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Date: 27 December 1989
ES Project No. NC222.05

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Attn: Mr. Dennis Byrne
Re: Groundwater Contamination Investigation at the
1650 65th Street Property, Emeryville, California

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COPIES	DATE	ITEM
1	11/89	Groundwater Contamination Investigation at the 1650 65th Street Property, Emeryville, California
1	10/24/89	October 1989 Quarterly Groundwater Monitoring Results for the 1650 65th Street Site in Emeryville, California

REMARKS For your files and review. Please call us if you have any
questions.

COPY TO

- File
- Author
- Reading File
- _____

233-6660
Bob Greenwald
SIGNED: Marcus L. Pierce
Marcus L. Pierce



ENGINEERING-SCIENCE, INC.

600 BANCROFT WAY
BERKELEY, CA 94710
Tel: (415) 548-7970 Fax: (415) 548-7635

26 December 1989
Ref: NC222.05

Mr. Dennis Byrne
Alameda County Environmental Health Services
Hazardous Materials
80 Swan Way, Suite 200
Oakland, California 94621

Subject: Groundwater Contamination Investigation at the
1650 65th Street Property, Emeryville, California

Dear Mr. Byrne:

Enclosed is the site investigation report discussing the results of the groundwater contamination investigation at the 1650 65th Street property in Emeryville, California. This report describes the groundwater "grab" sample survey, the installation of four monitoring wells (MW-2, MW-3, MW-4, and MW-5), and the initiation of a groundwater monitoring program. A preliminary assessment of the extent of hydrocarbon contamination in the soil and groundwater underlying the site is included.

A groundwater "grab" sample (GW-8) was collected and Well MW-5 was installed on the northeast side of the 1650 65th Street property near former underground fuel storage tanks (UFSTs). Groundwater analytical results for GW-8 and a sample collected from Well MW-5 suggests that contamination associated with the UFSTs on the adjacent property has migrated on to the 1650 65th Street property.

If you have any questions or need clarifications regarding this submittal, please call.

Sincerely,

Marcus L. Pierce
Project Manager

Richard S. Makdisi, R.G.
Manager, Hazardous Waste
Management Department

MLP/RSM/dae/143-31.R0

cc: Walt Kaczmarek, P.O. Partners

GROUNDWATER CONTAMINATION INVESTIGATION

**1650 65TH STREET PROPERTY
EMERYVILLE, CALIFORNIA**

**Prepared for
P. O. PARTNERS
Emeryville, California**

November 1989

**Prepared by
ENGINEERING-SCIENCE, INC.
600 Bancroft Way
Berkeley, California 94710**

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EXECUTIVE SUMMARY

Groundwater contamination investigations at the 1650 65th Street property involved the completion of a groundwater "grab" sample survey and the installation of four monitoring wells (MW-2, MW-3, MW-4, and MW-5) to characterize hydrocarbon contamination associated with an on-site underground fuel storage tank (UFST) removed in July 1987 and off-site UFSTs removed in September/October 1989. Field investigations were conducted between 28 September and 21 November 1989.

Groundwater was encountered at depths of 8 to 12 feet below ground surface and flows toward the southwest and south below the 1650 65th Street property. The subsurface materials are fill to a depth of 11.5 to 22 feet, with underlying layers of primarily fine sand, clay, and silty clay.

Groundwater "grab" sample analytical results indicate that a significant concentration of gasoline (94,000 mg/L) was detected in the product sample collected from sample GW-8. This contamination is probably associated with the off-site leakage from the former UFSTs on the adjacent property to the north. Significant concentrations of benzene, toluene, xylene, and ethylbenzene (BTXE) are likely present in the product sample, however, the detection limits for BTXE in the product sample were very high, ranging from 50,000 to 100,000 ug/L. All other groundwater "grab" sample results showed relatively minor concentrations of contaminants.

The groundwater monitoring analytical results for Wells MW-2, MW-3, MW-4, and MW-5 are generally consistent with the results of the groundwater "grab" sample survey. The relatively low concentrations detected in Wells MW-3 and MW-4 and groundwater "grab" samples bordering the south, west, and east sides of the property suggest that hydrocarbon contamination associated with the former on-site UFST on the property has not migrated very far from the source area. However, a gasoline concentration of 100 mg/L was detected in Well MW-2 which was installed in the excavation backfill of the former on-site UFST. Groundwater remediation is likely to be required in the vicinity of Well MW-2 and the former on-site UFST.

Contamination detected in Well MW-5 and groundwater "grab" sample GW-8 likely originates from the former UFSTs on the adjacent property. This analytical data suggests that the leakage from the off-site UFST is of limited lateral extent. The UFSTs in the adjacent property were removed in September/October 1989 and groundwater in the open excavation contains a thin layer of floating hydrocarbon product that has the same appearance and odor as the product sample collected at sample location GW-8. Groundwater remediation is likely to be required in the vicinity of the off-site UFSTs and sample location GW-8. Further characterization and remediation of groundwater contamination in this area should be conducted by the adjacent property owner(s).

SECTION 1

INTRODUCTION

INTRODUCTION

This report discusses the further groundwater characterization investigations performed by ES at the 1650 65th Street property, since the initial sampling of Monitoring Well MW-2 on 2 and 16 October 1989. The well installation details of Wells MW-2 are included in this report, however, the results of the 2 and 16 October 1989 sampling events are detailed in a previous report (Reference 1) and are only summarized in the Site History section that follows.

OBJECTIVE

Engineering-Science (ES) has been retained by P. O. Partners to assess the extent of groundwater contamination associated with a former leaking 2,000-gallon underground fuel storage tank (UFST) at the 1650 65th Street property. The extent of on-site groundwater contamination associated with an off-site UFST is also evaluated. In order to achieve these goals, ES has conducted the following tasks during September to November 1989:

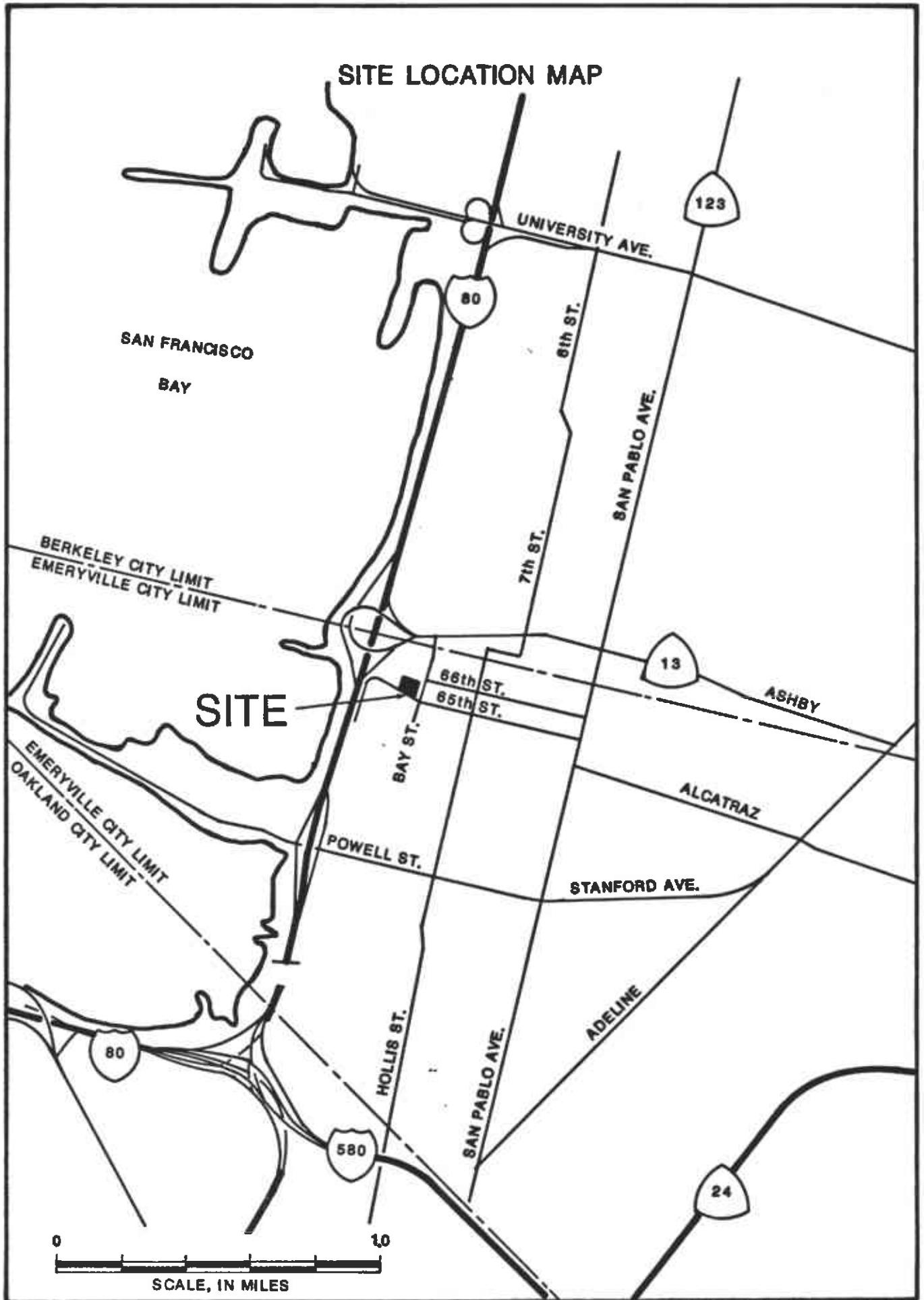
- 1) Groundwater "grab" sample survey (8 locations);
- 2) Installation of 4 groundwater monitoring wells; and
- 3) Implementation of a groundwater monitoring program.

SITE DESCRIPTION

The 1650 65th Street site covers approximately 5.5 acres in northwest Emeryville, California (Figure 1.1). The site is relatively flat and is bounded by Highway 80 (west), the Emeryville-Berkeley boundary (2-1/2 blocks north), the Southern Pacific Railroad (1-block east), and 65th Street (south). The San Francisco Bay is approximately 1,000 feet west of the site.

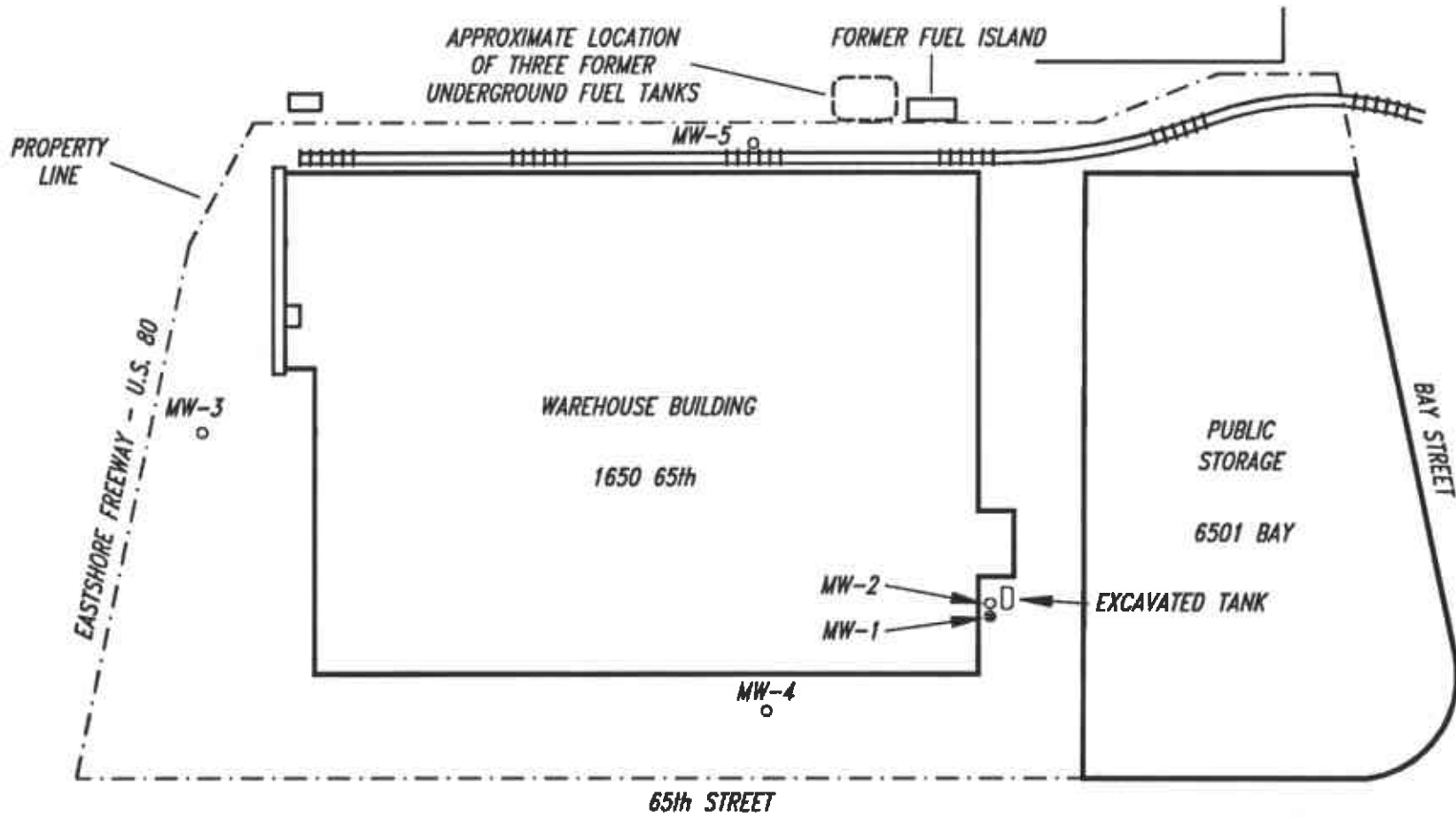
Presently, the site is occupied by a one-story warehouse building (120,000 square feet) with concrete walls, dock-high concrete slab floors, and a wood roof (Figure 1.2). Concrete aprons flank the west and south sides of the warehouse. The remaining area is covered with asphaltic concrete to the east, south, and west of the warehouse and abandoned railroad tracks along the northern property boundary.

FIGURE 1.1

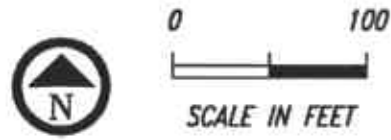


SITE PLAN

1650 65th Street Property



- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK



Site use in the area is mixed. The dominant use is industrial (Grove Valve & Regulator Co., Ryerson Steel). However, residential (Emery Bay Club & Apartments) and commercial office buildings (Emery Bay Offices) neighbor the south side of the property.

SITE HISTORY

Hydrocarbon contamination was detected in soil underlying the leaking 2,000-gallon UFST on the southeast corner of the property in April 1987 (Figure 1.1 and 1.2). Monitoring Well MW-1 was installed by ES after the removal of the UFST in July 1987. A total petroleum hydrocarbon (TPH) concentration of 6,600 mg/Kg was detected in a soil sample collected at a depth of 10 feet in well MW-1. A TPH concentration of 33 mg/L was detected in a groundwater sample collected from MW-1 in July 1987. Well MW-1 was abandoned in January 1988, prior to the excavation of hydrocarbon contaminated soils underlying the UFST. Contaminated soils were excavated to a depth of 16.5 feet, approximately 4.5 feet below the water table. A TPH concentration of 390 mg/kg was detected in a soil sample (BW-2) collected from the western base of the excavation, however, this was in the saturated zone and is not strictly valid as a soil sample result. Groundwater entering the excavation was pumped into a vacuum truck for disposal by M & M Ship Service in San Francisco. Excavated soils were transported to a Class I landfill for disposal. The excavation was backfilled with clean gravel and sand, which was subsequently compacted. The upper eight inches of the backfill were paved with Class 2 Aggregate Base and the surface was covered with 2 inches of asphalt and concrete.

In September 1989 an investigation of residual hydrocarbon contamination associated with the former leaking 2,000-gallon UFST and potential impacts to groundwater underlying the site (Engineering-Science, October 1989) was initiated. On 28 and 29 September 1989, Monitoring Well MW-2 was installed within 10 feet of the former UFST. Subsequent groundwater sampling events on 2 and 16 October 1989, showed that significant hydrocarbon concentrations are present in groundwater near the source area. Dissolved gasoline concentrations of 120 mg/L (2 October 1989) and 77 mg/L (16 October 1989) were detected in Well MW-2 groundwater. Benzene (6,300 and 7,300 $\mu\text{g/L}$), toluene (2,400 and 5,600 $\mu\text{g/L}$), total xylenes (3,800 and 9,400 $\mu\text{g/L}$), and ethylbenzene (1,800 and 1,600 $\mu\text{g/L}$) were detected during the two October sampling events at concentrations that exceed regulatory limits established by the Department of Health Services (DHS) for drinking water.

In September/October 1989 UFSTs on the adjacent property immediately north of the site were excavated and removed. These tanks are reported to contain diesel, unleaded gasoline, and regular gasoline. A thin layer of hydrocarbon product has been observed on groundwater in the excavation.

SECTION 2

GROUNDWATER "GRAB" SAMPLE SURVEY

INTRODUCTION

A groundwater "grab" sample survey was conducted along the perimeter of the 1650 65th Street property on 10 November 1989 (Figure 2.1, Table 2.1). The purpose of the survey was: 1) to assess the lateral boundaries of the gasoline contamination in groundwater underlying the site, 2) to evaluate the potential for off-site sources of hydrocarbon contamination, and 3) to evaluate the optimum well locations for monitoring the groundwater contamination. A total of eight locations, identified as GW-2 through GW-9, were sampled for groundwater. An attempt was made to collect a groundwater sample at location 1, however, drill refusal was encountered just above the water table. Groundwater "grab" samples were collected at depths ranging from 7.5 to 11 feet.

GROUNDWATER "GRAB" SAMPLING PROTOCOL

Groundwater "grab" samples were collected at specified locations (Figure 2.1) and depths (Table 2.1). These samples were obtained by driving a 3/4-inch diameter galvanized steel probe to desired sampling depths with a pneumatically operated hammer. Once the probe was installed to a depth just below the top of the water table, a clean stainless steel bailer was used to develop and purge the probe. If the probe recharged rapidly, five probe volumes were purged prior to sampling. If the probe recharged slowly, only one to two probe volumes were evacuated prior to sampling. All groundwater "grab" samples were collected with clean stainless steel bailers and transferred to 40 ml glass vials specifically designed to prevent the loss of volatile constituents. The groundwater "grab" samples were transported to a DHS certified hazardous waste laboratory, for analysis the same day.

Notably, groundwater was not encountered at a depth of 7.5 to 8.5 feet at sample location GW-8. However, a viscous layer of hydrocarbon product was present and a sample was collected for analysis (Photodocumentation - Appendix A).

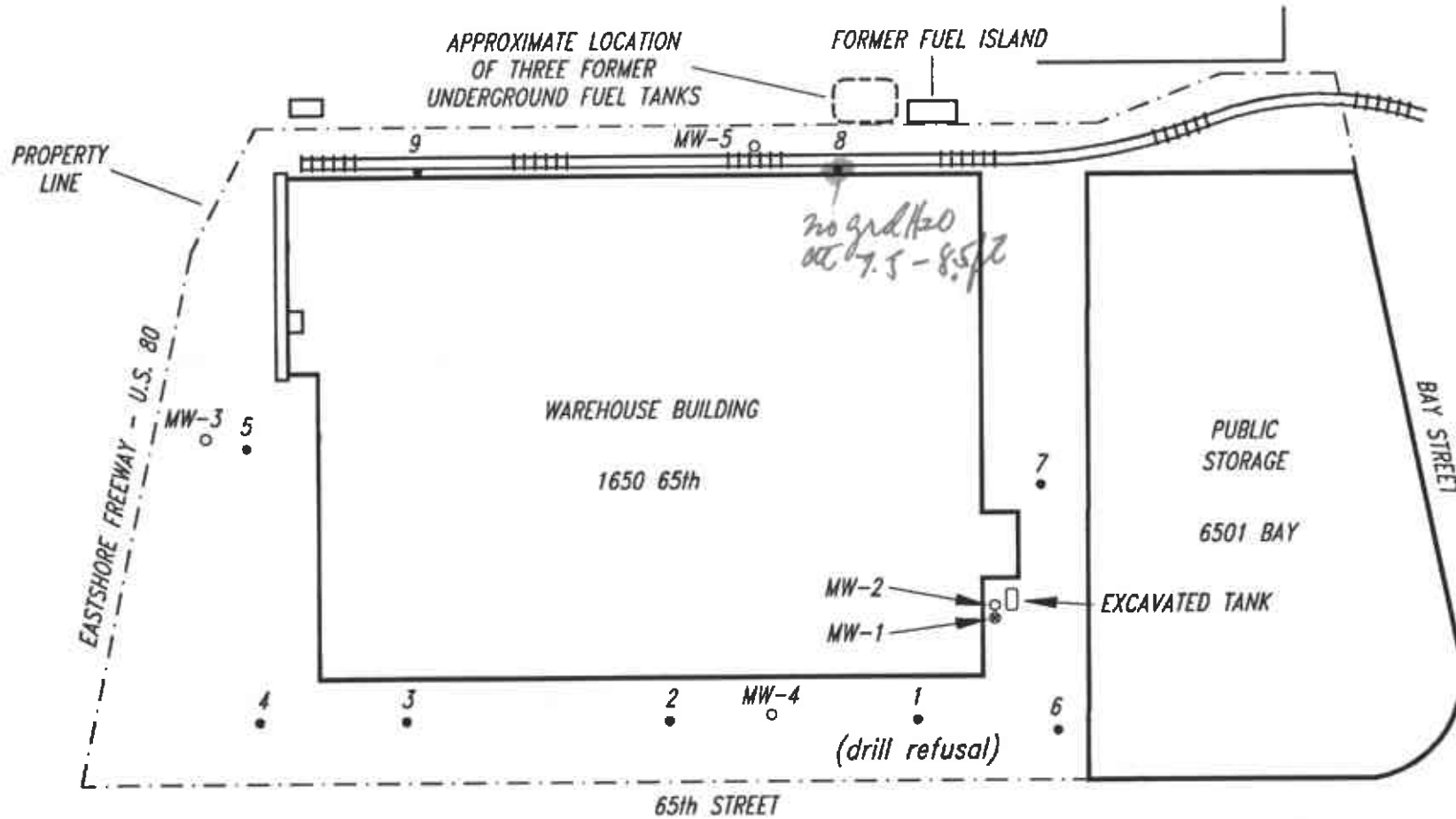
ANALYTICAL RESULTS

The groundwater "grab" samples were analyzed by modified EPA Method 8015 for TPH (as gasoline) and benzene, toluene, xylene and ethylbenzene (BTXE) by EPA Method 602. Table 2.1 contains the analytical results for the eight samples, and Figures 2.2 through 2.6 present contaminant concentrations for gasoline, benzene,

GROUNDWATER "GRAB" SAMPLE LOCATIONS

1650 65th Street Property

10 NOVEMBER 1989



LEGEND:

- FORMER MONITORING WELL
- MONITORING WELL
- EXCAVATED TANK
- GROUNDWATER "GRAB" SAMPLE

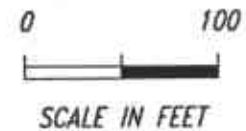


TABLE 2.1

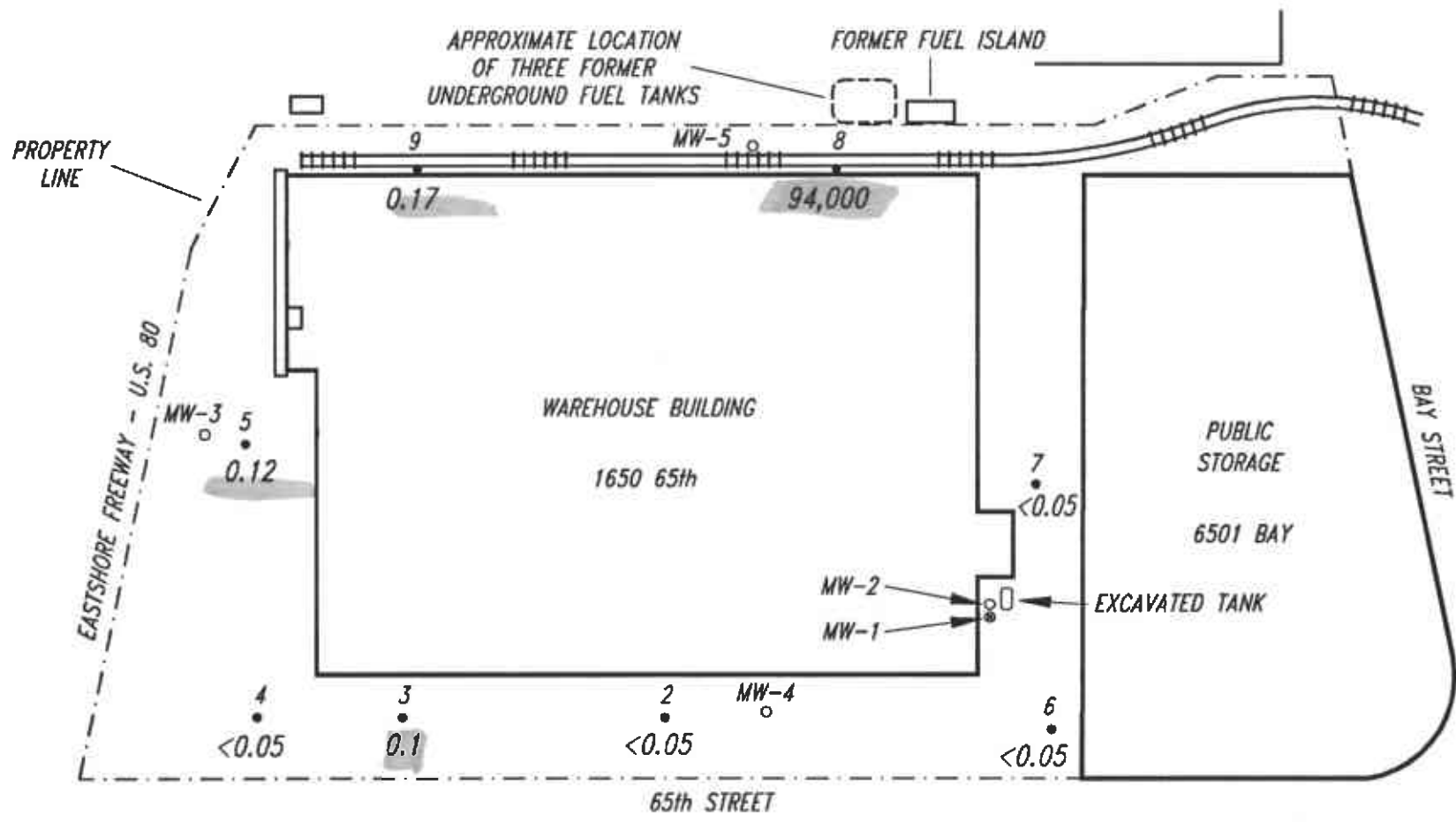
GROUNDWATER "GRAB" SAMPLE ANALYTICAL RESULTS
 1650 65th Street Property
 10 November 1989

Sample Location	Depth (Feet)	Gasoline (mg/L)	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)	Ethylbenzene ($\mu\text{g/L}$)
GW-1	Drill Refusal at 9.5'	NS	NS	NS	NS	NS
GW-2	10-11	<0.05	2.9	0.8	<1.0	<0.5
GW-3	10-11	0.1	3.0	0.9	<1.0	2.1
GW-4	9.5 - 10.5	<0.05	<0.5	<0.5	<1.0	<0.5
GW-5	8-9	0.12	3.0	0.8	1.6	2.4
GW-6	9-10	<0.05	<0.5	<0.5	2.3	<0.5
GW-7	9-10	<0.05	<0.5	<0.5	<1.0	<0.5
GW-8 ¹	7.5-8.5		<50,000	<50,000	<100,000	<50,000
GW-9	8-9	0.17	4.7	<0.5	<1.0	5.1

¹Collected free product sample.

NS = Not Sampled

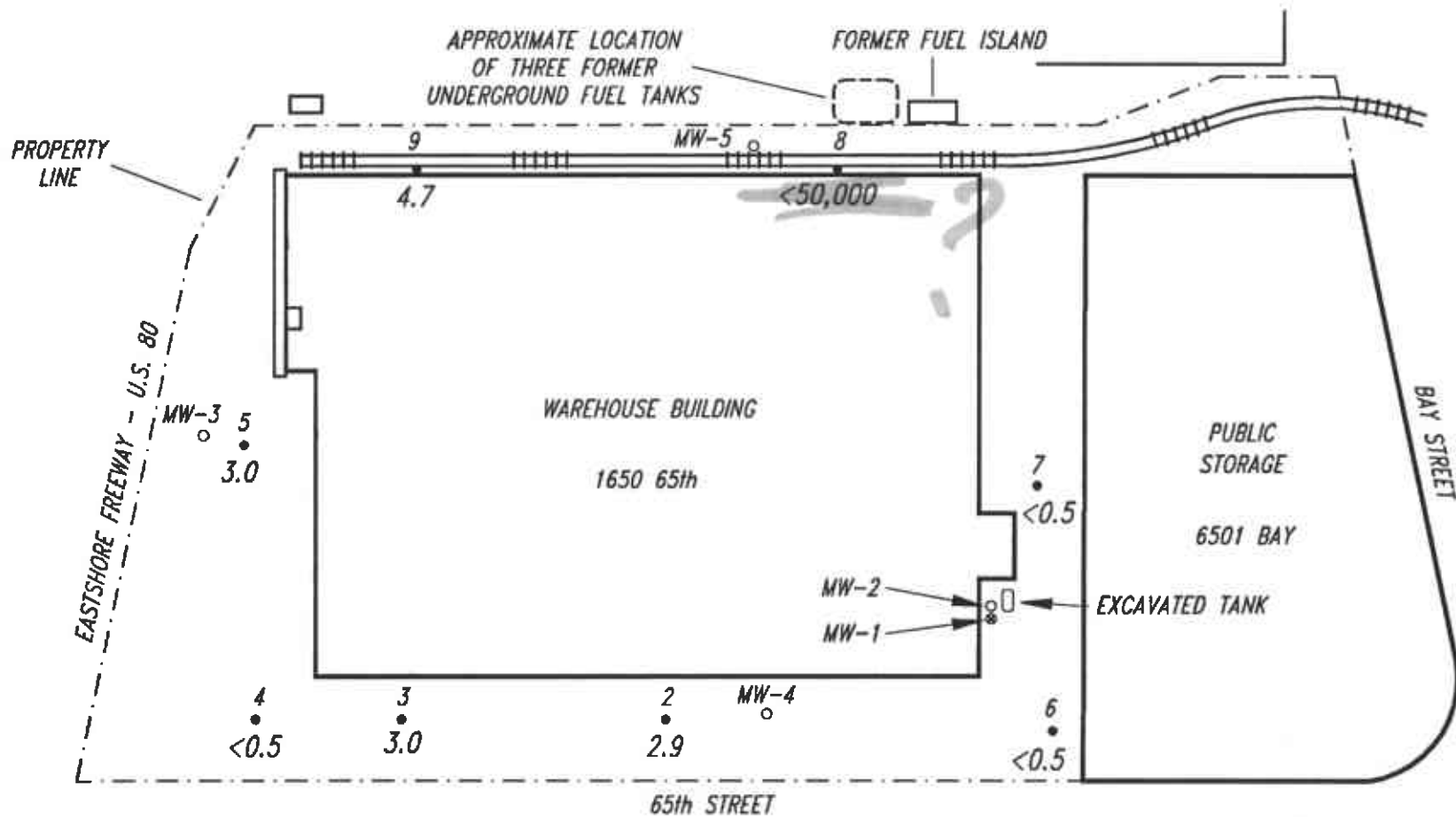
GASOLINE CONCENTRATIONS GROUNDWATER "GRAB" SAMPLE SURVEY 1650 65th Street Property 10 NOVEMBER 1989(mg/L)



- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK
 - GROUNDWATER "GRAB" SAMPLE



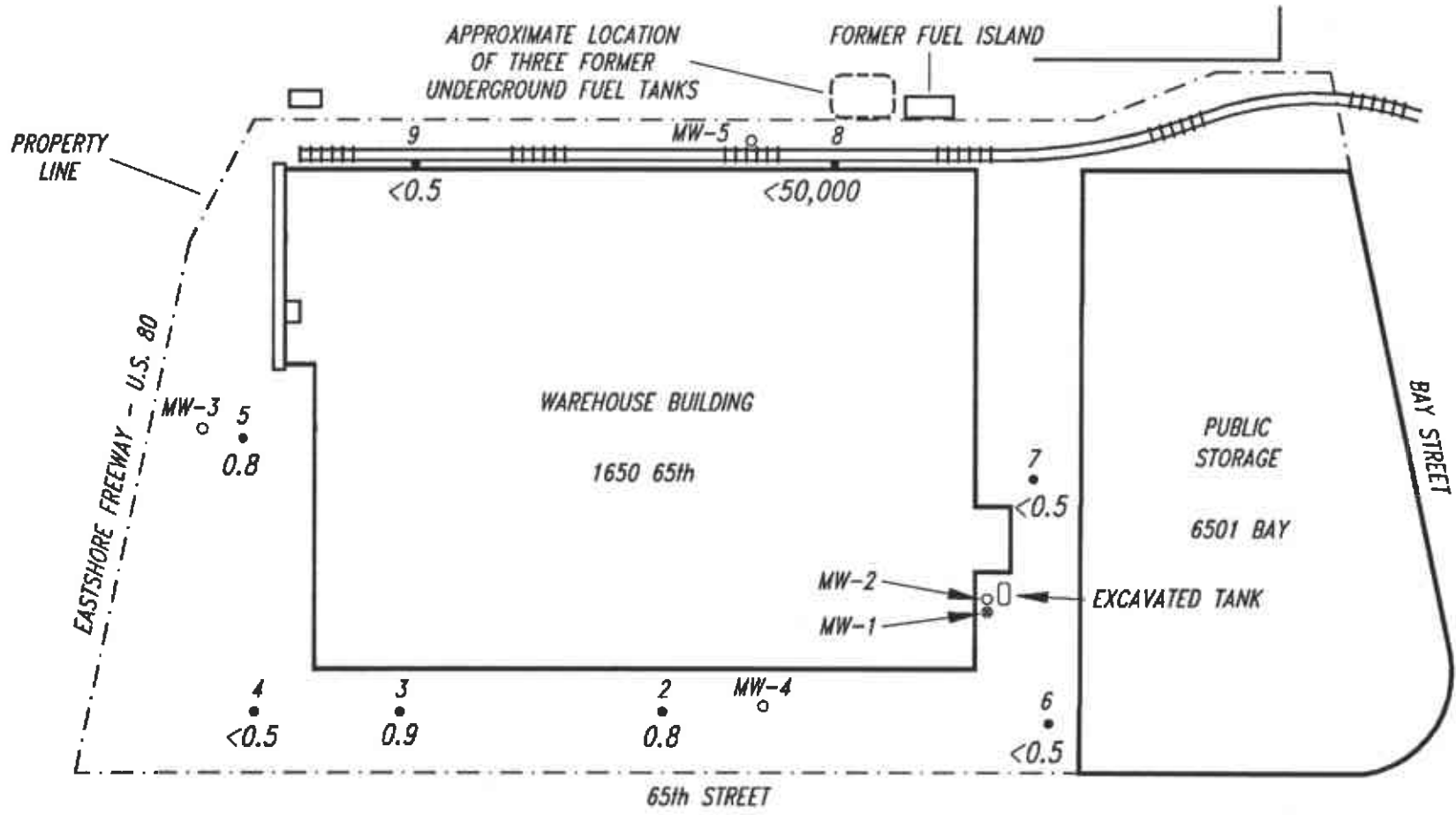
BENZENE CONCENTRATIONS GROUNDWATER "GRAB" SAMPLE SURVEY 1650 65th Street Property 10 NOVEMBER 1989(ug/L)



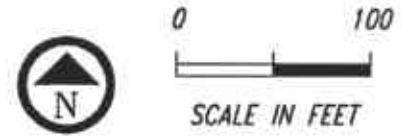
- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK
 - GROUNDWATER "GRAB" SAMPLE



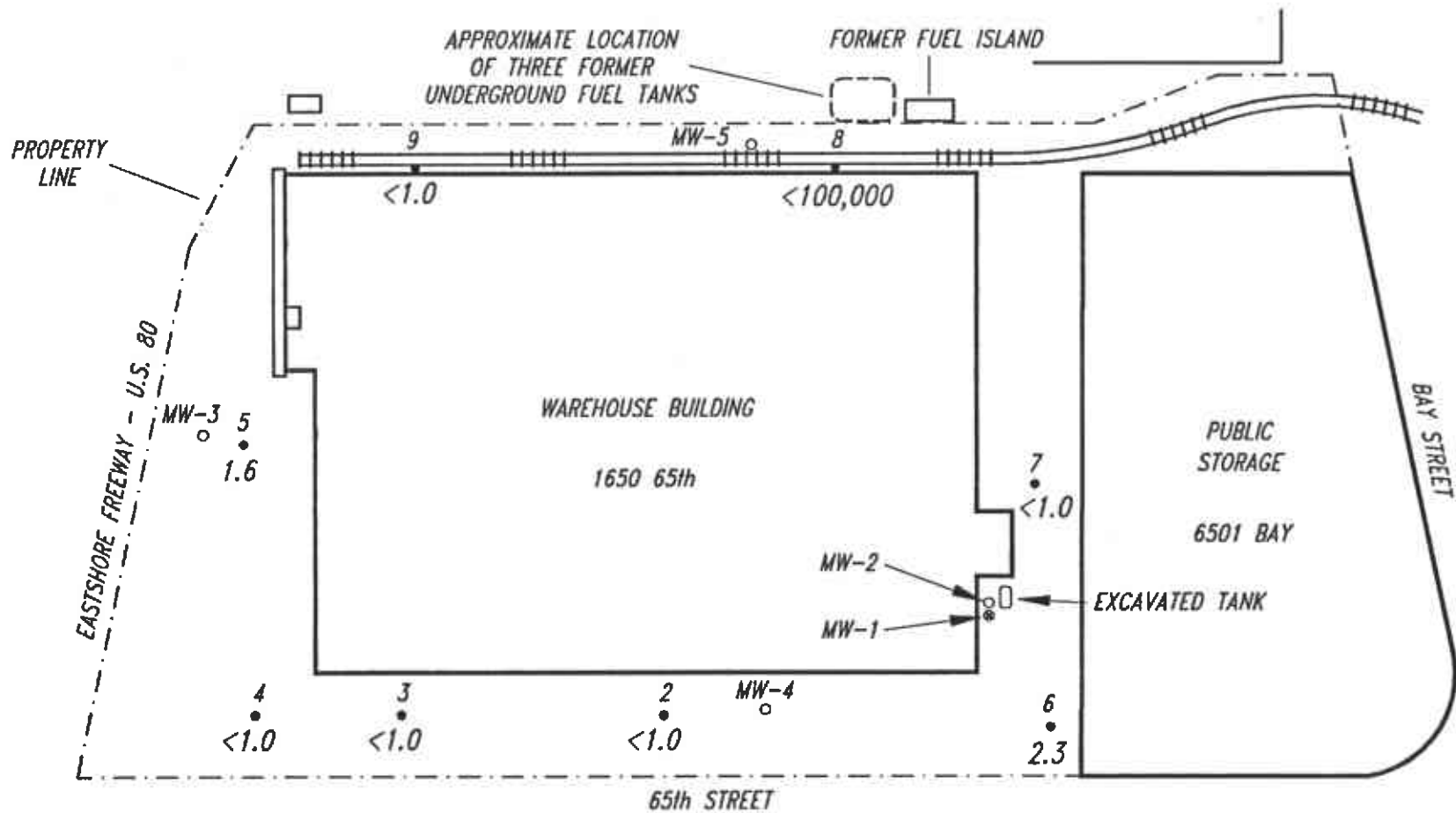
TOLUENE CONCENTRATIONS
GROUNDWATER "GRAB" SAMPLE SURVEY
1650 65th Street Property
10 NOVEMBER 1989(ug/L)



- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK
 - GROUNDWATER "GRAB" SAMPLE



**TOTAL XYLENES CONCENTRATIONS
GROUNDWATER "GRAB" SAMPLE SURVEY
1650 65th Street Property
10 NOVEMBER 1989(ug/L)**

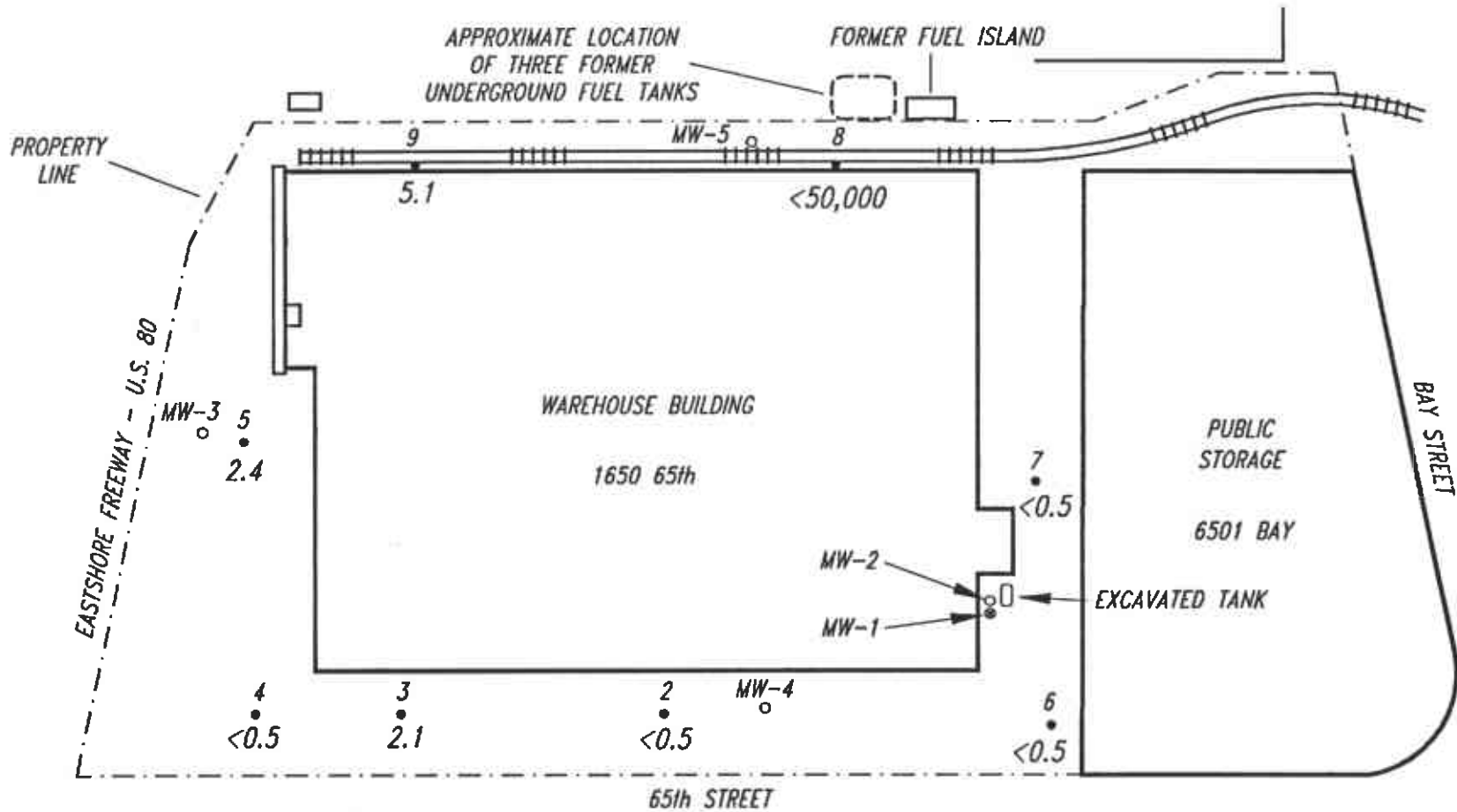


- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK
 - GROUNDWATER "GRAB" SAMPLE



ETHYLBENZENE CONCENTRATIONS GROUNDWATER "GRAB" SAMPLE SURVEY

1650 65th Street Property 10 NOVEMBER 1989(ug/L)



LEGEND:

- FORMER MONITORING WELL
- MONITORING WELL
- EXCAVATED TANK
- GROUNDWATER "GRAB" SAMPLE



toluene, xylenes, and ethylbenzene. A complete listing of "grab" sample analytical results is presented in Appendix B. A brief description of the contaminant distribution is given for each analyte below.

Total Petroleum Hydrocarbons as Gasoline

Gasoline (Figure 2.2) was detected at sample locations GW-3 (0.1 mg/L), GW-5 (0.12 mg/L), GW-8 (94,000 mg/L), and GW-9 (0.17 mg/L). The maximum concentrations were detected in product sample collected at location GW-8 (94,000 mg/L) and groundwater collected at location GW-9 (0.17 mg/L), which are both located on the north side of the property. Gasoline was not detected at sample locations (GW-2, GW-6, GW-7) nearest to the on-site source area.

Benzene

Benzene (Figure 2.3) was detected at sample locations GW-2 (2.9 $\mu\text{g/L}$), GW-3 (3.0 $\mu\text{g/L}$), GW-5 (3.0 $\mu\text{g/L}$), and GW-9 (4.7 $\mu\text{g/L}$). The maximum concentration was detected at sample location GW-9 (4.7 $\mu\text{g/L}$). Significant concentrations of benzene are likely present in the product sample collected from GW-8, however, the detection limit is very high (<50,000 $\mu\text{g/L}$).

Toluene

Toluene (Figure 2.4) was detected at sample locations GW-2 (0.8 $\mu\text{g/L}$), GW-3 (0.9 $\mu\text{g/L}$), and GW-5 (0.8 $\mu\text{g/L}$). Significant concentrations of toluene are probably present in the product sample collected from GW-8, however, the detection limit is very high (<50,000 $\mu\text{g/L}$).

Total Xylenes

Xylenes (Figure 2.5) were detected at sample locations GW-5 (1.6 $\mu\text{g/L}$) and GW-6 (2.3 $\mu\text{g/L}$). Significant concentrations of total xylenes are likely to be present in the product sample (GW-8), however, the detection limit is very high (<100,000 $\mu\text{g/L}$).

Ethylbenzene

Ethylbenzene (Figure 2.6) was detected at sample locations GW-3 (2.1 $\mu\text{g/L}$), GW-5 (2.4 $\mu\text{g/L}$), and GW-9 (5.1 $\mu\text{g/L}$). The maximum concentration was detected on the north side of the property at sample location GW-9 (5.1 $\mu\text{g/L}$). Ethylbenzene was not detected at sample locations (GW-2, GW-6, GW-7) nearest the on-site source area. Significant concentrations of ethylbenzene are likely present in the product sample from location GW-8, however, the detection limit is very high (<50,000 $\mu\text{g/L}$).

INTERPRETATION OF ANALYTICAL RESULTS

Examination of the groundwater "grab" sample results suggest that hydrocarbon contamination associated with the former on-site leaking UFST has not migrated very far from the source area. Gasoline was not detected and BTXE was only detected at low concentrations at nearby sample locations GW-2, GW-6, and GW-7.

The maximum gasoline concentration was detected at sample location GW-8, which is located approximately 25 feet south of the former UFSTs on the adjacent

property. Contamination found at sample location GW-8 appears to originate from the adjacent property to the north where UFSTs were removed in September/October 1989. The open excavation, where the adjacent UFSTs were formerly located, contains groundwater with a thin layer of floating hydrocarbon product having the same appearance and odor as the sample collected from location GW-8.

Significant concentrations of BTXE are likely present in the product sample collected from GW-8. A high concentration of gasoline (94,000 mg/L) was detected in the product sample and BTXE are common components of gasoline. However, the detection limits for BTXE in the product sample are very high, ranging from 50,000 to 100,000 $\mu\text{g/L}$ due to the high gasoline concentration in the sample.

Contamination detected in the vicinity of GW-8 is unlikely to have emanated from the on-site source of gasoline contamination on the southeast side of the property which is located approximately 300 feet downgradient. Contamination detected at sample location GW-8 appears to be primarily heavy, less volatile hydrocarbons than gasoline which is consistent with the product observed in the adjacent property excavation. Furthermore, gasoline and BTXE were not detected at sample location GW-7, which is located between the on-site source area and sample location GW-8.

Minor concentrations of gasoline (0.1 to 0.17 mg/L) and BTXE were detected at sample locations west (GW-3, GW-5) and northwest (GW-9) of the former on-site leaking UFST. Contamination detected at these locations may originate from the on-site source area. However, the absence of significant hydrocarbon contamination at sample locations (GW-2, GW-6, GW-7) nearest to the on-site source area suggest that contamination detected at locations GW-3, GW-5, and GW-8 may have originated from off-site sources such as the former UFSTs on the adjacent property north of the 1650 65th Street site.

SECTION 3

GROUNDWATER MONITORING WELL INSTALLATIONS

INTRODUCTION

Four groundwater monitoring wells were installed on the 1650 65th Street property on 28 and 29 September 1989 and from 14 November to 17 November 1989. The purpose of these wells is to monitor groundwater quality within the project site boundaries as well as to characterize subsurface materials and determine hydrogeologic conditions. Locations of the newly installed wells (MW-2, MW-3, MW-4, and MW-5) are shown in Figure 1.2. Exact well locations were selected based on the results of the groundwater "grab" sample survey, the well purpose, known hydrogeologic conditions, and the presence of underground utilities.

WELL INSTALLATION PROCEDURES

All wells were installed according to procedures and guidelines recommended by the California Department of Water Resources (DWR) and the Regional Water Quality Control Board (RWQCB). These procedures were implemented to minimize the potential for cross-contamination during the drilling and construction of the wells and to provide quality assurance for analytical data collected from well samples. Well construction procedures were designed and implemented to ensure that proper casing, sanding, sealing, and grouting prevented the wells themselves from acting as conduits for the transmission of contaminants into groundwater zones that were not contaminated prior to their installation.

Well installations were conducted using the following general specifications:

- Test holes were bored with an 8- or 10-3/4-inch hollow stem auger.
- During drilling of the test holes, lithologic soil samples were collected every 2.5 feet. Analytical soil samples were collected at a depth of 4.5 to 5.5 feet in the unsaturated zone using a California modified split spoon sampler. Analytical samples were not collected below the top of the saturated zone.
- The monitoring wells were completed using 10-foot sections of 2- or 4-inch ID (inside diameter) PVC blank and slotted casing (slot size = 0.020 inches). Slotted casings were installed in the zone of saturation, with the slotted interval extending 1 to 2 feet above the top of the zone of saturation.
- The blank and slotted PVC casings were threaded together. PVC bottom caps were either threaded or attached with stainless steel screws to the base

of the slotted sections. Glues, solvents, and adhesives were not used in the assembly of the individual casing sections.

- All casing lengths were steam cleaned prior to installation to prevent contamination of wells with pollutants which could have been acquired during shipment, storage, and transport.
- The annular space surrounding slotted intervals was packed with sand (Monterey Sand No. 3) from the bottom of the screen to a level approximately 1 to 2 feet above the top of the screen. This allows for settlement of the sand and ensures cover for the entire slotted interval.
- Approximately 1 to 2 feet of activated bentonite pellets were placed at the top of the sand pack in each well to prevent vertical migration of contaminants through the annular space.
- The surface seal in each well was completed by filling the remaining annular space with a mixture of 95 percent Portland cement and 5 percent bentonite from the top of the bentonite seal to a depth of 1-foot below ground surface.
- A traffic-rated 6-5 Christy Box was cemented in-place around the top of each well and a locking cap was inserted into the top of the PVC casing.
- All soil cuttings produced during well installation were stored on-site in labelled 55-gallon drums.
- Groundwater purged during well development was stored on-site in labelled 55-gallon drums.

Well Installation Details and Observations

The installation details of Monitoring Wells MW-2, MW-3, MW-4, and MW-5 are described in this section, and the location of the wells are displayed in Figure 1.2. Well logs and construction summaries are contained in Appendix C. Photodocumentation of the well installations are included in Appendix A.

Monitoring Well MW-2

Monitoring Well MW-2 was installed on 28 September 1989, approximately 55 feet west of the eastern property boundary and 105 feet north of the southern property boundary (Figure 1.2). The purpose of this well is to provide a monitoring point near the former on-site underground fuel storage tank.

Well MW-2 was drilled to a depth of 32.7 feet. Organic vapor meter readings (OVM) of the soil samples indicated that contamination extended to a depth of approximately 25 to 29 feet. Groundwater was encountered at an approximate depth of 12 feet and a competent (relatively impermeable) clay layer was not encountered during drilling of the pilot hole. Therefore, the borehole was backfilled with bentonite between the depths of 29 and 32.7 feet and the well was completed with 2-inch ID PVC casing, with the slotted interval set between depths of 8.3 and 28 feet. Monterey Sand No. 3 was placed in the annulus around the casing between the depths of 7.0 and 28.5 feet. Bentonite was placed between 5.0 and 7.0 feet to seal the

annulus between the sand pack and the surface seal (95 percent Portland Cement, 5 percent bentonite).

The well was initially developed on 29 September 1989 by surging and pumping for a period of 2.5 hours. Approximately 100 gallons were purged during development. Well MW-2 was redeveloped by surging and bailing on 17 November 1989 for a period of 2 hours. Approximately 50 gallons were removed, however, the well water remained semi-turbid.

Monitoring Well MW-3

Monitoring Well MW-3 was installed on 14 November 1989, approximately 30 feet east of the western property boundary and 205 feet north of the southern property boundary (Figure 1.2). This well will provide a control point for monitoring the westward migration of contamination from the on-site source area near Well MW-2 and the former UFSTs north of the 1650 65th Street property.

Well MW-3 was bored to a depth of 22 feet. A faint hydrocarbon odor and positive organic vapor meter readings (67 maximum) were present between the depths of 10 and 17.5 feet. A relatively impermeable brown silty clay was encountered at the bottom of the borehole between the depths of 18 and 22 feet. This distinctive silty clay layer did not exhibit obvious signs of contamination (odor or measurable OVM response); therefore, the borehole was backfilled with bentonite between the depths of 18 and 22 feet. Well MW-3 was constructed with 4-inch ID PVC casing with the slotted interval set between the depths of 6.6 and 18.0 feet. Monterey Sand No. 3 was placed in the annulus around the casing between the depths of 5.3 and 18.3 feet. Bentonite was placed between 3.8 and 5.3 feet to seal the annulus between the sand pack and the surface seal (95 percent Portland Cement, 5 percent bentonite).

The well was developed on 17 November 1989 for a period of 2.5 hours. Approximately 110 gallons were purged before the water became relatively clear.

Monitoring Well MW-4

Monitoring Well MW-4 was installed on 15 November 1989, approximately 190 feet west of the eastern property boundary and 42 feet north of the southern property line (Figure 1.2). Well MW-4 will provide a monitoring point for contamination migrating southwest from the on-site source area.

Well MW-4 was drilled to a depth of 19 feet. A faint hydrocarbon odor and organic vapors (OVM max = 8) were detected between the depths of 12 and 16 feet. A relatively impermeable brown silty clay was penetrated at the bottom of the borehole between the depths of 16.3 and 19 feet. Obvious signs of contamination were not observed in the silty clay and the borehole was backfilled with bentonite between the depths of 16.3 and 19 feet. Well MW-4 was constructed with 4-inch PVC casing with the slotted interval set between the depths of 6.1 and 15.8 feet. Monterey Sand No. 3 was placed in the annulus around the casing from 5.1 to 16.3 feet below ground surface. Bentonite was placed between 3.7 and 5.1 feet to seal the annulus between the sandpack and the surface seal (95 percent Portland Cement, 5 percent bentonite).

The well was developed on 17 November 1989 for a period of 2.5 hours. Approximately 70 gallons were purged before the water became relatively clear.

Monitoring Well MW-5

Monitoring Well MW-5 was installed on 16 November 1989, approximately 300 feet east of the western property line and 12 feet south of the northern property line (Figure 1.2). Well MW-5 was positioned along the northern property line in order to monitor contaminant migration from the former UFSTs on the adjacent property.

The pilot hole for Well MW-5 was advanced to a depth of 21.5 feet and obvious signs of hydrocarbon contamination were not observed. A brown silty clay, correlative to the one encountered in Wells MW-3 and MW-4, was penetrated between the depths of 17.3 and 20.8 feet. The bottom of the borehole was backfilled with bentonite between the depths of 17.5 and 20.8 feet. Well MW-5 was constructed with 4-inch PVC casing, slotted from 6.7 to 17.9 feet below ground surface. Monterey Sand No. 3 was placed in the annulus around the casing between the depths of 5.3 and 17.9 feet. Bentonite was placed between 3.8 and 5.3 feet to seal the annulus between the sand pack and the surface seal (95 percent Portland Cement, 5 percent bentonite).

Well MW-5 was developed on 17 November 1989 for a period of 2.5 hours. Approximately 165 gallons were evacuated before the water became relatively clear.

SITE HYDROGEOLOGY

Examination of borehole logs from Wells MW-2, MW-3, MW-4, and MW-5 indicate the 1650 65th Street property is underlain by approximately 11.5 and 22 feet of fill. Fill materials primarily consist of silty clay, silt, and fine sand with varying amounts of red brick, asphalt, concrete, cement, wood, and glass. The native materials underlying the fill are generally layers of fine sand, clay, and silty clay ranging from approximately 1 to 4 feet thick. A relatively impermeable brown silty clay is encountered at a depth of 16 to 18 feet in Wells MW-3, MW-4, and MW-5.

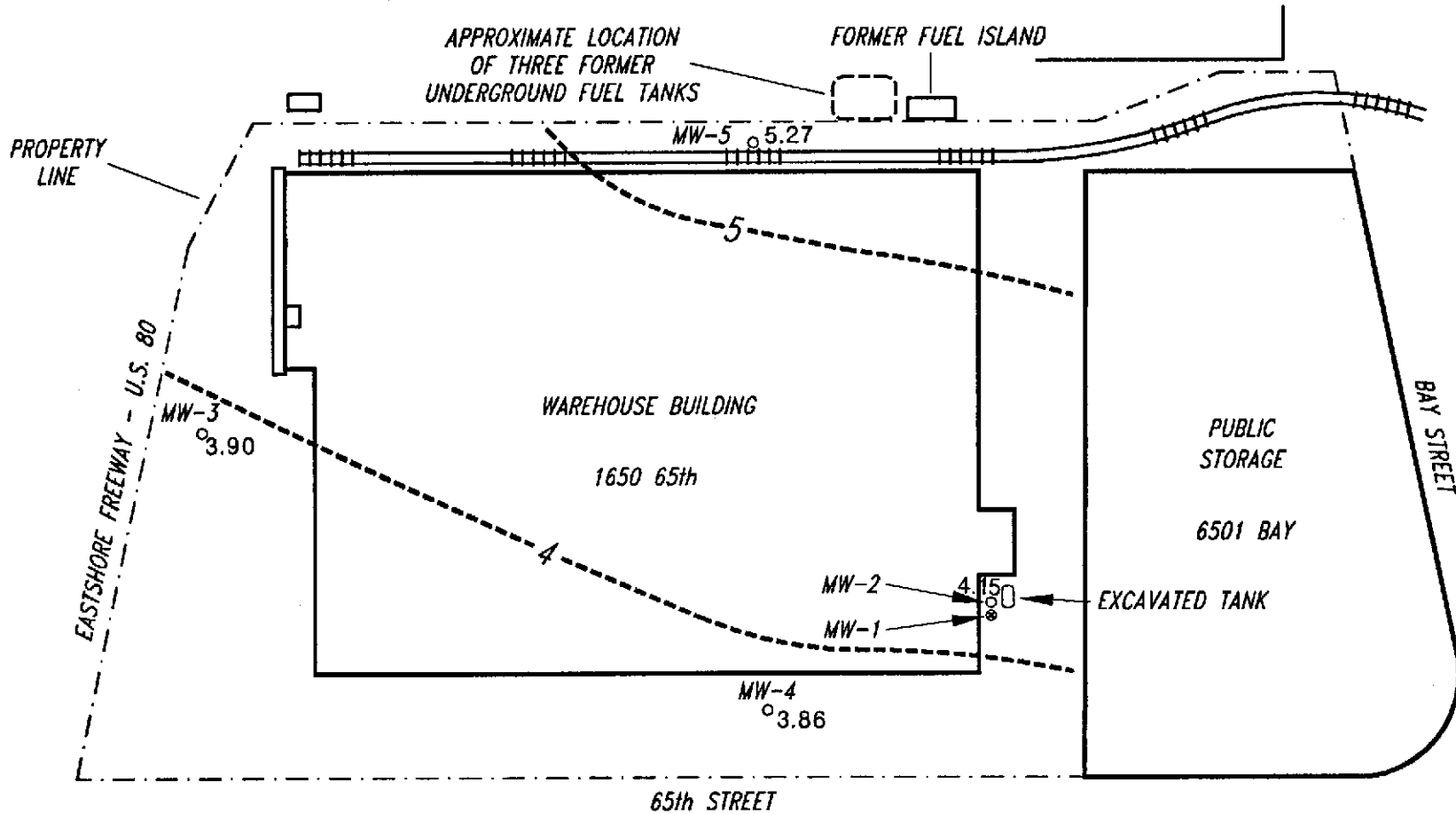
Groundwater is encountered at depths of 8 to 12 feet below the project site. Figure 3.1 shows the groundwater elevations (relative to mean sea level) measured in Wells MW-2, MW-3, MW-4, and MW-5 on 20 November 1989. The groundwater elevation contours show groundwater presently flows toward the southwest and south below the 1650 65th Street property.

SOIL SAMPLING AND ANALYSIS

Table 3.1 presents the analytical results for three soil samples collected during the installation of Wells MW-3, MW-4, and MW-5. One sample was collected at a depth of 4.5 to 5.5 feet from each well. Sampling protocol consisted of driving a clean sampler with 2.5-inch OD inner brass tube liners into undisturbed soil. When the sampler was removed from the hole, the appropriate inner brass tube liner was sealed at both ends with Teflon tape and non-reactive caps, refrigerated, and transported to a DHS certified hazardous waste laboratory. The soil samples from

GROUNDWATER ELEVATION CONTOURS

1650 65th Street Property
20 NOVEMBER 1989



- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK

---5--- GROUNDWATER ELEVATION CONTOUR

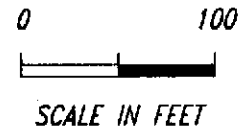


TABLE 3.1
SOIL SAMPLING ANALYTICAL RESULTS
Groundwater Monitoring Wells MW-3, MW-4, and MW-5
1650 65th Street Property
14, 15, and 16 November 1989

Contaminant	MW-3 (4.5 ft.)	MW-4 (5.5 ft.)	MW-5 (5.5 ft.)
<u>Organics</u>			
Gasoline (mg/Kg)	<10	<10	<10
Benzene (μ g/Kg)	<5	<5	<5
Toluene (μ g/Kg)	<5	10	<5
Total Xylenes (μ g/Kg)	<5	10	<5
Ethylbenzene (μ g/Kg)	<5	<5	<5
<u>Inorganics</u>			
Lead (mg/Kg)	NA	NA	25

NA = Not Analyzed

all three wells were analyzed by modified EPA Method 8015 for TPH (as gasoline) and by EPA Method 8020 for BTXE. The soil sample from Well MW-5 was also analyzed by EPA Method 8010 for purgeable halocarbons and by EPA Method 7420/7421 for lead. Appendix B contains the soil sampling analytical results and chain-of-custody records.

Gasoline was not detected (<10 mg/Kg) in the three soil samples. Low concentrations of toluene (10 μ g/Kg) and total xylenes (10 μ g/Kg) were detected in the soil sample collected from Well MW-4. A concentration of 25 mg/Kg lead was detected in the soil sample collected from Well MW-5. This concentration of lead is probably indicative of the composition of the local fill materials and may not represent contamination associated with leakage from a UFST.

GROUNDWATER SAMPLING AND ANALYSIS

On 20 and 21 November 1989 the quarterly groundwater monitoring program was initiated for the newly installed wells (MW-2, MW-3, MW-4, and MW-5). Well MW-2 was previously sampled on 2 and 16 October 1989 (Reference 4). The quarterly

groundwater monitoring program involves the measurement of water levels, collection of groundwater samples, and analysis of groundwater samples by a DHS certified hazardous waste laboratory. Groundwater sampling protocol and analytical results are discussed below.

Groundwater Sampling Protocol

Prior to sampling, the static water level in each well was measured using an electronic water level indicator. Groundwater sampling protocol followed recommended RWQCB guidelines for sampling "free-phase" floating product. A quartz Teflon bailer was used to collect a sample from the upper 6 inches of the water table. The sample was field-inspected for free product thickness and the presence of any odor or sheen.

The collection of dissolved product samples also followed recommended RWQCB guidelines. A minimum of three (3) well volumes were purged from the well prior to sampling. During the purging of the well, water temperature (T), hydrogen ion index (pH) and electric conductivity (EC) were monitored. These parameters were considered stabilized when the last two consecutive readings fell within the following ranges: ± 0.5 degrees C for T; ± 0.10 for pH; for electric conductivity, measurements should stabilize within ± 5.0 uhmos in the 0 to 500 uhmos range, ± 50 uhmos in the 0 to 5,000 range, and ± 500 uhmos in the 0 to 50,000 range. However, if the formation water parameter did not stabilize after purging 3 well volumes, purging continued until a maximum of 5 well volumes were evacuated.

Purging and sample collection was performed with a quartz Teflon bailer. Groundwater samples were transferred to appropriate containers, labelled, refrigerated, and transported to a DHS certified hazardous waste laboratory.

All sampling equipment was rinsed with Alconox solution (a detergent) and deionized water before and after the well was sampled. Purge-water was containerized on-site in clearly labeled, 55-gallon drums. Disposal of the purge water will be the responsibility of P.O. Partners. Groundwater sampling field notes are contained in Appendix D.

Groundwater Analytical Results

Groundwater samples were analyzed by modified EPA Method 8015 for TPH (as gasoline), EPA Method 601 for purgeable halocarbons, EPA Method 602 for purgeable aromatics, and EPA Method 7420/7421 for lead. Table 3.2 presents a summary of the analytical results, and Appendix B contains the complete analytical documentation including chain-of-custody records. Figures 3.2 to 3.6 illustrate the gasoline, benzene, toluene, xylenes, and ethylbenzene concentrations detected in Wells MW-2, MW-3, MW-4, and MW-5, and a brief description of each analyte is given below.

Total Petroleum Hydrocarbons as Gasoline

Figure 3.2 presents the dissolved gasoline concentrations detected in the four monitoring wells. Well MW-2 showed the maximum gasoline concentration (100,000 $\mu\text{g/L}$), and relatively minor concentrations of gasoline were detected in Wells MW-3

TABLE 3.2

GROUNDWATER SAMPLING ANALYTICAL RESULTS
Groundwater Monitoring Wells MW-2, MW-3, MW-4, and MW-5
1650 65th Street Property
20 and 21 November 1989

Contaminant	MW-2	MW-3	MW-4	MW-5	Drinking Water Regul. Limits	Site Cleanup Regul. Limits
<u>Organics (µg/L)</u>						
Gasoline	100,000	130	200	ND	NA	AD
Benzene	8,400	2.2	2.3	74	1 ¹	AD
Toluene	7,400	ND	ND	ND	100 ²	AD
Total Xylenes	13,000	3.0	ND	4.2	1,750 ¹	AD
Ethylbenzene	2,400	ND	ND	ND	680 ¹	AD
1,2-Dichloroethane	15	ND	ND	ND	0.5 ¹	AD
<u>Inorganics (mg/L)</u>						
Lead	0.05	ND	ND	ND	0.05 ³	AD

¹DHS Maximum Contaminant Level (MCL) in drinking water. California Administrative Code, Title 22, 6/1/89.

²DHS Recommended Drinking Water State Action Level (SAL), 6/1/89.

³U.S. EPA Maximum Contaminant Level - 40 CFR Parts 141, 142, and 143; National Primary and Secondary Drinking Water Regulations, 4/10/89.

"NA" indicates not applicable.

"ND" indicates nothing detected above the detection limit of analysis.

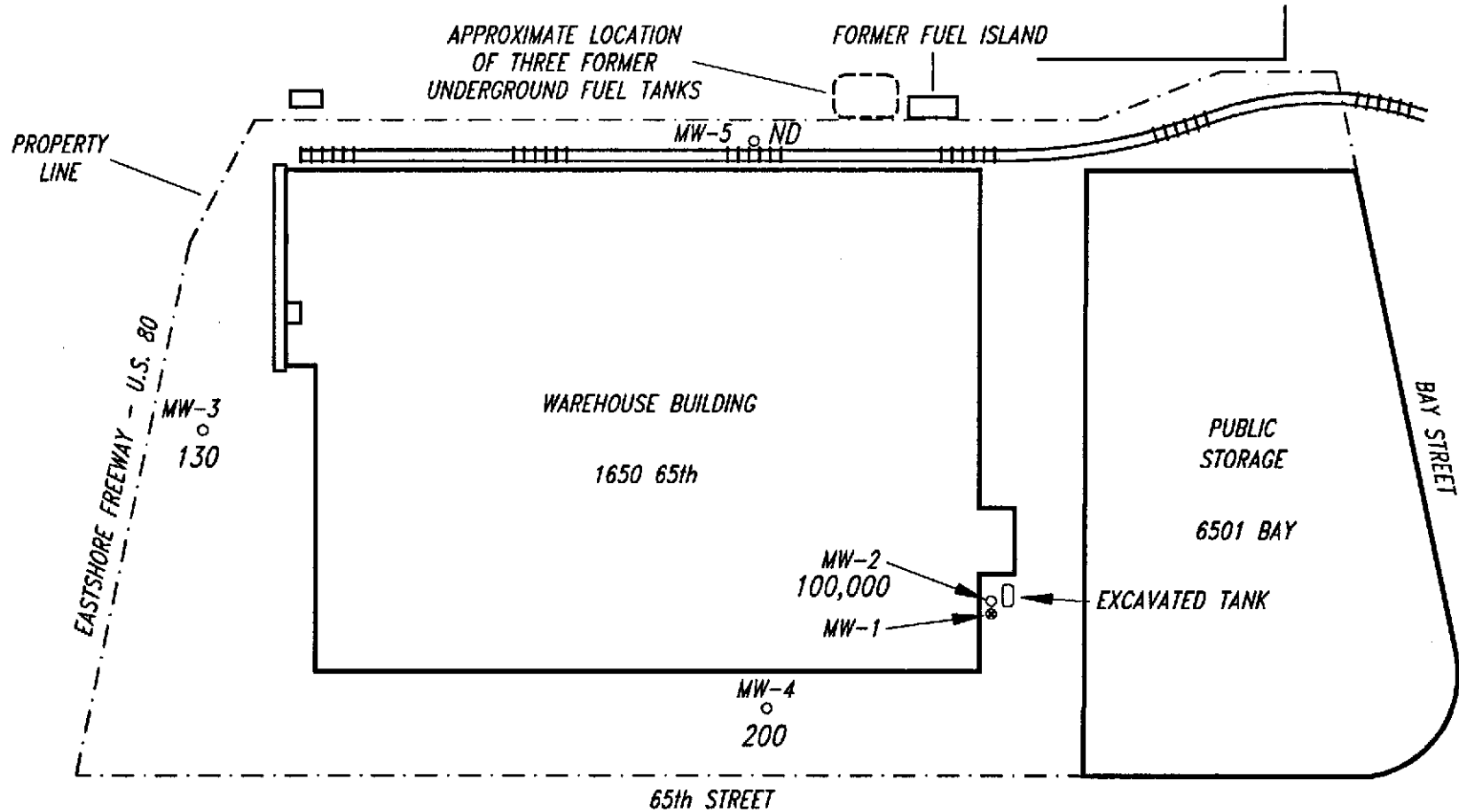
"AD" = Agency Derived: Determined on a site-by-site basis by the RWQCB and/or ACHD depending on beneficial uses of the affected groundwater and potential sensitive receptors.

(130 µg/L) and MW-4 (200 µg/L). Gasoline was not detected at or above the detection limit of 50 µg/L in Well MW-5.

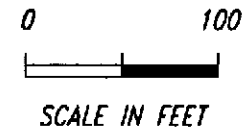
Benzene

Figure 3.3 shows that the maximum concentration of benzene was detected in Well MW-2 (8,400 µg/L). A significant concentration of benzene was also detected in Well MW-5 (74 µg/L). Low concentrations of benzene were detected in Wells MW-3 (2.2 µg/L) and MW-4 (2.3 µg/L).

**GASOLINE CONCENTRATIONS
GROUNDWATER MONITORING WELLS MW-2, MW-3, MW-4 and MW-5
1650 65th Street Property
20 and 21 NOVEMBER 1989(ug/L)**



- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK

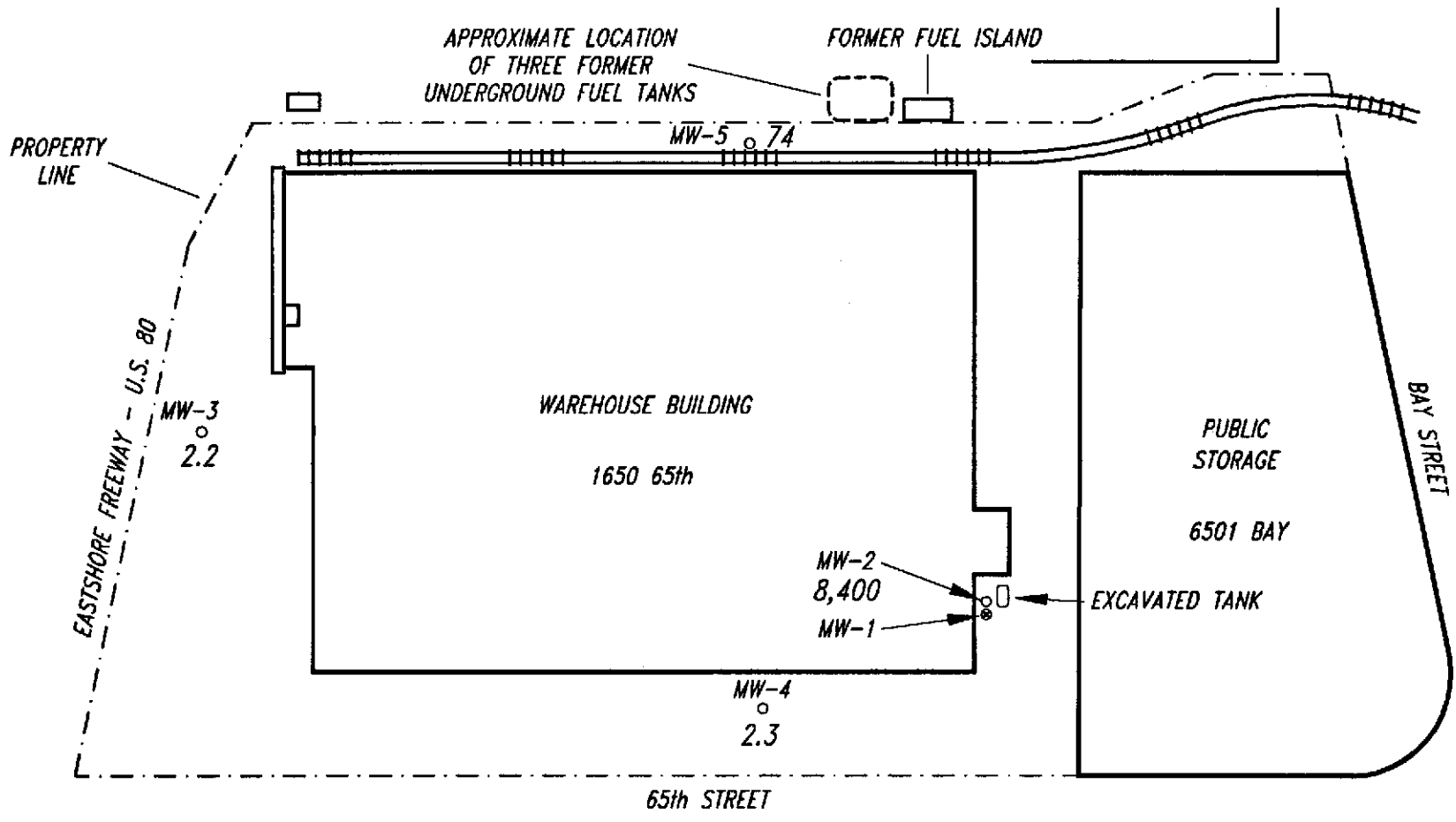


BENZENE CONCENTRATIONS

GROUNDWATER MONITORING WELLS MW-2, MW-3, MW-4 and MW-5

1650 65th Street Property

20 and 21 NOVEMBER 1989(ug/L)



- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK



ENGINEERING-SCIENCE

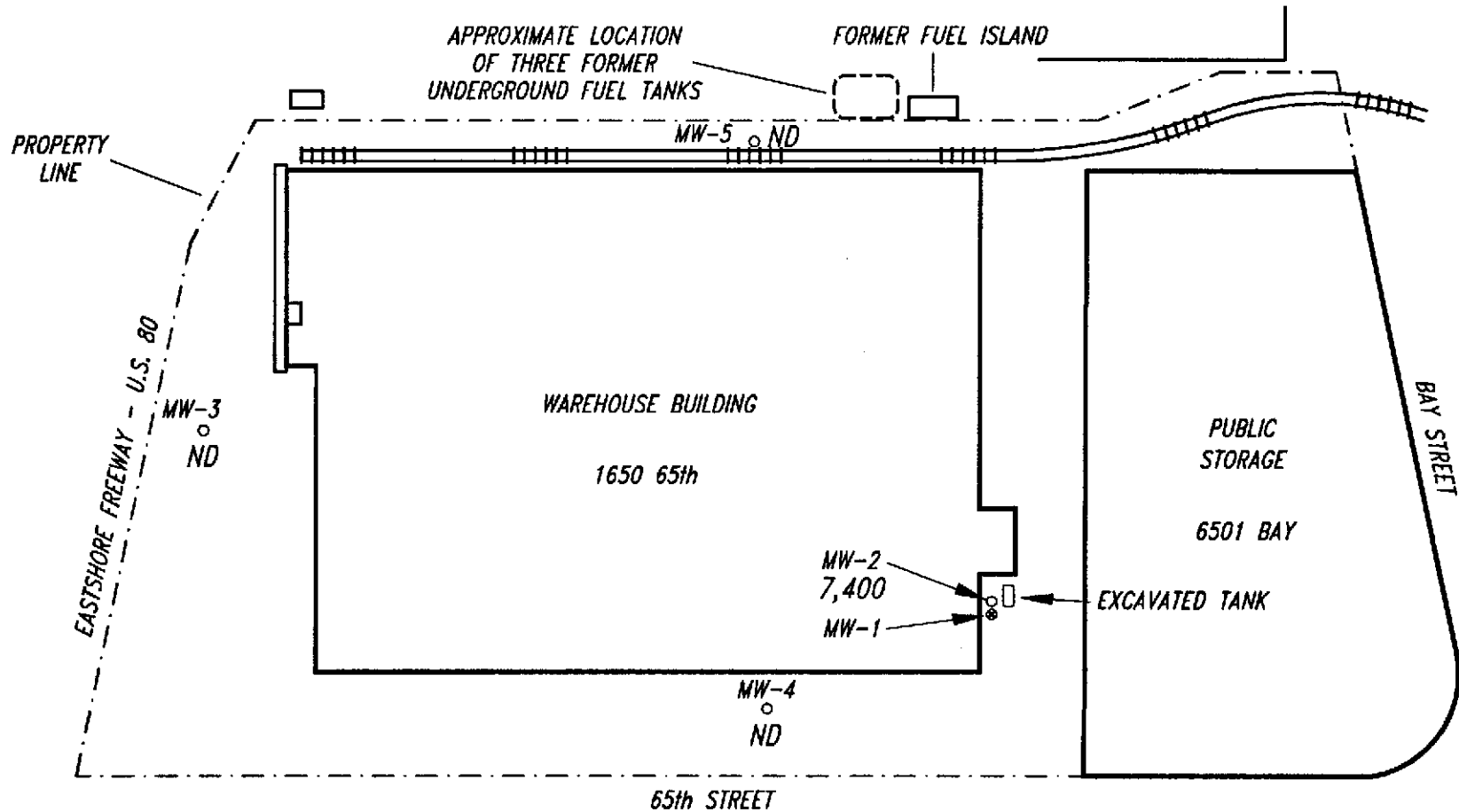
FIGURE 3.3

TOLUENE CONCENTRATIONS

GROUNDWATER MONITORING WELLS MW-2, MW-3, MW-4 and MW-5

1650 65th Street Property

20 and 21 NOVEMBER 1989(ug/L)



- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK



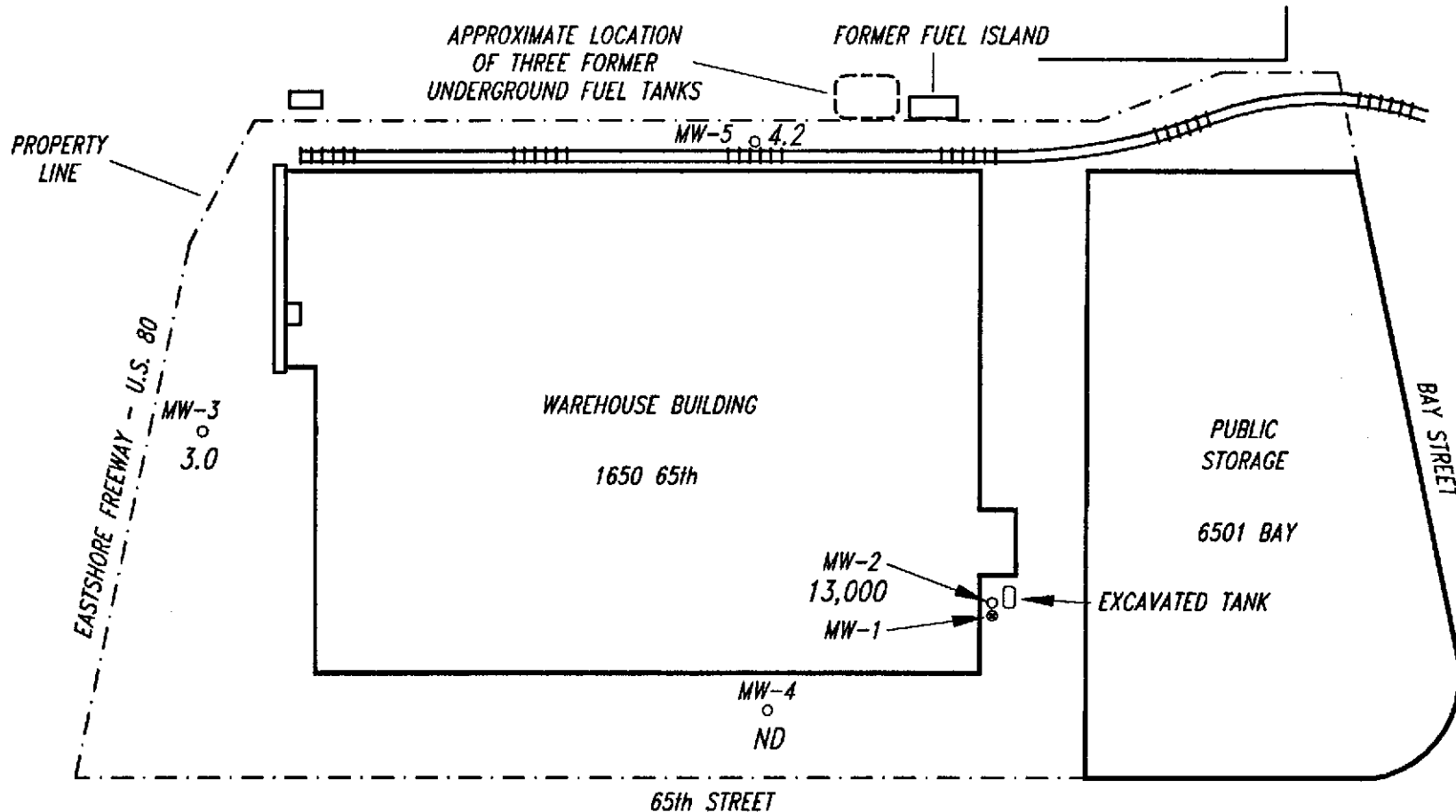
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SCALE IN FEET

XYLENES CONCENTRATIONS

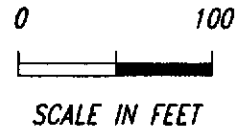
GROUNDWATER MONITORING WELLS MW-2, MW-3, MW-4 and MW-5

1650 65th Street Property

20 and 21 NOVEMBER 1989(ug/L)



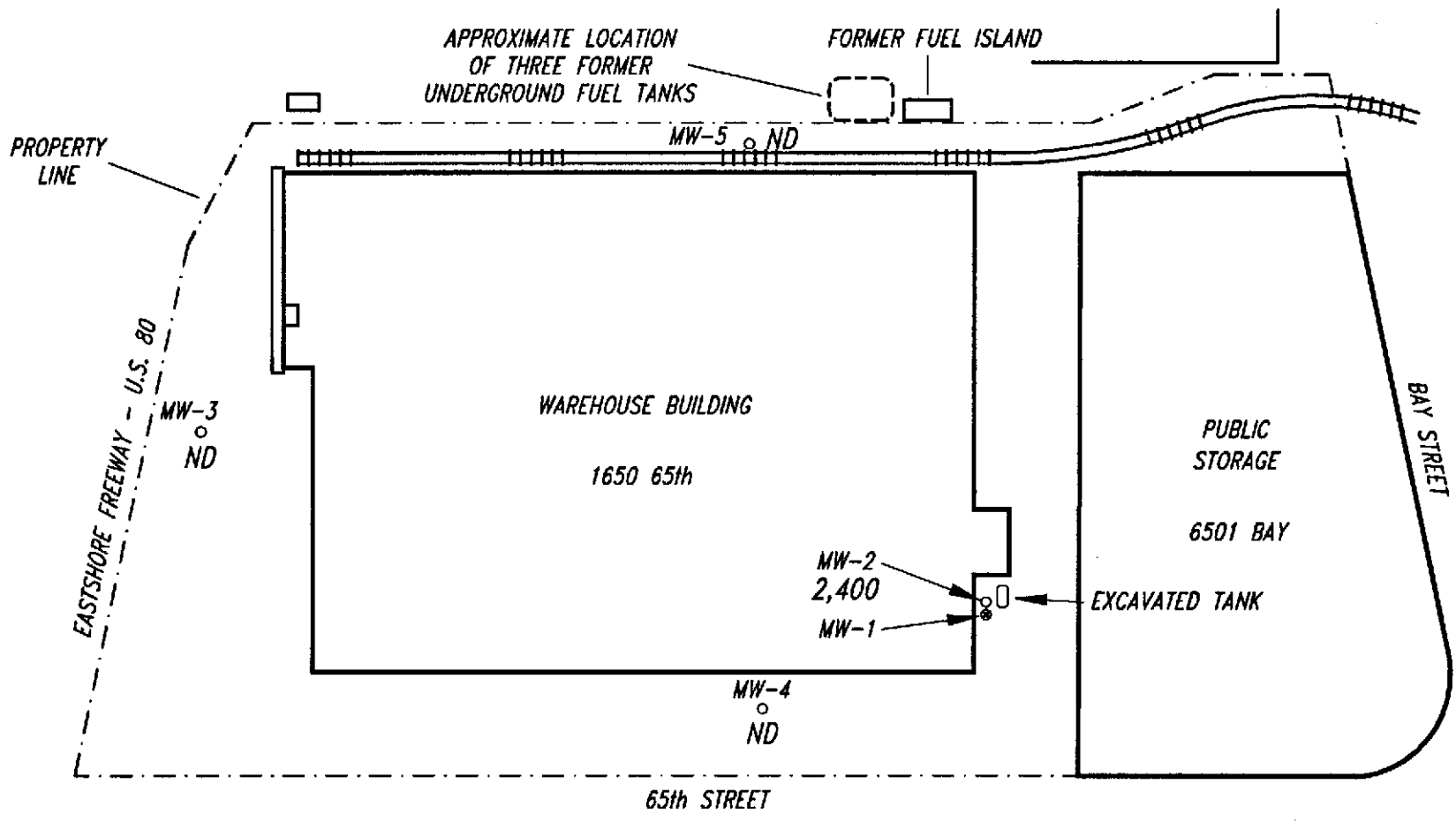
- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK



ENGINEERING—SCIENCE

FIGURE 3.5

ETHYLBENZENE CONCENTRATIONS
GROUNDWATER MONITORING WELLS MW-2, MW-3, MW-4 and MW-5
1650 65th Street Property
20 and 21 NOVEMBER 1989(ug/L)



- LEGEND:**
- FORMER MONITORING WELL
 - MONITORING WELL
 - EXCAVATED TANK



ENGINEERING-SCIENCE

FIGURE 3.6

Toluene

The maximum concentration of toluene (Figure 3.4) was detected in Well MW-2 (7,400 $\mu\text{g/L}$). Toluene was not detected in Wells MW-3, MW-4, and MW-5.

Total Xylenes

The maximum concentration of total xylenes (Figure 3.5) was detected in Well MW-2 (13,000 $\mu\text{g/L}$). Low concentration of total xylenes were present in Wells MW-3 (3.0 $\mu\text{g/L}$) and MW-5 (4.2 $\mu\text{g/L}$) and xylenes were not detected in Well MW-4.

Ethylbenzene

The maximum concentration of ethylbenzene (Figure 3.6) was detected in Well MW-2 (2,400 $\mu\text{g/L}$). Ethylbenzene was not detected in Wells MW-3, MW-4, and MW-5.

Other Contaminants

A 1,2-Dichloroethane concentration of 15 $\mu\text{g/L}$ was detected in Well MW-2. Purgeable halocarbons were not detected in Wells MW-3, MW-4, and MW-5. A trace concentration of lead was also detected in Well MW-2 (0.05 $\mu\text{g/L}$). Lead was not detected in Wells MW-3, MW-4, and MW-5.

Interpretation of Analytical Results

The groundwater analytical results for Wells MW-2, MW-3, MW-4, and MW-5 are generally consistent with the results of the groundwater "grab" sample survey. A limited extent of lateral dispersion to the west from the off-site UFSTs and localized contaminant concentrations of concern associated with the on-site UFST are indicated. Only low concentrations of gasoline and BTXE appear to have migrated relatively far from the on-site source near Well MW-2. Relatively low concentrations of gasoline and BTXE were detected in Wells MW-3 and MW-4. The highest trace concentration of benzene (74 $\mu\text{g/L}$) was detected in Well MW-5. This concentration is probably associated with the adjacent off-site contamination as corroborated by GW-8 data and groundwater elevation data (Figure 3.1).

The minor hydrocarbon contamination detected in Wells MW-3 and MW-4 may originate, in part, from the former UFSTs on the adjacent property or unidentified sources north or northeast of the 1650 65th Street property. Presently, the local groundwater flow direction is toward the south and southwest beneath the 1650 65th Street property (Figure 3.1). Monitoring Wells MW-3 and MW-4 are located down-gradient from contamination detected in Well MW-5 and groundwater "grab" sample GW-8 and, therefore, may also intercept hydrocarbon contamination migrating from an off-site source north or northeast of the property.

SECTION 4

SUMMARY AND CONCLUSIONS

The following summary and conclusions are based on observations delineated in the body of this report.

- On 28 and 29 September 1989, Well MW-2 was installed within 10 feet of the former leaking 2,000-gallon UFST near the southeast corner of the 1650 65th Street property. The purpose of the well was to evaluate whether residual hydrocarbon contamination underlying the former UFST has impacted groundwater underlying the site. Groundwater samples collected from Well MW-2 on 2 and 16 October showed elevated levels of dissolved gasoline (120 and 77 mg/L) and concentrations of BTXE that exceed regulatory "action limits" for drinking water. Based on these results further site characterization was implemented.
- A groundwater "grab" sample survey was conducted on 10 November 1989 to assess the optimum monitoring well locations for the 1650 65th Street property. The lateral extent of hydrocarbon contamination underlying the property and potential off-site sources of contamination were also evaluated.
- Groundwater "grab" samples were collected at depths of 7.5 to 11 feet below ground surface on each side of the 1650 65th Street property. The samples were analyzed by modified EPA Method 8015 for TPH (as gasoline) and by EPA Method 602 for BTXE. Gasoline concentrations were relatively low, ranging from below detection to 0.17 mg/L at 7 of the 8 sample locations. A concentration of 9,400 mg/L was detected in a product sample collected from sample location GW-8, which is located near the northeast property line and former UFSTs on the adjacent property. Significant concentrations of BTXE are likely present in the product sample, however, the detection limits for BTXE in the product sample were very high, ranging from 50,000 to 100,000 $\mu\text{g/L}$. BTXE concentrations were relatively low at the other 7 sample locations. Only benzene, which ranged from below detection to 4.7 $\mu\text{g/L}$, was detected at concentrations exceeding regulatory action limits for drinking water.
- On 14 to 17 November 1989, three wells (MW-3, MW-4, MW-5) were installed on the 1650 65th Street site to monitor groundwater quality on the north (MW-5) west (MW-3), and south (MW-4) sides of the property, characterize subsurface materials, and determine hydrogeologic conditions (local groundwater flow direction).

- During drilling of the pilot holes for Wells MW-3, MW-4, and MW-5, one analytical soil sample was collected at a depth of 4.5 to 5.5 feet in each borehole. The soil samples from each well were analyzed by modified EPA Method 8015 for TPH (as gasoline) and EPA Method 8020 for BTXE. The soil sample from Well MW-5 was also analyzed by EPA Method 8010 for purgeable halocarbons and EPA Method 7420/7421 for lead. Minor concentrations of toluene (10 µg/L) and total xylenes (10 µg/L) were detected in Well MW-4. Lead (25 mg/Kg), significantly lower than the DHS Total Threshold Limit Concentration (TTLC) of 1,000 mg/Kg, was detected in a soil sample collected from the pilot hole for Well MW-5.
- Examination of borehole logs from Wells MW-2, MW-3, MW-4, and MW-5 indicate the property is underlain by approximately 11.5 to 22 feet of fill. Fill materials primarily consist of silty clay, silt, and fine sand with varying amounts of red brick, asphalt, concrete, cement, wood, and glass. Native materials underlying the fill are generally layers of fine sand, clay and silty clay ranging from 1 to 4 feet thick. A relatively impermeable brown silty clay was encountered at a depth of 16 to 18 feet in the pilot holes for Wells MW-3, MW-5, and MW-5.
- Groundwater elevation data collected from Wells MW-2, MW-3, MW-4, and MW-5 on 20 November 1989 indicate that groundwater presently flows towards the southwest and south beneath the project site. Depth to groundwater varies from approximately 8 to 12 feet below ground surface.
- A quarterly groundwater monitoring program was implemented on 20 and 21 November 1989. Groundwater samples were analyzed by modified EPA Method 8015 for TPH (as gasoline), EPA Method 601 for purgeable halocarbons, EPA Method 602 for BTXE, and EPA Method 7420/7421 for lead. Maximum concentrations of gasoline (100,000 µg/L), benzene (8,400 µg/L), toluene (7,400 µg/L), total xylenes (13,000 µg/L), and ethylbenzene (2,400 µg/L) were detected in Well MW-2. Well MW-3 groundwater contained relatively low concentrations of gasoline (130 µg/L), benzene (2.2 µg/L), and xylenes (3.0 µg/L). Well MW-4 groundwater showed comparable contaminant levels with 200 µg/L gasoline and 2.3 µg/L benzene. Dissolved gasoline was not present in Well MW-5 groundwater, however, 74 µg/L benzene and 4.2 µg/L xylenes were detected. Lead (0.05 mg/L) was only detected in Well MW-2. 1,2-Dichloroethane, detected in Well MW-2 at a concentration of 15 µg/L, was the only purgeable halocarbon identified in the groundwater samples.
- The groundwater analytical results for Wells MW-2, MW-3, MW-4, and MW-5 are generally consistent with the results of the groundwater "grab" sample survey. The relatively low concentrations detected in Wells MW-3 and MW-4 and groundwater "grab" samples bordering the south, west, and east sides of the property suggest that hydrocarbon contamination associated with the former 2,000-gallon UFST on the property has not migrated very far from the source area.

- Contamination detected in Well MW-5 and groundwater "grab" sample GW-8 likely originates from the former off-site UFSTs. The UFSTs on the adjacent property were removed in September/October 1989 and groundwater in the open excavation contains a thin layer of floating hydrocarbon product that has the same appearance and odor as the product sample collected at sample location GW-8.
- The relatively low hydrocarbon contamination detected in Wells MW-3 and MW-4 and at groundwater "grab" sample locations west of Well MW-2 may originate, in part, from off-site source(s) north and/or northeast of the 1650 65th Street property. Presently, the local groundwater flow direction is towards the southwest and south, which places Wells MW-3 and MW-4 downgradient from the former UFSTs on the adjacent property and the floating product detected at sample location GW-8.

SECTION 5

RECOMMENDATIONS

Concentrations of gasoline and BTXE detected in Well MW-2 will be of regulatory concern to Alameda County Environmental Health Department (ACEHD) and the Regional Water Quality Control Board (RWQCB). Concentrations of BTXE are significantly greater than regulatory limits established by DHS for drinking water. Evaluations of gasoline impacts on groundwater and/or public health are conducted by the RWQCB on a case-by-case basis, considering such factors as depth to groundwater and potential beneficial uses of the affected groundwater. In consideration of the significant gasoline and BTXE concentrations detected in Well MW-2, groundwater remediation is likely to be required in the vicinity of Well MW-2.

Ideally, a year of groundwater monitoring to gather more information on the hydrochemistry and hydrologic properties of the local groundwater body should be completed before developing and implementing remediation plans. However, ES understands that P. O. Partners plans to start renovating the property in January 1990 and has requested a preliminary remedial plan. P. O. Partners wants to avoid any unnecessary impacts to their renovation plans that might be caused by the installation of a groundwater treatment system.

Furthermore, the integration of planned construction activities in 1990 with the installation of a groundwater treatment system may be a very cost-effective means for satisfying both goals (redevelopment and environmental remediation).

ES recommends the following interim actions:

- Informing the adjacent property owner(s) to the north of the evidence of their responsibility for the contamination of the northeastern area of the 1650 65th Street property.
- Installation of a groundwater extraction well through the excavation backfill of the former 2,000-gallon on-site UFST.
- Performance of an aquifer pumping test to evaluate extraction rates and response.
- Evaluation of hydraulic containment/treatment alternatives.
- Completion of a Remedial Action Plan.

SECTION 6

REFERENCES

1. Engineering-Science, Inc., 1989, October 1989 Quarterly Groundwater Monitoring Results for the 1650 65th Street Property in Emeryville, California.
2. Engineering-Science, Inc., 1987, Underground Fuel Storage Tank Site Investigation near the Southeast Corner of the Warehouse Building, 1650 65th Street Property, Emeryville, California.
3. Engineering-Science, Inc., 1987, Soil Remediation Plan for the Southeastern Corner of the 1650 65th Street Property, Emeryville, California.
4. Engineering-Science, Inc., 1988, Implementation of Remedial Action Plan Report for United States Postal Service at 1650 65th Street, Emeryville, California.



PHOTO 1

EMPLACEMENT OF SAMPLING PROBE AT GROUNDWATER
"GRAB" SAMPLE LOCATION GW-3



PHOTO 2

BENT SAMPLING PROBE FROM DRILL REFUSAL NEAR GROUNDWATER
"GRAB" SAMPLE LOCATION GW-4

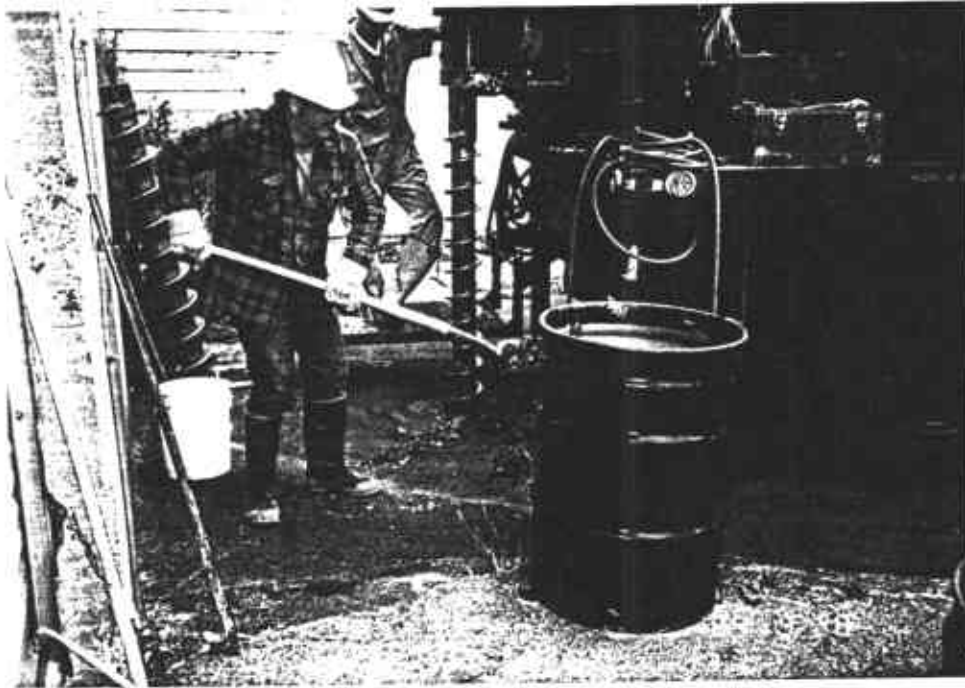


PHOTO 5

DRILLING PILOT HOLE FOR MONITORING WELL MW-2



PHOTO 6

STEAM CLEANING AUGER AFTER COMPLETION OF MONITORING WELL MW-2

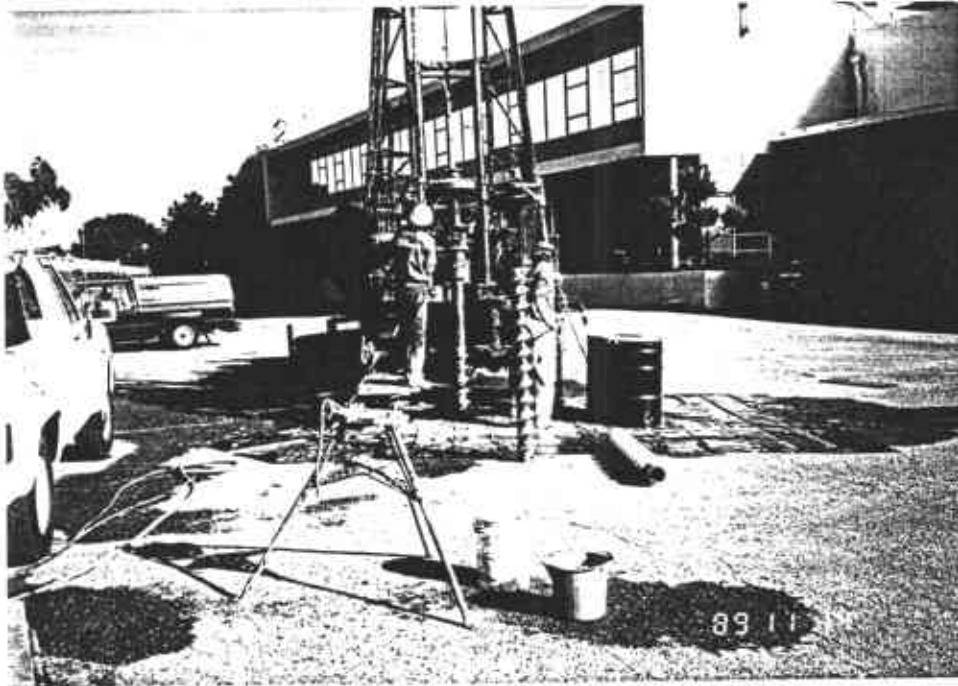


PHOTO 7

DRILLING PILOT HOLE FOR MONITORING WELL MW-3



PHOTO 8

DRILLING PILOT HOLE FOR MONITORING WELL MW-5



PHOTO 9

STEAM CLEANING PVC CASING PRIOR TO CONSTRUCTION OF MONITORING
WELL MW-4

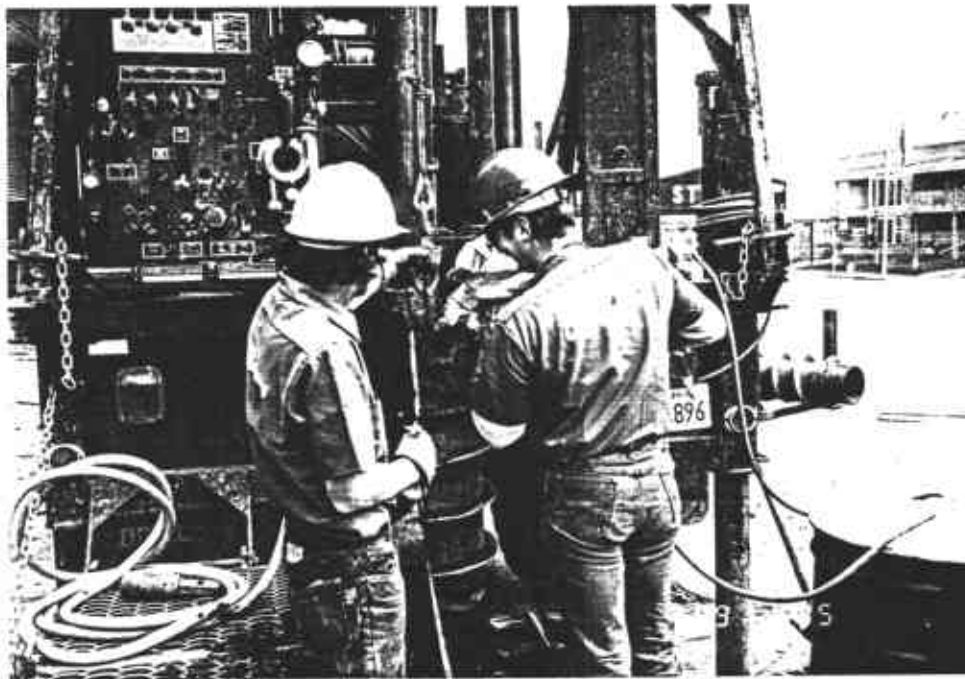


PHOTO 10

EMPLACEMENT OF SAND PACK, MONITORING WELL MW-4

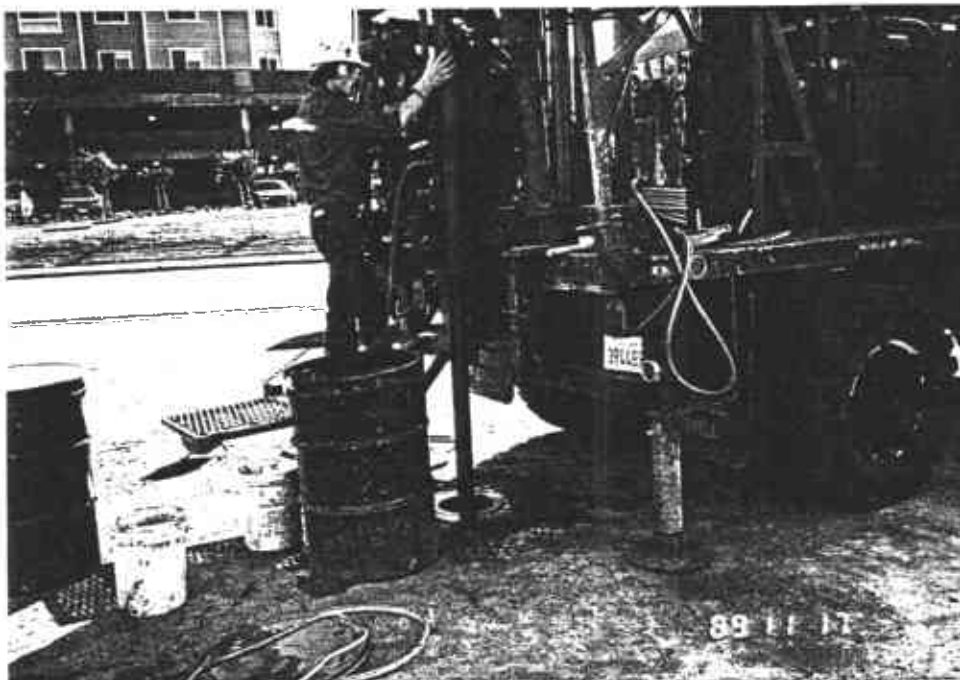


PHOTO 11

DEVELOPMENT OF MONITORING WELL MW-4 WITH 4-INCH
O.D. STEEL BAILER



PHOTO 12

REDEVELOPMENT OF MONITORING WELL MW-2
WITH 2-INCH O.D. PVC BAILER



Engineering Science, Inc.
600 Bancroft Way
Berkeley, CA 94710

November 13, 1989
Acurex ID: 8911056
Client PO: NC222.04
Page 1 of 3

Attention: Marcus L. Pierce

Subject: Analysis of 8 Water Samples, Received 11/10/89.

Water samples were analyzed for benzene, toluene, ethyl benzene, total xylenes (BTEX) and gasoline according to the guidelines established in the Regional Water Quality Control Board (RWQCB) Leaking Underground Fuel Tank (LUFT) manual. Results are presented in Table 1. The method for BTEX and gasoline can be summarized as follows:

An aliquot of sample is introduced into a purge and trap using a gas-tight syringe. Helium is bubbled through the water contained in a specially designed purging chamber. Low boiling petroleum hydrocarbons are efficiently transferred from aqueous phase to the vapor phase. After purging is completed, the sorbent column is heated and back-flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate BTEX and other components of gasoline. BTEX is detected using a photo ionization detector (PID) and gasoline is detected using a flame ionization detector (FID). Other petroleum hydrocarbons may be quantified using this technique.

If you should have any technical questions, please contact the undersigned at (415)964-0844.

Approved by: *M. Claire Ferguson, for*
Daniel L. Middleton
Client Services Manager

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. BTEX Results

	Engineering Science Sample ID				
	GW-2 S SIDE PROPERTY	GW-3 S SIDE PROPERTY	GW-5 W SIDE PROPERTY	GW-4 SW SIDE PROPERTY	GW-6 SE SIDE PROPERTY
Low Boiling Petroleum Hydrocarbons	ug/L	ug/L	ug/L	ug/L	ug/L
Benzene	2.9	3.0		<0.5	<0.5
Toluene	0.8	0.9	0.8	<0.5	<0.5
Ethylbenzene	<0.5	2.1	2.4	<0.5	<0.5
Total Xylenes	<1.0	<1.0	1.6	<1.0	2.3
	mg/L	mg/L	mg/L	mg/L	mg/L
Gasoline	<0.05	0.1	0.12	<0.05	<0.05
Date Analyzed:	11/11/89	11/11/89	11/11/89	11/11/89	11/13/89

Table 1. BTEX Results (Continued)

	Engineering Science Sample ID		
	GW-7 E SIDE PROPERTY	GW-8 N SIDE PROPERTY	GW-9 N SIDE PROPERTY
Low Boiling Petroleum Hydrocarbons	ug/L	ug/L	ug/L
Benzene	<0.5	<50000	4.7
Toluene	<0.5	<50000	<0.5
Ethylbenzene	<0.5	<50000	5.1
Total Xylenes	<1.0	<100000	<1.0
	mg/L	mg/L	mg/L
Gasoline	<0.05	94000	0.17
Date Analyzed:	11/11/89	11/11/89	11/11/89

ENGINEERING SCIENCE, INC.
CHAIN OF CUSTODY RECORD

8911-056

PAGE ___ OF ___

CLIENT: ENGINEERING-SCIENCE, INC. BERKELEY		PROJECT MANAGER: Marcus L. Pierce		PROJ. NO.: NC222.04		NO. OF CONTAINERS	ANALYSES REQUIRED							REMARKS		
PROJECT NAME / LOCATION: 1650 65TH Street Property, Emeryville							EPA method 8015 EPA 8020 for BTXE									
SAMPLER(S): (SIGNATURE) Marcus L. Pierce Marcus L. Pierce																
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION												
-1	GW-2	11/10/89	0935	H ₂ O	South Side of Property		3	X	X						24 hrs	
-2	GW-3	"	1015	"	South Side of Property		3	X	X						24 hrs	Need the results
-3	GW-5	"	1215	"	West Side of Property		3	X	X						24 hrs	by 13:00 on
-4	GW-4	"	1300	"	Southwest Side of Property		3	X	X						24 hrs	November 13, 1989
-5	GW-6	"	1430	"	Southeast Side of Property		3	X	X						24 hrs	
-6	GW-7	"	1530	"	East Side of Property		3	X	X						24 hrs	
-7	GW-8	"	1625	"	North Side of Property		3	X	X						Hold	Analyze for
-8	GW-9	"	1655	"	North Side of Property		3	X	X						24 hrs	TPH by EPA method 8015 and BTXE by EPA 8020
RELINQUISHED BY: (SIGNATURE) Marcus L. Pierce		DATE/TIME 11/10/89 1755		RECEIVED BY: (SIGNATURE) Burd In		RELINQUISHED BY: (SIGNATURE) Burd In		DATE/TIME 11/10/89 7:10 pm		RECEIVED BY: (SIGNATURE)						
RELINQUISHED BY: (SIGNATURE)		DATE/TIME		RECEIVED FOR LABORATORY BY: (SIGNATURE) McClair Ferguson		DATE/TIME 11/10/89 7:10 pm		REMARKS								

**SOIL SAMPLE
ANALYTICAL RESULTS FOR
MONITORING WELLS MW-3, MW-4, AND MW-5**



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 18698
 CLIENT: ENGINEERING SCIENCE
 JOB NUMBER: NC222.04

DATE RECEIVED: 11/14/89
 DATE ANALYZED: 11/15/89
 DATE REPORTED: 11/15/89

Total Volatile Hydrocarbons (TVH) by EPA 8015
 Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
 Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
18698-1	MW3-4.5'	ND(10)	ND(5)	ND(5)	ND(5)	ND(5)

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD 2
 %RECOVERY 84

[Signature]
 QA/QC OFFICER
[Signature]
 LABORATORY DIRECTOR



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

LABORATORY NUMBER: 18711
 CLIENT: ENGINEERING SCIENCE
 JOB NUMBER: NC222.04

DATE RECEIVED: 11/15/89
 DATE ANALYZED: 11/17/89
 DATE REPORTED: 11/20/89

Total Volatile Hydrocarbons (TVH) by EPA 8015
 Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
 Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
18711-1	MW4-5.5'	ND(10)	ND(5)	10	ND(5)	10

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	<1
%RECOVERY	84

M. E. Printera
 QA/QC OFFICER

Jim Way for CPB
 LABORATORY DIRECTOR



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 11/17/89
DATE REPORTED: 11/21/89
PAGE 1 OF 4

LAB NUMBER: 18743

CLIENT: ENGINEERING SCIENCE

REPORT ON: 1 SOIL SAMPLE

JOB #: NC222.04

RESULTS: SEE ATTACHED

M. S. Priitera
QA/QC Officer

Jon Wengler (BG)
Laboratory Director

LABORATORY NUMBER: 18743
 CLIENT: ENGINEERING SCIENCE
 JOB NUMBER: NC222.04

DATE RECEIVED: 11/17/89
 DATE ANALYZED: 11/20/89
 DATE REPORTED: 11/21/89
 PAGE 2 OF 4

Total Volatile Hydrocarbons (TVH) by EPA 8015
 Benzene, Toluene, Ethyl Benzene, Xylenes by EPA 8020
 Extraction by EPA 5030 Purge and Trap

LAB ID	CLIENT ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
18743-1	MW5-5.5'	ND (10)	ND (5)	ND (5)	ND (5)	ND (5)

ND = None Detected; Limit of detection is indicated in parentheses.

QA/QC SUMMARY

%RPD	2
%RECOVERY	86

LABORATORY NUMBER: 18743
CLIENT: ENGINEERING SCIENCE
PROJECT #: NC222.04

DATE RECEIVED: 11/17/89
DATE ANALYZED: 11/21/89
DATE REPORTED: 11/21/89
PAGE 3 OF 4

=====
ANALYSIS: LEAD
METHOD REFERENCE: EPA 7420
=====

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
18743-1	MW5-5.5'	25	mg/Kg	2.5

QA/QC:

=====
RPD, % 3
RECOVERY, % 104
=====

CHAIN OF CUSTODY RECORD

CLIENT: ENGINEERING-SCIENCE, INC. BERKELEY		PROJECT MANAGER: Marcus L. Pierce		PROJ. NO.: NC222.04		NO. OF CONTAINERS	ANALYSES REQUIRED				PRESERVED TO BE COMPOSITED BY LAB TURNAROUND TIME	REMARKS			
PROJECT NAME / LOCATION: P.O. Partners 1650 65TH Street, Emeryville							1	X	X	X			X	48hr	
SAMPLER(S): (SIGNATURE) Marcus L. Pierce <i>Marcus L. Pierce</i>															
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION											
MW5-55	11/16/89	0930	Soil	Monitoring Well MW-5											
RELINQUISHED BY: (SIGNATURE)		DATE/TIME		RECEIVED BY: (SIGNATURE)		RELINQUISHED BY: (SIGNATURE)		DATE/TIME		RECEIVED BY: (SIGNATURE)					
RELINQUISHED BY: (SIGNATURE)		DATE/TIME		RECEIVED FOR LABORATORY BY: (SIGNATURE)		DATE/TIME		REMARKS							
<i>Marcus L. Pierce</i>		11/17/89		<i>Berinda Peters</i>		11/7/89									

**GROUNDWATER
ANALYTICAL RESULTS FOR
MONITORING
WELLS MW-2, MW-3, MW-4, AND MW-5**



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 11/20/89
DATE REPORTED: 11/27/89
PAGE 1 OF 6

LAB NUMBER: 18764

CLIENT: ENGINEERING SCIENCE

REPORT ON: 1 WATER SAMPLE

JOB #: NC222.04

RESULTS: SEE ATTACHED

M. Z. Printers

QA/QC Officer

Jon Wang for 1B6

Laboratory Director



LABORATORY NUMBER: 18764
CLIENT: ENGINEERING SCIENCE
PROJECT #: NC222.04

DATE RECEIVED: 11/20/89
DATE ANALYZED: 11/22/89
DATE REPORTED: 11/27/89
PAGE 2 OF 6

Extractable Petroleum Hydrocarbons in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 3510

LAB ID	CLIENT ID	KEROSENE (mg/L)	DIESEL (mg/L)	OTHER (mg/L)
18764-1	MW-4	ND(0.5)	ND(0.5)	ND(0.5)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

RPD, %	14
Spike: % Recovery	95



LABORATORY NUMBER: 18764
CLIENT: ENGINEERING SCIENCE
JOB #: NC222.04

DATE RECEIVED: 11/20/89
DATE ANALYZED: 11/22/89
DATE REPORTED: 11/27/89
PAGE 3 OF 6

Total Volatile Hydrocarbons as Gasoline in Aqueous Solutions
EPA 8015 (Modified)
Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	GASOLINE (ug/L)
18764-1	MV-4	200

QA/QC SUMMARY

Duplicate: Relative % Difference	2
Spike: % Recovery	86

LABORATORY NUMBER: 18764-1
 CLIENT: ENGINEERING SCIENCE
 PROJECT #: NC222.04
 SAMPLE ID: MW-4

DATE RECEIVED: 11/20/89
 DATE ANALYZED: 11/21/89
 DATE REPORTED: 11/27/89
 PAGE 4 OF 6

EPA 601
Purgeable Halocarbons in Water

Compound	Result ug/L	LOD ug/L
chloromethane	ND	10
bromomethane	ND	10
vinyl chloride	ND	10
chloroethane	ND	10
methylene chloride	ND	10
trichlorofluoromethane	ND	10
1,1-dichloroethene	ND	10
1,1-dichloroethane	ND	10
1,2-dichloroethene (total)	ND	10
chloroform	ND	10
freon 113	ND	10
1,2-dichloroethane	ND	10
1,1,1-trichloroethane	ND	10
carbon tetrachloride	ND	10
bromodichloromethane	ND	10
1,2-dichloropropane	ND	10
cis-1,3-dichloropropene	ND	10
trichloroethylene	ND	10
1,1,2-trichloroethane	ND	10
cis-1,3-dichloropropene	ND	10
dibromochloromethane	ND	10
2-chloroethylvinyl ether	ND	10
bromoform	ND	10
tetrachloroethene	ND	10
1,1,2,2-tetrachloroethane	ND	10
chlorobenzene	ND	10
1,3-dichlorobenzene	ND	10
1,2-dichlorobenzene	ND	10
1,4-dichlorobenzene	ND	10

ND = None Detected. Limit of detection (LOD) in last column.

QA/QC:

Duplicate: Relative % Difference	<1
Average Spike Recovery %	81

LABORATORY NUMBER: 18764
 CLIENT: ENGINEERING SCIENCE
 JOB #: NC222.04
 SAMPLE ID: MW-4

DATE RECEIVED: 11/20/89
 DATE ANALYZED: 11/21/89
 DATE REPORTED: 11/27/89
 PAGE 5 OF 6

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene.....	2.3	1
Toluene.....	ND	1
Ethyl Benzene.....	ND	1
Total Xylenes.....	ND	1
Chlorobenzene.....	ND	1
1,4-Dichlorobenzene.....	ND	1
1,3-Dichlorobenzene.....	ND	1
1,2-Dichlorobenzene.....	ND	1

ND = None Detected

QA/QC SUMMARY

RPD %	<1
SPIKE RECOVERY %	81

LABORATORY NUMBER: 18764
CLIENT: ENGINEERING SCIENCE
PROJECT #: NC222.04

DATE RECEIVED: 11/20/89
DATE ANALYZED: 11/21/89
DATE REPORTED: 11/27/89
PAGE 6 OF 6

=====

ANALYSIS: LEAD
METHOD REFERENCE: EPA 7421

=====

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
18764-1	MW-4	ND	mg/L	0.05

ND = NONE DETECTED

QA/QC:

=====

RPD, %	2
RECOVERY, %	98

=====

ENGINEERING - SCIENCE, INC.
CHAIN OF CUSTODY RECORD

CLIENT: ENGINEERING-SCIENCE, INC. BERKELEY			PROJECT MANAGER: <i>M. L. Pierce</i>			PROJ. NO.: <i>NK222.07</i>			NO. OF CONTAINERS	ANALYSES REQUIRED				PRESERVED TO BE COMPOSITED BY LAB TURNAROUND TIME	REMARKS	
PROJECT NAME / LOCATION: <i>1650 65TH Street Property, Emeryville</i>										<i>EPA Method 8013</i>	<i>EPA 602</i>	<i>EPA 601</i>	<i>EPA 7420/7421</i>			
SAMPLER(S): (SIGNATURE)																
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION												
<i>NW-4</i>	<i>11/24/89</i>	<i>16:00</i>	<i>water</i>						<i>6</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<i>* 24hrs *</i>		
RELINQUISHED BY: (SIGNATURE)			DATE/TIME		RECEIVED BY: (SIGNATURE)			RELINQUISHED BY: (SIGNATURE)			DATE/TIME		RECEIVED BY: (SIGNATURE)			
<i>[Signature]</i>			<i>11/20/89 17:17</i>		<i>[Signature]</i>			<i>[Signature]</i>			<i>11/24/89 5:15</i>		<i>[Signature]</i>			
RELINQUISHED BY: (SIGNATURE)			DATE/TIME		RECEIVED FOR LABORATORY BY: (SIGNATURE)			DATE/TIME		REMARKS						
<i>[Signature]</i>			<i>11/20/89 17:17</i>		<i>[Signature]</i>			<i>11/24/89 5:15</i>								



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (415) 486-0900

DATE RECEIVED: 11/21/89
DATE REPORTED: 11/27/89
PAGE 1 OF 9

LAB NUMBER: 18771

CLIENT: ENGINEERING-SCIENCE, INC.

REPORT ON: 3 WATER SAMPLES

JOB #: NC222.04
LOCATION: 1650 65TH ST., EMERYVILLE

RESULTS: SEE ATTACHED

M. S. Pinter

QA/QC Officer

Jim May for IPB

Laboratory Director

LABORATORY NUMBER: 18771
 CLIENT: ENGINEERING-SCIENCE, INC.
 JOB #: NC222.04
 LOCATION: 1650 65TH ST., EMERYVILLE

DATE RECEIVED: 11/21/89
 DATE ANALYZED: 11/22/89
 DATE REPORTED: 11/27/89
 PAGE 2 OF 9

Total Volatile Hydrocarbons as Gasoline in Aqueous Solutions
 EPA 8015 (Modified)
 Extraction Method: EPA 5030 (Purge & Trap)

LAB ID	CLIENT ID	GASOLINE (ug/L)
18771-1	MW-3	130
18771-2	MW-2	100,000
18771-3	MW-5	ND(50)

ND = Not Detected; Limit of detection in parentheses.

QA/QC SUMMARY

Duplicate: Relative % Difference	<1
Spike: % Recovery	84

LABORATORY NUMBER: 18771
CLIENT: ENGINEERING-SCIENCE, INC.
PROJECT #: NC222.04
LOCATION: 1650 65TH ST., EMERYVILLE

DATE RECEIVED: 11/21/89
DATE ANALYZED: 11/21/89
DATE REPORTED: 11/27/89
PAGE 3 OF 9

=====
ANALYSIS: LEAD
METHOD REFERENCE: EPA 7420
=====

LAB ID	SAMPLE ID	RESULT	UNITS	DETECTION LIMIT
18771-1	MW-3	ND	mg / L	0.05
18771-2	MW-2	0.05	mg / L	0.05
18771-3	MW-5	ND	mg / L	0.05

ND = NONE DETECTED

QA/QC:

=====
RPD, % 3
RECOVERY, % 104
=====



LABORATORY NUMBER: 18771-1
CLIENT: ENGINEERING-SCIENCE, INC.
PROJECT #: NC222.04
SAMPLE ID: MW-3

DATE RECEIVED: 11/21/89
DATE ANALYZED: 11/21/89
DATE REPORTED: 11/27/89
PAGE 4 OF 9

EPA 601
Purgeable Halocarbons in Water

Compound	Result ug/L	LOD ug/L
chloromethane	ND	1.0
bromomethane	ND	1.0
vinyl chloride	ND	1.0
chloroethane	ND	1.0
methylene chloride	ND	1.0
trichlorofluoromethane	ND	1.0
1,1-dichloroethene	ND	1.0
1,1-dichloroethane	ND	1.0
1,2-dichloroethene (total)	ND	1.0
chloroform	ND	1.0
freon 113	ND	1.0
1,2-dichloroethane	ND	1.0
1,1,1-trichloroethane	ND	1.0
carbon tetrachloride	ND	1.0
bromodichloromethane	ND	1.0
1,2-dichloropropane	ND	1.0
cis-1,3-dichloropropene	ND	1.0
trichloroethylene	ND	1.0
1,1,2-trichloroethane	ND	1.0
cis-1,3-dichloropropene	ND	1.0
dibromochloromethane	ND	1.0
2-chloroethylvinyl ether	ND	1.0
bromoform	ND	1.0
tetrachloroethene	ND	1.0
1,1,2,2-tetrachloroethane	ND	1.0
chlorobenzene	ND	1.0
1,3-dichlorobenzene	ND	1.0
1,2-dichlorobenzene	ND	1.0
1,4-dichlorobenzene	ND	1.0

ND = None Detected. Limit of detection (LOD) in last column.

QA/QC:

Duplicate: Relative % Difference
Average Spike Recovery %

3
88

LABORATORY NUMBER: 18771-2
 CLIENT: ENGINEERING-SCIENCE, INC.
 PROJECT #: NC222.04
 SAMPLE ID: MW-2

DATE RECEIVED: 11/21/89
 DATE ANALYZED: 11/21/89
 DATE REPORTED: 11/27/89
 PAGE 5 OF 9

EPA 601
 Purgeable Halocarbons in Water

Compound	Result ug/L	LOD ug/L
chloromethane	ND	10
bromomethane	ND	10
vinyl chloride	ND	10
chloroethane	ND	10
methylene chloride	ND	10
trichlorofluoromethane	ND	10
1,1-dichloroethene	ND	10
1,1-dichloroethane	ND	10
1,2-dichloroethene (total)	ND	10
chloroform	ND	10
freon 113	ND	10
1,2-dichloroethane	15	10
1,1,1-trichloroethane	ND	10
carbon tetrachloride	ND	10
bromodichloromethane	ND	10
1,2-dichloropropane	ND	10
cis-1,3-dichloropropene	ND	10
trichloroethylene	ND	10
1,1,2-trichloroethane	ND	10
cis-1,3-dichloropropene	ND	10
dibromochloromethane	ND	10
2-chloroethylvinyl ether	ND	10
bromoform	ND	10
tetrachloroethene	ND	10
1,1,2,2-tetrachloroethane	ND	10
chlorobenzene	ND	10
1,3-dichlorobenzene	ND	10
1,2-dichlorobenzene	ND	10
1,4-dichlorobenzene	ND	10

ND = None Detected. Limit of detection (LOD) in last column.

QA/QC:

Duplicate: Relative % Difference	3
Average Spike Recovery %	88



LABORATORY NUMBER: 18771-3
CLIENT: ENGINEERING-SCIENCE, INC.
PROJECT #: NC222.04
SAMPLE ID: MW-5

DATE RECEIVED: 11/21/89
DATE ANALYZED: 11/21/89
DATE REPORTED: 11/27/89
PAGE 6 OF 9

EPA 601
Purgeable Halocarbons in Water

Compound	Result ug/L	LOD ug/L
chloromethane	ND	1.0
bromomethane	ND	1.0
vinyl chloride	ND	1.0
chloroethane	ND	1.0
methylene chloride	ND	1.0
trichlorofluoromethane	ND	1.0
1,1-dichloroethene	ND	1.0
1,1-dichloroethane	ND	1.0
1,2-dichloroethene (total)	ND	1.0
chloroform	ND	1.0
freon 113	ND	1.0
1,2-dichloroethane	ND	1.0
1,1,1-trichloroethane	ND	1.0
carbon tetrachloride	ND	1.0
bromodichloromethane	ND	1.0
1,2-dichloropropane	ND	1.0
cis-1,3-dichloropropene	ND	1.0
trichloroethylene	ND	1.0
1,1,2-trichloroethane	ND	1.0
cis-1,3-dichloropropene	ND	1.0
dibromochloromethane	ND	1.0
2-chloroethylvinyl ether	ND	1.0
bromoform	ND	1.0
tetrachloroethene	ND	1.0
1,1,2,2-tetrachloroethane	ND	1.0
chlorobenzene	ND	1.0
1,3-dichlorobenzene	ND	1.0
1,2-dichlorobenzene	ND	1.0
1,4-dichlorobenzene	ND	1.0

ND = None Detected. Limit of detection (LOD) in last column.

QA/QC:

Duplicate: Relative % Difference
Average Spike Recovery %

3
88

LABORATORY NUMBER: 18771-1
 CLIENT: ENGINEERING-SCIENCE, INC.
 JOB #: NC222.04
 SAMPLE ID: MW-3

DATE RECEIVED: 11/21/89
 DATE ANALYZED: 11/21/89
 DATE REPORTED: 11/27/89
 PAGE 7 OF 9

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene.....	2.2	1.0
Toluene.....	ND	1.0
Ethyl Benzene.....	ND	1.0
Total Xylenes.....	3.0	1.0
Chlorobenzene.....	ND	1.0
1,4-Dichlorobenzene.....	ND	1.0
1,3-Dichlorobenzene.....	ND	1.0
1,2-Dichlorobenzene.....	ND	1.0

ND = None Detected

QA/QC SUMMARY

.....
 RPD % 3
 SPIKE RECOVERY % 88

LABORATORY NUMBER: 18771-2
 CLIENT: ENGINEERING-SCIENCE, INC.
 JOB #: NC222.04
 SAMPLE ID: MW-2

DATE RECEIVED: 11/21/89
 DATE ANALYZED: 11/21/89
 DATE REPORTED: 11/27/89
 PAGE 8 OF 9

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene.....	8,400	10
Toluene.....	7,400	10
Ethyl Benzene.....	2,400	10
Total Xylenes.....	13,000	10
Chlorobenzene.....	ND	10
1,4-Dichlorobenzene.....	ND	10
1,3-Dichlorobenzene.....	ND	10
1,2-Dichlorobenzene.....	ND	10

ND = None Detected

QA/QC SUMMARY

RPD %	3
SPIKE RECOVERY %	88

LABORATORY NUMBER: 18771-3
 CLIENT: ENGINEERING-SCIENCE, INC.
 JOB #: NC222.04
 SAMPLE ID: MW-5

DATE RECEIVED: 11/21/89
 DATE ANALYZED: 11/21/89
 DATE REPORTED: 11/27/89
 PAGE 9 OF 9

EPA 602: Volatile Aromatic Hydrocarbons in Water

COMPOUND	RESULT ug/L	DETECTION LIMIT ug/L
Benzene.....	74	1.0
Toluene.....	ND	1.0
Ethyl Benzene.....	ND	1.0
Total Xylenes.....	4.2	1.0
Chlorobenzene.....	ND	1.0
1,4-Dichlorobenzene.....	ND	1.0
1,3-Dichlorobenzene.....	ND	1.0
1,2-Dichlorobenzene.....	ND	1.0

ND = None Detected

QA/QC SUMMARY

 RPD % 3
 SPIKE RECOVERY % 88

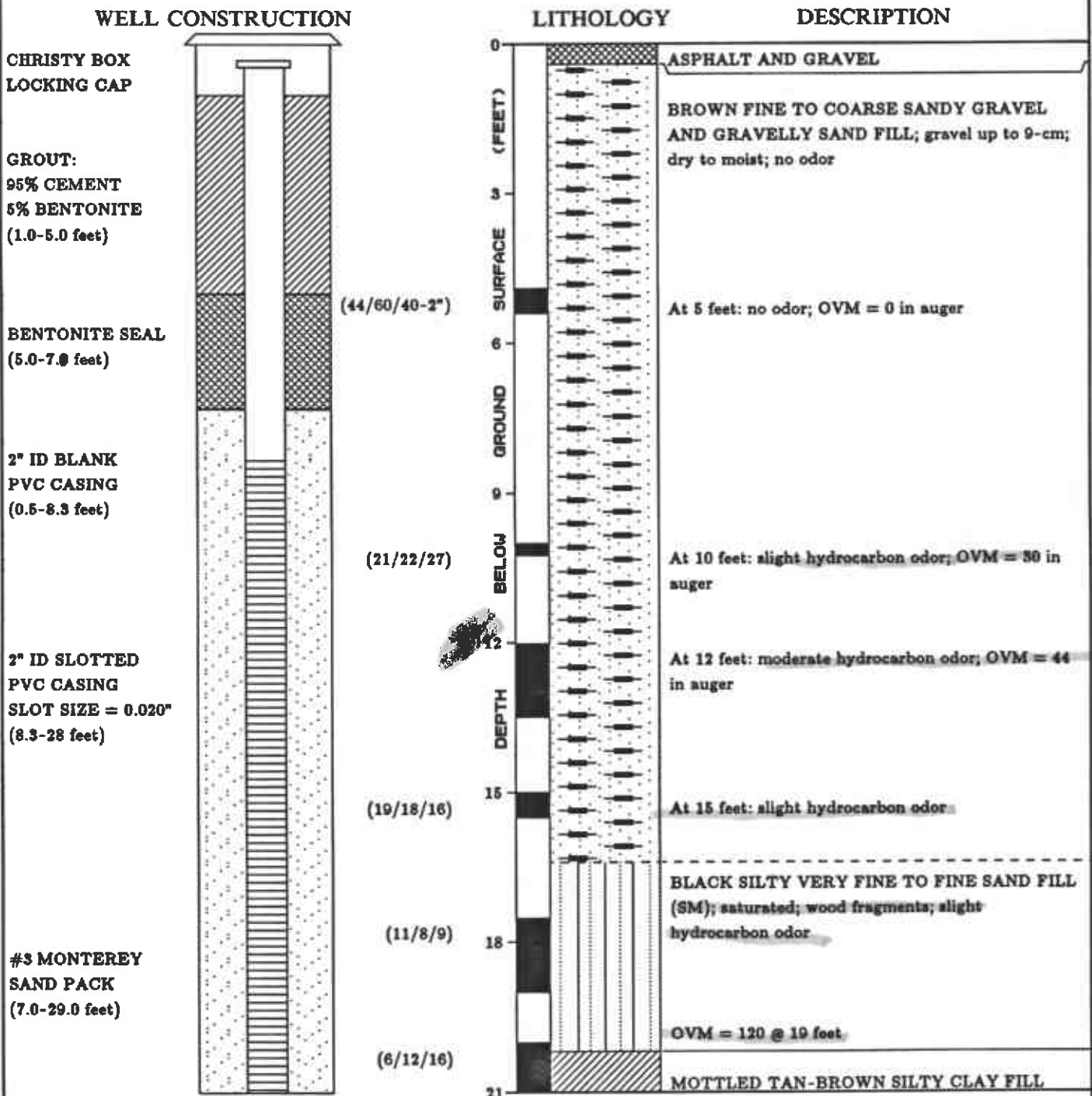
ENGINEERING SCIENCE INC.

CHAIN OF CUSTODY RECORD

CLIENT: ENGINEERING-SCIENCE, INC. BERKELEY				PROJECT MANAGER: <i>M.L. Pierce</i>		PROJ. NO.: <i>PL222-044</i>		NO. OF CONTAINERS	ANALYSES REQUIRED					PRESERVED	TO BE COMPOSITED BY LAB	TURNAROUND TIME	REMARKS		
PROJECT NAME / LOCATION: <i>1650 65th St, Emeryville</i>									EPA 601	EPA 602	EPA 603	EPA 605 Volatiles	EPA 7420/7421					24 HRS	* 24 HOUR TURNAROUND *
SAMPLER(S): (SIGNATURE) <i>[Signature]</i> <i>Marcus J. Pierce</i> <i>Marcus L. Pierce</i>																			
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION															
<i>MW-3</i>	<i>11/21/89</i>	<i>09:20</i>	<i>W</i>	<i>MW-3</i>				<i>7</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>						
<i>MW-2</i>	<i>11/21/89</i>	<i>10:00</i>	<i>W</i>	<i>MW-2</i>				<i>7</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>						
<i>MW-5</i>	<i>11/21/89</i>	<i>10:55</i>	<i>W</i>	<i>MW-5</i>				<i>7</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>	<i>✓</i>		<i>HOLD 1 Liter bottles for possible 8015 for extractables</i>				
RELINQUISHED BY: (SIGNATURE)				DATE/TIME		RECEIVED BY: (SIGNATURE)				DATE/TIME		RECEIVED BY: (SIGNATURE)							
RELINQUISHED BY: (SIGNATURE)				DATE/TIME		RECEIVED FOR LABORATORY BY: (SIGNATURE)				DATE/TIME		REMARKS							
<i>Marcus J. Pierce</i>				<i>11/21/89 11:20</i>		<i>Belinda Peters</i>				<i>11-21 11:20</i>									

CLIENT P.O. PARTNERS
 LOCATION 1650 65th STREET,
 EMERYVILLE, CALIFORNIA
 DATE 28 September 1989
 GEOLOGIST M.L. PIERCE

TEST HOLE NUMBER MW-2
 DRILLER ASE DRILLING, INC.
 DRILLING METHOD HOLLOW-STEM AUGER
 HOLE DIAMETER 8-INCHES



EXPLANATION

∇ Water level during drilling
 OVM Organic Vapor Meter Reading

--- Contact (dashed where approximate)
 ■ Location of sample

CLIENT P.O. PARTNERS

TEST HOLE NUMBER MW-2

LOCATION 1660 65th STREET,
EMERYVILLE, CALIFORNIA

DRILLER ASE DRILLING, INC.

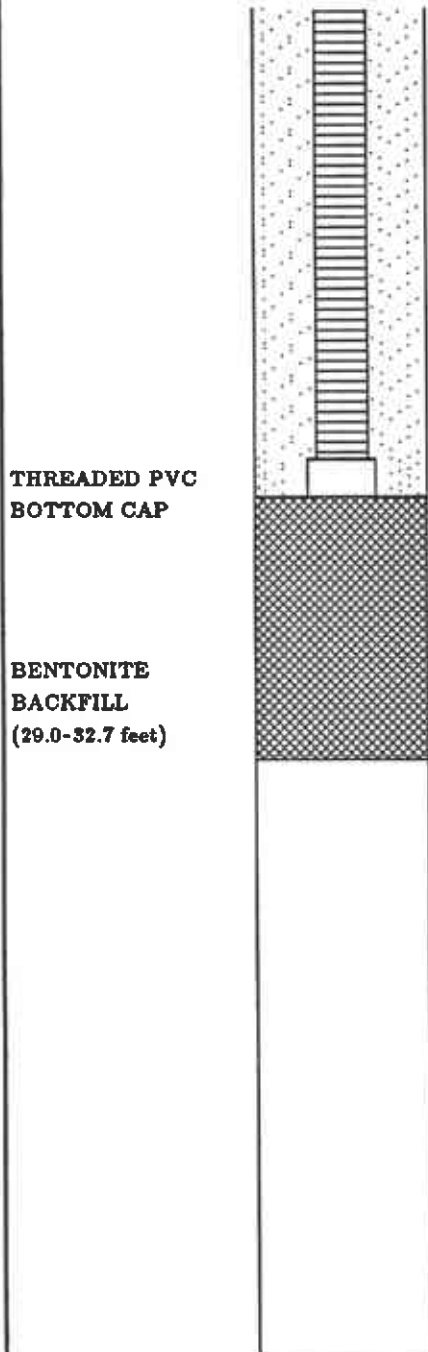
DATE 28 September 1989

DRILLING METHOD HOLLOW-STEM AUGER

GEOLOGIST M.L. PIERCE

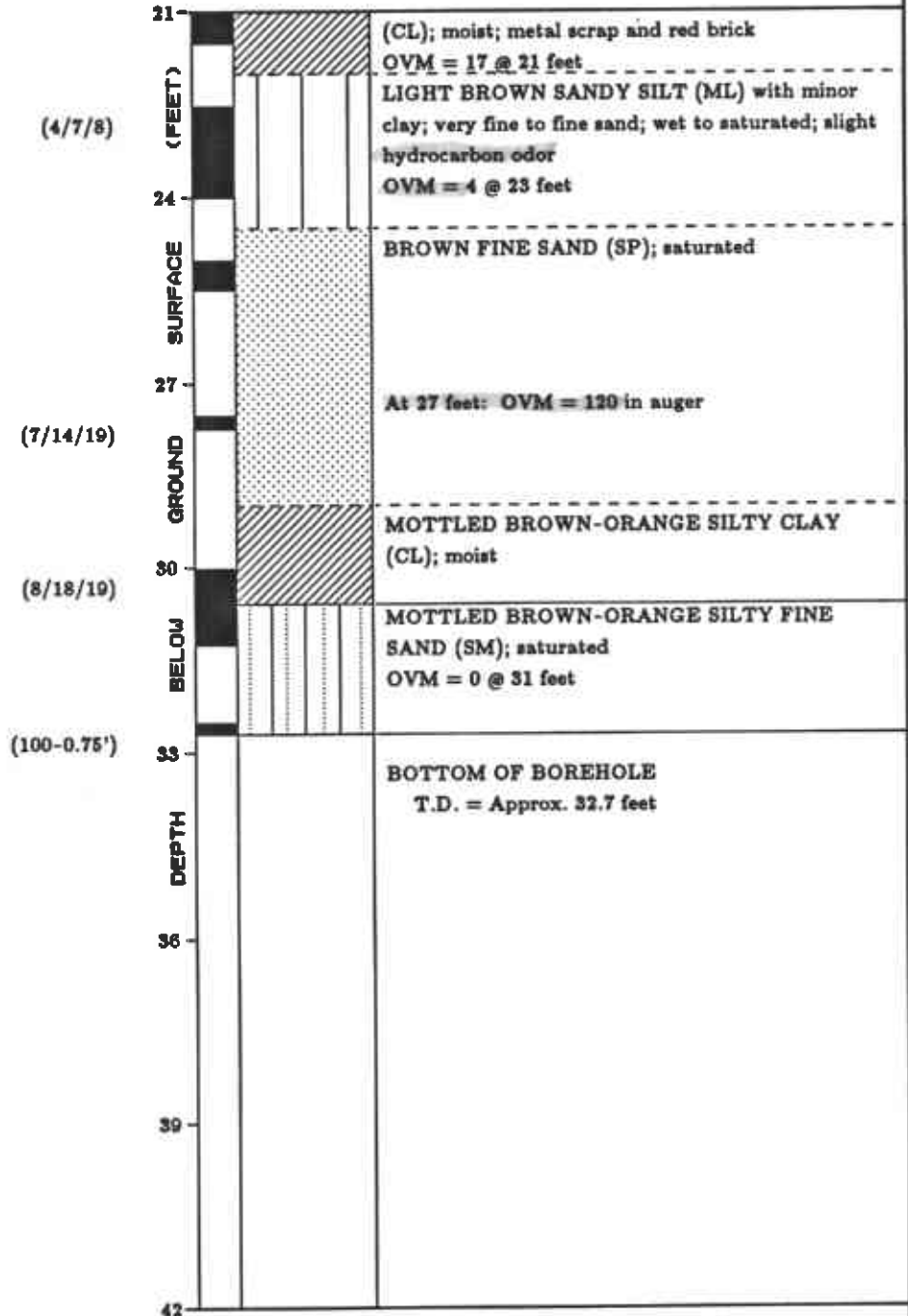
HOLE DIAMETER 8-INCHES

WELL CONSTRUCTION



LITHOLOGY

DESCRIPTION



EXPLANATION

▼ Water level during drilling
OVM Organic Vapor Meter Reading

--- Contact (dashed where approximate)
■ Location of sample

CLIENT P.O. PARTNERS
 LOCATION 1650 65th STREET,
 EMERYVILLE, CALIFORNIA
 DATE 14 November 1989
 GEOLOGIST M.L. PIERCE

TEST HOLE NUMBER MW-3
 DRILLER ASE DRILLING, INC.
 DRILLING METHOD HOLLOW-STEM AUGER
 HOLE DIAMETER 10.75-INCHES

WELL CONSTRUCTION

CHRISTY BOX
 LOCKING CAP

GROUT:
 95% CEMENT
 5% BENTONITE
 (1.0-3.8 feet)
 BENTONITE SEAL
 (3.8-5.3 feet)

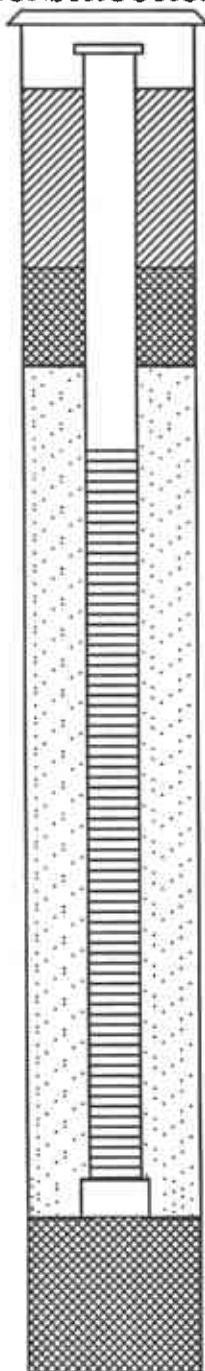
4" ID BLANK
 PVC CASING
 (0.5-6.6 feet)

#3 MONTEREY
 SAND PACK
 (5.3-18.3 feet)

4" ID SLOTTED
 PVC CASING
 SLOT SIZE = 0.020"
 (6.6-18.0 feet)

PVC BOTTOM CAP

BENTONITE
 BACKFILL
 (18.3-22.0 feet)



(11/12/11)

(5/7/32)

(7/10/15)

(1/2/4)

(1/2/2)

(2/1/3)

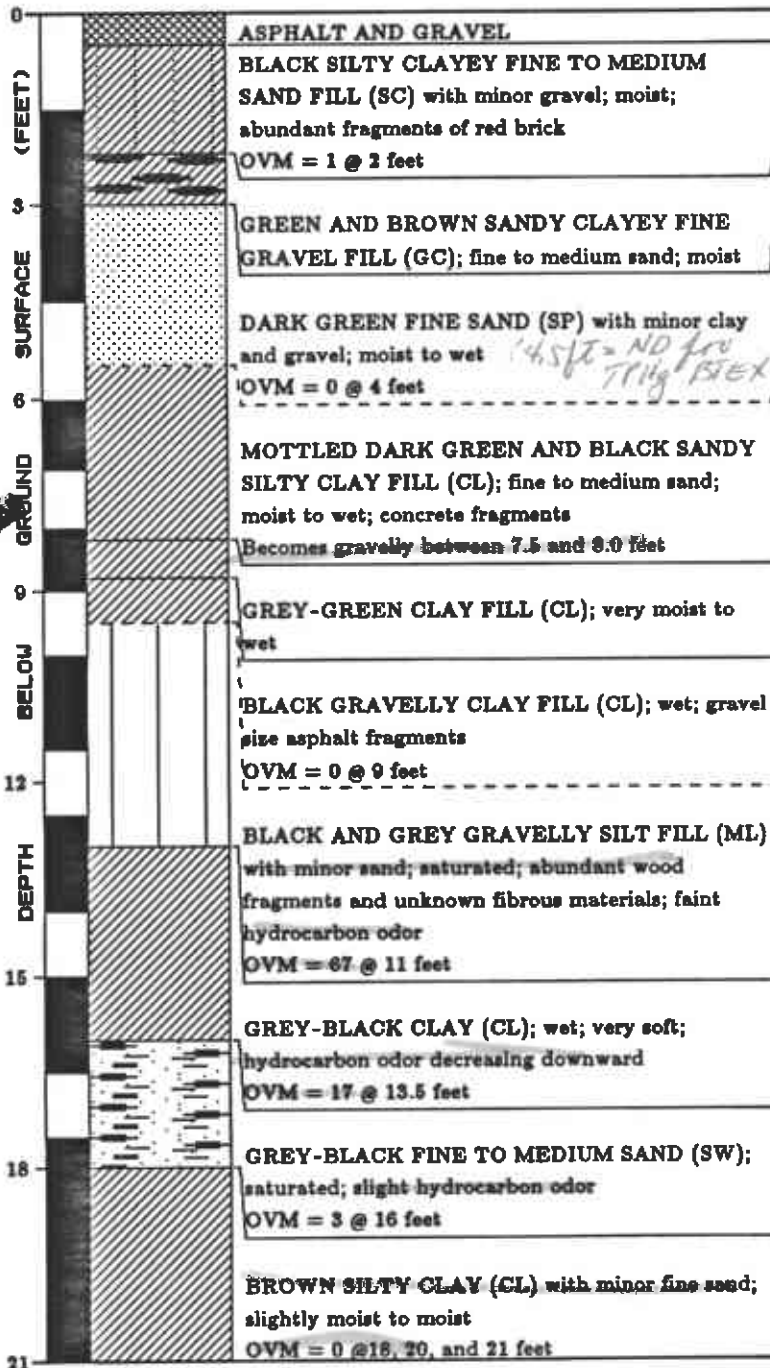
(4/4/5)

(4/10/10)

(4/4/10)

LITHOLOGY

DESCRIPTION



EXPLANATION

Water level during drilling
 OVM Organic Vapor Meter Reading

--- Contact (dashed where approximate)
 ■ Location of sample

CLIENT P.O. PARTNERS
 LOCATION 1650 65th STREET,
 EMERYVILLE, CALIFORNIA
 DATE 14 November 1989
 GEOLOGIST M.L. PIERCE

TEST HOLE NUMBER MW-3
 DRILLER ASE DRILLING, INC.
 DRILLING METHOD HOLLOW-STEM AUGER
 HOLE DIAMETER 10.75-INCHES

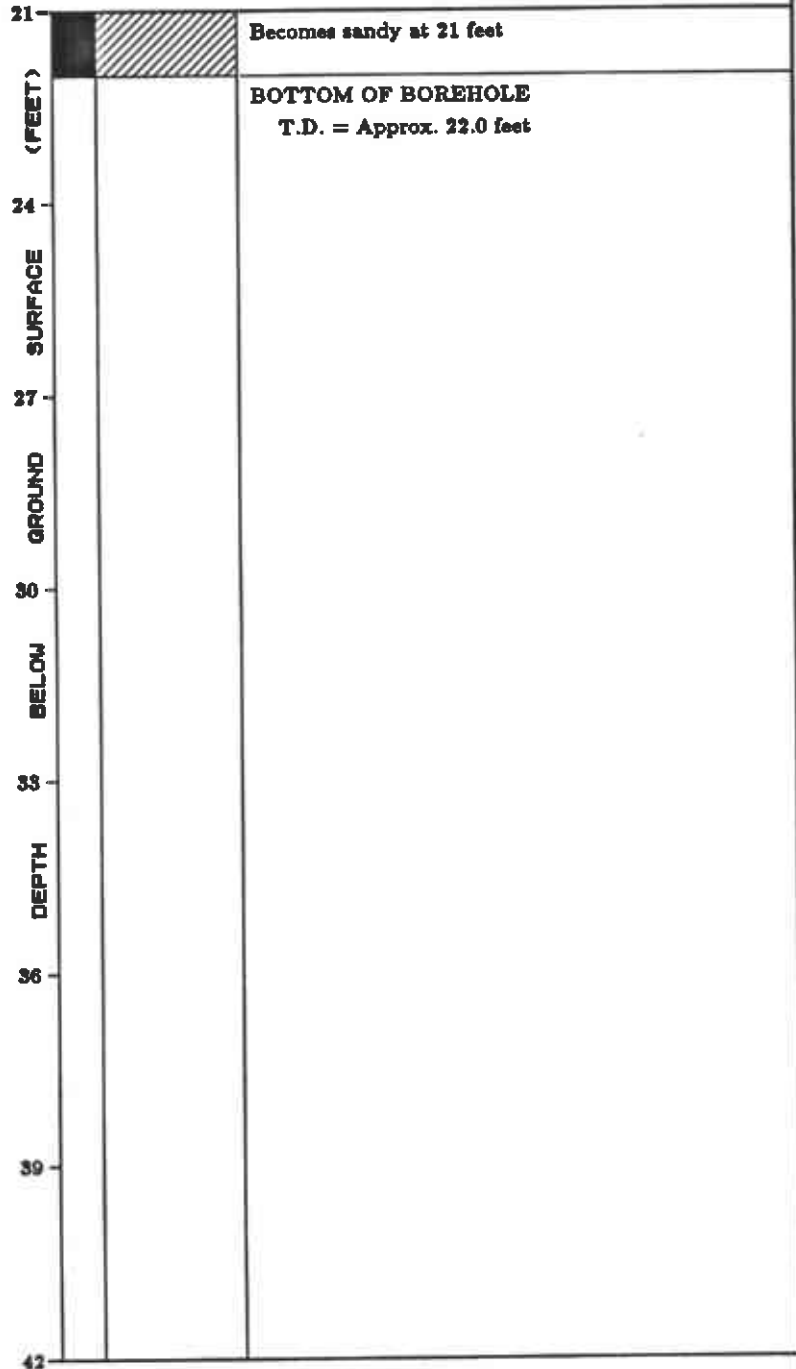
WELL CONSTRUCTION

(18.5-22.0 feet)



LITHOLOGY

DESCRIPTION



EXPLANATION

∇ Water level during drilling
 OVM Organic Vapor Meter Reading

--- Contact (dashed where approximate)
 ■ Location of sample

CLIENT P.O. PARTNERS

TEST HOLE NUMBER MW-4

LOCATION 1650 65th STREET,
EMERYVILLE, CALIFORNIA

DRILLER ASE DRILLING, INC.

DATE 15 November 1989

DRILLING METHOD HOLLOW-STEM AUGER

GEOLOGIST M.L. PIERCE

HOLE DIAMETER 10.75-INCHES

WELL CONSTRUCTION

CHRISTY BOX
LOCKING CAP

GROUT:
95% CEMENT
5% BENTONITE
(1.0-3.7 feet)
BENTONITE SEAL
(3.7-5.1 feet)

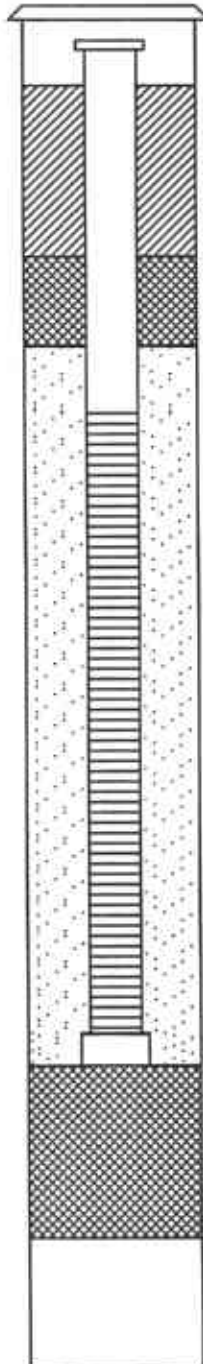
4" ID BLANK
PVC CASING
(0.5-6.1 feet)

#3 MONTEREY
SAND PACK
(5.1-16.3 feet)

4" ID SLOTTED
PVC CASING
SLOT SIZE = 0.020"
(6.1-15.8 feet)

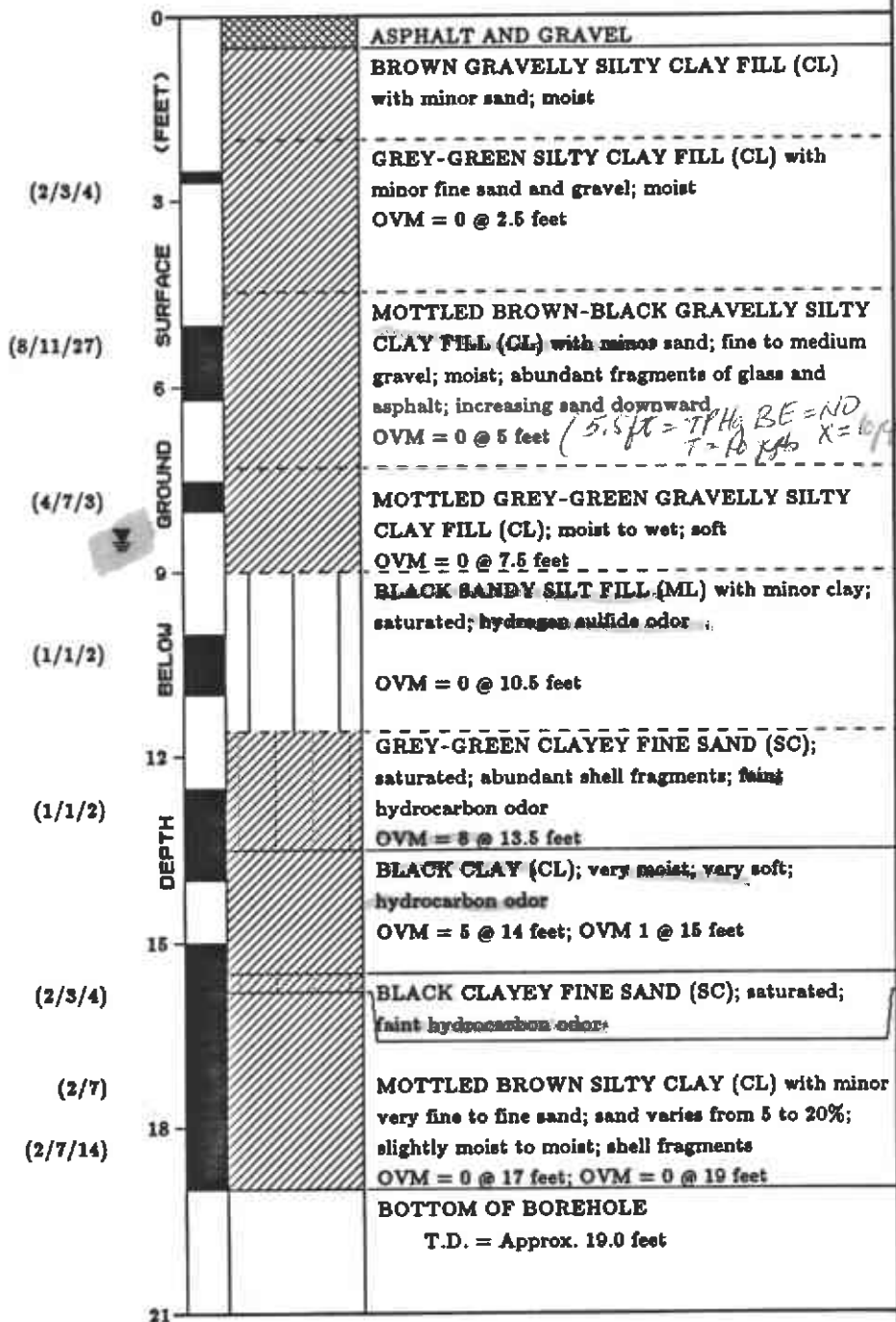
THREADED PVC
BOTTOM CAP

BENTONITE
BACKFILL
(16.3-19.0 feet)



LITHOLOGY

DESCRIPTION



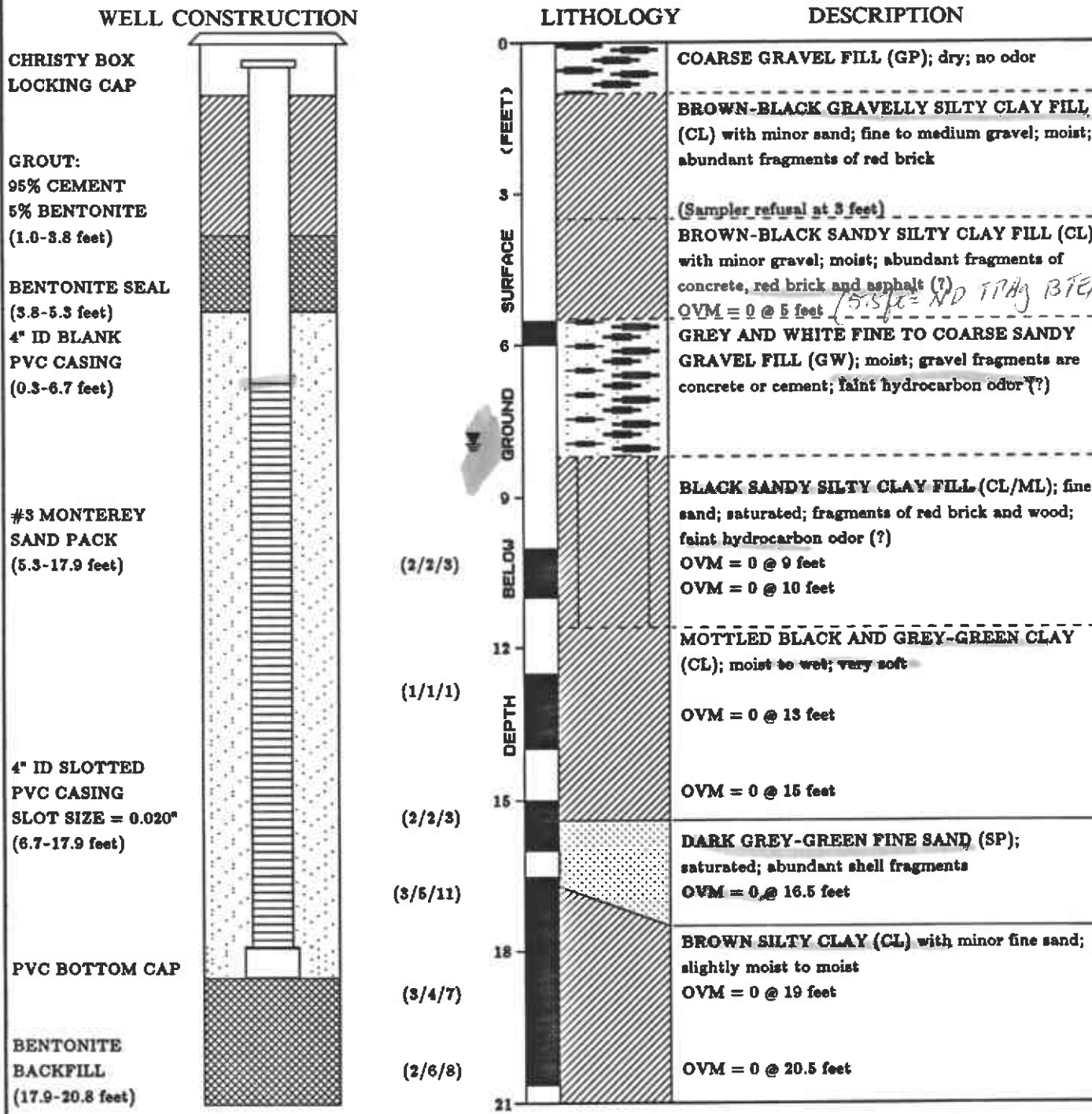
EXPLANATION

▼ Water level during drilling
OVM Organic Vapor Meter Reading

--- Contact (dashed where approximate)
■ Location of sample

CLIENT P.O. PARTNERS
 LOCATION 1650 65th STREET,
EMERYVILLE, CALIFORNIA
 DATE 16 November 1989
 GEOLOGIST M.L. PIERCE

TEST HOLE NUMBER MW-5
 DRILLER ASE DRILLING, INC.
 DRILLING METHOD HOLLOW-STEM AUGER
 HOLE DIAMETER 10.75-INCHES



CHRISTY BOX
LOCKING CAP

GROUT:
95% CEMENT
5% BENTONITE
(1.0-3.8 feet)

BENTONITE SEAL
(3.8-5.3 feet)
4" ID BLANK
PVC CASING
(0.3-6.7 feet)

#3 MONTEREY
SAND PACK
(5.3-17.9 feet)

4" ID SLOTTED
PVC CASING
SLOT SIZE = 0.020"
(8.7-17.9 feet)

PVC BOTTOM CAP

BENTONITE
BACKFILL
(17.9-20.8 feet)

LITHOLOGY DESCRIPTION

0		COARSE GRAVEL FILL (GP); dry; no odor
3		BROWN-BLACK GRAVELLY SILTY CLAY FILL (CL) with minor sand; fine to medium gravel; moist; abundant fragments of red brick
3		(Sampler refusal at 3 feet)
5.3		BROWN-BLACK SANDY SILTY CLAY FILL (CL) with minor gravel; moist; abundant fragments of concrete, red brick and asphalt (?)
5.3		OVM = 0 @ 5 feet (5.3 ft = NO TRAY BTE)
6		GREY AND WHITE FINE TO COARSE SANDY GRAVEL FILL (GW); moist; gravel fragments are concrete or cement; faint hydrocarbon odor (?)
6	GROUND	
9		BLACK SANDY SILTY CLAY FILL (CL/ML); fine sand; saturated; fragments of red brick and wood; faint hydrocarbon odor (?)
9		OVM = 0 @ 9 feet
10		OVM = 0 @ 10 feet
12		MOTTLED BLACK AND GREY-GREEN CLAY (CL); moist to wet; very soft
12		OVM = 0 @ 13 feet
15		OVM = 0 @ 15 feet
16.5		DARK GREY-GREEN FINE SAND (SP); saturated; abundant shell fragments
16.5		OVM = 0 @ 16.5 feet
18		BROWN SILTY CLAY (CL) with minor fine sand; slightly moist to moist
18		OVM = 0 @ 19 feet
20.5		OVM = 0 @ 20.5 feet
21		

EXPLANATION

- ▼ Water level during drilling
- Location of sample
- Contact (dashed where approximate)
- OVM Organic Vapor Meter Reading

CLIENT P.O. PARTNERS

TEST HOLE NUMBER MW-5

LOCATION 1650 65th STREET,
EMERYVILLE, CALIFORNIA

DRILLER ASE DRILLING, INC.

DATE 16 November 1989

DRILLING METHOD HOLLOW-STEM AUGER

GEOLOGIST M.L. PIERCE

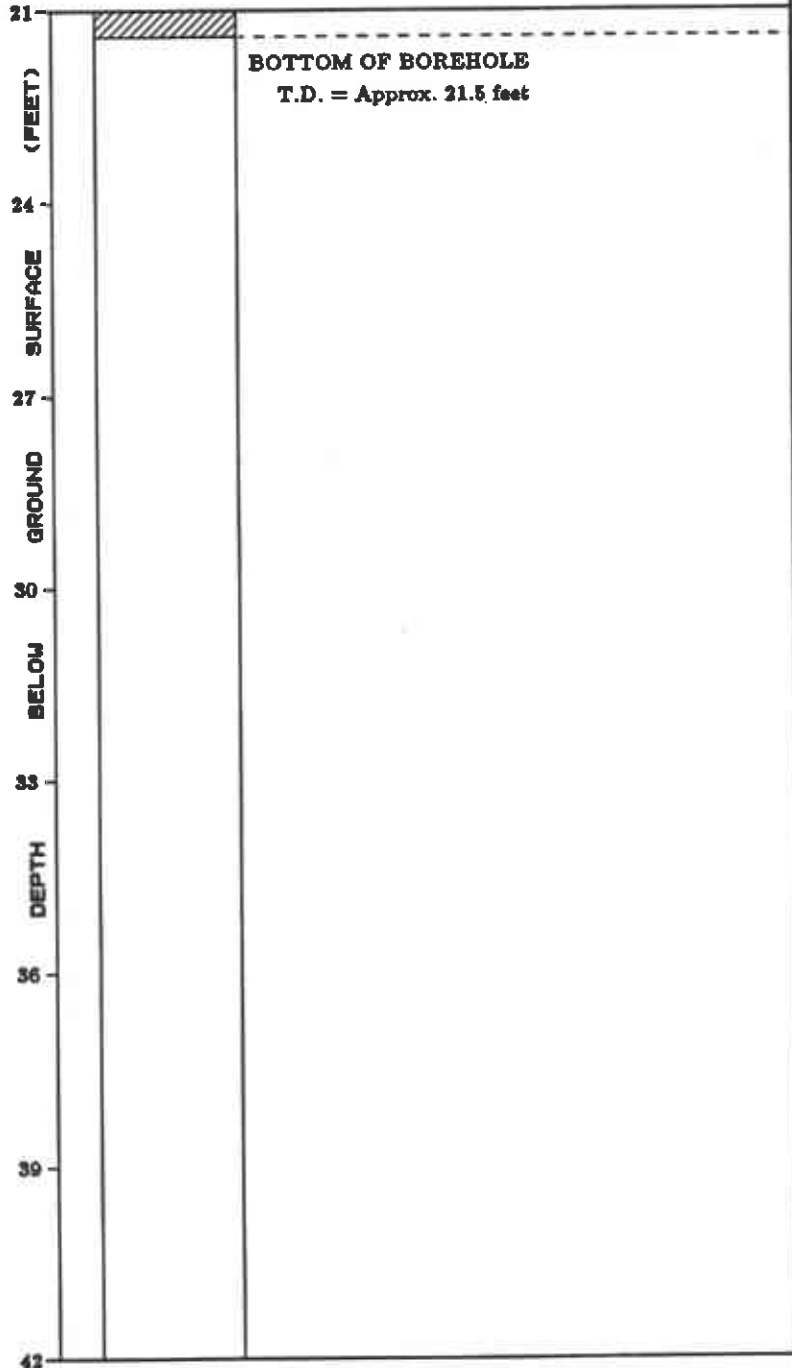
HOLE DIAMETER 10.75-INCHES

WELL CONSTRUCTION



LITHOLOGY

DESCRIPTION



EXPLANATION

☒ Water level during drilling
OVM Organic Vapor Meter Reading

--- Contact (dashed where approximate)
■ Location of sample

GROUNDWATER SAMPLING FIELD NOTES

PROJECT/LOCATION 1650 65th St./Emeryville

PROJ. NO. NC222.03 DATE 20,21
November 1989

WELL ID	SAMPLE DATE, TIME AND SAMPLER	WATER LEVEL BEFORE WELL DIAMETER AND DEPTH	WATER LEVEL AFTER*	GALLONS PER CASING VOLUME	WELL PURGING METHOD **	PUMP ON	PUMP OFF	FLOW RATE/ GALLONS PURGED	TEMPERATURE °C	SPECIFIC CONDUCTIVITY (UMHOS / CM)	PH	TOTAL WATER PURGE (GALLONS) SAMPLE COLLECTION METHOD **	ANALYSIS AND PRESERVATIVE	NO. AND TYPE OF CONTAINERS	COMMENTS (SAMPLE TURBIDITY, SAMPLE ODOR, WEATHER CONDITIONS, ETC.) *
MW-3	11/21/89 9:20 DC/MP	8.55 (TOC) 4" 18.02	9.60 TOC	B	N/A	N/A	N/A	20.2 20.2 20.5	5000 5000 5000	8.23 8.31 8.36	20.0	B	601, 602, 7420/7421	Yellow, semi clear, overcast, cool	
MW-4	11/20/89 16:00 DC/ES	8.38 (TOC) 4" 15.66	9.72 TOC	B	N/A	N/A	N/A	21.6 24.0 20.9	10500 10250 10000	8.61 8.76 8.81	14.5	B	601, 602, 7420/7421, Modified 8015	Slightly turbid; green in color; decomposition odor; sunny, warm	
MW-2	11/21/89 10:00 DC/MP	11.60 (TOC) 2" 27.05	11.80 TOC	B	N/A	N/A	N/A	17.6 18.3 18.2	3125 3000 3000	7.52 7.37 7.32	7.0	B	" "	Clear; product sheen; hydrocarbon odor; overcast, cool	
MW-5	11/21/89 10:55 DC/MP	7.54 (TOC) 4" 17.80	7.80 TOC	B	N/A	N/A	N/A	16.6 16.6 16.5	2350 2350 2350	7.59 7.57 7.57	20.0	B	" "	Clear, slight decomposition odor yellow/green color overcast, cool	

* WATER LEVEL FROM GROUND SURFACE

** WW-WELL WIZARD; G-GRUNDFOS PUMP; B-BAILER