A Report Prepared for

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

# INITIAL GASOLINE LEAK INVESTIGATION CHINATOWN REDEVELOPMENT PROJECT AREA OAKLAND, CALIFORNIA

HLA Job No. 9382,005.02

By

for

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Project Geologist

Donald G. Gray
Civil Engineer

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415/892-0821

June 19, 1987

# INTRODUCTION

This report summarizes the results of Harding Lawson Associates' (HLA) initial investigation of gasoline leakage from underground storage tanks located near 11th and Webster Streets in the Chinatown Redevelopment Project Area of Oakland. The purpose of our investigation was to evaluate the vertical extent of gasoline in soil below the former tank locations and whether leakage has impacted ground water. The scope of our services, as outlined in our revised proposal to the City of Oakland Department of Public Works, dated May 8, 1987, was to drill two test borings, complete one of the borings as a ground-water monitoring well, analyze soil samples for gasoline, and prepare a report summarizing our findings.

## Background

HLA provided observation, sampling, and chemical analysis services during removal of four underground storage tanks from below the sidewalk area on 11th Street just west of Webster Street (Plate 1). The results of observations, sampling, and chemical analysis during tank removal were summarized in our letter report dated May 8, 1987. The report concluded that there has been significant spillage or leakage into the material surrounding the tanks and that hydrocarbon materials have migrated into the native soils below the tank backfill. Concentrations of total petroleum hydrocarbons (TPH) as gasoline ranged from 3,200 to 11,000 parts per million (ppm) below the three tanks that contained gasoline. One of the tanks contained waste oil and concentrations of oil and grease measured as total oil and grease (TOG) were 5,700 ppm. Based on these observations and test results, we recommended that a ground-water monitoring well be installed to evaluate the

impact on water quality and that a test boring be drilled in the tank excavation to evaluate the vertical distribution of gasoline below the former tank location.

## FIELD INVESTIGATION

### Drilling and Sampling

We drilled two test borings at this site on May 26, 1987 (Plate 1). The borings were drilled with truck-mounted hollow-stem auger drilling equipment. Our geologist was present during drilling to log the soil conditions encountered and to obtain samples for lithologic classification and chemical analyses. Soil samples were obtained by driving a split-barrel sampler lined with stainless steel tubes into the soils. Soil samples were sealed in the tubes with aluminum foil, capped, labeled, and stored on ice in a cooler until delivery to the analytical laboratory. During drilling, we screened the soil samples for vapors using a Gastech Model 1314 portable gas analyzer. Soil conditions encountered in the borings, sample locations, and vapor readings are shown on the boring logs (Plates 2 and 3). The soils are classified in accordance with the Unified Soil Classification System (Plate 4).

Each boring was drilled with augers that had been steam cleaned before drilling. The soil sampler was washed in a solution of Alconox and rinsed in tap water prior to each sampling effort. Boring 1 was completed as a ground-water monitoring well, as described in the following section. Boring 2, which was drilled to the ground-water level, was grouted from the bottom to a depth of 9 feet below ground surface. The upper 9 feet was not grouted because old backfill in the upper 9 feet will subsequently be excavated and removed.

Monitoring Well Installation and Sampling

Boring 1, located south (and assumed to be downgradient) and within 10 feet of the former tank location, was completed as a 4-inch-diameter ground-water monitoring well. The well extended 15 feet into the ground water, as required by the Regional Water Quality Control Board (RWQCB) in their guidelines for addressing fuel leaks. Details of the well completion are shown on Plate 5, which indicates the screened interval, sand pack, bentonite pellet, and sanitary seal dimensions. The well was developed the day following installation. Prior to well development, the ground water was checked for floating product using a clear Lucite bailer. Development was performed by pumping 15 well-bore volumes with a submersible pump. During the development process, pH, specific conductance, and temperature of the discharge water were monitored. The water was discharged into 55 gallon drums and left on site. The water sample was obtained from the well after development using a laboratory-cleaned plastic bottle. The water was decanted into laboratory-prepared volatile organic analysis (VOA) bottles, labeled, and placed in a cooler on ice until delivery to the analytical laboratory.

Chemical Analyses

The soil and ground-water samples were transported in a cool ice chest under chain of custody to Wesco Laboratories in Novato for chemical analyses. The analyses were performed using methods approved by the Regional Water Quality Control Board and EPA as indicated on the laboratory test result forms (attached). Three soil samples from Boring 2 and one soil sample from Boring 1 were analyzed for TPH as gasoline and for benzene, toluene, and xylenes (BTX). Concentrations of TPH and BTX found in Borings 1 and 2 are noted on the boring

logs (Plates 2 and 3). The water sample was analyzed for TPH, BTX, and for purgeable halocarbons using EPA Method 601. The sample was analyzed by Method 601 because our geologist smelled a "sweet" odor during sampling that was uncharacteristic of gasoline. Concentrations of TPH, BTX, and other organic compounds that were detected in the ground-water sample are summarized on Table 1.

## SUBSURFACE CONDITIONS

### Soil Conditions

Test borings encountered 4 to 9 feet of old fill underlain by natural sandy soils to the depths explored (39 feet). The deeper fill in Boring 2 consisted of temporary backfill placed in the former tank excavation. Sandy soils below the fill consist of slightly clayey and silty sands to a depth of about 22 feet, where clean sands were encountered. These subsurface conditions generally agree with the results of previous geotechnical test borings drilled in the parcel south of our investigation for a proposed high-rise building. Strong gasoline odors were detected in Boring 2, drilled at the former tank location, all the way to ground water. Light to moderate odors were detected in Boring 1 located south of the tank location.

Ground water was encountered in our test borings at 24 to 26 feet below ground surface. The depth of ground water stabilized in our monitoring well one day after installation at a depth of 26.4 feet below ground surface.

Chemical Analyses

High concentrations of gasoline were detected in the soil samples from Boring 2 (Plate 3), with the highest concentrations encountered just above the ground-water level. The soil sample obtained from just above the water level in Boring 1 showed relatively low concentrations of gasoline (Plate 2). TPH measured as gasoline, typical gasoline indicators (BTX), purgeable halocarbons, and ethylene dibromide (EDB) were detected in the ground water. Some of these chemicals exceed state action levels for drinking water (Table 1).

## DISCUSSION AND CONCLUSIONS

The vertical extent of gasoline in the former tank excavation area confirms our previous conclusion that there has been significant leakage from one or more of the former tanks. The concentrations of gasoline detected exceed the RWQCB guideline of 1,000 ppm for soil removal or remediation. Although data are limited, the relatively low concentration of gasoline in the soil in Boring 1 and the relatively lower vapor reading suggest that migration of gasoline from the tanks has been largely downward with limited lateral migration in the unsaturated zone. This is to be expected, considering the relatively free-draining nature of the sands underneath the site.

Dissolved gasoline is present in the ground water, indicating that leakage from the tanks has impacted ground-water quality. The source of the other organic compounds detected in the water is unknown. The laboratory was asked to check the chromatographic records from the soil analysis in Boring 2 to see if there were indications that these organic compounds are present in the unsaturated zone. However, the high concentrations of gasoline present masked any lower

concentrations of other organics that might be present. The "sweet" odor noticed in the ground water was not noticed in the soil and previous analysis of the tank contents indicates that three of the tanks contained gasoline and one contained waste oil. Therefore, it is possible that the source of the organic compounds is upgradient. Additional ground-water investigations will be needed to evaluate the source of the organic compounds, the lateral extent of the gasoline, and the ground-water flow direction.

We recommend that an Underground Storage Tank Unauthorized Release/ Contamination Site Report be filed as required by the RWQCB and that appropriate regulatory agencies be contacted regarding the scope for additional investigations. Also, the ground water should be resampled and analyzed using EPA method 624 to confirm the organic compounds initially detected.

Table 1. Compounds Detected in Ground Water from MW-1 on May 28, 1987

| Compound | Concentration mg/l (ppm) | State Action Level[1] |
|---|---|---|
| Petroleum hydrocarbons (as gasoline) | 66 | N[2] |
| Benzene | 4.9 | .0007 |
| Toluene | 6.8 | 0.10 |
| Xylenes | 6.1 | 0.62 |
| Chlorobenzene | 0.051 | N |
| 1,2-Dichloroethane (1,2-DCA) | 0.51 | 0.001 |
| 1,2-Dichloropropane | 0.003 | 0.010 |
| Ethylene dibromide (EDB) | 0.18 | 0.00005 |
| Trichloroethene (TCE) | 0.036 | 0.005 |
| 1,1,2-Trichloroethane (1,1,2-TCA) | 0.002 | N |

[1]Drinking water action level, ppm.
[2]No standard.

# PLATES

Plate 1 - Boring Location Map

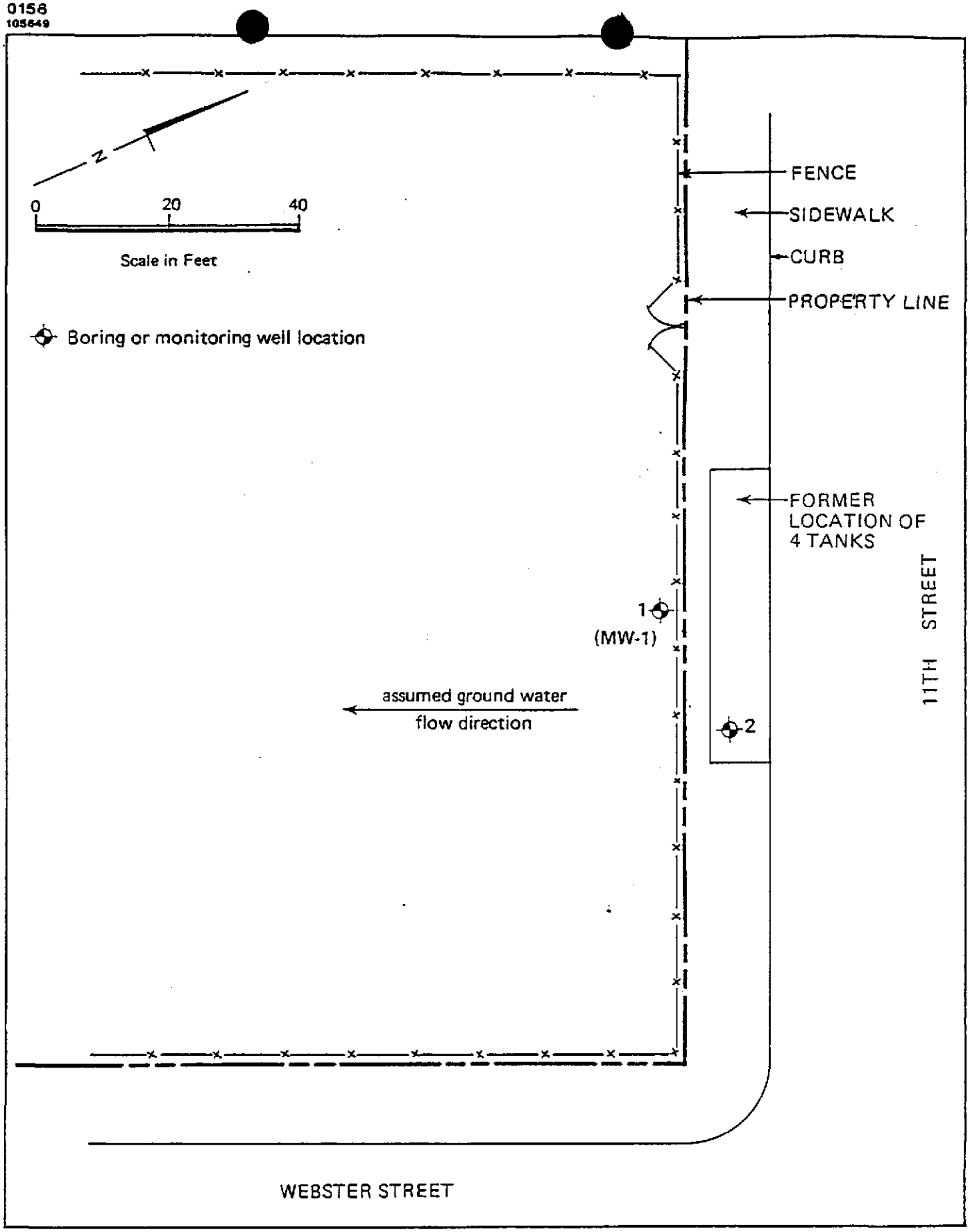
Plate 2 - Log of Boring 1

Plate 3 - Log of Boring 2

Plate 4 - Unified Soil Classification Chart

Plate 5 - Well Construction Detail for Monitoring Well 1

0156
105649



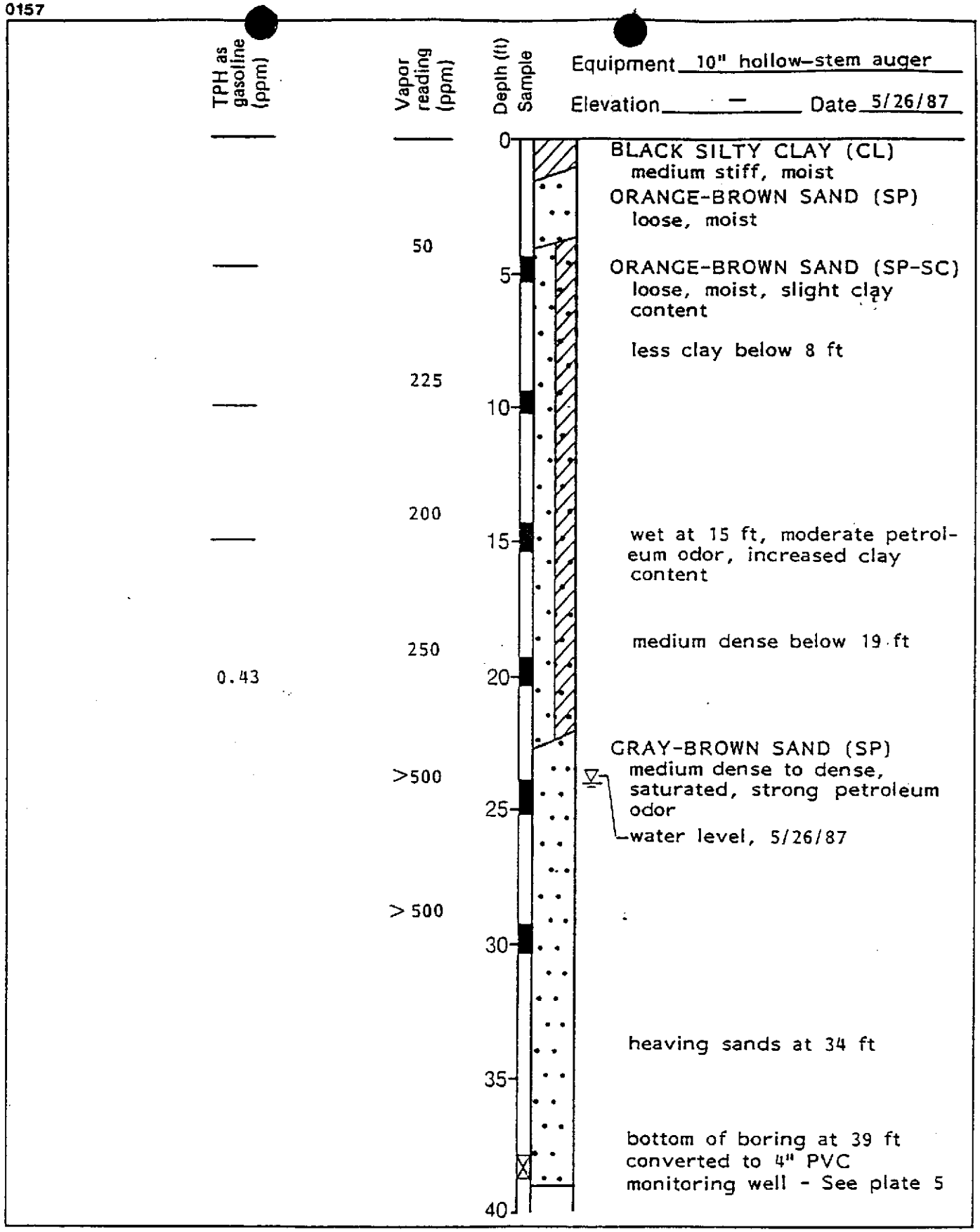

Harding Lawson Associates
Engineers and Geoscientists

**Boring Location Map**
Oakland Chinatown Tanks
Oakland, California

PLATE
**1**

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| MG | 09382,005.02 | D. Bray | 6/87 | | |

0157

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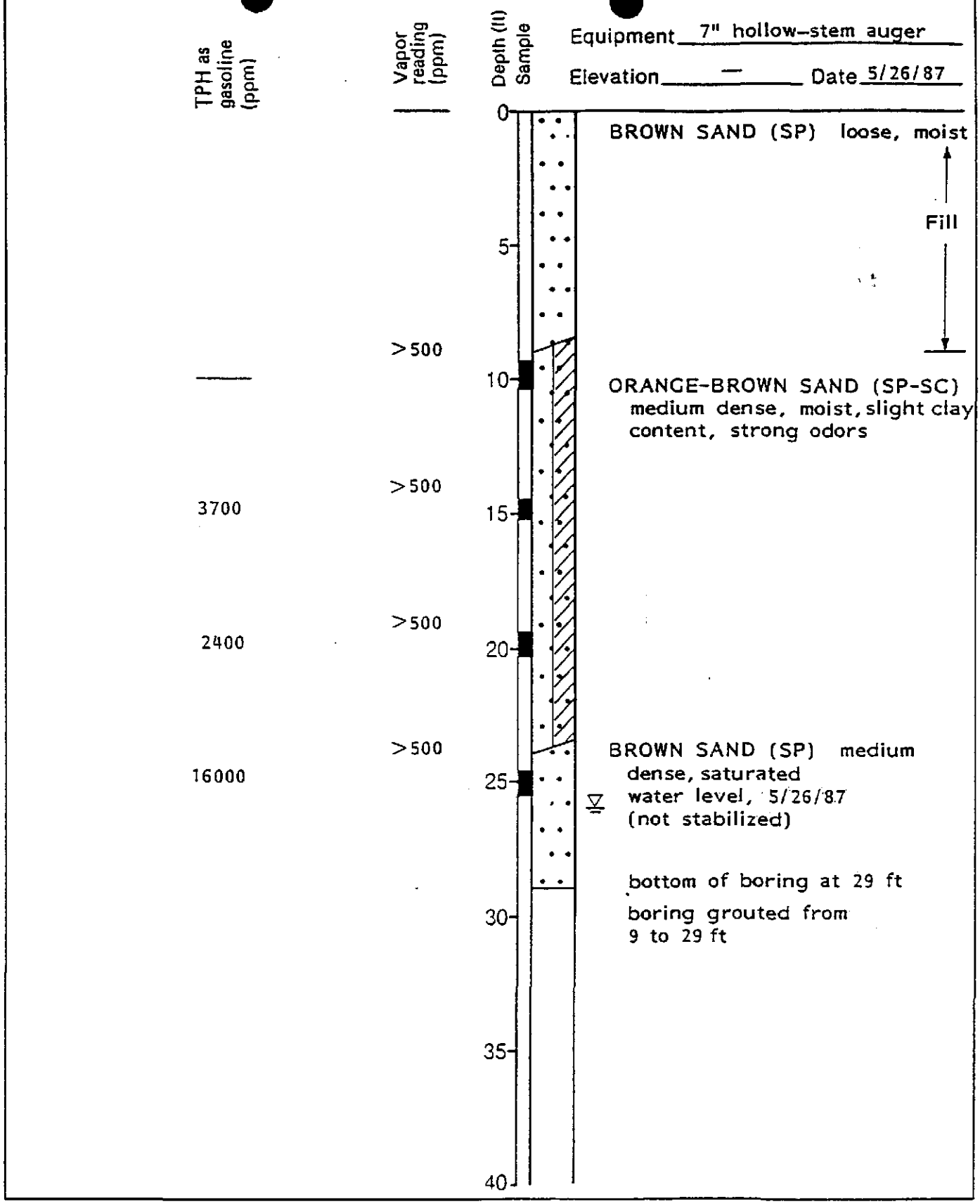
Log of Boring 1
Oakland Chinatown Tanks
Oakland, California

PLATE 2

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| | 9382.005.02 | D Bray | 6/87 | | |

0158

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Log of Boring 2
Oakland Chinatown Tanks
Oakland, California

PLATE 3

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| | 9382.005.02 | D. Gray | 6/87 | | |

| MAJOR DIVISIONS | | | | | TYPICAL NAMES |
|---|---|---|---|---|---|
| COARSE-GRAINED SOILS MORE THAN HALF IS LARGER 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, GRAVEL-SAND MIXTURES |
| | | | GP | | POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES |
| | | GRAVELS WITH OVER 12% FINES | GM | | SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES |
| | | | GC | | CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES |
| | SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE | CLEAN SANDS WITH LITTLE OR NO FINES | SW | | WELL-GRADED SANDS, GRAVELLY SANDS |
| | | | SP | | POORLY GRADED SANDS, GRAVELLY SANDS |
| | | SANDS WITH OVER 12% FINES | SM | | SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES |
| | | | SC | | CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES |
| FINE-GRAINED SOILS MORE THAN HALF IS SMALLER THAN NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT 50% OR LESS | | ML | | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY |
| | | | CL | | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
| | | | OL | | ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| | SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50% | | MH | | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS |
| | | | CH | | INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS |
| | | | OH | | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| HIGHLY ORGANIC SOILS | | | Pt | | PEAT AND OTHER HIGHLY ORGANIC SOILS |

## UNIFIED SOIL CLASSIFICATION SYSTEM

| | | |
|---|---|---|
| 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) or (S) | 3200 | (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

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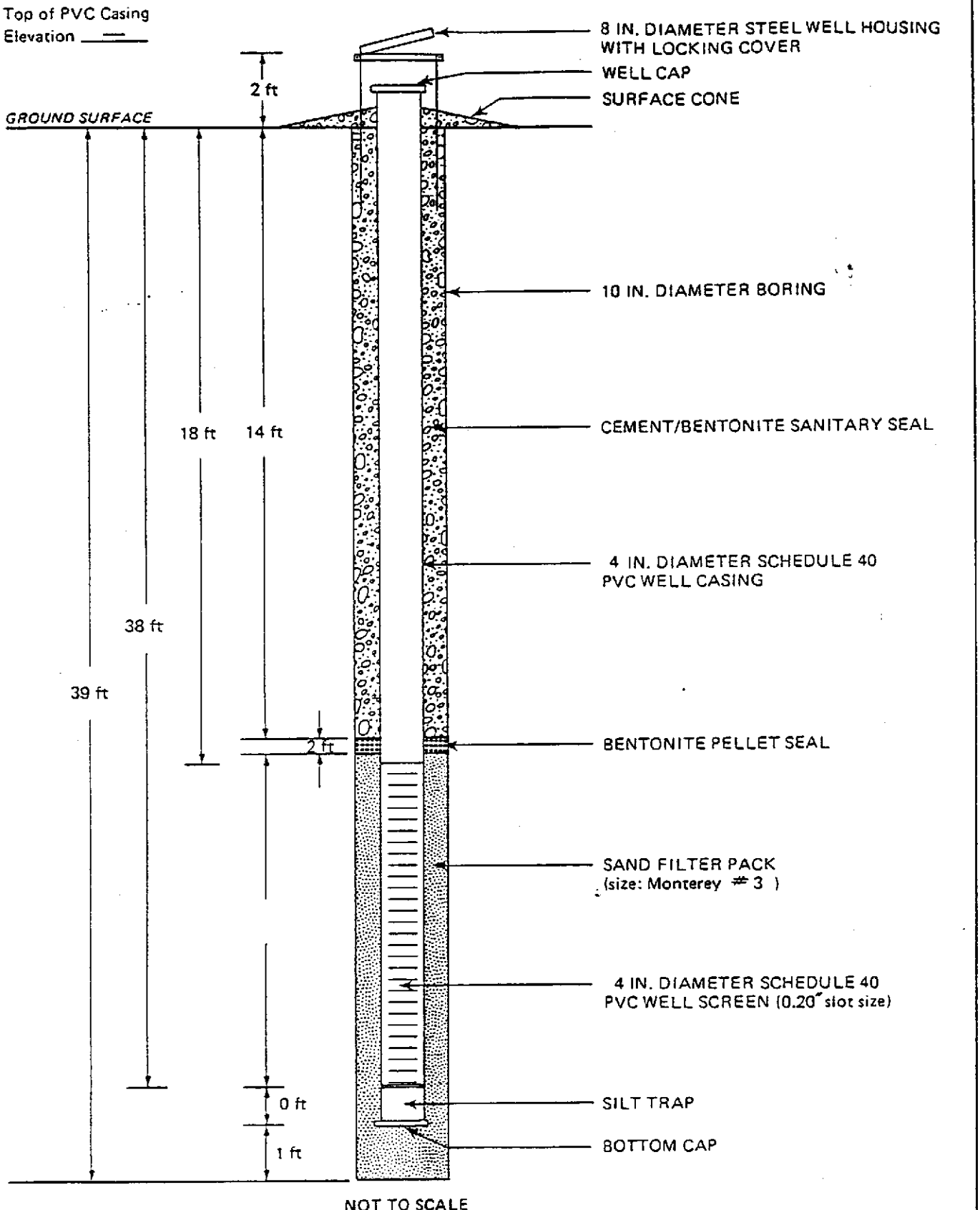
Engineers, Geologists & Geophysicists

**Unified Soil Classification Chart**
Oakland Chinatown Tanks
Oakland, California

PLATE **4**

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| MG | 09382.005.02 | | 6/87 | | |

0159

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**Well Construction Detail for Monitoring Well 1**
Oakland Chinatown Tanks
Oakland, California

PLATE **5**

| DRAWN | JOB NUMBER | APPROVED | DATE | REVISED | DATE |
|---|---|---|---|---|---|
| | 9382,005.02 | D Bray | 6/87 | | |

FORM GW1

# LABORATORY REPORTS

WESCO Laboratories

HARDING LAWSON
JUN 12 1987

Date: June 11, 1987 Client Job/P.O. #: 9382,005.02

Client: Harding Lawson Associates Date Collected: May 26, 1987

Submitted by: Dave Hochmuth Date Submitted: May 27, 1987

Report to: Dave Hochmuth # & Type of Samples: 4 soils

WESCO Job#: HLA8733-L Site: Oakland Chinatown



| Lab No. | Client ID | Benzene mg/kg | Toluene mg/kg | Xylene mg/kg | Gasoline mg/kg |
|---|---|---|---|---|---|
| 7-8481 | MWo4 | 0.012 | <0.001 | <0.001 | 0.43 |
| 7-8482 | Boo2 | 9.8 | 22 | 74 | 3700 |
| 7-8483 | Boo3 | 1.6 | 5.5 | 42 | 2400 |
| 7-8484 | Boo4 | 48 | 110 | 190 | 16000 |
| | METHOD(S) | Note 1 | Note 1 | Note 1 | Note 1 |

NOTES: Note 1: EPA 5020/8020/8015

Analytical supervisor

14 Galli Drive, Suite A
Novato, California 94947 415 883-6425
A Division of Western Ecological Services Company

WESCO Laboratories

Date: June 15, 1987

Client Job/P.O. #: 9382,005.02

Client: Harding Lawson Associates

Date Collected: May 27, 1987

Submitted by: Greg Sengelmann

Date Submitted: May 28, 1987

Report to: Dave Hochmuth

# & Type of Samples: 2 waters

WESCO Job#: HLA 8735-L, 2nd EDIT

Site: Oakland Chinatown Tanks



| Lab No. | Client ID | Gasoline mg/l | Benzene mg/l | Toluene mg/l | Xylene mg/l | Ethylbenzene mg/l |
|---|---|---|---|---|---|---|
| 7-8496 | 8721-0101 | 66 | 4.9 | 6.8 | 6.1 | (0.005 |
| | METHOD(S) | Note 1 | Note 2 | Note 2 | Note 2 | Note 2 |

| Lab No. | Client ID | 1,2-DCA | Trichloro-ethylene mg/l | 1,2-dichloro-propane mg/l | 1,1,2-tri-chloroethane mg/l | chloro-benzene mg/l |
|---|---|---|---|---|---|---|
| 7-8497 | 8721-0101 | 0.51 | 0.036 | 0.003 | 0.002 | 0.051 |
| | METHOD(S) | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |

| Lab No. | Client ID | 2-chloro ethyl vinyl ether mg/l | All other EPA 601 Compounds mg/l | dibromoethane (EDB)* mg/l | Freon 113 mg/l |
|---|---|---|---|---|---|
| 7-8497 | 8721-0101 | (0.005 | (0.001 | 0.18 | (0.001 |
| | METHOD(S) | Note 3 | Note 3 | Note 3 | Note 3 |

NOTES: Note 1: EPA Methods 5020/8015
Note 2: EPA Method 602
Note 3: EPA Method 601
*: Confirmed by liquid/liquid extraction; second column, GC/ECD

Analytical supervisor

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A Division of Western Ecological Services Company

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Principal Civil Engineer

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DPH/DGG/ljc/B0662-R

QUALITY CONTROL REVIEWER

David P. Hochmuth
Civil Engineer