	Ammonia	Phosphate	Microbial Enumeration	Dissolved Iron	Dissolved Oxygen	EPA 8015 (TPH)	EPA 8010	EPA 8020 (BTEX)
Injection Wells										
Composite	D	B	B	B	--	--	--	--	--	--
IW-1	D	--	--	--	--	--	--	--	--	--
IW-2	D	--	--	--	--	--	--	--	--	--
IW-3	D	--	--	--	--	--	--	--	--	--
IW-4	D	--	--	--	--	--	--	--	--	--
IW-5	D	--	--	--	--	--	--	--	--	--
IW-6	D	--	--	--	--	--	--	--	--	--
IW-7	D	--	--	--	--	--	--	--	--	--
IW-8	D	--	--	--	--	--	--	--	--	--
IW-9	D	--	--	--	--	--	--	--	--	--
IW-10	D	--	--	--	--	--	--	--	--	--
IW-11	D	--	--	--	--	--	--	--	--	--
Extraction Wells										
Composite	D	--	--	--	--	--	--	M	M	M
EW-1	D	W	W	W	W	W	--	M	--	M
EW-2	D	--	--	--	--	--	--	--	--	--
EW-3	D	--	--	--	--	--	--	--	--	--
EW-4	D	W	W	W	W	W	--	M	--	--

Table 1. Schedule for Sampling, Measurement, and Analysis
Soil Treatment System
Pacific Renaissance Plaza

Harding Lawson Associates

Sampling Station	Flow/Water Levels	Measurement/Analysis								
		Nitrate	Ammonia	Phosphate	Microbial Enumeration	Dissolved Iron	Dissolved Oxygen	EPA 8015 (TPH)	EPA 8010	EPA 8020 (BTEX)
EW-5	D	M	M	M	--	--	--	--	--	--
EW-6	D	--	--	--	--	--	--	--	--	--
EW-7	D	--	--	--	--	--	--	--	--	--
EW-8	D	W	W	W	W	W	--	--	--	--
EW-9	D	--	--	--	--	--	--	--	--	--
EW-10	D	--	--	--	--	--	--	--	--	--
EW-11	D	--	--	--	--	--	--	--	--	--
EW-12	D	W	W	W	W	W	--	--	--	--
EW-13	D	--	--	--	--	--	--	--	--	--
EW-14	D	--	--	--	--	--	--	--	--	--
EW-15	D	--	--	--	--	--	--	--	--	--
EW-16	D	W	W	W	W	W	--	M	--	M
EW-17	D	--	--	--	--	--	--	--	--	--
EW-18	D	--	--	--	--	--	--	--	--	--
EW-19	D	M	M	M	--	--	--	--	--	--
EW-20	D	--	--	--	--	--	--	--	--	--
EW-21	D	M	M	M	--	M	--	M	--	--
EW-22	D	--	--	--	--	--	--	--	--	--

Monitoring Wells

Table 1. Schedule for Sampling, Measurement, and Analysis
Soil Treatment System
Pacific Renaissance Plaza

Harding Lawson Associates

Sampling Station	Flow/Water Levels	Measurement/Analysis								
		Nitrate	Ammonia	Phosphate	Microbial Enumeration	Dissolved Iron	Dissolved Oxygen	EPA 8015 (TPH)	EPA 8010	EPA 8020 (BTEX)
MW-2	W	--	--	--	--	--	--	--	--	--
MW-3	W	--	--	--	--	--	--	--	--	--
MW-5	W	--	--	--	--	--	--	M	--	M
MW-6	W	--	--	--	--	--	--	--	--	--
MW-7	W	B	B	B	--	--	--	M	--	M
MW-8	W	--	--	--	--	--	--	--	--	--
MW-9	W	W	W	W	W	W	M	M	--	M
MW-10	W	W	W	W	M	W	M	M	--	M
MW-11	W	W	W	W	M	W	M	M	--	M
MW-12	W	W	W	W	M	W	M	M	--	M
MW-13	W	W	W	W	M	W	M	M	--	M
MW-14	W	W	W	W	M	W	M	M	--	M
MW-15	D	W	W	W	W	W	M	M	--	M
MW-16	D	W	W	W	W	W	M	M	--	M
MW-17	D	W	W	W	W	W	M	M	--	M
MW-18	W	W	W	W	M	W	M	M	--	M

Table 2. Summary of Results of Chemical Analysis of Soil Samples
Total Petroleum Hydrocarbons (TPH) As Gasoline
EPA Test Method 8015, Modified

Boring Well Number	Date	Sample Depth (feet)	TPH as Gasoline (mg/kg)	LOD (mg/kg)
B-25	1-18-89	21.0	5.8	1.0
		26.0	130	25.0
EW-6	1-26-89	25.5	ND	3.0
EW-7	1-26-89	25.5	ND	3.0
MW-12	2-10-89	20.0	ND	3.0
		25.0	ND	3.0
MW-18	2-11-89	5.0	ND	3.0
		10.0	ND	3.0
		15.0	ND	3.0
		30.0	ND	3.0

Notes: mg/kg = milligrams per kilogram
LOD = Limit of Detection
ND = Not detected at or above LOD

Table 3. Injection Well Flow Rates: March 1989

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Meter No.	18-Mar-89 Totalizer Reading	04-Mar-89 Totalizer Reading	Elapsed Time (min)	14-Day Avg. Flow Rate (gpm)
IW-1	53061	10	20370	2.60
IW-2	67920	10	20370	3.33
IW-3	48799	10	20370	2.40
IW-4	55616	10	20370	2.73
IW-5	26112	10	20370	1.28
IW-6	39013	10	20370	1.91
IW-7	104464	10	20370	5.13
IW-8	29057	10	20370	1.43
IW-9	45688	10	20370	2.24
IW-10	24567	10	20370	1.21
IW-11	16008	10	20370	0.79
Total (1-9)	469730	90	20370	23.06
Total (10,11)	40575	20	20370	1.99
Total (1-11)	510305	110	20370	25.05

Meter No.	04-Apr-89 Totalizer Reading	18-Mar-89 Totalizer Reading	Elapsed Time (min)	17-Day Avg. Flow Rate (gpm)
IW-1	149809	53061	24300	3.98
IW-2	135156	67920	24300	2.77
IW-3	112611	48799	24300	2.63
IW-4	118017	55616	24300	2.57
IW-5	43268	26112	24300	0.71
IW-6	82650	39013	24300	1.80
IW-7	203639	104464	24300	4.08
IW-8	59773	29057	24300	1.26
IW-9	98729	45688	24300	2.18
IW-10	42237	24567	24300	0.73
IW-11	44523	16008	24300	1.17
Total (1-9)	1003652	469730	24300	21.97
Total (10,11)	86760	40575	24300	1.90
Total (1-11)	1090412	510305	24300	23.87

Meter No.	04-Apr-89 Totalizer Reading	04-Mar-89 Totalizer Reading	Elapsed Time (min)	Monthly Avg. Flow Rate (gpm)
IW-1	149809	10	44670	3.35
IW-2	135156	10	44670	3.03
IW-3	112611	10	44670	2.52
IW-4	118017	10	44670	2.64
IW-5	43268	10	44670	0.97
IW-6	82650	10	44670	1.85
IW-7	203639	10	44670	4.56
IW-8	59773	10	44670	1.34
IW-9	98729	10	44670	2.21
IW-10	42237	10	44670	0.95
IW-11	44523	10	44670	1.00
Total (1-9)	1003652	90	44670	22.47
Total (10,11)	86760	20	44670	1.94
Total (1-11)	1090412	110	44670	24.41

Table 4. Extaction Well Flow Rates: March 1989

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Meter No.	18-Mar-89 Totalizer Reading	04-Mar-89 Totalizer Reading	Elapsed Time (min)	14-Day Avg. Flow Rate (gpm)
EW-1	6933	10	20360	0.34
EW-2	7238	10	20360	0.36
EW-3	10691	10	20360	0.52
EW-4	5133	10	20360	0.25
EW-5	17339	10	20360	0.85
EW-6	3570	10	20360	0.17
EW-7	4467	10	20360	0.22
EW-8	3787	10	20360	0.19
EW-9	11942	10	20360	0.59
EW-10	10408	10	20360	0.51
EW-11	8967	10	20360	0.44
EW-12	9853	10	20360	0.48
EW-13	10813	10	20360	0.53
EW-14	8407	10	20360	0.41
EW-15	7845	10	20360	0.38
EW-16	44527	10	20360	2.19
EW-17	25198	10	20360	1.24
EW-18	29571	10	20360	1.45
EW-19	10434	10	20360	0.51
EW-20	2166	10	20360	0.11
EW-21			20360	0.00
EW-22			20360	0.00
Total (1-20)	239289	200	20360	11.74
Total (21-22)	0	0	20360	0.00
Total (1-22)	239289	200	20360	11.74

Meter No.	04-Apr-89 Totalizer Reading	04-Mar-89 Totalizer Reading	Elapsed Time (min)	Monthly Avg. Flow Rate (gpm)
EW-1	21538	10	44665	0.48
EW-2	22947	10	44665	0.51
EW-3	32993	10	44665	0.74
EW-4	17386	10	44665	0.39
EW-5	48529	10	44665	1.09
EW-6	13236	10	44665	0.30
EW-7	15623	10	44665	0.35
EW-8	13012	10	44665	0.29
EW-9	32634	10	44665	0.73
EW-10	28287	10	44665	0.63
EW-11	24207	10	44665	0.54
EW-12	25533	10	44665	0.57
EW-13	28393	10	44665	0.64
EW-14	21611	10	44665	0.48
EW-15	26021	10	44665	0.58
EW-16	133422	10	44665	2.99
EW-17	64775	10	44665	1.45
EW-18	78656	10	44665	1.76
EW-19	42468	10	44665	0.95
EW-20	14044	10	44665	0.31
EW-21			44665	0.00
EW-22			44665	0.00
Total (1-20)	705315	200	44665	15.79
Total (21-22)	0	0	44665	0.00
Total (1-22)	705315	200	44665	15.79

Meter No.	04-Apr-89 Totalizer Reading	18-Mar-89 Totalizer Reading	Elapsed Time (min)	17-Day Avg. Flow Rate (gpm)
EW-1	21538	6933	24305	0.60
EW-2	22947	7238	24305	0.65
EW-3	32993	10691	24305	0.92
EW-4	17386	5133	24305	0.50
EW-5	48529	17339	24305	1.28
EW-6	13236	3570	24305	0.40
EW-7	15623	4467	24305	0.46
EW-8	13012	3787	24305	0.38
EW-9	32634	11942	24305	0.85
EW-10	28287	10408	24305	0.74
EW-11	24207	8967	24305	0.63
EW-12	25533	9853	24305	0.65
EW-13	28393	10813	24305	0.72
EW-14	21611	8407	24305	0.54
EW-15	26021	7845	24305	0.75
EW-16	133422	44527	24305	3.66
EW-17	64775	25198	24305	1.63
EW-18	78656	29571	24305	2.02
EW-19	42468	10434	24305	1.32
EW-20	14044	2166	24305	0.49
EW-21			24305	0.00
EW-22			24305	0.00
Total (1-20)	705315	239289	24305	19.17
Total (21-22)	0	0	24305	0.00
Total (1-22)	705315	239289	24305	19.17

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Table 5. Water-Level Elevations

Well No.	MW-2		MW-3		MW-5		MW-6		MW-7		MW-8		MW-9	
	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING
	40.05	39.55	39.02	38.35	38.45	37.86	39.95	39.59	39.35	39.10	40.63	40.47	38.65	38.50
DATE	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation
03-Jan-89	33.10	6.45	32.35	6.00	33.00	4.86	30.22	9.37	31.15	7.95	32.78	7.69	30.58	7.92
05-Jan-89	-	-	32.35	6.00	33.00	4.86	30.22	9.37	31.15	7.95	32.78	7.69	30.58	7.92
02-Feb-89	33.05	6.50	33.01	5.34	31.82	6.04	30.23	9.36	30.51	8.59	32.62	7.85	31.67	6.83
08-Feb-89	33.83	5.72	32.21	6.14	32.02	5.84	31.05	8.54	31.44	7.66	33.03	7.44	30.65	7.85
18-Feb-89	30.59	8.96	29.26	9.09	31.90	5.96	30.05	9.54	30.21	8.89	31.96	8.51	30.16	8.34
25-Feb-89	29.85	9.70	28.68	9.67	30.32	7.54	30.57	9.02	31.10	8.00	31.90	8.57	30.80	7.70
02-Mar-89	-	-	-		-	-	-	-	-	-	-	-	30.05	8.45
11-Mar-89	-	-	-		-	-	-	-	-	-	-	-	23.06	15.44
18-Mar-89	-	-	32.20	6.15	32.01	5.85	-	-	31.52	7.58	-	-	22.45	16.05
25-Mar-89	-	-	27.76	10.59	27.53	10.33	-	-	30.08	9.02	-	-	22.62	15.88
30-Mar-89	-	-	-		-	-	-	-	-	-	-	-	23.00	15.50
04-Apr-89	28.52	11.03	27.56	10.79	-	-	28.00	11.59	29.00	10.10	30.45	10.02	22.61	15.89

* Elevations are in feet above Mean Sea Level (MSL)

Table 5. Water-Level Elevations

Well No.	MW-10		MW-11		MW-12		MW-13		MW-14		MW-15		MW-16	
	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING
	36.74	36.35	37.98	37.55	37.70	37.00	39.79	39.77	39.27	40.26	39.69	40.73	39.55	40.53
DATE	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation
03-Jan-89	27.34	9.01	30.30	7.25	-	-	-	-	-	-	-	-	-	-
05-Jan-89	27.34	9.01	30.30	7.25	-	-	-	-	-	-	-	-	-	-
02-Feb-89	28.11	8.24	30.03	7.52	-	-	-	-	-	-	-	-	-	-
08-Feb-89	27.65	8.70	29.52	8.03	-	-	-	-	-	-	-	-	-	-
18-Feb-89	27.65	8.70	28.02	9.53	-	-	-	-	-	-	-	-	-	-
25-Feb-89	27.12	9.23	29.05	8.50	30.87	6.13	32.63	7.14	31.07	9.19	32.83	7.90	32.43	8.10
02-Mar-89	27.23	9.12	28.98	8.57	28.46	8.54	32.79	6.98	32.28	7.98	32.40	8.33	32.50	8.03
11-Mar-89	23.59	12.76	28.93	8.62	28.22	8.78	30.12	9.65	28.64	11.62	27.10	13.63	25.64	14.89
18-Mar-89	23.17	13.18	27.79	9.76	27.85	9.15	30.29	9.48	28.20	12.06	26.62	14.11	24.74	15.79
25-Mar-89	23.19	13.16	28.10	9.45	27.47	9.53	29.76	10.01	27.79	12.47	26.28	14.45	24.88	15.65
30-Mar-89	23.56	12.79	28.48	9.07	27.43	9.57	30.12	9.65	27.99	12.27	26.50	14.23	25.48	15.05
04-Apr-89	23.34	13.01	28.61	8.94	28.44	8.56	29.60	10.17	27.84	12.42	26.84	13.89	25.53	15.00

* Elevations are in feet above Mean Sea Level (MSL)

Table 5. Water-Level Elevations

Well No.	MW-17		MW-18		DW-1	
	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING	GROUND SURFACE	TOP OF CASING
	39.16	40.16	36.56	35.88	39.03	38.42
DATE	Depth to Water	Elevation	Depth to Water	Elevation	Depth to Water	Elevation
03-Jan-89	-	-	-	-	-	-
05-Jan-89	-	-	-	-	-	-
02-Feb-89	-	-	-	-	-	-
08-Feb-89	-	-	-	-	-	-
18-Feb-89	-	-	-	-	-	-
25-Feb-89	32.02	8.14	26.90	8.98	-	-
02-Mar-89	-	-	26.66	9.22	-	-
11-Mar-89	23.45	16.71	26.28	9.60	-	-
18-Mar-89	23.35	16.81	26.18	9.70	-	-
25-Mar-89	23.35	16.81	25.70	10.18	-	-
30-Mar-89	-	-	-	-	-	-
04-Apr-89	24.18	15.98	26.10	9.78	-	-

* Elevations are in feet above Mean Sea Level (MSL)

Table 6. Results of Inorganic Chemical and Microbial Analyses of Ground-Water Samples from System Wells

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WELL	DATE	NITRATE	PHOSPHATE	DISSOLVED IRON (Fe)	AMMONIA	MICROBIAL ENUMERATION TC	HCU
LOD		0.5(ppm)	0.5(ppm)	0.1(ppm)	0.5(ppm)	NA	NA
EW-1							
	15-Mar-89	17.6	ND	ND	ND	7.8E+6	1.2E+2
	29-Mar-89	9.7	3.5	NT	ND	1.8E+6	3.8E+2
	04-Apr-89	13.2	3.8	ND	ND	3.3E+5	--
EW-4							
	15-Mar-89	16.7	0.6	ND	ND	5.1E+6	9.5E+1
	29-Mar-89	25.5	2.8	NT	ND	5.3E+5	1.7E+2
	04-Apr-89	31.7	4	ND	ND	2.5E+5	--
EW-5							
	15-Mar-89	NT	NT	NT	NT	NT	NT
	29-Mar-89	28.0	3.8	NT	ND	NT	NT
	04-Apr-89	NT	NT	NT	NT	NT	NT
EW-8							
	15-Mar-89	11.4	0.5	ND	ND	NT	NT
	29-Mar-89	28.0	3.5	NT	ND	NT	NT
	04-Apr-89	33.0	3.8	ND	ND	3.1E+5	--
EW-12							
	15-Mar-89	13.2	1.0	ND	ND	NT	NT
	29-Mar-89	22.0	3.3	NT	ND	NT	NT
	04-Apr-89	22.9	3.8	ND	ND	NT	NT
EW-16							
	15-Mar-89	1.8	0.5	ND	ND	NT	NT
	29-Mar-89	18.4	3.0	NT	ND	NT	NT
	04-Apr-89	31.7	5.0	ND	ND	5.7E+5	--
EW-19							
	15-Mar-89	NT	NT	NT	NT	NT	NT
	29-Mar-89	NT	NT	NT	NT	NT	NT
	04-Apr-89	18.5	4.0	ND	ND	NT	NT

NOTES:

HCU: Hydrocarbon Utilizers
TC: Total Count
LOD: Limit of Detection.
NA: Limit of Detection not applicable.
ND: Not detected at or above LOD.
NT: Not tested.
--: Results not available.

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Table 7. Results of Inorganic Chemical and Microbial Analyses of Ground-water Monitoring Well Samples

WELL	DATE	NITRATE	PHOSPHATE	DISSOLVED OXYGEN	DISSOLVED IRON (Fe)	AMMONIA	MICROBIAL ENUMERATION TC	MICROBIAL ENUMERATION HCU
LOD		0.5(ppm)	0.5(ppm)	0.5(mg/l)	0.1(ppm)	0.5(ppm)	NA	NA
MW-9								
	03-Mar-89	37.0/32.0*	1.5	1.0**	ND	ND	5.3E+5	9.5E+2
	10-Mar-89	NT	NT	NT	NT	NT	NT	NT
	15-Mar-89	6.0	6.0	NT	ND	ND	5.9E+6	1.8E+2
	29-Mar-89	37.0	32.0	NT	NT	ND	1.8E+6	2.1E+2
	04-Apr-89	41.8	36.0	NT	ND	ND	3.6E+5	--
MW-10								
	03-Mar-89	8.4/5.5*	1.0	4.0**	ND	ND	2.3E+5	3.5E+2
	10-Mar-89	NT	NT	NT	NT	NT	NT	NT
	15-Mar-89	5.5	1.2	NT	ND	ND	NT	NT
	29-Mar-89	11.4	4.5	NT	NT	ND	NT	NT
	04-Apr-89	15.0	1.3	NT	ND	ND	NT	NT
MW-11								
	03-Mar-89	ND/ND*	0.8	2.0**	ND	ND	1.1E+6	2.8E+3
	10-Mar-89	NT	NT	NT	NT	NT	NT	NT
	15-Mar-89	ND	1.0	NT	ND	ND	NT	NT
	29-Mar-89	31.7	4.3	NT	NT	ND	NT	NT
	04-Apr-89	37.0	5.0	NT	ND	ND	NT	NT
MW-12								
	03-Mar-89	11.4/6.2*	1.0	5.8**	ND	ND	7.1E+5	1.1E+1
	10-Mar-89	NT	NT	NT	NT	NT	NT	NT
	15-Mar-89	12.3	1.1	NT	ND	ND	NT	NT
	29-Mar-89	13.6	4.8	NT	NT	ND	NT	NT
	04-Apr-89	11.4	1.5	NT	ND	ND	NT	NT
MW-13								
	03-Mar-89	11.4/8.6*	1.0	2.0**	0.25	ND	4.1E+6	1.7E+2
	10-Mar-89	NT	NT	NT	NT	NT	NT	NT
	15-Mar-89	9.2	1.1	NT	ND	ND	NT	NT
	29-Mar-89	8.8	6.3	NT	NT	ND	NT	NT
	04-Apr-89	9.7	3.5	NT	ND	ND	NT	NT
MW-14								
	03-Mar-89	37.0/22.0*	0.8	3.0**	ND	ND	3.6E+5	2.2E+2
	10-Mar-89	NT	NT	NT	NT	NT	NT	NT
	15-Mar-89	37.0	1.0	NT	ND	ND	NT	NT
	29-Mar-89	22.8	3.8	NT	NT	ND	NT	NT
	04-Apr-89	29.9	3.8	NT	ND	ND	NT	NT

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Table 7. Results of Inorganic Chemical and Microbial Analyses of Ground-water Monitoring Well Samples

WELL	DATE	NITRATE	PHOSPHATE	DISSOLVED OXYGEN	DISSOLVED IRON (Fe)	AMMONIA	MICROBIAL ENUMERATION TC	MICROBIAL ENUMERATION HCU
LOD		0.5(ppm)	0.5(ppm)	0.5(mg/l)	0.1(ppm)	0.5(ppm)	NA	NA
MW-15								
	03-Mar-89	42.2/19.0*	0.9	4.0**	ND	ND	4.5E+5	2.8E+2
	10-Mar-89	40.5	2.2	NT	NT	NT	1.0E+6	2.8E+2
	15-Mar-89	35.2	1.2	NT	ND	ND	6.9E+6	2.8E+2
	29-Mar-89	20.2	4.2	NT	NT	ND	9.1E+5	2.1E+2
	04-Apr-89	24.6	5.3	NT	ND	ND	4.4E+5	--
MW-16								
	03-Mar-89	49.3/17.0*	1.2	2.0**	ND	ND	8.4E+5	1.4E+2
	10-Mar-89	14.5	2.2	NT	ND	ND	1.4E+5	1.2E+3
	15-Mar-89	11.4	3.0	NT	ND	ND	6.0E+6	1.1E+3
	29-Mar-89	33.4	7.2	NT	NT	ND	1.6E+6	3.5E+3
	04-Apr-89	39.6	11.5	NT	0.2	NT	2.2E+6	--
MW-17								
	03-Mar-89	NT	NT	NT	NT	NT	NT	NT
	10-Mar-89	12.3	0.8	NT	ND	ND	1.6E+5	1.1E+3
	15-Mar-89	7.5	3.1	NT	ND	ND	1.1E+7	3.5E+3
	29-Mar-89	25.5	3.8	NT	NT	ND	2.6E+6	1.1E+3
	04-Apr-89	35.2	3.5	NT	ND	ND	3.3E+6	--
MW-18								
	03-Mar-89	15.4/9.3*	0.5	2.9**	ND	ND	1.3E+6	7.9E+1
	10-Mar-89	NT	NT	NT	NT	NT	NT	NT
	15-Mar-89	4.0	1.1	NT	ND	ND	NT	NT
	29-Mar-89	8.8	3.0	NT	NT	ND	NT	NT
	04-Apr-89	6.6	2.8	NT	ND	ND	NT	NT

NOTES:

HCU: Hydrocarbon Utilizers
TC: Total Count
LOD: Limit of Detection.
NA: Limit of Detection not applicable.
ND: Not detected at or above LOD.
NT: Not tested.
* : First value from HLA laboratory
Second value from Pace Laboratories, Inc.
**: Results from Pace Laboratories, Inc.
--: Results not available.

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Table 8. Results of Organic Chemical Analyses of Ground-Water Monitoring Well Samples

Purgeable Aromatics (EPA Method 8020)
Petroleum Hydrocarbons (EPA Method 8015)

WELL	DATE		BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES, TOTAL	TPH AS GASOLINE
LOD		(mg/l)	0.0005	0.0005	0.0005	0.0005	0.25
MW-7							
	04-Apr-89		ND	0.0007	0.0010	0.0012	ND
MW-9							
	02-Mar-89		NT	NT	NT	NT	1.2
	04-Apr-89		0.19	0.35	0.041	0.36	1.5
MW-10							
	02-Mar-89		NT	NT	NT	NT	2.8
	04-Apr-89		1.6	0.76	0.13	0.68	4.2
MW-11							
	02-Mar-89		NT	NT	NT	NT	15
	04-Apr-89		2.5	3.8	0.17	2.4	10
MW-12							
	03-Mar-89		NT	NT	NT	NT	ND
	05-Apr-89		0.0014	0.0023	ND	0.0054	ND
MW-13							
	02-Mar-89		NT	NT	NT	NT	1.4
	04-Apr-89		0.041	0.039	0.0038	0.28	0.71
MW14							
	02-Mar-89		NT	NT	NT	NT	ND
	04-Apr-89		0.44	0.063	ND	0.27	1.4
MW-15							
	03-Mar-89		NT	NT	NT	NT	3.9
	04-Apr-89		0.88	0.97	0.11	0.93	3.7
MW-16							
	02-Mar-89		NT	NT	NT	NT	2.1
	04-Apr-89		2.1	2.2	0.18	1.4	6.7
MW-17							
	03-Mar-89		NT	NT	NT	NT	NT
	04-Apr-89		3.1	2.9	0.27	3.9	12
MW-18							
	03-Mar-89		NT	NT	NT	NT	ND
	05-Apr-89		ND	ND	ND	ND	ND

Table 8. Results of Organic Chemical Analyses of Ground-Water Monitoring Well Samples

Purgeable Aromatics (EPA Method 8020)
Petroleum Hydrocarbons (EPA Method 8015)

WELL	DATE		BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES, TOTAL	TPH AS GASOLINE
LOD		(mg/l)	0.0005	0.0005	0.0005	0.0005	0.25
EW-1							
	03-Mar-89		NT	NT	NT	NT	NT
	04-Apr-89		1.6	1.0	0.087	1.8	5.9
EW-4							
	03-Mar-89		NT	NT	NT	NT	NT
	04-Apr-89		NT	NT	NT	NT	2.5
EW-16							
	03-Mar-89		NT	NT	NT	NT	NT
	04-Apr-89*		2.8/3.3	2.0/2.6	0.10/0.14	0.99/1.2	8.9/8.8
BLANK							
	03-Mar-89		NT	NT			
	05-Apr-89		0.5	ND	ND	ND	ND

NOTES:

LOD: Limit of Detection.
ND: Not detected at or above LOD.
NT: Not tested.
*: Two values indicate results of duplicate samples

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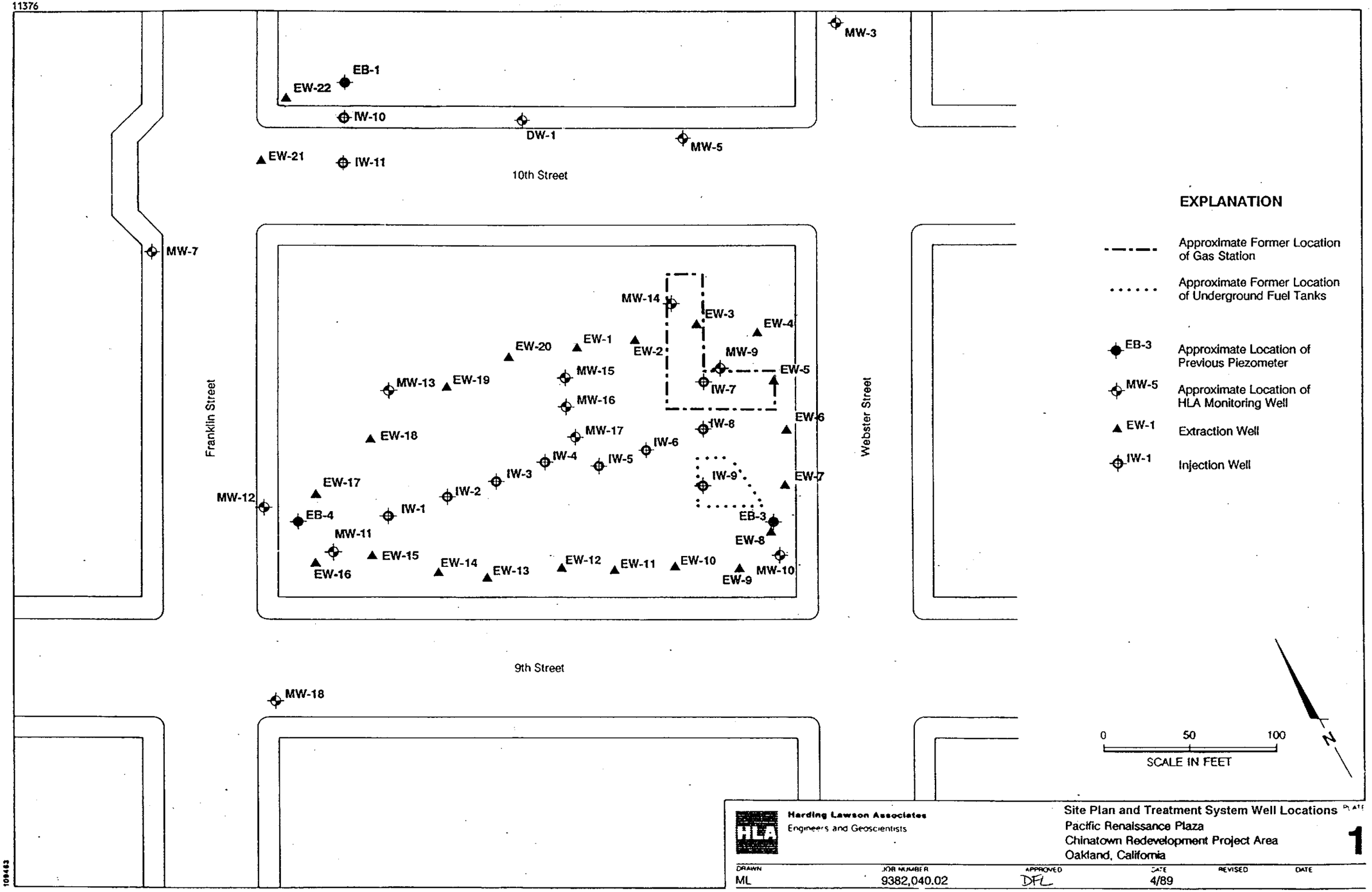


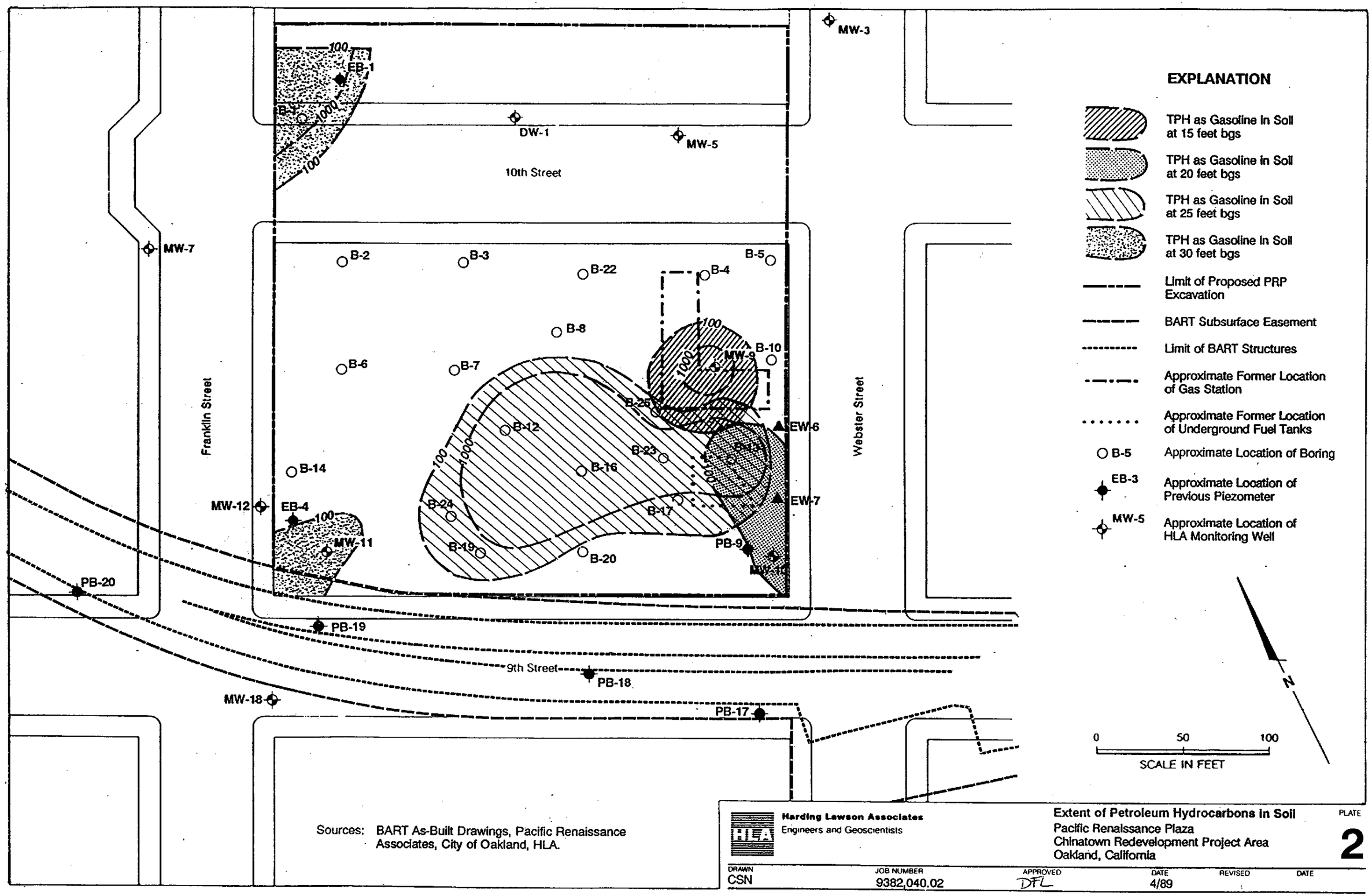
Harding Lawson Associates
Engineers and Geoscientists

Site Plan and Treatment System Well Locations
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE 1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DFL	4/89		

109463



Sources: BART As-Built Drawings, Pacific Renaissance Associates, City of Oakland, HLA.

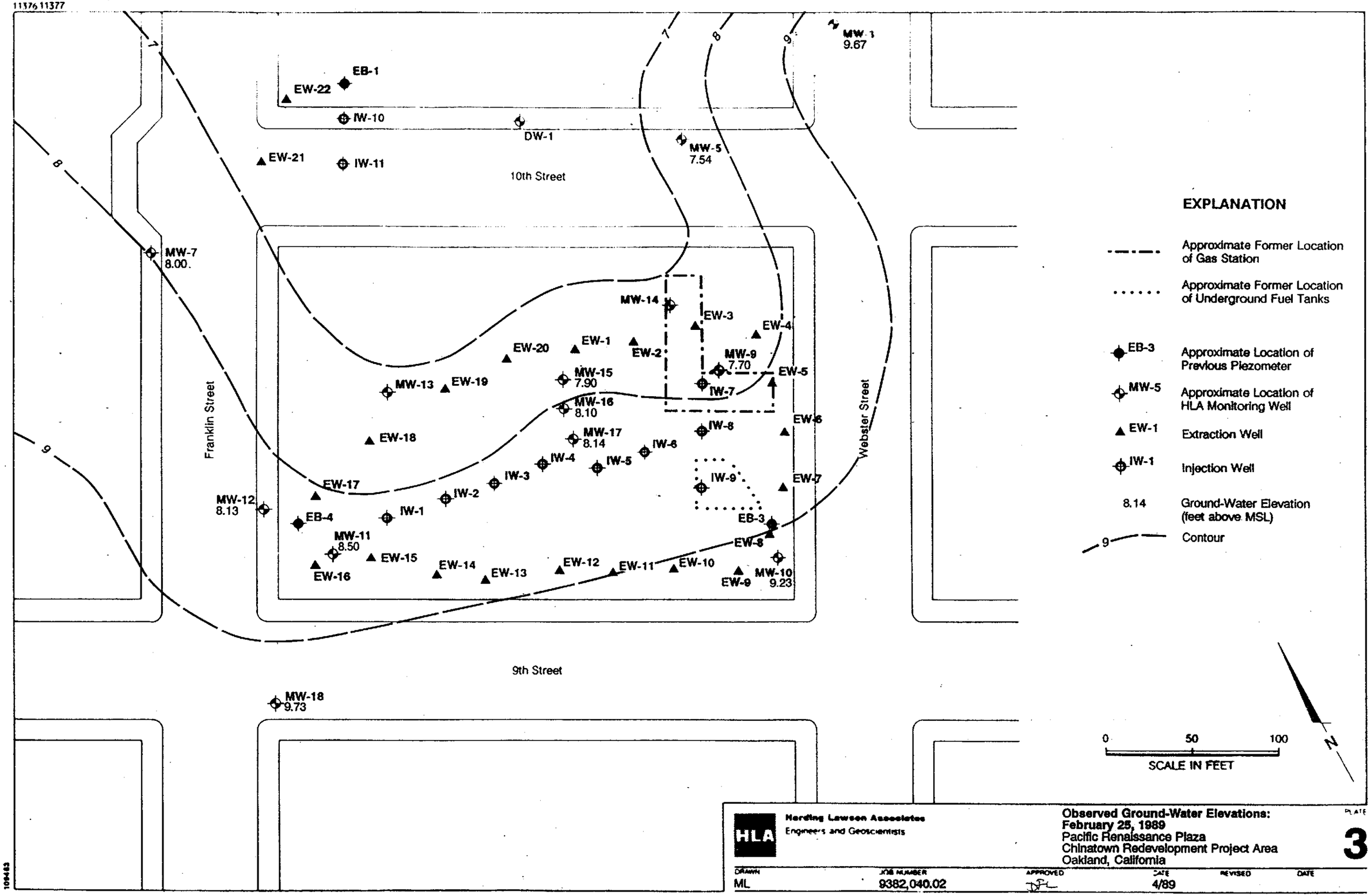
Harding Lawson Associates
Engineers and Geoscientists

Extent of Petroleum Hydrocarbons in Soil
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
CSN	9382,040.02	DFL	4/89		

11376 11377



106483

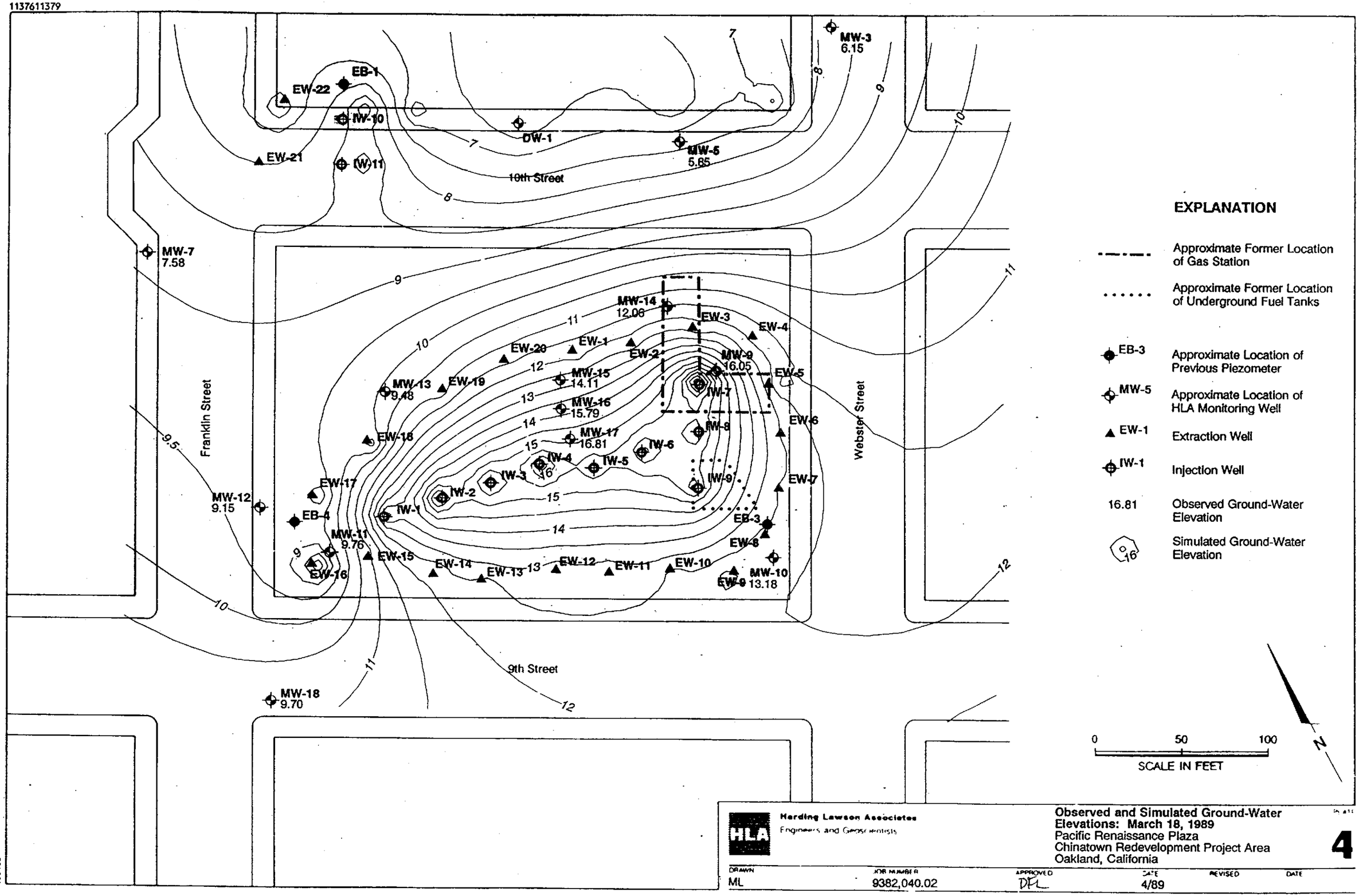
Harding Lawson Associates
Engineers and Geoscientists

Observed Ground-Water Elevations:
February 25, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02		4/89		

1137611379



EXPLANATION

- Approximate Former Location of Gas Station
- Approximate Former Location of Underground Fuel Tanks
- EB-3 — Approximate Location of Previous Piezometer
- MW-5 — Approximate Location of HLA Monitoring Well
- EW-1 — Extraction Well
- IW-1 — Injection Well
- 16.81 — Observed Ground-Water Elevation
- 16 — Simulated Ground-Water Elevation

0 50 100
SCALE IN FEET

N

Harding Lawson Associates
Engineers and Geoscientists

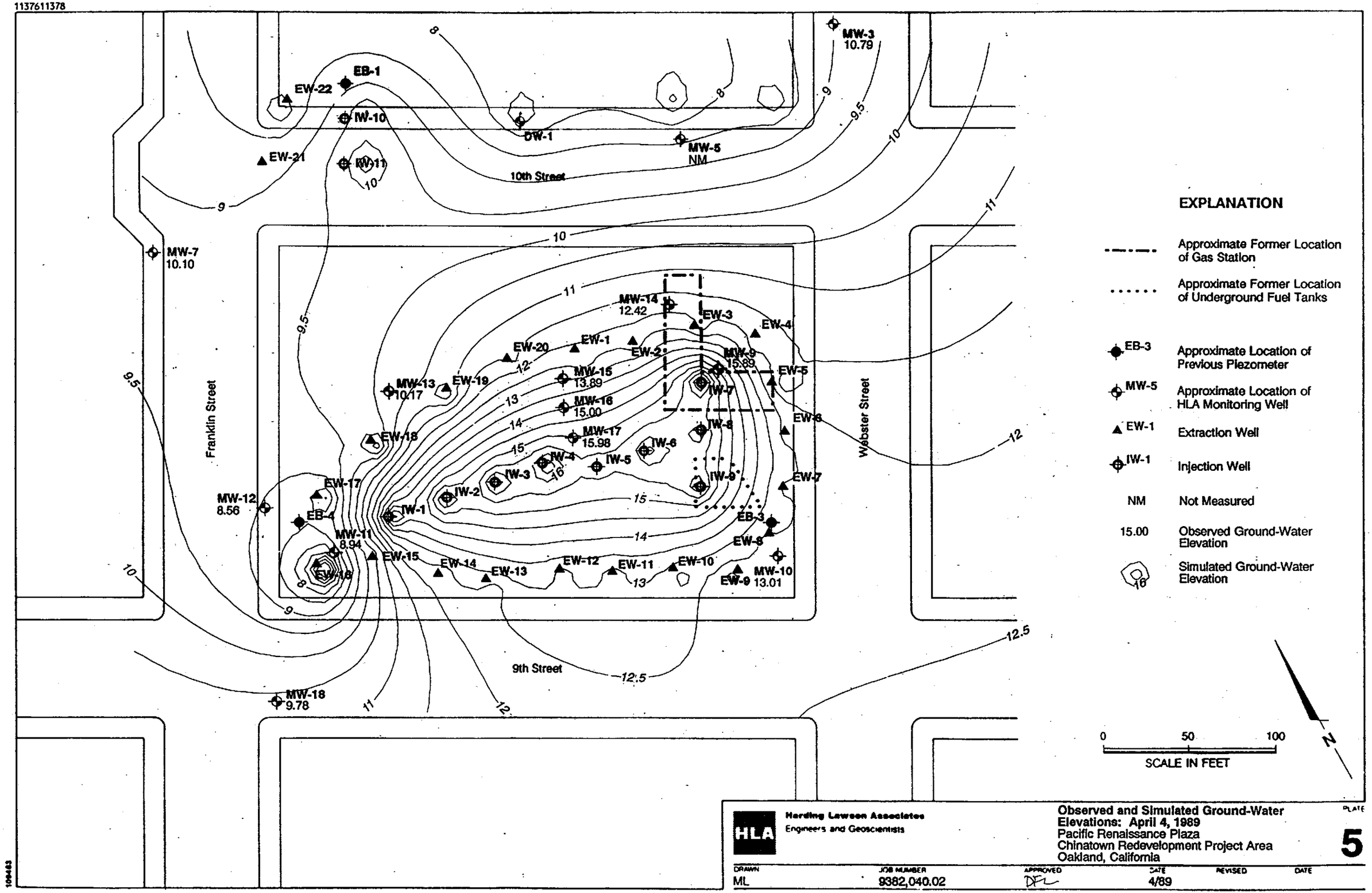
Observed and Simulated Ground-Water Elevations: March 18, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DPL	4/89		

109483

1137611378



EXPLANATION

- Approximate Former Location of Gas Station
- Approximate Former Location of Underground Fuel Tanks
- EB-3 — Approximate Location of Previous Piezometer
- MW-5 — Approximate Location of HLA Monitoring Well
- EW-1 — Extraction Well
- IW-1 — Injection Well
- NM — Not Measured
- 15.00 — Observed Ground-Water Elevation
- 16 — Simulated Ground-Water Elevation

0 50 100
SCALE IN FEET

N

106463

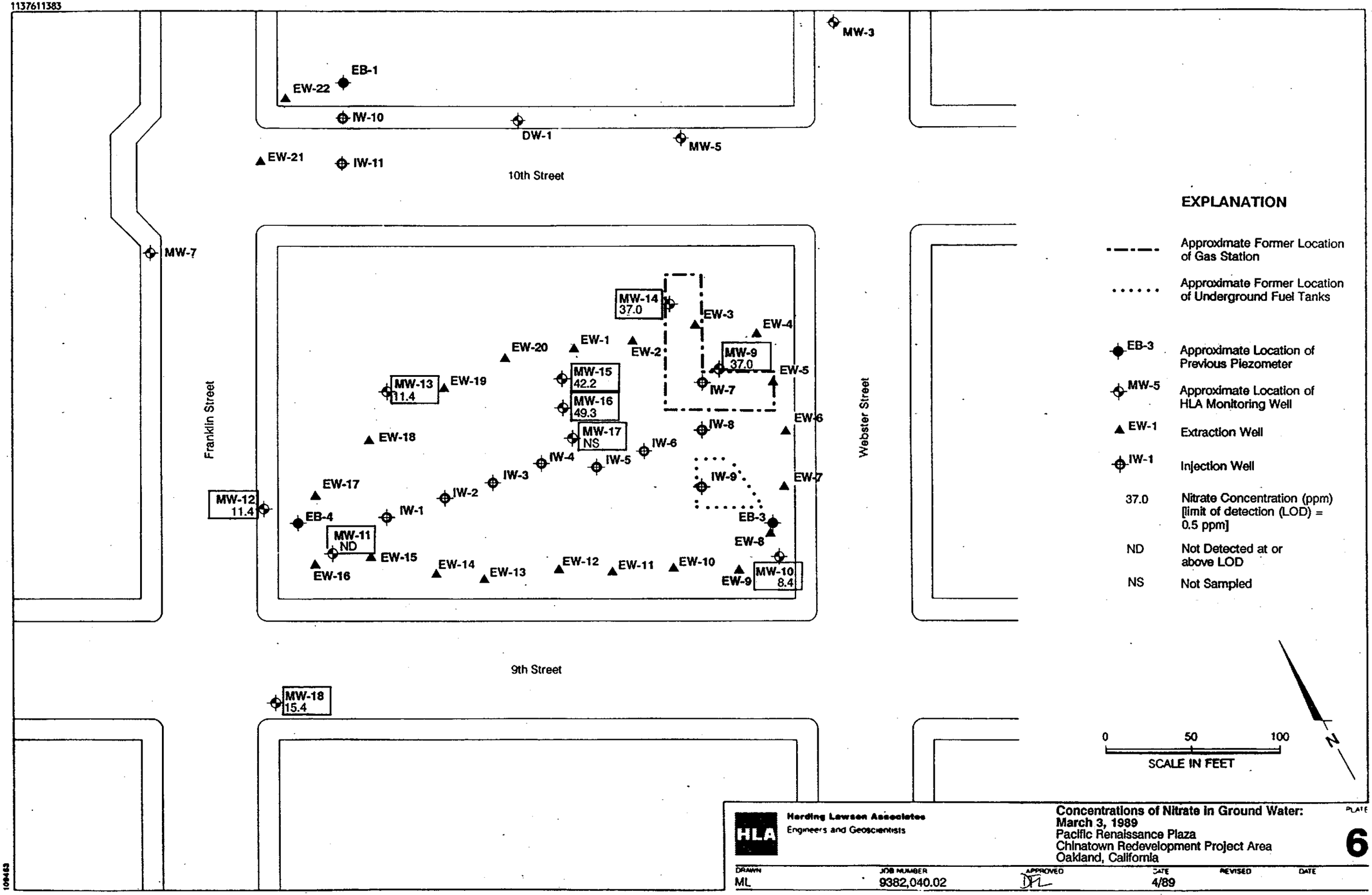
HLA Harding Lawson Associates
Engineers and Geoscientists

Observed and Simulated Ground-Water Elevations: April 4, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **5**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DFL	4/89		

1137611383



10463

HLA Harding Lawson Associates
Engineers and Geoscientists

Concentrations of Nitrate in Ground Water: March 3, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **6**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DFL	4/89		

1137,11382

MW-3

EB-1

EW-22

IW-10

DW-1

MW-5

EW-21

IW-11

10th Street

MW-7

Franklin Street

MW-14
0.8

EW-3

EW-4

EW-20

EW-1

EW-2

MW-9
1.5

EW-5

MW-13
1.0

EW-19

MW-15
0.9

IW-7

MW-16
1.2

EW-6

EW-18

MW-17
NS

IW-8

IW-6

IW-4

IW-5

IW-9

EW-7

EW-17

IW-3

IW-2

MW-12
1.0

EB-4

IW-1

EB-3

MW-11
0.8

EW-8

EW-15

EW-16

EW-14

EW-13

EW-12

EW-11

EW-10

EW-9

MW-10
1.0

Webster Street

9th Street

MW-18
0.5

EXPLANATION

- Approximate Former Location of Gas Station
- Approximate Former Location of Underground Fuel Tanks
- EB-3 — Approximate Location of Previous Piezometer
- MW-5 — Approximate Location of HLA Monitoring Well
- EW-1 — Extraction Well
- IW-1 — Injection Well
- 1.5 — Phosphate Concentration (ppm) [limit of detection (LOD) = 0.5 ppm]
- NS — Not Sampled

0 50 100

SCALE IN FEET

N

109463

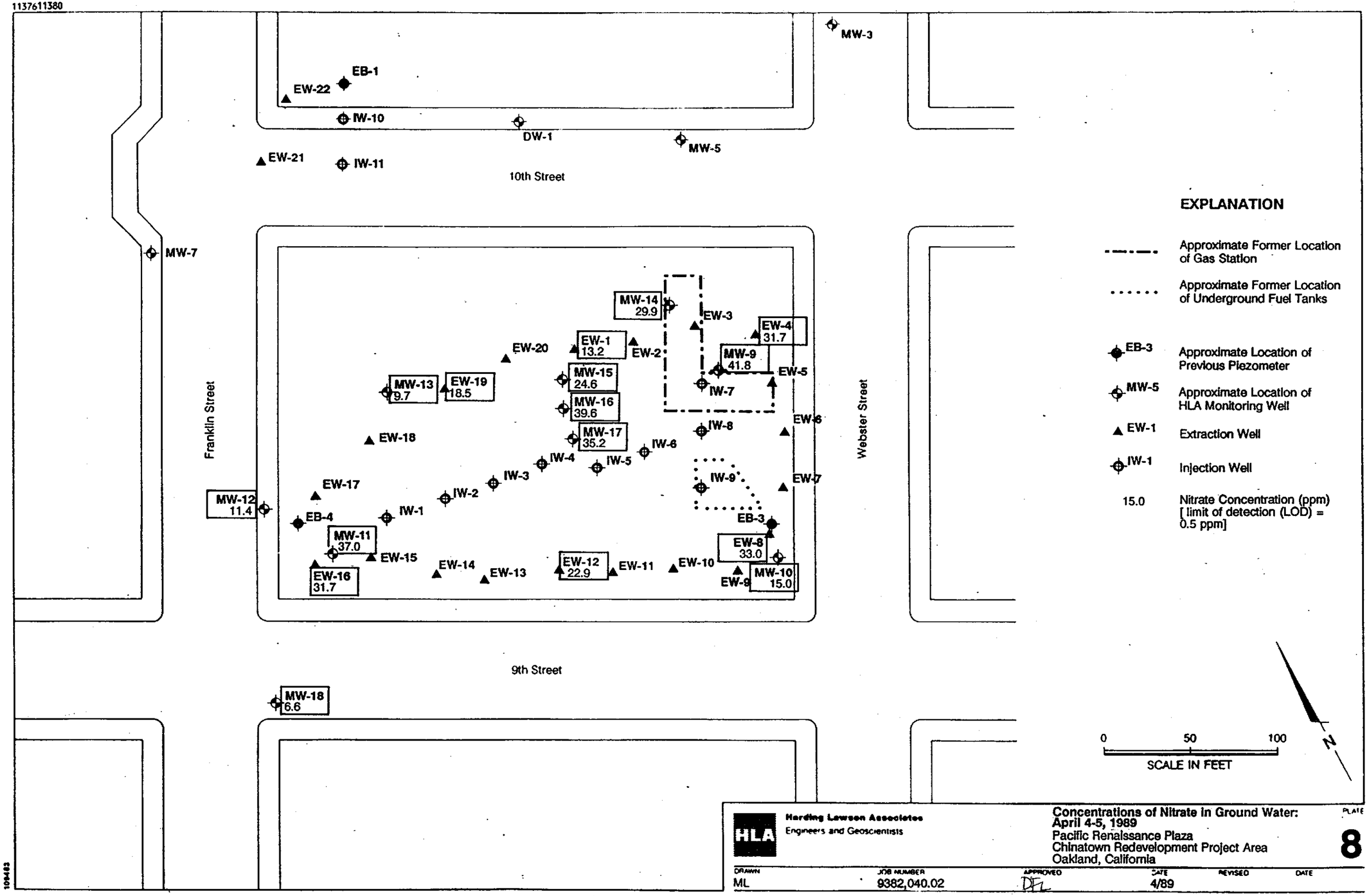
Harding Lawson Associates
Engineers and Geoscientists

Concentrations of Phosphate in Ground Water: March 3, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DPL	4/89		

1137611380



103483

HLA

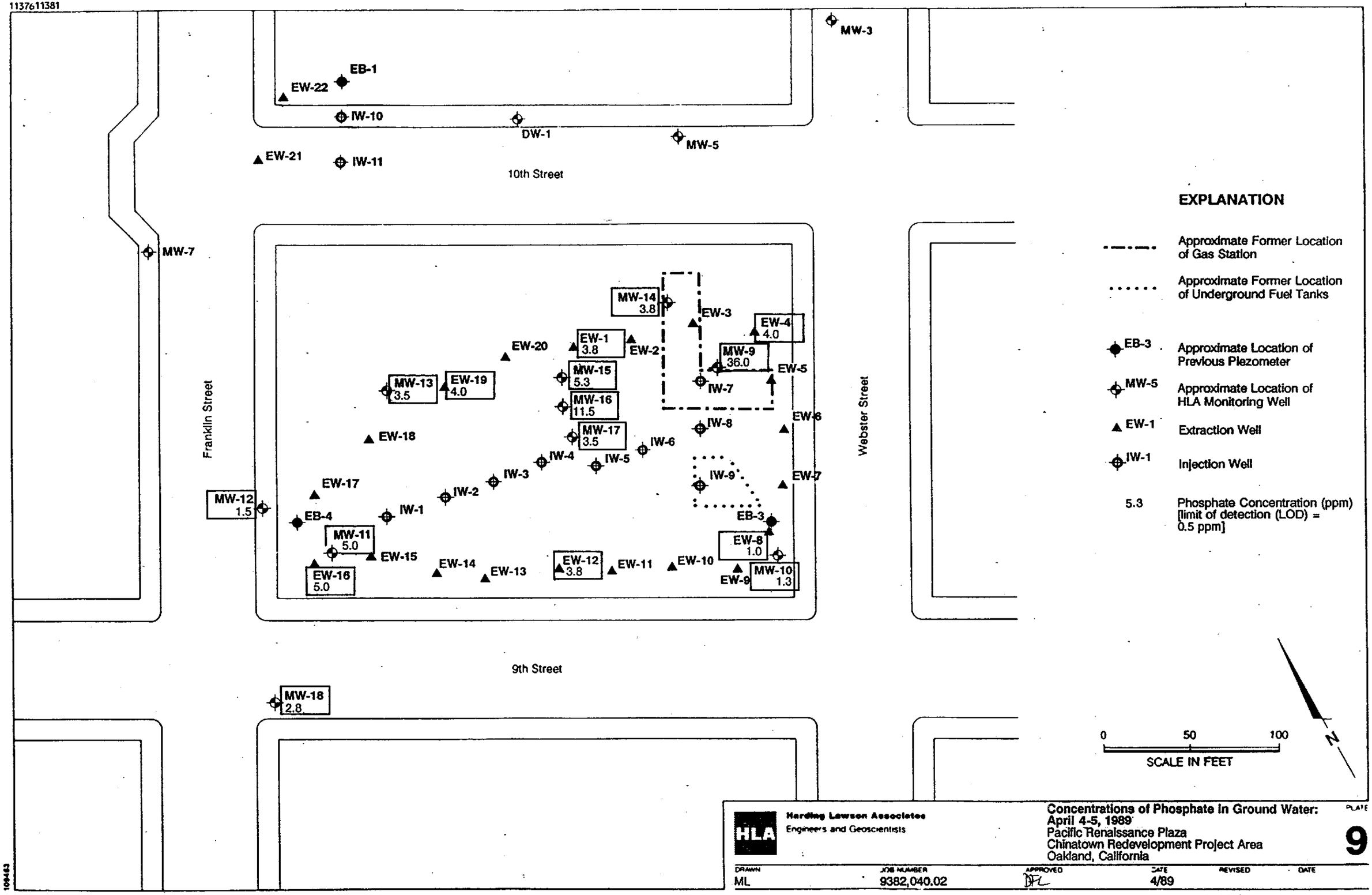
Harding Lawson Associates
Engineers and Geoscientists

Concentrations of Nitrate in Ground Water: April 4-5, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **8**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DFL	4/89		

1137611381



109463

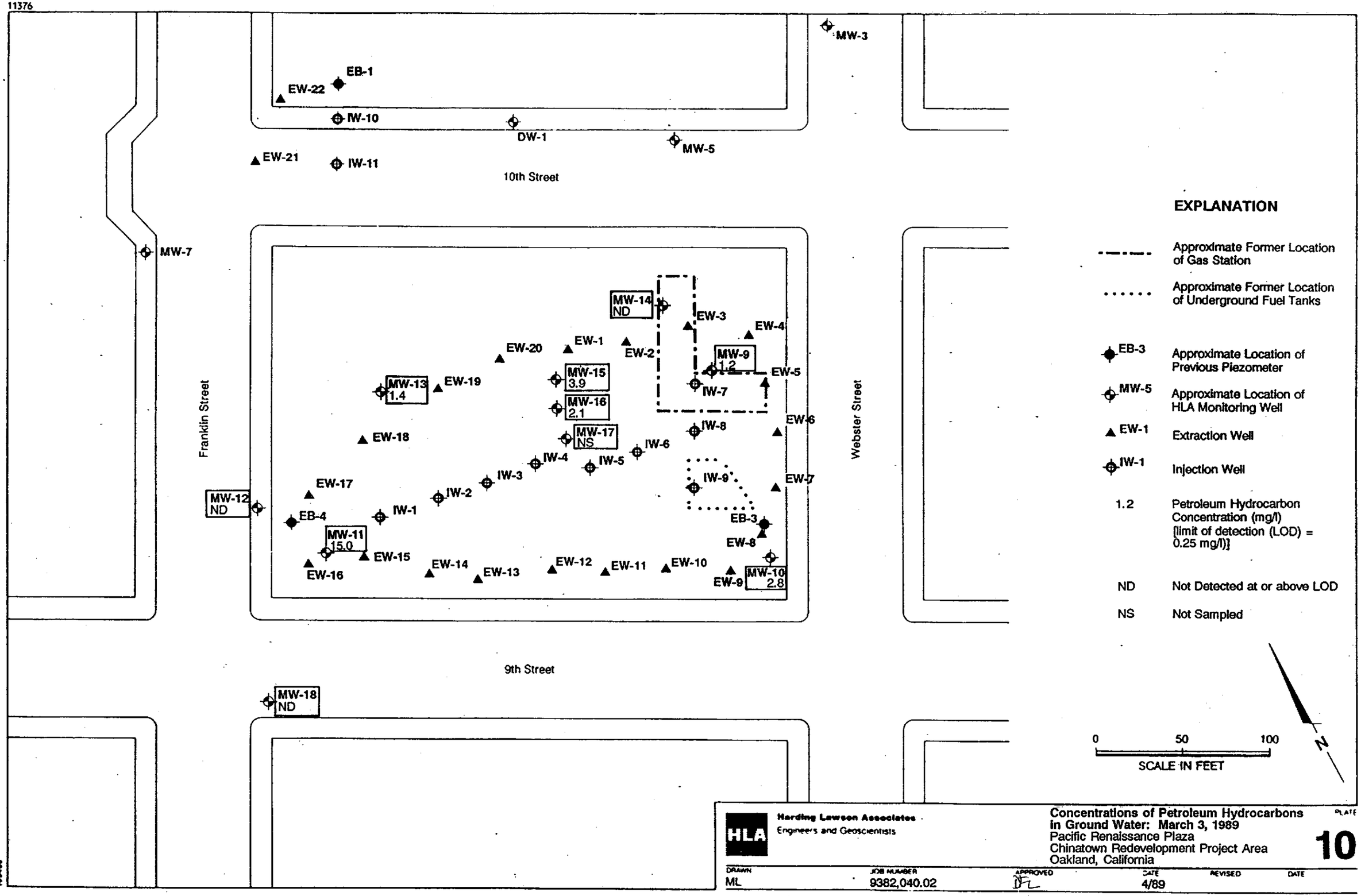
HLA Harding Lawson Associates
Engineers and Geoscientists

Concentrations of Phosphate in Ground Water: April 4-5, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **9**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DPL	4/89		

11376



EXPLANATION

- Approximate Former Location of Gas Station
- Approximate Former Location of Underground Fuel Tanks
- EB-3 — Approximate Location of Previous Piezometer
- MW-5 — Approximate Location of HLA Monitoring Well
- EW-1 — Extraction Well
- IW-1 — Injection Well
- 1.2 — Petroleum Hydrocarbon Concentration (mg/l) [limit of detection (LOD) = 0.25 mg/l)]
- ND — Not Detected at or above LOD
- NS — Not Sampled

0 50 100

SCALE IN FEET

N

HLA Harding Lawson Associates
Engineers and Geoscientists

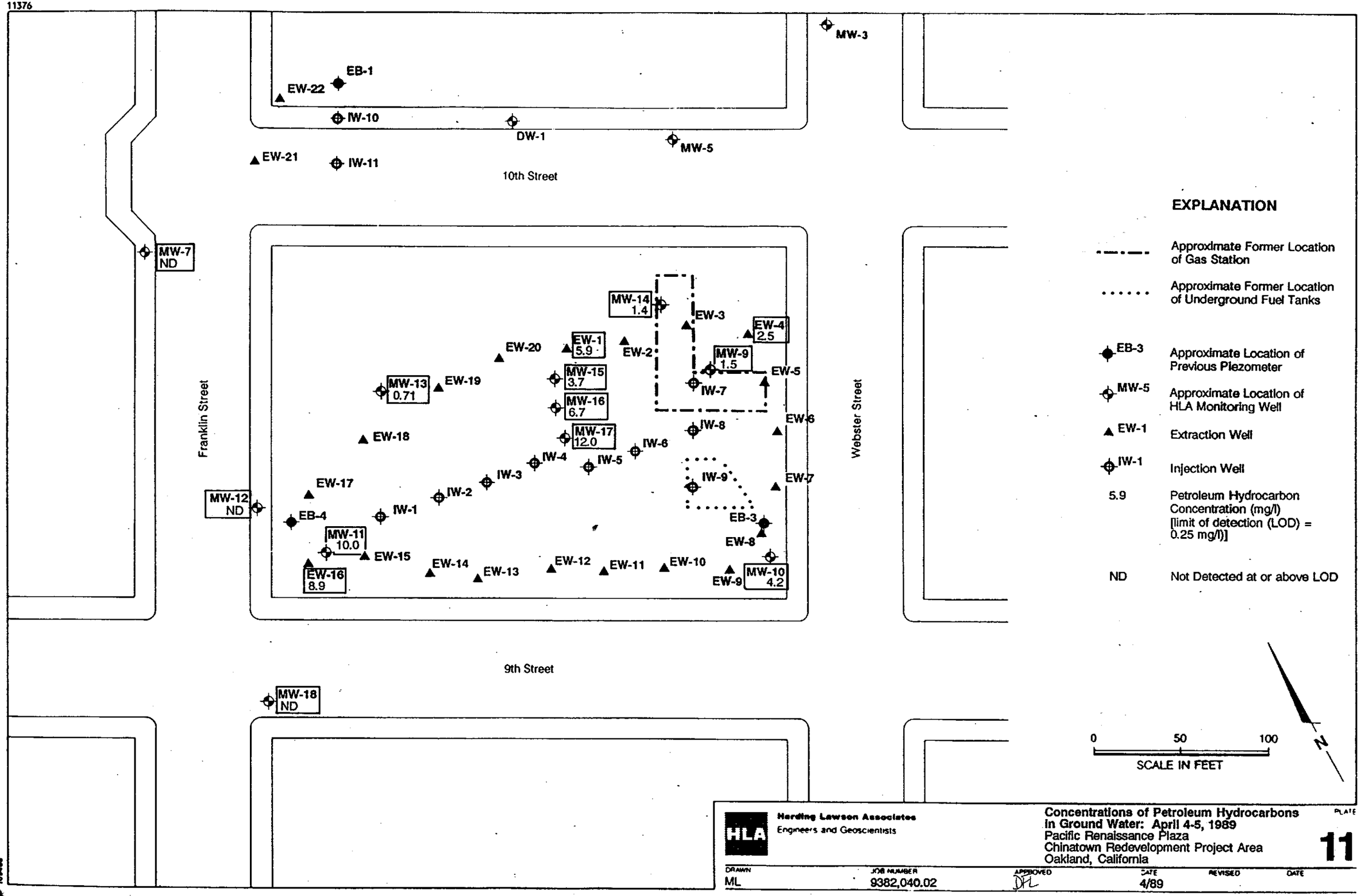
Concentrations of Petroleum Hydrocarbons in Ground Water: March 3, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **10**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DFL	4/89		

109463

11376



Harding Lawson Associates
Engineers and Geoscientists

Concentrations of Petroleum Hydrocarbons in Ground Water: April 4-5, 1989
Pacific Renaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **11**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
ML	9382,040.02	DFL	4/89		

Appendix A

EXAMPLE WELL COMPLETION DETAILS

11705

MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION - ASTM D2487-85

Perm	—	Permeability
Consol	—	Consolidation
LL	—	Liquid Limit (%)
PI	—	Plastic Index (%)
G_s	—	Specific Gravity
MA	—	Particle Size Analysis
■	—	"Undisturbed" Sample
⊠	—	Bulk or Classification Sample

Shear Strength (psf) ↓		Confining Pressure ↓		
TxUU (FM)	3200 or (S)	(2600)	—	Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
TxCU (P)	3200	(2600)	—	Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
TxCD	3200	(2600)	—	Consolidated Drained Triaxial Shear
SSCU (P)	3200	(2600)	—	Simple Shear Consolidated Undrained (with or without pore pressure measurement)
SSCD	3200	(2600)	—	Simple Shear Consolidated Drained
DSCD	2700	(2000)	—	Consolidated Drained Direct Shear
UC	470		—	Unconfined Compression
LVS	700		—	Laboratory Vane Shear

KEY TO TEST DATA

Harding Lawson Associates
Engineers and Geoscientists

Unified Soil Classification Chart
Pacific Rennaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **A1**

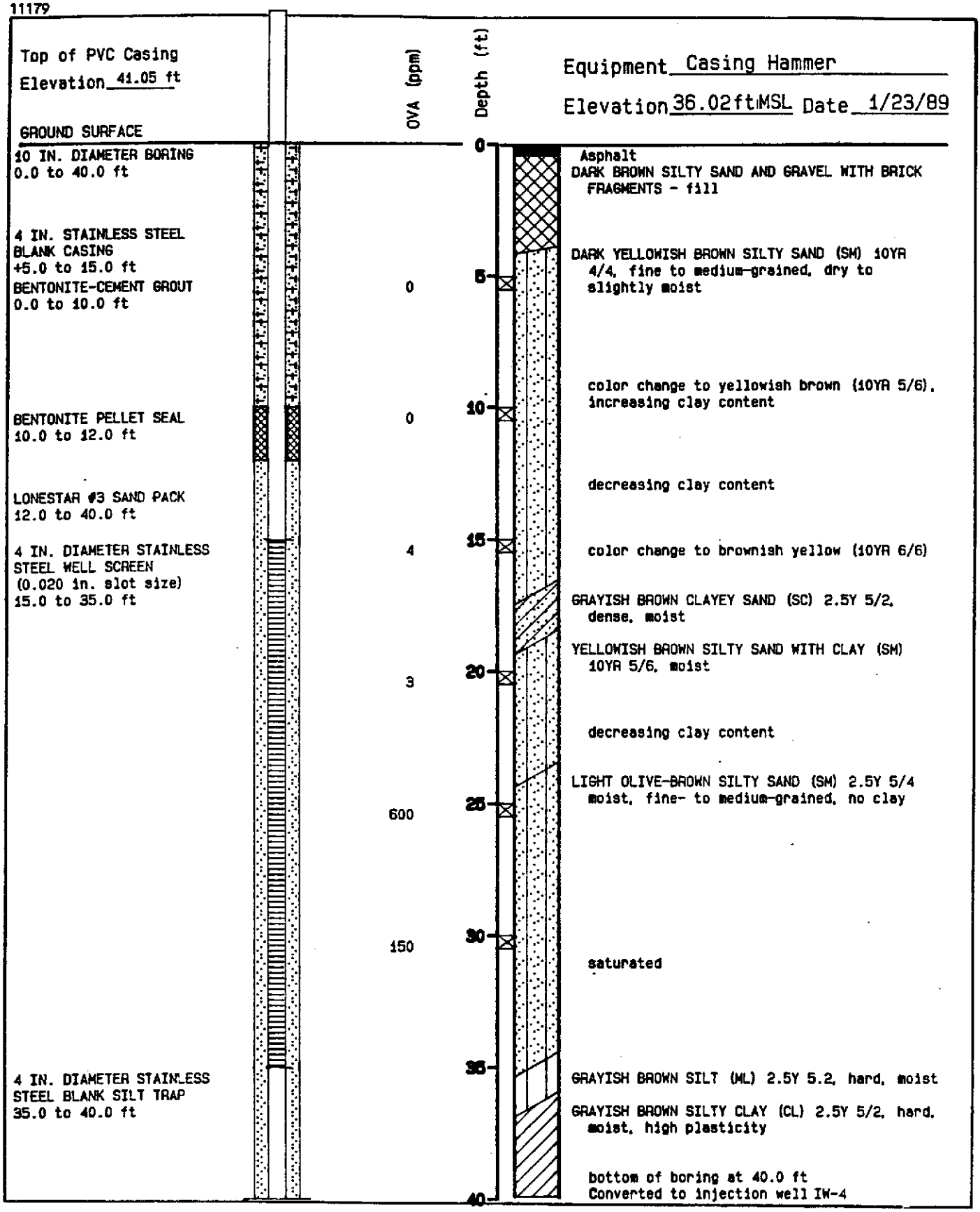
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	9382,040.02	DFL	4/89		

11179

Top of PVC Casing Elevation 41.05 ft

Equipment Casing Hammer

Elevation 36.02 ft MSL Date 1/23/89



Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail IW-4
Pacific Rennaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **A2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	9382, 037.02	DFL	4/89		

11178

Top of PVC Casing
Elevation 34.76 ft

GROUND SURFACE

10 IN. DIAMETER BORING
0.0 to 38.0 ft

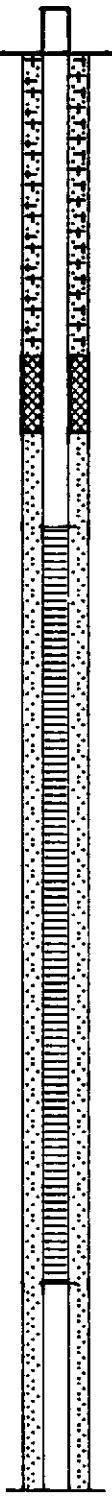
4 IN. DIAMETER SCHEDULE 40
PVC WELL CASING
+1.0 to 12.5 ft
GROUT from 0.0 to 8.0 ft

BENTONITE PELLET SEAL
8.0 to 10.0 ft

LONESTAR #3 SAND PACK
10.0 to 38.0 ft

4 IN. DIAMETER SCHEDULE 40
PVC WELL SCREEN
(0.030 in. slot size)
12.5 to 32.5 ft

4 IN. DIAMETER SCHEDULE 40
PVC BLANK SILT TRAP
32.5 to 38.0 ft



OVA (ppm)	Depth (ft)	
	0	Asphalt DARK BROWN SILTY SAND WITH GRAVEL (10YR 3/3) - fill
	5	DARK YELLOWISH BROWN SILTY SAND WITH CLAY (SM) 10YR 4/6 moist, medium-grained, subround grains
5	10	clay content decreasing
5	15	color change to yellowish brown (10YR 5/6)
3	20	YELLOWISH BROWN CLAYEY SAND WITH SILT (SC) 10YR 5/6, stiff to hard, moist
300	25	YELLOWISH BROWN SILTY SAND WITH CLAY (SM) 10YR 5/6, dense, moist, petroleum odor
5	30	color change to olive-brown (2.5Y 4/4), wet, no odor
0	35	GRAYISH BROWN SILTY CLAY (CL) 2.5Y 5/2, hard, moist, high plastcity
	40	bottom of boring at 38.0 ft Converted to extraction well EW-9

Equipment Casing Hammer
Elevation 33.70 ft MSL Date 1/21/89

Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail EW-9
Pacific Rennaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **A3**

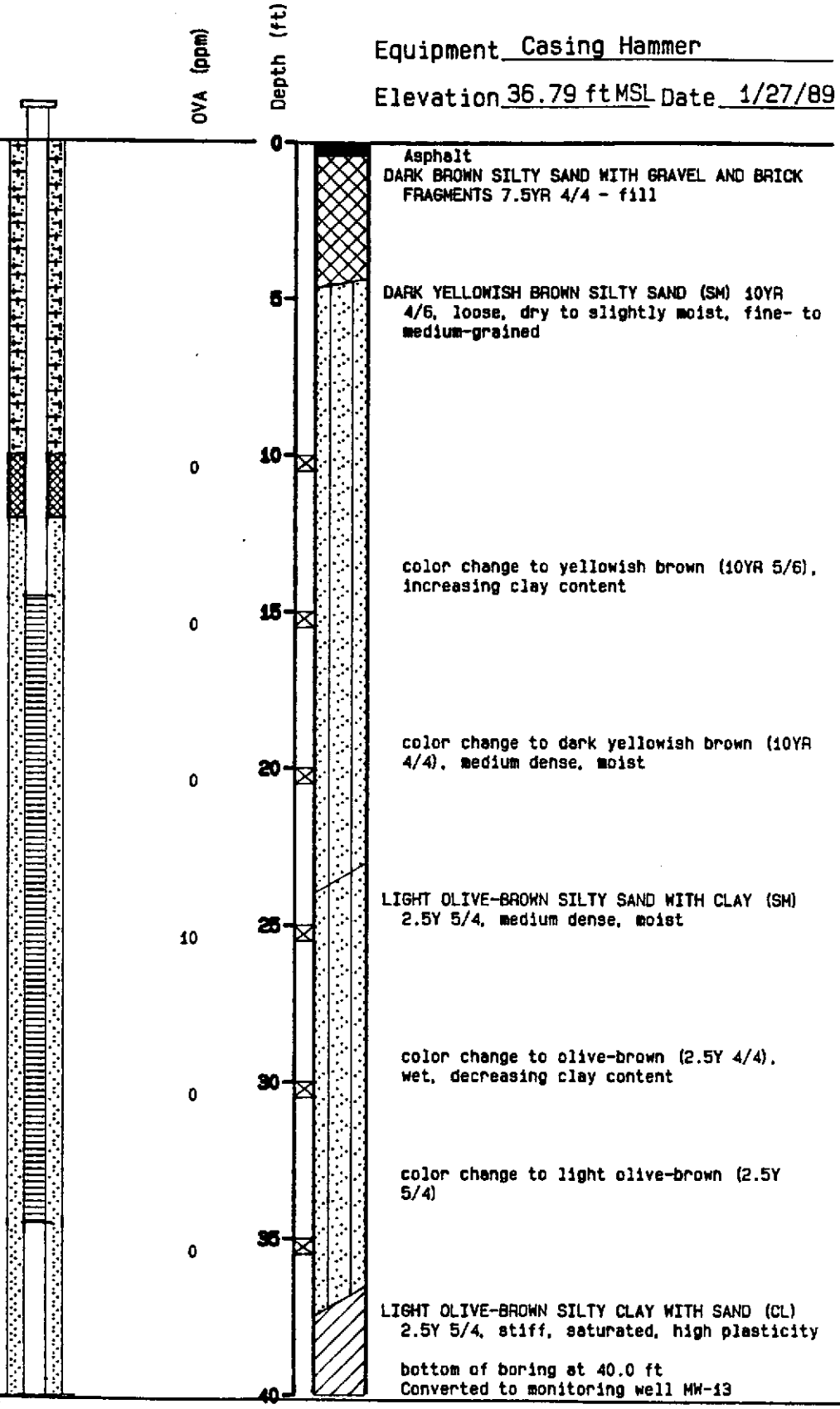
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	9382, 037.02	DFL	4/89		

11180

Top of PVC Casing Elevation 37.77 ft

Equipment Casing Hammer

Elevation 36.79 ft MSL Date 1/27/89



Harding Lawson Associates
Engineers and Geoscientists

Log of Boring and Well Completion Detail MW-13
Pacific Rennaissance Plaza
Chinatown Redevelopment Project Area
Oakland, California

PLATE **A4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	9382.037.02	DFL	4/89		

Appendix B

LABORATORY ANALYTICAL RESULTS FOR SOIL SAMPLES

pace laboratories, inc
FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

February 02, 1989
PACE Project Number: 490119.500

Attn: Mr. David Leland

Re: Pac Renaissance

Date Sample(s) Collected: 01/18/89
Date Sample(s) Received: 01/19/89

PACE Sample Number:			70236
Parameter	Units	MDL	B25-21.0
ORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, modified.)	mg/kg	1.0	5.8
EXTRACTABLE FUELS			
Extractable Fuels, as Diesel	mg/kg	10	ND
Soxhlet Extraction Date Started			01-19-89

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

pace laboratories, inc
FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

February 02, 1989
PACE Project Number: 490119.500

PACE Sample Number: Parameter	Units	MDL	70237 B25-26.0
ORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, modified.)	mg/kg	25.0	130
EXTRACTABLE FUELS			
Extractable Fuels, as Diesel	mg/kg	10	ND
Soxhlet Extraction Date Started			01-19-89

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

Approval:

Lisa J. Petersen
Project Manager for
PACE Laboratories

Douglas Oram
Technical Reviewer for
PACE Laboratories

Harding Lawson Associates
200 Rush Landing Road
P.O. Box 6107
Novato, California 94948
415 892-0821
Telecopy: 415/892-1586

CHAIN OF CUSTODY FORM

Lab: 440114.500

Samplers: MICHELLE WATSON

Job Number: 09382,030.02

Name/Location: Pac Renaissance Plaza / Oakland

Project Manager: David Lelaurel

Recorder: David Lelaurel (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
			X					B	25	-06.5	89	01	18	1025	Hold
			X					B	25	-16.0	89	01	18	1155	Hold
			X					B	25	-21.0	89	01	18	1140	
			X					B	25	-26.5	89	01	18	1255	
			X					B	25	-30.0	89	01	18	1205	Hold
			X					B	25	-35.5	89	01	18	1250	Hold
								B	25	-11.0	89	01	18		Hold
										PL					

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb. 4+H
					X	X
					X	X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
						5 day TAT

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) 1/19/89	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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)	DATE/TIME 1/19/89 845
METHOD OF SHIPMENT		

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

6533

pace laboratories, inc.
FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

February 15, 1989
PACE Project Number: 490126.503

Attn: Mr. David Leland

Re: Pacific Ren. Plaza

Date Sample(s) Collected: 01/26/89
Date Sample(s) Received: 01/26/89

PACE Sample Number:			70358	70359
Parameter	Units	MDL	E-6-25.5	E-7-25.5
ORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, Modified)	mg/kg	3.0	ND	ND
PURGEABLE AROMATIC COMPOUNDS, EPA 8020				
Benzene	mg/kg	0.004	0.02	ND
Ethylbenzene	mg/kg	0.004	ND	ND
Toluene	mg/kg	0.004	0.04	0.03
Xylenes, Total	mg/kg	0.004	0.02	ND

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

Approval:

Lisa J. Petersen
Project Manager for
PACE Laboratories

Douglas Oram, Ph.D
Technical Reviewer for
PACE Laboratories

Harding Lawson Associates
200 Rush Landing Road
P.O. Box 6107
Novato, California 94948
415/892-0821
Telecopy: 415/892-1586

CHAIN OF CUSTODY FORM

490126.503

Lab: PACE

Samplers: S. Michelle Watson

Job Number: 09382,030.02

Name/Location: Oakland Pacific Rem. Plaza (PRP)

Project Manager: Dave Leland / Pete Mote Recorder: S Michelle Watson (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	ICE	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
SO			X					1	E-	6-	25.5	89	01	26	1340	
SO			X					1	E-	7-	25.5	89	01	26	1025	

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb. GAS
					X	X
					X	X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
						2 week TAT

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
Michelle Watson		
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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) Michelle Casey	DATE/TIME 1-26 | 5:30

METHOD OF SHIPMENT

pace laboratories, inc
FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

March 10, 1989
PACE Project Number: 490213.501

Attn: Mr. David Leland
Re: Oakland PRP

Date Sample(s) Collected: 02/10/89
Date Sample(s) Received: 02/13/89

PACE Sample Number:			MW-12 19.5' 70626	MW-12 24.5' 70627
Parameter	Units	MDL	89061201	89061202
ORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, Modified)	mg/kg	3.0	ND	ND
HALOGENATED VOLATILE COMPOUNDS EPA 8010				
Dichlorodifluoromethane	ug/kg	2.0	ND	ND
Chloromethane	ug/kg	2.0	ND	ND
Vinyl Chloride	ug/kg	2.0	ND	ND
Bromomethane	ug/kg	2.0	ND	ND
Chloroethane	ug/kg	2.0	ND	ND
Trichlorofluoromethane	ug/kg	2.0	ND	ND
1,1-Dichloroethene	ug/kg	5.0	ND	ND
Methylene Chloride	ug/kg	5.0	ND	5.0
trans-1,2-Dichloroethene	ug/kg	5.0	ND	ND
1,1-Dichloroethane	ug/kg	5.0	ND	ND
Chloroform	ug/kg	5.0	11	ND
1,1,1-Trichloroethane (TCA)	ug/kg	5.0	ND	ND
Carbon Tetrachloride	ug/kg	5.0	11	ND
1,2-Dichloroethane (EDC)	ug/kg	5.0	ND	ND
Trichloroethene (TCE)	ug/kg	5.0	ND	ND
1,2-Dichloropropane	ug/kg	5.0	ND	ND
Bromodichloromethane	ug/kg	5.0	ND	ND
trans-1,3-Dichloropropene	ug/kg	5.0	ND	ND
cis-1,3-Dichloropropene	ug/kg	5.0	ND	ND
1,1,2-Trichloroethane	ug/kg	5.0	ND	ND
Tetrachloroethene	ug/kg	5.0	ND	ND
Dibromochloromethane	ug/kg	5.0	11	ND
Chlorobenzene	ug/kg	5.0	ND	ND
Bromoform	ug/kg	5.0	ND	ND
1,1,2,2-Tetrachloroethane	ug/kg	5.0	ND	ND
1,3-Dichlorobenzene	ug/kg	5.0	ND	ND
1,4-Dichlorobenzene	ug/kg	5.0	ND	ND
1,2-Dichlorobenzene	ug/kg	5.0	ND	ND
Bromochloromethane (Surrogate Recovery)			86%	84%

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

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FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

March 10, 1989
PACE Project Number: 490213.501

PACE Sample Number: Parameter	Units	MDL	70626 89061201	70627 89061202
ORGANIC ANALYSIS				
HALOGENATED VOLATILE COMPOUNDS EPA 8010				
1,4-Dichlorobutane (Surrogate Recovery)			73%	91%
AROMATIC VOLATILE COMPOUNDS EPA 8020				
Benzene	ug/kg	0.2	ND	ND
Toluene	ug/kg	0.2	1.2	ND
Chlorobenzene	ug/kg	0.2	ND	ND
Ethylbenzene	ug/kg	0.2	ND	ND
Xylene	ug/kg	0.2	0.6	ND
1,3-Dichlorobenzene	ug/kg	0.2	ND	ND
1,4-Dichlorobenzene	ug/kg	0.2	ND	ND
1,2-Dichlorobenzene	ug/kg	0.2	ND	ND
Fluorobenzene (Surrogate Recovery)			95%	111%
EXTRACTABLE FUELS				
Extractable Fuels, as Diesel	mg/kg	10	ND	ND
Soxhlet Extraction Date Started			02-16-89	02-16-89

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

Approval:

Lisa J. Petersen
Project Manager for
PACE Laboratories

Douglas E. Oram, Ph.D
Technical Reviewer for
PACE Laboratories

Harding Lawson Associates
200 Rush Landing Road
P.O. Box 6107
Novato, California 94948
415/892-0821
Telecopy: 415/892-1586

CHAIN OF CUSTODY FORM

Lab: PACE 490213.501

Job Number: 09382,030.02

Name/Location: OAKLAND PRP

Project Manager: D. LEZAND / P. ALLAT

Samplers: THOMAS C. WRIGHT

Recorder: Thomas C. Wright (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb./ LIGHT AND HEAVY
50			X		1			89	06	1201	89	02	10	1140		X	X					X
50			X		1			89	06	1202	89	02	10	1150		X	X					X
50			X		1			89	06	1204	89	02	10	1315	HOLD FOR ANALYSES → UNTIL CONFIRMED BY D. LEZAND	X	X					X

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

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
Thomas C. Wright		
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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)	DATE/TIME
		[signature]	12:35 2/13/89

METHOD OF SHIPMENT

Laboratory Copy Project Office Copy Field or Office Copy

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REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

March 10, 1989
PACE Project Number: 490213.502

Attn: Mr. David Leland
Re: Oakland PRP

Date Sample(s) Collected: 02/11/89
Date Sample(s) Received: 02/13/89

Parameter	Units	MDL	MW-18 4.8'	MW-18 9.5'	MW-18 14.8'
PACE Sample Number:			70629	70630	70631
			89061801	89061802	89061803
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, Modified)	mg/kg	3.0	ND	ND	ND
HALOGENATED VOLATILE COMPOUNDS EPA 8010					
Dichlorodifluoromethane	ug/kg	2.0	ND	ND	ND
Chloromethane	ug.kg	2.0	ND	ND	ND
Vinyl Chloride	ug/kg	2.0	ND	ND	ND
Bromomethane	ug/kg	2.0	ND	ND	ND
Chloroethane	ug/kg	2.0	ND	ND	ND
Trichlorofluoromethane	ug/kg	2.0	ND	ND	ND
1,1-Dichloroethene	ug/kg	5.0	ND	ND	ND
Methylene Chloride	ug/kg	5.0	ND	ND	ND
trans-1,2-Dichloroethene	ug/kg	5.0	ND	ND	ND
1,1-Dichloroethane	ug/kg	5.0	ND	ND	ND
Chloroform	ug/kg	5.0	ND	ND	ND
1,1,1-Trichloroethane (TCA)	ug/kg	5.0	ND	ND	ND
Carbon Tetrachloride	ug/kg	5.0	ND	ND	ND
1,2-Dichloroethane (EDC)	ug/kg	5.0	ND	ND	ND
Trichloroethene (TCE)	ug/kg	5.0	ND	ND	ND
1,2-Dichloropropane	ug/kg	5.0	ND	ND	ND
Bromodichloromethane	ug/kg	5.0	ND	ND	ND
trans-1,3-Dichloropropene	ug/kg	5.0	ND	ND	ND
cis-1,3-Dichloropropene	ug/kg	5.0	ND	ND	ND
1,1,2-Trichloroethane	ug/kg	5.0	ND	ND	ND
Tetrachloroethene	ug/kg	5.0	ND	ND	ND
Dibromochloromethane	ug/kg	5.0	ND	ND	ND
Chlorobenzene	ug/kg	5.0	ND	ND	ND
Bromoform	ug/kg	5.0	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/kg	5.0	ND	ND	ND
1,3-Dichlorobenzene	ug/kg	5.0	ND	ND	ND
1,4-Dichlorobenzene	ug/kg	5.0	ND	ND	ND
1,2-Dichlorobenzene	ug/kg	5.0	ND	ND	ND
Bromochloromethane (Surrogate Recovery)			80%	79%	77%
1,4-Dichlorobutane (Surrogate Recovery)			88%	86%	72%

MDL Method Detection Limit, Esitmated Value.
ND Not detected at or above the MDL.

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FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
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Novato, California

March 10, 1989
PACE Project Number: 490213.502

PACE Sample Number: / Parameter	Units	MDL	70629 89061801	70630 89061802	70631 89061803
ORGANIC ANALYSIS					
AROMATIC VOLATILE COMPOUNDS EPA 8020					
Benzene	ug/kg	20	ND	ND	ND
Toluene	ug/kg	20	ND	ND	ND
Chlorobenzene	ug/kg	20	ND	ND	ND
Ethylbenzene	ug/kg	20	ND	ND	ND
Xylene	ug/kg	20	ND	ND	ND
1,3-Dichlorobenzene	ug/kg	20	ND	ND	ND
1,4-Dichlorobenzene	ug/kg	20	ND	ND	ND
1,2-Dichlorobenzene	ug/kg	20	ND	ND	ND
Fluorobenzene (Surrogate Recovery)			110%	112%	109%
EXTRACTABLE FUELS					
Extractable Fuels, as Diesel	mg/kg	10	ND	ND	ND
Soxhlet Extraction Date Started			02-16-89	02-16-89	02-16-89

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

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FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
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March 10, 1989
PACE Project Number: 490213.502

MW-18
29.51

PACE Sample Number:			70632*
Parameter	Units	MDL	89061806
ORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, Modified)	mg/kg	3.0	ND
HALOGENATED VOLATILE COMPOUNDS EPA 8010			
1,1-Dichloroethene	ug/kg	5.0	ND
Methylene Chloride	ug/kg	5.0	ND
trans-1,2-Dichloroethene	ug/kg	5.0	ND
1,1-Dichloroethane	ug/kg	5.0	ND
Chloroform	ug/kg	5.0	ND
1,1,1-Trichloroethane (TCA)	ug/kg	5.0	ND
Carbon Tetrachloride	ug/kg	5.0	ND
1,2-Dichloroethane (EDC)	ug/kg	5.0	ND
Trichloroethene (TCE)	ug/kg	5.0	ND
1,2-Dichloropropane	ug/kg	5.0	ND
Bromodichloromethane	ug/kg	5.0	ND
trans-1,3-Dichloropropene	ug/kg	5.0	ND
cis-1,3-Dichloropropene	ug/kg	5.0	ND
1,1,2-Trichloroethane	ug/kg	5.0	ND
Tetrachloroethene	ug/kg	5.0	ND
Dibromochloromethane	ug/kg	5.0	ND
Chlorobenzene	ug/kg	5.0	ND
Bromoform	ug/kg	5.0	ND
1,1,2,2-Tetrachloroethane	ug/kg	5.0	ND
1,3-Dichlorobenzene	ug/kg	5.0	ND
1,4-Dichlorobenzene	ug/kg	5.0	ND
1,2-Dichlorobenzene	ug/kg	5.0	ND
Bromochloromethane (Surrogate Recovery)			79%
1,4-Dichlorobutane (Surrogate Recovery)			91%
AROMATIC VOLATILE COMPOUNDS EPA 8020			
Benzene	ug/kg	20	38
Toluene	ug/kg	20	ND
Chlorobenzene	ug/kg	20	ND

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.
* Sample ran past EPA holding time.

pace laboratories, inc
FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Mr. David Leland
Page 4

March 10, 1989
PACE Project Number: 490213.502

PACE Sample Number: / Parameter	Units	MDL	70632 89061806
ORGANIC ANALYSIS			
AROMATIC VOLATILE COMPOUNDS EPA 8020			
Ethylbenzene	ug/kg	20	ND
Xylene	ug/kg	20	ND
1,3-Dichlorobenzene	ug/kg	20	ND
1,4-Dichlorobenzene	ug/kg	20	ND
1,2-Dichlorobenzene	ug/kg	20	ND
Fluorobenzene (Surrogate Recovery)	%		98
EXTRACTABLE FUELS			
Extractable Fuels, as Diesel	mg/kg	10	ND
Soxhlet Extraction Date Started			02-16-89

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

Approval:

Lisa J. Petersen
Project Manager for
PACE Laboratories

Douglas E. Oram
Technical Reviewer for
PACE Laboratories

Harding Lawson Associates
7655 Redwood Boulevard
P.O. Box 578
Novato, California 94948
415/892-0821
Telecopy: 415/892-0831
Telex: 340523

CHAIN OF CUSTODY FORM

490213.502

Lab: PACE

Samplers: THOMAS C. WRIGHT

Job Number: 09382,030.02

Name/Location: OAKLAND PRP

Project Manager: D. LELAND/P. MOAT

Recorder: Thomas C. Wright
(Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr.	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES
SC			X		1			89	06	1801	89	02	11	0805	
↓			↓		↓			89	06	1802	89	02	11	0810	
								89	06	1803	89	02	11	0820	
								89	06	1806	89	02	11	0855	

ANALYSIS REQUESTED

EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb. - Light + Heavy
X	X					X
↓	↓					↓

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

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) Thomas C. Wright	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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)	DATE/TIME 2/13 12:45
METHOD OF SHIPMENT		

Appendix C

LABORATORY ANALYTICAL RESULTS FOR WATER SAMPLES

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REPORT OF LABORATORY ANALYSIS

Offices:
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Novato, California

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

March 14, 1989
PACE Project Number: 490216.500

Attn: Mr. David Leland

Re: Oakland PRP

Date Sample(s) Collected: 02/15/89
Date Sample(s) Received: 02/16/89

PACE Sample Number:			MW-12 70737	MW-18 70738
Parameter	Units	MDL	890712W1	890718W1
ORGANIC ANALYSIS				
INDIVIDUAL PARAMETERS				
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, Modified)	mg/L	0.25	ND	ND
HALOGENATED VOLATILE COMPOUNDS EPA 8010				
Dichlorodifluoromethane	ug/L	2.0	ND	ND
Chloromethane	ug/L	2.0	ND	ND
Vinyl Chloride	ug/L	2.0	ND	ND
Bromomethane	ug/L	2.0	ND	ND
Chloroethane	ug/L	2.0	ND	ND
Trichlorofluoromethane	ug/L	2.0	ND	ND
1,1-Dichloroethene	ug/L	0.5	2.0	1.8
Methylene Chloride	ug/L	0.5	ND	ND
trans-1,2-Dichloroethene	ug/L	0.5	ND	ND
1,1-Dichloroethane	ug/L	0.5	4.0	3.2
Chloroform	ug/L	0.5	ND	2.7
1,1,1-Trichloroethane (TCA)	ug/L	0.5	ND	ND
Carbon Tetrachloride	ug/L	0.5	ND	ND
1,2-Dichloroethane (EDC)	ug/L	0.5	8.1	31
Trichloroethene (TCE)	ug/L	0.5	0.75	1.2
1,2-Dichloropropane	ug/L	0.5	ND	ND
Bromodichloromethane	ug/L	0.5	ND	ND
2-Chloroethylvinyl ether	ug/L	0.5	ND	ND
trans-1,3-Dichloropropene	ug/L	0.5	ND	ND
cis-1,3-Dichloropropene	ug/L	0.5	ND	ND
1,1,2-Trichloroethane	ug/L	0.5	ND	ND
Tetrachloroethene	ug/L	0.5	6.7	0.54
Dibromochloromethane	ug/L	0.5	ND	ND

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

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FORMERLY WESCO LABORATORIES

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
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Novato, California

March 14, 1989
PACE Project Number: 490216.500

PACE Sample Number: / Parameter	Units	MDL	MW-12 70737 890712W1	MW-18 70738 890718W1
ORGANIC ANALYSIS				
HALOGENATED VOLATILE COMPOUNDS EPA 8010				
Chlorobenzene	ug/L	0.5	ND	ND
Bromoform	ug/L	0.5	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	0.5	ND	ND
1,3-Dichlorobenzene	ug/L	0.5	ND	ND
1,4-Dichlorobenzene	ug/L	0.5	ND	ND
1,2-Dichlorobenzene	ug/L	0.5	ND	ND
Bromochloromethane (Surrogate Recovery)			82%	73%
1,4-Dichlorobutane (Surrogate Recovery)			93%	81%
AROMATIC VOLATILE COMPOUNDS EPA 8020				
Benzene	ug/L	0.2	ND	ND
Toluene	ug/L	0.2	ND	ND
Chlorobenzene	ug/L	0.2	ND	ND
Ethylbenzene	ug/L	0.2	ND	ND
Xylene	ug/L	0.2	ND	ND
1,3-Dichlorobenzene	ug/L	0.2	ND	ND
1,4-Dichlorobenzene	ug/L	0.2	ND	ND
1,2-Dichlorobenzene	ug/L	0.2	ND	ND
Fluorobenzene (Surrogate Recovery)			99%	99%

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

Approval:

Lisa J. Petersen
Project Manager for
PACE Laboratories

Douglas E. Oram, Ph.D
Technical Reviewer for
PACE Laboratories

HLA
P.O. Box 578
Novato, California 94948
415/892-0821
Telecopy: 415/892-0831
Telex: 340523

CHAIN OF CUSTODY FORM

Lab: PACE 490216.500

Job Number: 09382.037.02

Name/Location: OAKLAND PRP

Project Manager: D. LELAND/R. MOAT

Samplers: THOMAS C. WRIGHT

Recorder: Thomas C. Wright (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pltnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb. (418.1)
23	X				1			89	07	12W1	89	02	15	1130		X	X					X
23	X				1			89	07	19W1	89	02	15	1500		X	X					X

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

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) Thomas C. Wright	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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) V. Scott Nelson	DATE/TIME 2/16 0830
METHOD OF SHIPMENT HLA DROPOFF AT LAB		

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

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Offices:
Minneapolis, Minnesota
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Novato, California

REPORT OF LABORATORY ANALYSIS

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

March 30, 1989
PACE Project Number: 490302.505

Attn: Mr. David Leland

Re: Pacific Renaissance

Date Sample(s) Collected: 03/02/89
Date Sample(s) Received: 03/02/89

PACE Sample Number: / Parameter	Units	MDL	MW-9 71035 89090301	MW-10 71037 89090302	MW-11 71039 89090303
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Oxygen, Dissolved	mg/L	0.50	1.0	4.0	2.0
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, Modified)	mg/L	0.25	1.2	2.8	15
ANIONS BY EPA METHOD 300 (ION CHROM.)					
Nitrate, as N	mg/L	1.0	32	5.5	ND
Phosphate, as P	mg/L	2.0	ND	ND	ND

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

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Offices:
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REPORT OF LABORATORY ANALYSIS

Mr. David Leland
Page 2

March 30, 1989
PACE Project Number: 490302.505

PACE Sample Number: / Parameter	Units	MDL	MW-16 71041 89090304	MW-13 71043 89090305	MW-14 71045 89090306
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Oxygen, Dissolved	mg/L	0.50	2.0	2.0	3.0
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Petroleum Fuels, Purgeable, as Gasoline (EPA Method 8015, Modified)	mg/L	0.25	2.1	1.4	ND
ANIONS BY EPA METHOD 300 (ION CHROM.)					
Nitrate, as N	mg/L	1.0	17	8.6	22
Phosphate, as P	mg/L	2.0	ND	ND	ND

MDL Method Detection Limit, Estimated Value.
ND Not detected at or above the MDL.

Approval:

Steve Mackird for:
Lisa J. Petersen
Project Manager for
PACE Laboratories

Douglas E. Oram
Douglas E. Oram, Ph.D
Technical Reviewer for
PACE Laboratories

Harding Lawson Associates
7655 Redwood Boulevard
P.O. Box 578
Novato, California 94948
415/892-0821
Telecopy: 415/892-0831
Telex: 340523

CHAIN OF CUSTODY FORM

490302.505

Lab: PACE

Samplers: C.A.O / T.D

Job Number: 938203702

Name/Location: Pacific Renaissance Plaza

Project Manager: David Leland

Recorder: Caleb A. Oceanoy / Tom Drinkard
(Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Plltnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.	Nitrate / Phosphorus	Dissolved Oxygen	~~EPA 8015~~
23	X				2	3		89	01	0301	89	03	02	1325								X	X	X	
23	X				2	3		89	01	0302	89	03	02	1410								X	X	X	
23	X				2	3		89	01	0303	89	03	02	1500								X	X	X	
23	X				2	3		89	01	0304	89	03	02	1545								X	X	X	
23	X				2	3		89	01	0305	89	03	02	1650								X	X	X	
23	X				2	3		89	01	0306	89	03	02	1830								X	X	X	
23	X				2	3		89	01	0307	89	03	02												
23	X				2	3		89	01	0308	89	03	02												
23	X				2	3		89	01	0309	89	03	02												

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
						Samples
						[illegible]
						rec'd
						[illegible]
						[illegible]
						3/3/89

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
Caleb A. Oceanoy		
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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)	DATE/TIME
		SoRid Allen	3/2/8

METHOD OF SHIPMENT

pace laboratories, inc.

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

March 29, 1989
PACE Project Number: 490303.504

Attn: Mr. David Leland

Re: Pacific Renaissance

Date Sample(s) Collected: 03/03/89
Date Sample(s) Received: 03/03/89

			MW-15	MW-12	MW-18
PACE Sample Number:			71070	71071	71072
Parameter	Units	MDL	89090307	89090308	89090309
INORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Oxygen, Dissolved	mg/L	0.5	4.0	5.8	2.9
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Petroleum Fuels, Purgeable, as Gasoline	mg/L	0.25	3.9	ND	ND
ANIONS BY EPA METHOD 300 (ION CHROM.)					
Nitrate, as N	mg/L	1.0	19	6.2	9.3
Phosphate, as P	mg/L	2.0	ND	ND	ND

MDL Method Detection Limit, Estimated Value
ND Not detected at or above the MDL.

Approval:

Lisa J. Petersen
Project Manager for
Pace Laboratories

Douglas E. Oram
Technical Reviewer for
Pace Laboratories

Harding Lawson Associates
7655 Redwood Boulevard
P.O. Box 578
Novato, California 94948
415/892-0821
Telecopy: 415/892-0831
Telex: 340523

CHAIN OF CUSTODY FORM

490303.504

Lab: PACE

Job Number: 9382-03702

Name/Location: Pacific Renaissance Plaza

Project Manager: David Leland

Samplers: Caleb A. Oceaney, Gary, Tom Drinkwood

Recorder: Caleb A. Oceaney / T.D. / Gary
(Signature Required)

SOURCE CODE		MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Dy	Time	STATION DESCRIPTION/ NOTES	EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.	Nitrate/Phosphorus	Dissolved Oxygen
2	3	X				2	2		89	09	0307	89	03	03	0820								X	X	X
2	3	X				3	2		89	09	0308	89	03	03	0940								X	X	X
2	3	X				2	2		89	09	0309	89	03	03	1025								X	X	X

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

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
Caleb A. Oceaney		
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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)	DATE/TIME
		[signature]	3/3 1:45pm

METHOD OF SHIPMENT

Laboratory Copy   Project Office Copy   Field or Office Copy

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Offices:
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Tampa, Florida
Coralville, Iowa
Novato, California

REPORT OF LABORATORY ANALYSIS

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

April 21, 1989
PACE Project Number: 490404504

Attn: Mr. David Leland

Pacific Rensaissance

Date Sample(s) Collected: 04/04/89
Date Sample(s) Received: 04/04/89

			EW-1	EW-4	EW-16
PACE Sample Number:			719900	719910	719920
Parameter	Units	MDL	89140401	89140402	89140403 EW-16
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Purgeable Fuels, as Gasoline (EPA 8015)	mg/L	0.25	5.9	2.5	8.9
PURGEABLE AROMATIC COMPOUNDS, EPA 8020					
Benzene	mg/L	0.0005	1.6	-	2.8
Ethylbenzene	mg/L	0.0005	0.087	-	0.10
Toluene	mg/L	0.0005	1.0	-	2.0
Xylenes, total	mg/L	0.0005	1.8	-	0.99
HALOGENATED VOLATILE COMPOUNDS EPA 8010					
Dichlorodifluoromethane	ug/L	2.0	ND	-	-
Chloromethane	ug/L	2.0	ND	-	-
Vinyl Chloride	ug/L	2.0	ND	-	-
Bromomethane	ug/L	2.0	ND	-	-
Chloroethane	ug/L	2.0	ND	-	-
Trichlorofluoromethane	ug/L	2.0	ND	-	-
1,1-Dichloroethene	ug/L	0.5	ND	-	-
Methylene Chloride	ug/L	0.5	ND	-	-
trans-1,2-Dichloroethene	ug/L	0.5	ND	-	-
1,1-Dichloroethane	ug/L	0.5	ND	-	-
Chloroform	ug/L	0.5	10	-	-
1,1,1-Trichloroethane (TCA)	ug/L	0.5	ND	-	-
Carbon Tetrachloride	ug/L	0.5	ND	-	-
1,2-Dichloroethane (EDC)	ug/L	0.5	46	-	-
Trichloroethene (TCE)	ug/L	0.5	ND	-	-
1,2-Dichloropropane	ug/L	0.5	ND	-	-
Bromodichloromethane	ug/L	0.5	ND	-	-

MDL Method Detection Limit
ND Not detected at or above the MDL.

pace laboratories, inc.

REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

April 21, 1989
PACE Project Number: 490404504

PACE Sample Number:			EW-1 719900	EW-4 719910	EW-16 719920
Parameter	Units	MDL	89140401	89140402	89140403 EW-16
ORGANIC ANALYSIS					
HALOGENATED VOLATILE COMPOUNDS EPA 8010					
2-Chloroethylvinyl ether	ug/L	0.5	ND	-	-
trans-1,3-Dichloropropene	ug/L	0.5	ND	-	-
cis-1,3-Dichloropropene	ug/L	0.5	ND	-	-
1,1,2-Trichloroethane	ug/L	0.5	ND	-	-
Tetrachloroethene	ug/L	0.5	ND	-	-
Dibromochloromethane	ug/L	0.5	ND	-	-
Chlorobenzene	ug/L	0.5	ND	-	-
Bromoform	ug/L	0.5	ND	-	-
1,1,2,2-Tetrachloroethane	ug/L	0.5	ND	-	-
1,3-Dichlorobenzene	ug/L	0.5	ND	-	-
1,4-Dichlorobenzene	ug/L	0.5	ND	-	-
1,2-Dichlorobenzene	ug/L	0.5	ND	-	-
Bromochloromethane (Surrogate Recovery)			96%	-	-
1,4-Dichlorobutane (Surrogate Recovery)			92%	-	-

MDL Method Detection Limit
ND Not detected at or above the MDL.

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REPORT OF LABORATORY ANALYSIS

April 21, 1989
PACE Project Number: 490404504

PACE Sample Number:			EW-16 719930	MW-17 719940	MW-16 719950
Parameter	Units	MDL	89140405 EW-16	89140404	89140405 MW-16
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Purgeable Fuels, as Gasoline (EPA 8015)	mg/L	0.25	8.8	12	6.7
PURGEABLE AROMATIC COMPOUNDS, EPA 8020					
Benzene	mg/L	0.0005	3.3	3.1	2.1
Ethylbenzene	mg/L	0.0005	0.14	0.27	0.18
Toluene	mg/L	0.0005	2.6	2.9	2.2
Xylenes, total	mg/L	0.0005	1.2	3.9	1.4

MDL Method Detection Limit

pace laboratories, inc.

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REPORT OF LABORATORY ANALYSIS

April 21, 1989
PACE Project Number: 490404504

PACE Sample Number: / Parameter	Units	MDL	MW-10 719990 89140409	MW-11 720000 89140410	MW-13 720010 89140411
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Purgeable Fuels, as Gasoline (EPA 8015)	mg/L	0.25	4.2	10	0.71
PURGEABLE AROMATIC COMPOUNDS, EPA 8020					
Benzene	mg/L	0.0005	1.6	2.5	0.041
Ethylbenzene	mg/L	0.0005	0.13	0.17	0.0038
Toluene	mg/L	0.0005	0.76	3.8	0.039
Xylenes, total	mg/L	0.0005	0.68	2.4	0.28

MDL Method Detection Limit

Approval:

Stephen F. Nackord
Project Manager for
PACE Laboratories

Douglas E. Oram, Ph.D
Technical Reviewer for
PACE Laboratories

pace laboratories, inc.

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

REPORT OF LABORATORY ANALYSIS

Harding Lawson Associates
200 Rush Landing Road
Novato, CA 94947

April 18, 1989
PACE Project Number: 490405504

Attn: Mr. David Leland

Pacific Ren. Plaza

Date Sample(s) Collected: 04/05/89
Date Sample(s) Received: 04/05/89

Parameter	Units	MDL	MW-18 720080 89140512	MW-12 720090 89140513	MW-7 720100 89140514
ORGANIC ANALYSIS					
INDIVIDUAL PARAMETERS					
Purgeable, as Gasoline (EPA 8015)	mg/L	0.25	ND	ND	ND
PURGEABLE AROMATIC COMPOUNDS, EPA 8020					
Benzene	mg/L	0.0005	ND	0.014	ND
Ethylbenzene	mg/L	0.0005	ND	ND	0.0010
Toluene	mg/L	0.0005	ND	0.0023	0.0007
Xylenes, total	mg/L	0.0005	ND	0.0054	0.0012

MDL Method Detection Limit
ND Not detected at or above the MDL.

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REPORT OF LABORATORY ANALYSIS

Offices:
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Coralville, Iowa
Novato, California

April 18, 1989
PACE Project Number: 490405504

PACE Sample Number:			Blank 720110
Parameter	Units	MDL	89140515
ORGANIC ANALYSIS			
INDIVIDUAL PARAMETERS			
Purgeable Fuels, as Gasoline (EPA 8015)	mg/L	0.25	ND
PURGEABLE AROMATIC COMPOUNDS, EPA 8020			
Benzene	mg/L	0.0005	ND
Ethylbenzene	mg/L	0.0005	ND
Toluene	mg/L	0.0005	ND
Xylenes, total	mg/L	0.0005	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Approval:

Stephen F. Nackord
Project Manager for
PACE Laboratories

Douglas E. Oram, Ph.D
Technical Reviewer for
PACE Laboratories

Harding Lawson Associates
200 Rush Landing Road
P.O. Box 6107
Novato, California 94948
415/892-0821
Telecopy: 415/892-1586

CHAIN OF CUSTODY FORM

Lab: Pace

Samplers: CAO - IMH

Job Number: 09382,039.02

Name/Location: Pacific R. Plaza

Project Manager: David Leland

Recorder: Ike Hival (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	#CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	SAMPLE NUMBER OR LAB NUMBER: Yr Wk Seq	DATE: Yr Mo Dy Time	STATION DESCRIPTION/ NOTES	ANALYSIS REQUESTED: EPA 601/8010	EPA 802/8020 BTXE	EPA 624/8240	EPA 625/8270	Priority Pllnt. Metals	Benzene/Toluene/Xylene	Total Petrol. Hydrocarb.	8015 - TPH
2 3	X				X	2		8 9 1 4 0 5 1 2	8 9 0 4 0 5 1 0 3 0	72008		X					X	X
2 3	X				X	2		8 9 1 4 0 5 1 3	8 9 0 4 0 5 1 1 3 3	72009		X					X	X
2 3	X					2		8 9 1 4 0 5 1 4 0	8 9 0 4 0 5 1 3 0 2	72010		X					X	X
2 3	X					2		8 9 1 4 0 5 1 5	8 9 0 4 0 5 1 3 1 5	72011		X					X	X
										6/3								

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

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
Caleb A. Keamey		
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
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) Cathie Horan	DATE/TIME 4/5/89 9 pm
METHOD OF SHIPMENT		

Laboratory Copy White — Project Office Copy Yellow — Field or Office Copy Pink

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DISTRIBUTION

REPORT OF SYSTEM MONITORING: MARCH 1989
SOIL TREATMENT SYSTEM
PACIFIC RENAISSANCE PLAZA
OAKLAND, CALIFORNIA
May 3, 1989

COPY NO. 4

		Copy No.
1 copy:	California Regional Water Quality Control Board San Francisco Bay Region 1111 Jackson Street, Room 6000 Oakland, California 94607 Attention: Mr. Scott Huganberger	1
2 copies:	City of Oakland Redevelopment Agency One City Hall Plaza Oakland, California 94612 Attention: Mr. Peter Chen	2-3
1 copy:	Alameda County Department of Environmental Health 80 Swan Way, Room 200 Oakland, California 94621 Attention: Mr. Lowell Miller	4

CEM/DFL/CRS/rmc/J8010-H

QUALITY CONTROL REVIEWER

Christopher R. Smith
Geologist - 4619