ENSR®

CORRECTIVE ACTION EVALUATION AND FEASIBILITY STUDY

FORMER BILL CHUN SERVICE STATION

2301 Santa Clara Avenue

Alameda, California

June 1998

ENSR
Consulting • Engineering • Remediation

10324 Placer Lane
Suite 200
Sacramento, CA 95827
(916) 362-7100
FAX (916) 362-8100
http://www.ensr.com

June 17, 1998
Project No 8700-752

Mr. Barney Chan
Hazardous Materials Specialist
Alameda County Health Agency
1131 Harbor Way Parkway, 2nd Floor
Alameda, CA 94502

Subject: **Corrective Action Evaluation and Feasibility Study**
Former Wayne Chun Service Station
2301 Santa Clara Ave.
Alameda, California

Dear Mr. Chan:

ENSR, is pleased to provide this Final Report Corrective Action Evaluation and Feasibility Study at the former Bill Chun Service Station located at 2301 Santa Clara Avenue in Alameda, California. This report was prepared under the review and supervision of a professional geologist registered with the State of California, whose signature appears below.

We trust that this document has been prepared to meet your goals. Please do not hesitate to call us at (916) 362-7100 if there are any questions or comments regarding this report.

Sincerely,

ENSR

Alan D. Gibbs, R.G., C.H.G., R.E.A.

ADG:em

Attachments:

Cc: Mr. Wayne Chun

PROFESSIONAL CERTIFICATION

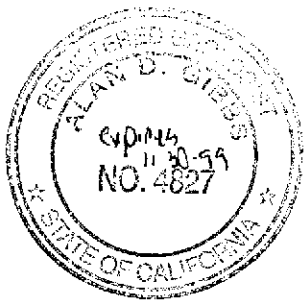
FINAL REPORT
CORRECTIVE ACTION EVALUATION
AND FEASIBILITY STUDY
THE FORMER BILL CHUN SERVICE STATION
2301 SANTA CLARA AVENUE
ALAMEDA, CALIFORNIA

8700-752

June 17, 1998

The staff of ENSR, INC. under the professional supervision of the Client Service Center Manager whose seal and signature appear hereon has prepared this Report.

The findings, recommendations, specifications or professional opinions are presented, within the limits prescribed by the client, after being prepared in accordance with generally accepted professional engineering and geologic practice. There is no other warranty, either expressed or implied.



Alan D. Gibbs, R.G., C.H.G., R.E.A.
Client Service Center Manager

CORRECTIVE ACTION EVALUATION AND FEASIBILITY STUDY

FORMER BILL CHUN SERVICE STATION

2301 Santa Clara Avenue

Alameda, California

June 1998

Prepared by:

ENSR

10324 Placer Lane, Suite 200

Sacramento, CA 95827

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

PAGE

TABLES

FIGURES

TABLE OF CONTENTS (Continued)

APPENDICES

1.0 INTRODUCTION

The Former Bill Chun Service Station is located at 2301 Santa Clara Avenue in Alameda, California (see Figures 1 and 2). The site has undergone ongoing soil and groundwater assessment activities since July 1992 when gasoline was found to have leaked from an underground storage tank (UST) beneath the property. ENSR is conducting this Corrective Action Evaluation to identify and evaluate feasible and cost-effective methods for remediating on-site subsurface soil and groundwater petroleum hydrocarbon impact.

1.1 Purpose and Organization of Report

This report fulfills a requirement of the Alameda County Department of Environmental Health (ACDEH). This document has been prepared in accordance with the following:

- Alameda County Water District's Groundwater Monitoring Guidelines, Groundwater Protection Program, September 1992
- Chapter 16, Title 23, Division 3, California Code of Regulations.

This report is intended to provide a comprehensive evaluation of past assessment activities and potential corrective action alternatives. Our study included a review of past reports, prepared by ENSR, Fugro West, Inc., and Environmental Science & Engineering, Inc. (ESE). Note that Fugro West Geo-Environmental (Fugro) was acquired by ENSR in January 1997.

ENSR has reviewed available documents and compiled data regarding the extent of the contamination, subsurface soil conditions, hydrogeology and chemical constituents of concern (COCs). Current remedial technologies were identified as alternatives and reviewed based on their applicability to the subject property conditions. Each alternative was evaluated based on:

- Effectiveness;
- Implementability;
- Reliability; and
- Duration

1.2 Current Regulatory Status

In April 1996, the ACDEH requested that Fugro prepare a work plan to:

- Characterize the groundwater plume beneath the existing onsite building and the adjacent Towata Flowers building;
- Propose a source removal plan to reduce the potential human health hazard and to reduce the concentrations in the groundwater; and
- Further delineate the lateral, downgradient extent of the groundwater plume to the northeast and east.

In response to the ACDEH request, Fugro prepared a work plan (Fugro West, August 1996) and a Work Plan Addendum (Fugro West, October 1996). The approach proposed by Fugro in these two Work Plans included four additional assessment tasks:

- *Task 1* - Air monitoring within the Towata Flower Shop Building at 2305 Santa Clara Avenue to determine whether accumulated hydrocarbon vapors associated with free-phase petroleum product were accumulating beneath the building;
- *Task 2* - Destruction of existing monitoring wells MW-1 and MW-2 and installation of an additional monitoring well to ensure that the groundwater monitoring well screen sections are adequately intercepting floating liquid hydrocarbons (FLH);
- *Task 3* - Installation of two on-site groundwater monitoring wells proposed to assess the extent of FLH beneath the existing site building; and
- *Task 4* - Installation of five temporary groundwater sampling probes and possible installation of permanent downgradient monitoring wells to determine the lateral, downgradient extent of the petroleum hydrocarbon plume in a northeast direction off-site.

In January 1997, ENSR acquired Fugro's geo-environmental division and has performed subsequent environmental services at this site.

Subsequent discussions between ENSR and the ACDEH in June 1997 resulted in modifications of the four proposed assessment tasks. ENSR recommended the initiation of remedial action at the subject property, rather than proceeding immediately with the additional assessment Tasks 2 and 3. The ACDEH and the California State Water Resources Control Board, and the UST Clean-up Program (USTCP) concurred that preparation of this Corrective Action Evaluation could be completed in lieu of Tasks 2 and 3. Additionally, rather than install two monitoring wells within the existing site building, ENSR recommended advancing exploratory soil borings to assist in determining the presence of FLH.

Air monitoring for hydrocarbon vapor accumulation beneath the Towata Flowers building (Task 1) was completed by ENSR on July 9, 1997. The results of that work were documented in a letter, submitted to the ACDEH on October 8, 1997. Task 4, the installation of temporary groundwater sampling points was completed on July 21, 1997 and the results were discussed in a letter submitted to the ACDEH on August 14, 1997. any full report?

2.0 BACKGROUND

This section includes descriptions of the site and surroundings and the general site history. This report has been prepared based upon information referenced from the following reports prepared by other consultants and ENSR. Note that this list only includes reports readily available to ENSR at the time of writing this report.

- ESE, Inc. October 1, 1993. *Report of Findings Additional Site Assessment and Third Quarter Groundwater Monitoring*
- ESE, Inc. March 31, 1993. *Preliminary Site Assessment*
- Fugro West, Inc. February 1995. *Results of Additional Site Assessment and Remediation Activities*
- Fugro West, Inc. January 30, 1996. *Results of Free Product Recovery, Additional Groundwater Assessment, and Quarterly Groundwater Monitoring Activities*
- ENSR, Inc. December 1997. *Quarterly Groundwater Monitoring Report*

2.1 Site Description

The subject property is located at 2301 Santa Clara Avenue on the northeast corner of Oak Street and Santa Clara Avenue in Alameda, California (see Figures 1 and 2). The area surrounding the subject property is comprised primarily of commercial and residential properties.

The island of Alameda lies within the Coastal Range Geomorphic Province on the east shore of the San Francisco Bay. Alameda is bounded to the east by the Oakland Inner Harbor and to the west by the San Francisco Bay. The elevation of Alameda ranges from 10 to 35 feet above mean sea level. Local topography is generally flat with a regional slope to the northeast. The depth to groundwater beneath the site is approximately 9 feet below ground surface (bgs).

Properties located adjacent to the subject property (Figure 2A) are as follows:

North The property located north of the subject property is the Alameda City Hall Building. This property is currently undergoing renovation.

South The property located south of the subject property consists of a Long's Drug Store with a large parking lot fronting Oak Street. The parking lot is the former location of the Shell Service Station.

West The property located to the west of the subject property contains the Alameda Free Library, which fronts on Santa Clara Avenue.

East The property located to the east of the subject property contains the Alameda Times Star Building.

The directions described here represent true directions. For the purposes of this report, Santa Clara Avenue is referred to in the east-west direction and Oak Street in the north-south direction.

2.2 Site History

A retail gasoline service station has operated at the subject property since at least the 1930s, and possibly since 1915. According to Mr. Wayne Chun, the current property owner, the subject property was acquired by Mr. Bill Chun who operated the service station as an automobile repair shop and retail gas station. In 1991, the Bill Chun Service Station was closed (Fugro, 1995).

The site is currently inactive, covered with asphalt, and surrounded by a security fence. Further information on the subject site can be obtained from:

Mr. Wayne Chun
265 Heron Drive
Pittsburg, California 94565
Telephone No. (925) 439-2302

Documents reviewed at the City of Alameda Fire Department (AFD), indicate that a 290-gallon UST, used for the storage of gasoline, was installed at the subject property in 1915. Two other gasoline USTs were also maintained on the subject property; however, their date of installation was not ascertained during the review of AFD files (Fugro, 1995).

2.3 Hydrogeology

The Oakland-Alameda area is situated on a broad, alluvial plain that slopes gently west from the Oakland-Berkeley Hills to the San Francisco Bay. The alluvial plain is comprised of quaternary (11,000 years ago) alluvial sediments derived from erosion of the hills to the east. Alameda is located at the eastern margin of the alluvial plain and is underlain by fine-grained alluvial and tidal-bayland sediments. These sediments include silts, sand, and bay mud to reported depths of at least 280 feet bgs. Former bayland areas in northern Alameda were filled prior to the construction of the Alameda Naval Air Station.

Subsurface materials beneath the subject property consist of artificial fill underlain by native silty sand (Merritt sand) to the maximum explored depth of approximately 25 feet bgs. Soils beneath the subject property are comprised of moist, brown silty sands to a depth of approximately seven feet at which they become primarily a brown clayey sand. Soils below eight feet are comprised of a moist brown silty sand with decreasing silt content (with depth) to a depth of approximately eleven feet. Below eleven feet, soils are primarily wet to saturated course grained sands. Soils encountered are primarily poorly graded and medium to densely compacted.

Groundwater beneath the subject property generally flows in a north to northeasterly direction with occasional flow variation to the northwest. The most recently calculated groundwater flow direction (calculated on January 30, 1998) was to the northwest. Groundwater is generally encountered beneath the subject property between 8 and 10 feet bgs with elevations of approximately 18.5 to 20 feet above mean sea level. The gradient is flat and generally ranges from 0.002 to 0.005 feet per foot.

Drinking water for the city of Alameda is imported surface water from the Mokelumne River in the Sierra Nevada which is provided by East Bay Municipal Utility District (EBMUD).

2.4 Potential Off-site Sources of Environmental Impacts

As part of the investigation conducted by Fugro, a limited Phase I Environmental Site Assessment (ESA) was conducted in 1994 to determine the potential existence of offsite sources. In conducting the limited ESA, government databases, historic aerial photographs, and regulatory agency records were reviewed.

The Regional Water Quality Control Board (RWQCB) Leaking Underground Storage Tank (LUST) list included the subject property in addition to 23 other addresses within one-half mile of the subject property. One of the 23 addresses identified on the LUST list is located upgradient of the subject property. This site (located approximately 1,000 feet southeast of the subject property) was the Automotive Auto Repair located at 2425 Central Avenue.

According to Ms. Juliet Shin of the Alameda County Environmental Health Department Hazardous Materials Division (HMD), four USTs were removed from the Automotive Auto Repair site in 1988. Two of the USTs (one 10,000-gallon and one 6,000-gallon) contained gasoline and two (750-gallons each) contained waste oil. Soil samples collected beneath the USTs contained concentrations of total petroleum hydrocarbons as gasoline (TPHg) up to 410 milligrams per kilogram (mg/kg). One groundwater monitoring well was installed, and the groundwater sample collected contained a TPHg concentration of 350 micrograms per liter (µg/l). Quarterly groundwater monitoring was requested by HMD in December 1994. This site, based on its distance from the subject property, most likely is not a probable off site source.

Documents were reviewed at the City of Alameda Engineering Department, which identified the Alameda City Hall (located on the northwest corner of Oak Street and Santa Clara Avenue) as a potential offsite source (Figure 2 and 2A). According to a report by RGA Environmental (1994), three USTs and associated petroleum-impacted soils were removed from the City Hall property. A concentration of 4,700 mg/kg TPHg in addition to the benzene, toluene, ethylbenzene, and total xylenes (BTEX) was detected in the soil collected from beneath Tank 1 (Figure 2); these soils were subsequently excavated and disposed. Soil samples collected from the excavation contained a TPHg concentration of 100 mg/kg; these compounds were not detected in the soil samples collected from the Tank 2 and Tank 3 excavations. No groundwater data was available at the time of Fugro's investigation. The Alameda City Hall property is located cross and down gradient of the subject property and most likely is not a potential off site source.

A file review conducted at the AFD, revealed locations with past or current USTs. Locations identified as potential offsite sources based on their locations upgradient of the subject property are as follows (Figure 2A):

- Shell Oil Company Service Station, located at 2300 Santa Clara Avenue, was listed as having five gasoline USTs installed in 1939. These were reportedly removed in 1950. This address is located on the southeast corner of Oak Street and Santa Clara Avenue, and is currently a parking lot for Long's Drug Store. Fugro's investigation did not reveal any reported spills or leaks at this site.

- The property located at 2248 Santa Clara Avenue (name of business is unknown) was listed as having a 250-gallon gasoline UST "in the rear yard". The UST was reportedly removed in 1965.

- The property located at 2254 Santa Clara Avenue (name of business is unknown) was listed as having a 550-gallon UST installed in 1947. No additional information regarding this tank was identified.

- The property located at 2268 Santa Clara Avenue (the Alameda Free Library) was listed as having a 1,500-gallon UST containing "stove oil". The UST permit was issued in 1927. No additional information regarding this tank was identified.

- The property located at 2314 Santa Clara Avenue (name of business is unknown) was listed as having a 125-gallon UST installed in 1926 (listed owner is George Otzen), and a 550-gallon gasoline UST installed in 1946 (listed owner is DaVeda Bottling Company). The 550-gallon UST was removed in 1951; no additional information regarding the 125-gallon UST was identified.

- The records reviewed also indicated the presence of a 290-gallon gasoline UST "under the sidewalk" at the subject property.

In addition to these properties, Mr. Wayne Chun recalled the existence of a gasoline UST at the Towata's Flower Shop property (2305 Santa Clara Avenue), which is located adjacent to the subject property (Figures 2 and 2A). The presence of this UST has not been verified. Additional research of this area is recommended.

Observations of nearby sites did not reveal evidence of USTs at 2248 Santa Clara Avenue, 2254 Santa Clara Avenue, 2268 Santa Clara Avenue, 2314 Santa Clara Avenue, or at the former Shell Oil Company Service Station located at 2300 Santa Clara Ave. A rectangular patch of newer asphalt was observed in the rear portion of the Towata's Flowers Shop (2305 Santa Clara Avenue). A UST is believed to have been removed from the property in 1991; however, this information has not been verified. Patched asphalt in the area of the removed USTs at the Alameda City Hall property (2263 Santa Clara Avenue) was also observed. No information on this site was readily available to ENSR in our review of documents.

3.0 UST REMOVAL AND PREVIOUS ASSESSMENT ACTIVITIES

This section describes UST removal and previous site assessment activities including soil and groundwater sample collection and analysis, groundwater monitoring well installation and monitoring, and remedial testing. Soil sample analytical results are summarized in Table 1. Groundwater analytical results from temporary monitoring wells and hydropunch groundwater sampling locations are summarized in Table 2. Depths to groundwater measured during groundwater monitoring are summarized in Table 3 and groundwater analytical results from samples collected during groundwater monitoring are summarized in Table 4.

3.1 UST Removal

In July 1992, Parker Environmental Services (Parker) excavated and removed three single-wall steel USTs (two 550-gallon and one 285-gallon), associated product piping, and a fuel dispenser island from the subject property. Note that the 285-gallon UST is assumed to be the 290-gallon UST reportedly installed in 1915.

The locations of the three former USTs, a former fuel dispensing island, and other site features are shown on Figure 2. During the removal activities, Parker reported that a 2-inch-diameter hole was observed in the bottom of the 285-gallon UST. Parker collected soil samples from beneath each UST, beneath the former dispenser island, and two samples from the stockpiled soil.

The soil samples collected from beneath the former 290-gallon UST contained concentrations of TPHg up to 16,000 mg/kg and benzene up to 280 mg/kg. Concentrations of TPHg and BTEX were also detected in the soil sample collected from beneath the two, 550-gallon USTs and the dispenser island (Parker, 1992).

Fugro performed over-excavation of soils adjacent to the former UST cavity at the subject property on August 12, 1994. Approximately 50 cubic yards of soil were excavated from the former UST cavity, and subsequently disposed of off-site. The cavity was backfilled with clean imported soil compacted in place.

Fugro collected ten soil samples, SW-1 through SW-10, from the sidewalls of the former UST cavity at approximately eight feet bgs. Four of the ten soil samples collected (SW-2, SW-4, SW-6, and SW-10) were submitted to a laboratory for chemical analysis. The soil samples were analyzed for TPHg, total petroleum hydrocarbons as diesel (TPHd), and BTEX. Soil sample SW-6 contained 0.006 mg/kg total xylenes but did not contain detectable concentrations of the remaining analytes (Table 1).

3.2 Soil Boring and Groundwater Monitoring Well Installation

Between January 1993 and July 1997, eleven monitoring wells (MW-1 through MW-11), four soil borings and hydropunch locations (SV-1, HP-1 through HP-3), ten temporary groundwater monitoring wells (P-1 through P-10), and eight additional temporary groundwater monitoring wells (TWP-1 through TWP-8) were installed at or adjacent to the subject site (Figure 2).

(P1-P10) (TW-1 - TWP-8)

8 MWs; 4 borings; 10 TW; 8 TWs

Soil sample analytical results are summarized in Table 1. Groundwater analytical results from temporary monitoring wells and hydropunch groundwater sampling locations are summarized in Table 2. Soil boring logs and monitoring well construction details for soil vapor extraction well SV-1 and monitoring wells MW-4 through MW-11 are presented in Appendix A. The boring logs and monitoring well construction details for monitoring wells MW-1, MW-2, and MW-3 were not available at the time this report was prepared. All eleven monitoring wells (MW-1 through MW-11) were surveyed by a California State Licensed Surveyor. See Appendix B for survey data.

3.2.1 Installation of MW-1, MW-2, and MW-3

In January 1993, Environmental Science & Engineering, Inc. (ESE) installed three 2-inch-diameter groundwater monitoring wells at the subject property (MW-1, MW-2, and MW-3) as shown in Figure 2. Soil samples collected from each of the borings at ten feet bgs, were analyzed for the presence of TPHg, TPHd, BTEX, and halogenated volatile organic compounds (HVOCs). Elevated concentrations of TPHg and BTEX were present in monitoring wells MW-1, MW-2, and MW-3 and concentrations of TPHd and HVOCs were not detected at or above the laboratory detection limits (Table 1).

The maximum TPHg concentration was 5,800 mg/kg and the maximum benzene concentration was 110 mg/kg, both from the soil sample collected at 10 feet bgs from MW-2. The depth to groundwater at that time was approximately 9 feet bgs indicating the soil sample was collected from the saturated soil.

Groundwater samples were collected from monitoring wells MW-1, MW-2, and MW-3 and analyzed for TPHg, TPHd, BTEX, and HVOCs. Elevated levels of TPHg and BTEX were present in monitoring wells MW-1, MW-2, and MW-3 with a maximum of 110,000 µg/l TPHg in MW-1 and 20,000 µg/l benzene in MW-2. TPHd and HVOCs were not detected at or above laboratory detection limits.

3.2.2 Installation of MW-4 through MW-7

In September 1993, ESE drilled and installed on-site groundwater monitoring wells MW-4, MW-5, MW-6, and MW-7 to further define the lateral and vertical extent of petroleum hydrocarbon impacted soil and groundwater. Soil samples were collected at various depths from monitoring wells MW-4, MW-5, MW-6 and MW-7 and analyzed for the presence of TPHg, TPHd, and BTEX.

Elevated concentrations of TPHg and BTEX were present in the soil samples collected from monitoring wells MW-5, MW-6, and MW-7 between 9 and 10 feet bgs which again corresponds to the saturated soil zone. The maximum TPHg concentration was 13,000 mg/kg and maximum benzene was 250 mg/kg, again, both of which came from the 10 foot sample collected from MW-7 (at the apparent saturated zone). TPHg, TPHd, and BTEX were not detected at or above laboratory detection limits in the soil samples collected from MW-4. The analytical results are presented in Table 1.

Groundwater samples were collected and analyzed for the presence of TPHg, TPHd, and BTEX. Elevated levels of these constituents were found in monitoring wells MW-4 through MW-7. The maximum concentrations of TPHg was 37,000 µg/l from monitoring well MW-5 and the maximum benzene was 6,000 µg/l from MW-7. The analytical results are presented in Table 2.

3.2.3 Installation of Soil Borings SV-1, HP-1, HP-2, and HP-3 and Collection of Hydropunch Samples

On August 30, 1994 Fugro drilled four additional soil borings at the subject property (SV-1, HP-1, HP-2, and HP-3) to further define the lateral extent of petroleum hydrocarbon impacted soil and ground water. Soil samples were collected from each boring, and a grab groundwater sample was collected from borings HP-1, HP-2, and HP-3 using a HydroPunch® sampling device. The soil and groundwater samples were analyzed for the presence of TPHg, TPHd and BTEX. In addition, HP-3 was analyzed for the presence of HVOCs.

Elevated levels of TPHg and benzene were present in the soil samples collected from borings HP-1 and SV-1. The highest concentration of TPHg was 8,400 mg/kg collected from SV-1 at 9.5 feet bgs (apparent saturated zone) and the highest benzene concentration was 37 mg/kg also collected from SV-1 at 9.5 feet bgs. Soil samples analyzed from HP-2 and HP-3 showed TPHg and benzene levels were below laboratory detection levels except for 0.008 mg/kg benzene in HP-3 (Table 1).

Elevated levels of TPHg and benzene were present in the groundwater samples collected from HP-1 and HP-3. The maximum TPHg concentration was 7,500 µg/l from HP-1 and the maximum benzene concentration was 410 µg/l from HP-3 (Table 2). Boring SV-1 was completed as a 2-inch-diameter vapor extraction well.

3.2.4 Installation of Temporary Groundwater Monitoring Wells P1 through P10

In October of 1995, Fugro installed ten temporary groundwater monitoring wells (P1 through P10) using PowerPunch technology. Each well was sited to further assist in the assessment of the lateral extent of petroleum hydrocarbon impacted groundwater downgradient of the subject site. Two of the wells (P1 and P2) were placed within the fill material of the sewer line located along Oak Street. Groundwater samples were collected from temporary monitoring wells P1 through P9 and analyzed for the presence of TPHg, TPHd, and BTEX. In addition, temporary monitoring wells P1 and P2 were analyzed for the presence of HVOCs. Note that samples were not collected from P-10 due to advancement refusal.

Elevated levels of TPHg and BTEX were detected in the groundwater samples collected from borings P2, P4, P5, P6, and P7. The maximum TPHg concentration (46,000 µg/l) was found in the groundwater sample collected from P7 located west or crossgradient of the site and the maximum benzene concentration (8,600 µg/l) was detected in the groundwater sample collected from P6 located downgradient of the site. Low concentrations of HVOCs were detected in the groundwater samples collected from borings P1 and P2 (Table 2).

3.2.5 Installation of Monitoring Wells MW-8 through MW-11

In November of 1995, monitoring wells MW-8, MW-9, MW-10, and MW-11 were installed by Fugro based on the results of the PowerPunch sampling locations (P1 through P9). Monitoring wells MW-8 through MW-11 were installed to further delineate the lateral extent of petroleum hydrocarbon impacted groundwater adjacent to the subject property. Selected soil samples from monitoring wells MW-8, MW-9, and MW-11 were analyzed for the presence of TPHg, TPHd, and BTEX. Additionally, MW-9 was analyzed for HVOCs. Soil samples from monitoring wells MW-8, and MW-11 contained elevated concentrations of TPHg. The maximum concentration was 3,500 mg/kg TPHg collected at 8 feet bgs from MW-8. The maximum benzene concentration (also collected from MW-8 at 8 feet bgs) was less than 1.3 mg/kg. TPHd was present at a maximum concentration of 88 mg/kg in the soil sample from MW-11.

Groundwater samples were collected from monitoring wells MW-8 through MW-11 and analyzed for the presence of TPHg, TPHd, and BTEX. The groundwater samples collected from monitoring wells MW-8, MW-9, and MW-11 revealed elevated concentrations of TPHg and benzene. The maximum TPHg concentration was 7,400 µg/l found in MW-8 and the highest benzene concentration was 590 µg/l in MW-9. TPHd was not detected at or above the laboratory detection limit in monitoring wells MW-8 through MW-11. The groundwater sample collected from monitoring well MW-9 contained 1,2-dichlorethane (1,2-DCA) at a concentration of 46 µg/l (Table 2).

3.2.6 Installation of Temporary Groundwater Monitoring Wells TWP-1 through TWP-8

On July 21, 1997, eight temporary groundwater monitoring wells (TWP-1 through TWP-8) were installed at the subject site (Figure 2). Temporary monitoring wells TWP-1 through TWP-5 were installed off site to assess the extent of dissolved hydrocarbon migration downgradient of the subject property. Temporary monitoring wells TWP-6, TWP-7, and TWP-8 were installed on the subject property. Soil samples collected from TWP-3 through TWP-8 were analyzed for the presence of TPHg, TPHd, and BTEX. In addition TWP3, TWP-2, and TWP-3 were analyzed for the presence of methyl tertiary-butyl ether MTBE and TWP-6, TWP-7, and TWP-8 were analyzed for lead.

TWP TWP TWP

Elevated concentrations of TPHg and BTEX in soils were present in TPW-6, TPW-7, and TPW-8. The maximum concentration of TPHg was 6,400 mg/kg and the maximum benzene concentration was 40 mg/kg both collected from TWP-6 at 10 feet bgs (apparent saturated zone). The analytical results are presented in Table 1. The maximum lead concentration was 12 mg/kg at TWP-8 at 10 feet bgs. MTBE was not detected at or above laboratory detection limits.

Groundwater samples collected from TWP-1 through TWP-8 were analyzed for the presence of TPHg, BTEX, and MTBE. Elevated concentrations of TPHg and BTEX were present in TWP-6, TWP-7, and TWP-8. The maximum TPHg and benzene concentrations were both found in TPW-7 at 180,000 µg/l TPHg and 41,000 µg/l benzene. MTBE was not detected at or above the laboratory detection limit in temporary monitoring wells TWP-1 through TWP-8 with the exception of TWP-2 (20 µg/l). The analytical results are presented in Table 2.

TPHg and BTEX were not detected in the groundwater samples in the offsite downgradient sample locations TWP-1 through TWP-5. Due to its increased mobility, MTBE is expected to define the furthest boundary of a contaminate plume. TWP-2 is downgradient and located along the same side of Oak Street as MW-9 (where MTBE was also detected). Discovery of MTBE in the TPW-2 may indicate the presence of a hydraulic conduit likely in the form of backfill surrounding a utility line. The presence of a conduit presents a concern in that it may increase the rate at which petroleum hydrocarbons migrate away from the subject property or from other offsite sources.

3.3 Suspected Additional UST

On December 27, 1994, Fugro attempted to locate a UST under the sidewalk at the subject property that had been mentioned in the AFD files. Fugro used a magnetic locator (CU surveys) and electromagnetic detection device to assess whether a UST was located beneath the sidewalks at the site. According to Mr. Otis Haskins of CU Surveys, no USTs or other large metal objects were detected beneath the sidewalks adjacent to the subject property.

3.4 Groundwater Monitoring

Groundwater elevation measurements collected during groundwater monitoring are summarized in Table 3. Groundwater sample analytical results from groundwater monitoring are summarized in Table 4. The potentiometric map from the January 30, 1998 groundwater monitoring event is shown on Figure 3. The distribution of petroleum hydrocarbons on January 30, 1998 is shown on Figure 4. Groundwater monitoring wells MW-1 through MW-3 have been monitored since January 1993. Groundwater monitoring wells MW-4 through MW-7 have been monitored since September 1993. Groundwater monitoring wells MW8 through MW-11 have been monitored since November 1995.

Depths to groundwater in all monitoring wells have ranged from 7.37 to 10.16 feet bgs. The groundwater gradient is typically flat (0.007 ft/ft in January 1998) and flows northeasterly with occasional variation to the northwest (Figure 3).

FLH has been detected in monitoring wells MW-1, MW-2, MW-5, MW-6, and MW-7. A sheen of FLH has been detected in monitoring wells MW-1, MW-2, and MW-6 since October 1997 (Figure 3). FLH has been detected in monitoring well MW-5 since November 1993 (maximum thickness 0.61 feet in December 1993) and MW-7 since February 1994 (maximum thickness 0.50 feet in March 1995).

The location of MW-1 and MW-2 in relation to MW-5 and MW-7 suggests that more than a sheen of FLH may be present near MW-1 and MW-2. Monitoring well construction details for MW-1 and MW-2 were not available to ENSR at the time this report was written. It is possible that the tops of the screen intervals of MW-1 and MW-2 are below the water table and therefore, FLH cannot enter these wells.

As shown on Table 4, the groundwater monitoring wells that have not recently been impacted with FLH include MW-3, MW-4, MW-8, MW-9, MW-10, and MW-11. Monitoring wells MW-3, MW-4, and MW-8 are located generally upgradient of the former USTs (Figure 4). During the last four quarters, MW-3 contained 600 to 9,060 µg/l TPHg and less than 0.5 to 136 µg/l benzene, MW-8 contained 430 to765 µg/l TPHg and 24 to 33.2 µg/l benzene. Monitoring well

MW-4 contained 200 µg/l TPHg in June 1997, but otherwise has not contained detectable concentrations of TPHg or benzene during the last four monitoring events.

Groundwater monitoring wells MW-9 and MW-10 are located generally downgradient from the USTs. During the last four quarters, MW-9 contained 910 to 8,000 µg/l TPHg and 480 to 4,600 µg/l benzene, and MW-10 contained 1.2 µg/l benzene in October 1997, but otherwise has not contained detectable concentrations of TPHg or benzene during the last four monitoring events.

Groundwater monitoring well MW-11 is located crossgradient from the USTs (Figure 4). During the last four quarters, MW-11 has contained 300 to 1,800 µg/l TPHg and 3.5 to 22 µg/l benzene.

3.5 Remedial Testing

Fugro performed soil vapor extraction (SVE) testing and ESE has performed slug testing at the site. These tests are described in the following sections.

3.5.1 Soil Vapor Extraction Pilot Test

On September 29, 1994, Fugro performed a SVE pilot test to assess the feasibility of using SVE to remediate hydrocarbon-impacted soils in the capillary fringe at the subject property. Soil vapors were extracted from wells SV-1, MW-4, MW-6, and MW-7 (one well at a time) by inducing a vacuum on the subject well (Figure 2). The results of this testing are summarized in Tables 5 and 6.

Field measurements of air flow rate, hydrocarbon concentrations, temperature, and vacuum were taken at regular intervals. The pressure/vacuum responses induced in the surrounding wells were measured at regular intervals with a minimum influence of 0.005 inches of water column head. Additionally, soil vapor samples were collected and analyzed for TPHg and BTEX.

SVE well SV-1 is constructed of 0.02-inch slotted 2-inch diameter well casing and is screened from 5 to 10 feet bgs. The air flow rate from well SV-1 ranged from 8 to 13 standard cubic feet per minute (scfm). An air sample collected from SV-1 at the end of the test, contained 9,000 milligrams per cubic meter (mg/ M^3) TPHg and 390 mg/M^3 benzene.

Vacuum influence during the test on SV-1 was measured in wells MW-4, MW-5, MW-6, and MW-7. Well MW-6 was the only well monitored that exhibited greater than 0.10 inches of water column (in. wc) vacuum. Well MW-6 is located approximately 22 feet from SV-1.

The air flow rates from wells MW-4, MW-6, and MW-7 were as follows; 18 scfm in MW-4, 4 scfm in MW-6, and 3 scfm in MW-7. Concentrations of volatile organic compounds in the three monitoring wells were measured during the SVE test with a photo ionization detector (PID).

During the tests on monitoring wells MW-4 and MW-6, no vacuum influence over 0.10 in. wc was measured at the remaining test wells. During the test on monitoring well MW-7, a vacuum influence of 0.37 in. wc was measured at monitoring well MW-6. Monitoring well MW-6 is located approximately 35 feet from MW-7.

The SVE test indicated that soil vapor flows can be generated from the subsurface soils and the soil vapors contain sufficient petroleum hydrocarbon vapors to make SVE an efficient remediation alternative. The flow rates and radius of influence during the test were probably reduced by the upwelling of groundwater in the wells caused by the induced vacuum.

probably OK for dual phase extraction

3.5.2 Aquifer Testing

On September 14, 1993, ESE performed aquifer testing (slug testing) on monitoring wells MW-1 through MW-7 at the subject property. The field data shows the average hydraulic conductivity (K) beneath the subject site to be 1.5 X 10^{-3} feet/minute and 2 X 10^{-2} feet^2/minute for transmissivity (T). These results can be found in ESE's report titled, *Report of Findings, Additional Site Assessment, and Third Quarter Groundwater Monitoring,* dated October 1, 1993.

3.6 Interim Remediation: FLH Recovery

FLH recovery was performed weekly in late 1994 by hand bailing from monitoring wells MW-5 and MW-7. A total of approximately 0.50 gallons of FLH was removed from the two wells. In September of 1995, passive FLH recovery bailers were installed in monitoring wells MW-5 and MW-7 as required by the ACDEH. A total of 1.32 gallons of FLH was recovered. Attempts were made to recover FLH from monitoring wells MW-1 and MW-2; however, these wells are believed to be screened too deep to capture FLH.

Silty Sand

4.0 CHEMICALS OF CONCERN

The Chemicals of Concern (COCs) identified at the subject site during site assessment activities include:

- total petroleum hydrocarbons as gasoline (TPHg);
- benzene, toluene, ethylbenzene, and xylenes (BTEX); and
- methyl tertiary-butyl ether (MTBE).

A few HVOCs and TPHd have also been detected in groundwater beneath the subject property. The maximum HVOC concentration was 1,2-DCA found in monitoring well MW-1. The concentration ranged from 470 µg/l in 1993 to less than 0.5 µg/l in 1997. Because the detection of HVOCs has been sporadic and generally prior to the most recent four quarters of groundwater monitoring, HVOCs are not considered a COC at the subject property.

The maximum TPHd concentration was found in monitoring well MW-6. The concentration ranged from 40,000 µg/l in 1995 to less than 50 µg/l in 1997. The laboratory reports state that the TPHd concentrations encountered in the monitoring wells may represent low range gasoline concentrations. Therefore, TPHd is not considered a COC at the subject property.

5.0 EXTENT OF COC IN SOIL AND GROUNDWATER

The estimated extent of petroleum hydrocarbon-impacted groundwater is shown on Figure 5. This figure was prepared using the January 30, 1998 groundwater monitoring results (Table 4) and the results from previous assessments (Table 2).

Migration of petroleum hydrocarbon impacted groundwater appears to be to the north-northeast of the subject property, which is consistent with the groundwater flow direction. Concentrations of TPHg and BTEX, have been encountered beneath Oak Street directly north of the subject property and in the driveway, on the northeast side of the former Pythion Fellowship building, northeast of the subject property.

The presence of MTBE in groundwater samples collected from monitoring well MW-9 at a concentration of 220 µg/l and temporary well point TWP-2 at 20 µg/l (both located on the east side of Oak Street) indicate the possibility of an offsite source and/or a conduit influencing groundwater migration. MTBE was not detected at or above laboratory detection limits in the groundwater sample collected from temporary well point TWP-4 (also located on the east side of Oak Street and downgradient of MW-9 and TPW-2).

The former Shell Oil Service Station at 2300 Santa Clara Avenue may be a contributing factor to the petroleum impacted soil and groundwater associated with the subject property. Additional research and possible subsurface investigation of this area is recommended. As shown on figure 5, the highest offsite TPHg concentration was detected in temporary monitoring well P7. In addition, the TPHg concentration in hydropunch location HP-1 and MW-3, strongly indicate that the concentration gradient is from 2300 Santa Clara Avenue toward the Subject Property.

Probable not done

As discussed previously, 50 cubic yards of impacted soil were excavated from the UST cavity down to the water table (approximately 8 feet bgs) on August 12, 1994. A sidewall soil sample was collected at a depth of 8 feet bgs from each of the four sidewalls of the UST cavity. The samples were analyzed for the site COCs. None of the COCs were detected at or above the laboratory limits (except 0.006 mg/kg xylene in one of the soil samples). This implies that the on site source of COCs in soil has been removed. it's mainly in GW

Historically, groundwater depths have been measured and recorded between 8 and 10.5 feet bgs. Soils beneath the subject property are comprised primarily of silty and fine grained, poorly graded sands with a thin clay layer encountered at approximately 6 to 7 feet bgs. A soil profile of TPHg and benzene concentrations indicates the presence of petroleum hydrocarbons at depths ranging from 9.5 to 11 feet bgs, suggesting soil samples were collected in the saturated zone and therefore reflect impact to groundwater not the vadose zone.

A cross section location map is shown on Figure 6 and the associated cross sections are shown on Figures 7 and 8. Figures 7 and 8 include saturated soil analytical results. Figure 9 shows a plan view of petroleum impacted saturated soil remaining at the subject site.

Based on previous soil and groundwater assessment and sampling activities and the limited investigation of potential off-site sources, ENSR concludes the following:

- Concentrations of gasoline-range hydrocarbons exist in soil at depths between 9.0 and 11 feet bgs beneath much of the subject property, with the exception of the vicinity of monitoring well MW-4. The zone between 9.0 and 11 bgs is below the water table, thus a saturated zone.

- The lateral extent of dissolved-phase hydrocarbons was not fully characterized to the east from the subject property.

- The lateral extent of FLH was not fully characterized to the east and north of monitoring well MW-7.

- Potential off-site sources of petroleum hydrocarbons in soil and groundwater at the subject property include the former Shell Service Station (2300 Santa Clara Avenue), Towata's Flower Shop, (2305 Santa Clara Avenue), The Alameda City Hall, (2263 Santa Clara Avenue), and the Automotive Auto Repair site (2425 Central Avenue).

- Hydrocarbons present in samples collected from monitoring well MW-11 and in P5, may have originated from the former UST at 2305 Santa Clara Avenue, or from another source.

6.0 COC FATE AND TRANSPORT

The environmental fate and transport of the COCs refers not only to the practical or actual end of a molecule's existance, but also to the factors that influence its transport. Some of the factors that influence groundwater contaminants are adsorption to mineral and organic particals in the soil, ionic and covalent bonding to minerals, volatilization, dispersion, and dilution in the ground water, chemical and biological degradation, and chemical speciation. The dominant route of migration of these COCs is through the groundwater as a solute.

Other potential routes of contaminant migration are uptake of the contaminants by vegetation and migration to surface waters of the San Francisco Bay thereby entering the food chain.

The exposure routes for receptors are through migration in the groundwater to other groundwater wells in the area, to surface waters of the San Francisco Bay, and through ingestion of site-contaminated vegetation. The site is covered with asphalt. This limits the possibility of vegetation contamination. The nearest surface water downgradient of the site is the Airport Channel approximately 3,500 feet away.

Potential environmentally sensitive receptors could be affected by contaminant migration through ground water. Based on groundwater sampling and analytical results, a hydraulic conduit may exist along the east side of Oak Street likely in the form of backfill surrounding a utility line. According to the City of Alameda Engineering Dept., a 6-inch diameter sanitary sewer line runs east-west along the south side of Oak Street at a depth of approximately 10.5 feet bgs. The backfill material for the sanitary sewer line trench is unknown. The presence of this conduit may increase the rate at which contaminants migrate off the subject property and potentially impact downgradient properties.

7.0 PROPOSED REMEDIAL OBJECTIVES

The remedial objectives for this site should be based upon an evaluation of the risks posed to public health and the environment and the feasibility of restoring water quality. Additional information is needed at this site to identify the remedial objectives. The additional information includes the following:

- Sensitive receptor survey;
- Utility survey (preferential migration pathways); and
- Review of potential uses of groundwater (basin plan).

This information will be necessary for site closure and may be acquired during the implementation of further proposed site remediation.

ENSR has developed the following remedial objectives for evaluating the feasibility of remedial alternatives at this site:

- Reduce the potential for continued migration;
- Remove continuing source of groundwater impact; and,
- Cost-effectively reduce the total mass of petroleum hydrocarbons in the soil and groundwater beneath the site.

8.0 EVALUATION OF REMEDIAL ALTERNATIVES

Remedial alternatives were pre-screened and selected based upon the suitability of the technology for the physical and chemical characteristics of this site. The pre-screened alternatives were then evaluated to select a preferred remedial alternative. A description of the technology screening approach is included below followed by descriptions of the remedial technologies chosen for screening. The following technologies have been evaluated for this site:

- No action;
- Excavation;
- *In-situ* biodegradation; and,
- Dual media extraction.

8.1 Screening Criteria

Each of the potential remedial alternatives is evaluated with respect to five screening criteria. The following provides a brief description of each of the evaluation criteria:

- **Effectiveness -** the ability of the technology to reach remedial objectives.
- **Implementability** - the ability to design, permit, construct, and operate the technology based upon site-specific conditions.
- **Reliability -** the level of development and reliability of the technology.
- **Cost -** the relative cost of the technology in comparison to other potentially feasible technologies.
- **Duration -** the ability to achieve remedial objectives within a reasonable time period.

A ranking is assigned to each technology for all of the above selection criteria. The individual rankings include high (+1), medium (0), and low (-1). Numerical values are assigned to each of the rankings to allow summation of the individual rankings to evaluate the overall ranking. A high overall ranking for a technology indicates that the technology is a viable remedial alternative for the site. A medium ranking indicates the technology contains some limitations but may still be applicable for the contaminants and media at the site. A low ranking essentially eliminates the technology from further consideration.

8.2 Description of Remedial Alternatives

The following sections describe the applicable technologies evaluated for corrective action at this site.

8.2.1 No Action

The no action alternative involves allowing natural mechanisms to control migration and remove petroleum hydrocarbons from groundwater beneath the site. The natural mechanisms include dispersion, volatilization, adsorption, aerobic biodegradation, and anaerobic biodegradation. Groundwater monitoring would likely be required until concentrations declined to a level acceptable to the oversight agency.

8.2.2 Excavation

Excavation is the direct removal of contaminated soils using a backhoe or excavator. Excavation can require shoring near buildings, sidewalks, roads, or in saturated soils. The excavated materials must be disposed of off site or treated on site.

8.2.3 *In-situ* Biodegradation

In-situ bioremediation involves enhancing natural conditions which may include augmenting microbial populations to accelerate metabolism of the petroleum hydrocarbons by microbes. This alternative requires hydraulic control to deliver the amendments to the petroleum hydrocarbon-impacted areas. For vadose zone impact, this technology relies upon infiltration of amended water through the vadose zone.

8.2.4 Dual-Media Extraction

For this evaluation, dual extraction refers to performing groundwater extraction and vapor extraction concurrently. Groundwater extraction reduces the potential for migration of the petroleum hydrocarbons, removes dissolved petroleum hydrocarbons, and dewaters portions of the subsurface allowing vapor extraction in these areas. Vapor extraction removes petroleum hydrocarbons as vapors and can achieve high mass removal rates compared to groundwater extraction.

8.3 Remedial Alternative Selection

Petroleum hydrocarbon impact at this site occurs in groundwater and the capillary zone above groundwater. The pilot-scale SVE test indicated very low flow rates were achievable at SV-1 and groundwater monitoring wells MW-4, MW-6, and MW-7. As shown on the geologic cross sections on Figures 7 and 8, the length of the screened intervals of these wells that extended above the groundwater were approximately 3 feet.

During the pilot-scale SVE test the induced vacuum at the wells would have lifted the groundwater and eliminated air flow through a portion of the 3 feet of exposed screen. Assuming that the groundwater rise would be equal to the induced vacuum, the groundwater rise in the tested wells ranged from 3 to 4 feet. If the groundwater rose to this extent in the wells, the exposed screen was essentially covered by the mounding groundwater, greatly reducing the air flows.

The remedial alternatives evaluation is summarized in Table 6. The evaluation of each technology is discussed in the following sections.

8.3.1 No Action

No action would involve establishing natural attenuation will complete remediation at this site. The groundwater chemistry data does not indicate that natural degradation is occurring, or that the plume has stabilized and is shrinking. Therefore, ENSR has ranked this alternative low in the effectiveness, reliability, and duration criteria. ENSR ranked this technology highly in the implementability and cost criteria. Implementation of this alternative would require only a monitoring plan. The cost of this technology would be spread over several years and could be substantial in total, however, compared to the up front costs of implementation of some of the other alternatives no action was given a high ranking for costs.

8.3.2 Excavation

ENSR ranked this alternative low in the implementability and reliability criteria. Site data indicates the groundwater impact may extend beneath structures. To increase the effectiveness of this alternative, excavation near structures would be necessary. Excavation near structures, sidewalks, and roads would require shoring and could involve risks associated with cave-ins. An additional complication of this alternative is the logistics involved with placing equipment and soil during the excavation.

ENSR also ranked this alternative low for reliability because the impacted groundwater and capillary zone extend beyond the potential boundaries of the excavation. It is unknown whether excavation could achieve the remedial objectives of sufficiently reducing the risks posed to human health and the environment by reducing migration of petroleum hydrocarbons.

8.3.3 *In-situ* Biodegradation

The key factor to biodegradation is oxygen. For every pound of petroleum hydrocarbons degraded, 3 to 4 pounds of oxygen is needed. For example, to aerobically biodegrade 5,000 pounds of petroleum hydrocarbons, 20,000 pounds of oxygen are needed. A factor of four is used to account for other potential losses of oxygen. The maximum solubility of oxygen in groundwater is approximately 10 milligrams per liter (mg/l) when sparged with air and 40 mg/l when sparged with pure oxygen (NRC, pg. 136). If water is used to deliver the oxygen to the petroleum hydrocarbons, the volume (V) of water necessary is:

$$V = \left[\frac{Mass}{Concentration}\right] = \left[\frac{20{,}000\,pounds}{40\,mg/l} \times \frac{453.59 \times 10^3\,mg/g}{3.785\,l/gal}\right] = 60{,}000{,}000\,gallons$$

For groundwater delivered at a flow rate (Q) of 10 gallons per minute (gpm), the time (t) to deliver 20,000 pounds of oxygen is:

$$t = \frac{V}{Q} = \left[\frac{60{,}000{,}000\,gallons}{10\,gpm} \times \frac{day}{1440\,min} \times \frac{year}{365\,day}\right] = 11.4\,years$$

Due to the amount of oxygen needed to biodegrade the amount of petroleum hydrocarbons present in the subsurface of this site, this technology is not feasible. The mass of petroleum hydrocarbons present beneath this site based on available assessment information likely exceeds 5,000 pounds. how was this determined ?

Because of the time needed to supply the necessary oxygen to biodegrade the petroleum hydrocarbons, ENSR ranked this technology low in the cost and duration criteria compared to the other potential remedial alternatives (Table 77). The reliability of this technology was also ranked below some of the other technologies due to the uncertainty associated with controlling the flow of oxygen and nutrients in the subsurface.

8.3.4 Dual-media Extraction

Dual-media extraction has the highest overall ranking of the technologies evaluated. This technology is a "demonstrated technology" that has been proven effective at several sites (NRC pg. 8).

The implementation of dual-media extraction would involve performing a combination groundwater/soil vapor extraction test to evaluate performance and well spacing. The vapor extraction testing performed at this site indicated that relatively low soil vapor flow can be induced. As discussed above, the soil vapor flow was probably limited due to upwelling of groundwater in the wells tested. Pumping groundwater in a combination SVE/groundwater extraction well, will lower the groundwater table and allow for greater flow of soil vapors. In addition, this increased soil vapor flow will occur through the capillary and saturated zones where the majority of the petroleum hydrocarbon mass is contained.

The groundwater extraction pumps should be placed as far beneath the water table as practical for the following reasons:

1) The pump operation can be controlled to allow sufficient drawdown while not allowing the FLH to reach the pump intake; and

2) The concentration of petroleum hydrocarbons are likely lower in the deeper water because the deeper water is further from the source.

Migration of petroleum hydrocarbons from off-site sources is a possibility with this technology. Frequent monitoring of the groundwater monitoring wells located on the perimeter of the site will provide an indication of whether migration from off-site sources is occurring. Carefully controlling the groundwater drawdown in the extraction wells and alternating extraction among different extraction wells will help reduce the potential for off-site migration.

Dual-media is the most feasible approach to reduce the mass of petroleum hydrocarbons beneath the site. The soil vapor and groundwater petroleum hydrocarbon concentrations will decline rapidly after startup and then stabilize at an asymptotic limit. When asymptotic concentrations are achieved, it is no longer feasible to maintain system operation, and closure based upon the reduced threat to human health and the environment should be requested.

9.0 RECOMMENDATIONS

ENSR recommends the following additional investigative work be performed as a first phase or in conjunction with site remediation:

- Perform a combination groundwater pumping/SVE test to assist in the design of a dual-media remediation approach for this site;
- Review the subject site files at the ACDEH to locate monitoring well construction details of MW-1, MW-2, and MW-3. This will determine whether or not the water table is above or below the top of the screen;
- Perform a search for wells located within ½ mile of the subject property;
- Perform a subsurface utilities search for potential sensitive receptors;
- Perform additional chemical analyses of the groundwater (general minerals) to assist in assessing groundwater quality and determining cleanup goals;
- Review the regional Basin Plan that includes Alameda to determine beneficial uses of the groundwater in the subject site area; and,
- Review files of adjacent properties with a history of USTs.

TABLE 1

ANALYTICAL RESULTS:SOIL

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

(all results presented in mg/kg)

Sample Identification	Date Collected	Sample Depth (feet)	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	Lead	HVOC's
1 (UST) 1	07/31/92	9.0	3,100	NA	48	210	55	260	NA	NA	NA
2 (UST) 2	07/31/92	9.0	11,000	NA	190	850	230	1,200	NA	NA	NA
3 (UST) 3	07/31/92	9.0	16,000	NA	280	1,000	270	1,400	NA	NA	NA
4 (SP)	07/31/92	SP	20	NA	0.072	0.3	0.08	1.2	NA	NA	NA
5 (SP)	07/31/92	SP	270	NA	0.55	6.6	5.4	35	NA	NA	NA
6 (DI)	07/31/92	2.5	2.1	NA	0.011	0.046	0.013	0.09	NA	NA	NA
MW-1	01/04/93	10.0	640	<50	1.5	17	10	54	NA	NA	<0.005*
MW-2	01/04/93	10.0	5,800	<300	110	850	210	1,200	NA	NA	<0.005*
MW-3	01/04/93	10.0	2,100	<50	<0.5	2	<0.5	1.4	NA	NA	<0.005*
MW-5	09/01/93	6.0	<1.0	<5.0	<0.005	0.006	<0.005	0.096	NA	NA	NA
MW-5	09/01/93	9.0	9,000	NA	34	310	180	1,000	NA	NA	NA
MW-6	09/01/93	10.0	13,000	NA	8	65	48	290	NA	NA	NA
MW-7	09/01/93	6.0	<1.0	<5.0	0.045	0.03	<0.005	0.016	NA	NA	NA
MW-7	09/01/93	9.5	<1.0	<5.0	190	720	170	1,000	NA	NA	NA
MW-7	09/01/93	10.0	<1.0	<5.0	250	990	260	1,600	NA	NA	NA
MW-7	09/01/93	20.0	<1.0	<5.0	0.038	0.1	0.02	0.14	NA	NA	NA
MW-4	09/02/93	6.0	<1.0	<5.0	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
MW-4	09/02/93	9.0	<1.0	<5.0	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
SW-2	08/12/94	8.0	<1.0	<5.0	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
SW-4	08/12/94	8.0	<1.0	<5.0	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
SW-6	08/12/94	8.0	<1.0	<5.0	<0.005	<0.005	<0.005	0.006	NA	NA	NA
SW-10	08/12/94	8.0	<1.0	<5.0	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
SP-1 – SP-3	08/12/94	SP	<1.0	<5.0	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
SP-4 – SP-6	08/12/94	SP	<1.0	<5.0	<0.005	<0.005	<0.005	<0.0.006005	NA	NA	NA
HP-1/11	08/30/94	11.0	4,600	<5.0	4.1	77	24	88	NA	NA	NA
HP-2/11	08/30/94	11.0	<1.0	<5.0	<0.005	<0.005	<0.005	<0.005	NA	NA	NA
HP-3/11	08/30/94	11.0	<1.0	<5.0	0.008	<0.005	<0.005	<0.005	NA	NA	NA
Sv-1/9.5	08/30/94	9.5	8,400	<5.0	37	330	170	830	NA	NA	NA
MW-8	11/22/95	8.0	3,500	80	<1.3	<1.3	16	46	NA	NA	NA
MW-9	11/22/95	9.5	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	NA	NA	<0.005
MW-11	11/22/95	9.5	154	88	<0.13	0.19	0.58	4.4	NA	NA	NA
TWP-3 @ 11'	07/21/97	11	<0.2	NA	<0.005	<0.005	<0.005	<0.005	<0.005	NA	NA

NOTE: < = Below Practical Quantitation Reporting Limits per "Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites" (August 10, 1990). (PQL for BTEX = 0.005 ppm, TPH, as gasoline and diesel = 1.0 ppm.)

SP = Stockpile Sample

TABLE 1 (CONT)

ANALYTICAL RESULTS:SOIL

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

(all results presented in mg/kg)

Sample Identification	Date Collected	Sample Depth (feet)	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE	Lead	HVOC's
TWP-4 @ 11'	07/21/97	11	<0.2	NA	<0.005	<0.005	<0.005	<0.005	<0.005	NA	NA
TWP-5 @ 11'	07/21/97	11	<0.2	NA	<0.005	<0.005	<0.005	<0.005	<0.005	NA	NA
TWP-6 @ 5'	07/21/97	5	<0.2	NA	<0.005	<0.005	<0.005	<0.005	<0.005	NA	NA
TWP-6 @ 10'	07/21/97	10	6,400	NA	40.0	470.0	220.0	1,100.0	NA	<3.0	NA
TWP-6 @ 13'	07/21/97	13	<0.2	NA	<0.005	<0.005	<0.005	<0.005	NA	<3.0	NA
TWP-7 @ 7'	07/21/97	7	0.5	NA	0.051	0.050	0.006	0.034	NA	NA	NA
TWP-7 @ 10'	07/21/97	10	3,400	NA	30.0	220.0	90.0	520.0	NA	4	NA
TWP-7 @ 13'	07/21/97	13	1	NA	0.43	0.44	<0.005	0.190	NA	<3.0	NA
TWP-8 @ 5'	07/21/97	5	<0.2	NA	0.012	0.016	<0.005	0.028	NA	NA	NA
TWP-8 @ 10'	07/21/97	10	2,100	NA	17.0	120.0	50.0	250.0	NA	12	NA
TWP-8 @ 13'	07/21/97	13	0.6	NA	0.29	0.051	0.014	0.052	NA	<3.0	NA

NOTE: < = Below Practical Quantitation Reporting Limits per "Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites" (August 10, 1990). (PQL for BTEX = 0.005 ppm, TPH, as gasoline and diesel = 1.0 ppm.)

SP = Stockpile Sample

TABLE 2

TEMPORARY GROUNDWATER MONITORING WELLS AND HYDROPUNCH GROUNDWATER SAMPLE ANALYTICAL RESULTS

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

(all results presented in µg/kg)

Sample Identification	Date Collected	TPHg	THPd	Benzene MCL=1.0 SNARL=200(10-day)	Toluene MCL=150 SNARL= 1,000	Ethyl-benzene MCL=700 SNARL= 700	Total Xylenes MCL=1,750 SNARL= 10,000	HVOCs MCL=NA SNARL=20-200	MTBE
HP-1	08/30/94	7,500	<50	19	98	15	53	ND	
HP-2	08/30/94	<50	<50	<0.5	<0.5	<0.5	0.5	ND	
HP-3	08/30/94	950	<50	<0.5	2	5	9	1,2-DCA=54	
P-1	10/06/95	<50	<100	410	<0.5	<0.5	<0.5	1,2-DCA-10	
P-2	10/06/95	<50	<50	<0.5	<0.5	<0.5	0.5	1,2-DCA=2.0 PCE-1.2	
P-3	10/06/95	<50	<500	<0.5	<0.5	<0.5	<0.5	NA	
P-4	10/06/95	<50	<50	<0.5	<0.5	<0.5	0.6	NA	
P-5	10/06/95	2,400	<500	<0.5	82	150	400	NA	
P-6	10/06/95	22,000	<500	65	320	800	1,200	NA	
P-7	10/06/95	46,000	<50	8,600	68	640	870	NA	
P-8	10/06/95	<50	<500	240,<0.5	<0.5	<0.5	<0.5	NA	
P-9	10/06/95	<50	<500	<0.5	<0.5	<0.5	<0.5	NA	
TWP-1	07/21/97	<50		<0.5	<0.5	<0.5	<0.5		<5.0
TWP-2	07/21/97	<50		<0.5	<0.5	<0.5	<0.5		20
TWP-3	07/21/97	<50		<0.5	<0.5	<0.5	<0.5		<5.0
TWP-4	07/21/97	<50		<0.5	<0.5	<0.5	<0.5		<5.0
TWP-5	07/21/97	<50		<0.5	<0.5	<0.5	<0.5		<5.0
TWP-6	07/21/97	18,000		5,200	1,400	520	2,600		<5.0
TWP-7	07/21/97	180,000		41,000	40,000	2,900	15,000		<5.0
TWP-8	07/21/97	62,000		29,000	5,400	1,500	6,200		<5.0

NOTE: < = Below Practical Quantitation Reporting Limits (PQL) per "Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites" (August 10, 1990). (PQL for BTEX = 0.5 ppb; TPH-g and TPH-d = 50 ppb).
SP = Stockpile Sample
1,2-DCA = 1,2-Dichloroethane

TABLE 3

GROUNDWATER ELEVATION DATA

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-1	01/07/93	28.53	8.87	--	0.00	19.66
	09/07/93		9.63	--	0.00	18.90
	11/16/93		9.89	--	0.00	18.64
	12/07/93		9.66	--	0.00	18.87
	01/06/94		9.67	--	0.00	18.86
	02/03/94		9.50	--	0.00	19.03
	03/04/94		9.18	--	0.00	19.35
	06/06/94		9.55	--	0.00	18.98
	11/09/94		8.83	--	0.00	19.70
	12/20/94		9.00	--	0.00	19.53
	03/29/95		8.44	--	0.00	20.09
	05/24/95		9.01	--	0.00	19.52
	08/30/95		9.52	--	0.00	19.01
	11/29/95	28.49 (2)	9.96	--	0.00	18.53
	05/01/96		9.19	--	0.00	19.30
	08/05/96		9.63	--	0.00	18.86
	12/10/96		9.31	--	0.00	19.18
	03/05/97		9.01	--	0.00	19.48
	06/25/97		9.61	--	0.00	18.88
	10/14/97		9.48	--	sheen	19.01
	1/30/98		8.16	--	sheen	20.33
MW-2	01/07/93	28.51	8.78	--	0.00	19.73
	09/07/93		9.52	--	0.00	18.99
	11/16/93		9.73	--	0.00	18.78
	12/07/93		9.54	--	0.00	18.97
	01/06/94		9.54	--	0.00	18.97
	02/03/94		9.37	--	0.00	19.14
	03/04/94		9.02	--	0.00	19.49
	06/06/94		9.40	--	0.00	19.11
	11/09/94		NM(1)	NM	NM	NM
	12/20/94		NM(1)	NM	NM	NM
	03/29/95		8.26	--	0.00	20.25
	05/24/95		8.89	--	0.00	19.62
	08/30/95		9.41	--	0.00	19.10
	11/29/96	28.47 (2)	9.96	--	0.00	18.53
	05/01/96		9.19	--	0.00	19.30
	08/05/96		9.49	--	0.00	18.98
	12/10/96		9.13	--	0.00	19.34
	03/05/97		8.90	--	0.00	19.57
	06/25/97		9.49	--	0.00	18.98
	10/14/97		9.37	--	sheen	19.10
	1/30/98		8.02	--	sheen	20.45

NOTES: 1 = MW-2 could not be located; well box was temporarily buried during tank excavation activities
2 = Top of casing reference elevations of all well were resurveyed on Nov. 29, 1995, following installation of MW-8, MW-9, and MW-11. Elevations relative to a found "cut-cross" in the top of the depressed curb at the mid return of the northwest corner of the intersection of Santa Clara Avenue and oak Street. Benchmark elevation taken as 28.455 feet above MSL
3 = MW-10 inaccessible due to parked car

MSL = Mean Sea Level
NM = Not Measured
Ground water elevations (GWE) are corrected for free product thickness (FPT) using the following equation: Corrected GWE = Top of Casing Elevation - (Measured Depth to Water - (0.8 x FPT))
Data prior to 11/09/94 from Environmental Science and Engineering, Inc.

TABLE 3 (Cont.)

GROUNDWATER ELEVATION DATA

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-3	01/07/93	28.82	8.86	--	0.00	19.96
	09/07/93		9.62	--	0.00	19.20
	11/16/93		9.82	--	0.00	19.00
	12/07/93		9.60	--	0.00	19.22
	01/06/94		9.62	--	0.00	19.20
	02/03/94		9.45	--	0.00	19.37
	03/04/94		9.11	--	0.00	19.71
	06/06/94		9.50	--	0.00	19.32
	11/09/94	28.78 (2)	8.82	--	0.00	20.00
	12/20/94		9.00	--	0.00	19.82
	03/29/95		8.45	--	0.00	20.37
	05/24/95		8.99	--	0.00	19.83
	08/30/95		9.54	--	0.00	19.28
	11/29/95		9.90	--	0.00	18.88
	05/01/96		9.25	--	0.00	19.53
	08/05/96		9.61	--	0.00	19.17
	12/10/96		9.27	--	0.00	19.51
	03/05/97		9.09	--	0.00	19.69
	06/25/97		9.62	--	0.00	19.16
	10/14/97		9.55	--	0.00	20.23
	1/30/98		8.28	--	0.00	20.5
MW-4	09/07/93	28.57	9.39	--	0.00	19.18
	11/16/93		9.60	--	0.00	18.97
	12/07/93		9.42	--	0.00	19.15
	01/06/94		9.44	--	0.00	19.13
	02/03/94		9.31	--	0.00	19.26
	03/04/94		9.05	--	0.00	19.52
	06/06/94		9.31	--	0.00	19.26
	11/09/94		8.68	--	0.00	19.89
	12/20/94		8.97	--	0.00	19.60
	03/29/95		8.46	--	0.00	20.11
	05/24/95		8.86	--	0.00	19.71
	08/30/95		9.41	--	0.00	19.16
	11/29/95	28.53 (2)	9.72	--	0.00	18.81
	05/01/96		9.17	--	0.00	19.36
	08/05/96		9.44	--	0.00	19.09
	12/10/96		9.18	--	0.00	19.35
	03/05/97		8.99	--	0.00	19.54
	06/25/97		9.43	--	0.00	19.10
	10/14/97		9.30	--	0.00	19.23
	1/30/98		8.29	--	0.00	20.24

NOTES:
1 = MW-2 could not be located; well box was temporarily buried during tank excavation activities
2 = Top of casing reference elevations of all well were resurveyed on Nov. 29, 1995, following installation of MW-8, MW-9, and MW-11. Elevations relative to a found "cut-cross" in the top of the depressed curb at the mid return of the northwest corner of the intersection of Santa Clara Avenue and oak Street. Benchmark elevation taken as 28.455 feet above MSL
3 = MW-10 inaccessible due to parked car

MSL = Mean Sea Level
NM = Not Measured
Ground water elevations (GWE) are corrected for free product thickness (FPT) using the following equation: Corrected GWE = Top of Casing Elevation - (Measured Depth to Water - (0.8 x FPT))
Data prior to 11/09/94 from Environmental Science and Engineering, Inc.

TABLE 3 (Cont.)

GROUNDWATER ELEVATION DATA

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-5	09/07/93	28.37	9.31	0.00	--	19.06
	11/16/93		9.99	9.45	0.54	18.81
	12/07/93		9.88	9.27	0.61	18.98
	01/06/94		9.85	9.27	0.58	18.98
	02/03/94		9.51	9.19	0.32	19.12
	03/04/94		8.99	8.96	0.03	19.40
	06/06/94		9.72	9.14	0.58	19.11
	11/09/94		8.58	8.56	0.02	19.81
	12/20/94		8.77	8.76	0.01	19.61
	03/29/95		8.31	--	0.00	20.06
	05/24/95		8.77	8.76	0.01	19.61
	08/30/95		9.50	9.19	0.31	19.12
	11/29/95	28.33 (2)	9.84	9.60	0.24	18.68
	05/01/96		8.87	8.86	0.01	19.47
	08/05/96		9.37	9.36	0.01	18.97
	12/10/96		8.15	8.14	0.01	19.39
	03/05/97		8.75	--	0.00	19.58
	06/25/97		9.34	--	0.00	18.99
	10/14/97		9.21	--	sheen	19.12
	1/30/98		8.09	--	sheen	20.24
MW-6	09/07/93	28.41	9.53	--	0.00	18.88
	11/16/93		9.74	--	0.00	18.67
	12/07/93		9.58	--	0.00	18.83
	01/06/94		9.60	--	0.00	18.81
	02/03/94		9.47	--	0.00	18.94
	03/04/94		9.18	--	0.00	19.23
	06/06/94		9.46	--	0.00	18.95
	11/09/94		8.72	--	0.00	19.69
	12/20/94		9.00	--	0.00	19.41
	03/29/95		8.44	--	0.00	19.97
	05/24/95		8.94	--	0.00	19.47
	08/30/95		9.43	--	0.00	18.98
	11/29/95	28.36 (2)	9.83	--	0.00	18.53
	05/01/96		9.00	--	0.00	19.36
	08/05/96		9.55	--	0.00	18.81
	12/10/96		9.18	--	0.00	19.18
	03/05/97		8.97	--	0.00	19.39
	06/25/97		9.53	--	0.00	18.83
	10/14/97		9.37	--	sheen	18.99
	1/30/98		8.16	--	sheen	20.2

NOTES: 1 = MW-2 could not be located; well box was temporarily buried during tank excavation activities
2 = Top of casing reference elevations of all well were resurveyed on Nov. 29, 1995, following installation of MW-8, MW-9, and MW-11. Elevations relative to a found "cut-cross" in the top of the depressed curb at the mid return of the northwest corner of the intersection of Santa Clara Avenue and oak Street. Benchmark elevation taken as 28.455 feet above MSL
3 = MW-10 inaccessible due to parked car

MSL = Mean Sea Level
NM = Not Measured
Ground water elevations (GWE) are corrected for free product thickness (FPT) using the following equation: Corrected GWE = Top of Casing Elevation - (Measured Depth to Water - (0.8 x FPT))
Data prior to 11/09/94 from Environmental Science and Engineering, Inc.

TABLE 3 (Cont.)

GROUNDWATER ELEVATION DATA

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-7	09/07/93	28.56	9.61	--	0.00	18.95
	11/16/93		9.86	--	0.00	18.70
	12/07/93		9.58	--	0.00	18.98
	01/06/94		9.59	--	0.00	18.97
	02/03/94		9.56	9.39	0.17	19.14
	03/04/94		9.04	9.01	0.03	19.54
	06/06/94		9.67	9.37	0.30	19.13
	11/09/94		8.57	8.52	0.05	20.03
	12/20/94		9.08	8.67	0.41	19.81
	03/29/95		8.51	7.96	0.55	20.49
	05/24/95		8.98	8.81	0.17	19.72
	08/30/95		9.71	9.40	0.31	19.10
	11/29/95	28.44 (2)	9.86	9.84	0.02	18.60
	05/01/96		8.94	8.85	0.09	19.57
	08/05/96		9.48	9.45	0.03	19.03
	12/10/96		8.96	8.95	0.01	19.49
	03/05/97		8.77	--	0.00	19.67
	06/25/97		9.47	--	0.00	18.97
	10/14/97		8.71	--	sheen	19.04
	1/30/98		8.09	7.68	0.41	20.68
MW-8	11/29/95	28.17 (2)	8.92	--	0.00	19.25
	05/01/95		8.42	--	0.00	19.75
	08/05/96		8.75	--	0.00	19.42
	12/10/96		8.53	--	0.00	19.64
	03/05/97		8.77	--	0.00	19.76
	06/25/97		8.72	--	0.00	19.45
	10/14/97		8.71	--	0.00	19.46
	1/03/98		7.84	--	0.00	20.33
MW-9	11/29/95	27.45 (2)	9.23	--	0.00	18.22
	05/01/96		8.66	--	0.00	18.79
	08/05/96		8.94	--	0.00	18.51
	12/10/96		8.60	--	0.00	18.85
	03/05/97		8.40	--	0.00	19.05
	06/25/97		8.96	--	0.00	18.49
	10/14/97		8.80	--	0.00	18.65
	1/30/98		7.86	--	0.00	19.59

NOTES: 1 = MW-2 could not be located; well box was temporarily buried during tank excavation activities
2 = Top of casing reference elevations of all well were resurveyed on Nov. 29, 1995, following installation of MW-8, MW-9, and MW-11. Elevations relative to a found "cut-cross" in the top of the depressed curb at the mid return of the northwest corner of the intersection of Santa Clara Avenue and oak Street. Benchmark elevation taken as 28.455 feet above MSL
3 = MW-10 inaccessible due to parked car

MSL = Mean Sea Level
NM = Not Measured
Ground water elevations (GWE) are corrected for free product thickness (FPT) using the following equation: Corrected GWE = Top of Casing Elevation - (Measured Depth to Water - (0.8 x FPT))
Data prior to 11/09/94 from Environmental Science and Engineering, Inc.

TABLE 3 (Cont.)

GROUNDWATER ELEVATION DATA

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Monitoring Well Identification	Monitoring Date	Top of Casing Elevation (ft. above MSL)	Depth to Water (feet)	Depth to Free Product (feet)	Free Product Thickness (feet)	Corrected Groundwater Elevation (ft. above MSL)
MW-10	11/29/95	27.32 (2)	8.73	--	0.00	18.59
	05/01/96		NM (3)	NM	NM	NM
	08/05/96		8.50	--	0.00	18.82
	12/10/96		8.17	-	0.00	19.15
	03/05/97		8.06	--	0.00	19.26
	06/25/97		8.51	--	0.00	18.81
	10/14/97		8.06	--	0.00	19.26
	1/30/98		7.37	--	0.00	19.95
MW-11	11/29/95	28.56 (2)	10.16	--	0.00	18.40
	05/01/96		9.12	--	0.00	1944
	08/05/96		9.62	--	0.00	18.94
	12/10/96		9.18	--	0.00	19.38
	03/05/97		8.93	--	0.00	19.63
	06/25/97		9.65	--	0.00	18.91
	10/14/97		9.63	--	0.00	18.93
	1/30/98		7.86	--	0.00	20.7

NOTES:
1 = MW-2 could not be located; well box was temporarily buried during tank excavation activities
2 = Top of casing reference elevations of all well were resurveyed on Nov. 29, 1995, following installation of MW-8, MW-9, and MW-11. Elevations relative to a found "cut-cross" in the top of the depressed curb at the mid return of the northwest corner of the intersection of Santa Clara Avenue and oak Street. Benchmark elevation taken as 28.455 feet above MSL
3 = MW-10 inaccessible due to parked car

MSL = Mean Sea Level
NM = Not Measured
Ground water elevations (GWE) are corrected for free product thickness (FPT) using the following equation: Corrected GWE = Top of Casing Elevation - (Measured Depth to Water - (0.8 x FPT))
Data prior to 11/09/94 from Environmental Science and Engineering, Inc.

TABLE 4

GROUNDWATER ANALYTICAL RESULTS

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

ell Number	Sample Date	TPH as Gasoline (µg/L) MCL=NE SNARL=NE	Benzene (µg/L) MCL=1.0 SNARL=200(10-day)	Toluene (µg/L) MCL=150 SNARL=1,000	Ethyl Benzene (µg/L) MCL=700 SNARL=700	Xylene (Total) (µg/L) MCL=1,750 SNARL=10,000	TPH as Diesel (µg/L) MCL=NE SNARL=(10-day 49)	HVOCs (µg/L)	MTBE (µg/L) MCL=SNARL=20-200
MW-1	01/07/93	110,000	14,000	17,000	2,500	8,800	< 3,000	1,2-DCE-(470)	NA
	09/07/93	28,000	11,000	2,100	380	1,200	1,000 (2)	NA	NA
	12/07/93	17,000	10,000	3,000	610	2,000	1,800 (1)	NA	NA
	03/04/94	6,600	4,400	870	150	590	920 (4)	NA	NA
	06/06/94	12,000	6,300	230	<0.5	< 0.5	710 (4)	NA	NA
	11/09/94	28,000	9,500	3,000	810	2,300	250	NA	NA
	12/20/94	5,600	3,000	92	86	76	< 50	NA	NA
	03/29/95	24,000	5,800	3,100	390	1,300	< 50	NA	NA
	05/24/95	2,500	800	280	31	130	< 50	NA	NA
	08/30/95	48,000	14,000	3,500	620	1,600	800	NA	NA
	11/29/95	120,000	42,000	22,000	2,300	9,900	< 1000	NA	NA
	05/01/96	49,800	11,800	5,720	121	3,160	< 50	1,2-DCE- (5.6)	NA
	08/05/96	54,600	17,400	7,440	1,130	3,880	< 50	1,2-DCE- (50.7)	NA
	12/10/96	27,500	7,680	2,020	720	720	< 50	< 0.5	NA
	03/06/97	86,900	18,900	7,730	1,470	3,320	< 50	< 0.5	NA
	06/25/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NSFP	NSFP
	10/14/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NSFP	NSFP
	01/30/98	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NA	NSFP
MW-2	01/07/93	85,000	20,000	8,500	1,500	4,300	< 3,000	1,2-DCE-550	NA
	09/07/93	140,000	46,000	28,000	3,300	15,000	8,200 (2)	NA	NA
	12/07/93	86,000	28,000	17,000	35,000	16,000	8,200 (2)	NA	NA
	03/04/94	130,000	22,000	22,000	3,500	16,000	18,000 (4)	NA	NA
	06/06/94	100,000	27,000	22,000	2,300	10,000	9,600 (5)	NA	NA
	11/09/94	NSL	NSL	NSL	NSL	NSL	NSL	NA	NA
	12/20/94	NSL	NSL	NSL	NSL	NSL	NSL	NA	NA
	03/29/95	240,000	56,000	30,000	3,100	7,000	3,800	NA	NA
	05/24/95	330,000	54,000	51,000	4,700	22,000	28,000	NA	NA
	08/30/95	200,000	48,000	52,000	3,900	16,000	8,000	NA	NA
	11/29/95	170,000	42,000	40,000	3,400	17,000	< 1000	NA	NA
	05/01/96	481,000	59,000	69,000	27,200	89,600	< 50	1,2-DCE- (61.8)	NA
	08/05/96	193,000	41,800	56,000	3,590	18,000	< 50	1,2-DCE- (83.2)	NA
	12/10/96	166,000	26,400	38,600	3,180	14,700	< 50	< 0.5	NA
	03/06/97	316,000	36,600	55,900	4,160	16,100	< 50	< 0.5	NA
	06/25/97	160,000	37,000	63,000	3,500	19,000	NA	< 0.5	<5.0
	10/14/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NSFP	NSFP
	1/30/98	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NA	NSFP

NOTES:
1,2-DCE = 1,2-Dichloroethane
TCB = 1,1,2,2-Tetrachlorobenzene
TPH-g = Total Petroleum Hydrocarbons as gasoline
TPH-d = Total Petroleum Hydrocarbons as diesel
MTBE = Methyl tertiarybutyl ether reported in µg/L (5)
µg/L = micrograms per liter or parts per billion (ppb)
MCL = Maximum Contaminant Level for Drinking Water Standards for the state of California
SNARL = EPA Suggested No-Adverse-Response Levels
NSFP = Not Sampled - Free Product present
NSL = Not Samples - well could not be located
NSR = Not Sampled - well could not be reached
NA = Not Analyzed
NE = Not Established

(1) = Results typical of a non-diesel mixture (<C16)
(2) = Results typical of a diesel and non-diesel mixture (<C16)
(3) = Results typical of weathered gasoline
(4) = Results typical of diesel and unidentified hydrocarbons <C14)
= Results typical of unidentified hydrocarbons (<C14)

TABLE 4 (Cont.)

GROUNDWATER ANALYTICAL RESULTS

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

ell Number	Sample Date	TPH as Gasoline (µg/L) MCL=NE SNARL=NE	Benzene (µg/L) MCL=1.0 SNARL=200(10-day)	Toluene (µg/L) MCL=150 SNARL=1,000	Ethyl Benzene (µg/L) MCL=700 SNARL=700	Xylene (Total) (µg/L) MCL=1,750 SNARL=10,000	TPH as Diesel (µg/L) MCL=NE SNARL=(10-day 49)	HVOCs (µg/L)	MTBE (µg/L) MCL= SNARL= 20-200
MW-3	01/07/93	8,500 (3)	170	70	< 30	< 30	< 3,000	NA	NA
	09/07/93	2,800	19	46	7.7	23	2,500 (1)	NA	NA
	12/07/93	3,000	17	43	13	28	520 (2)	NA	NA
	03/04/94	2,300	22	46	9.0	27	1,300 (5)	NA	NA
	06/06/94	1,900	3.9	< 0.5	9.0	27	1,600 (5)	NA	NA
	11/09/94	2,800	2.6	17	17	32	< 50	NA	NA
	12/20/94	2,700	10	62	24	59	< 50	NA	NA
	03/29/95	1,200	230	230	13	37	500	NA	NA
	05/24/95	5,700	< 5.0	73	20	57	< 50	NA	NA
	08/30/95	3,100	< 1.0	29	13	28	< 50	NA	NA
	11/29/95	13,000	39	59	7	33	< 80	NA	NA
	05/01/96	3,020	< 1.0	39.9	9.86	30.8	< 50	< 0.5	NA
	08/05/96	2,340	4.1	5.3	4.9	25.3	< 50	< 0.5	NA
	12/10/96	694,000	920	5,980	1,060	2,960	< 50	< 0.5	NA
	03/06/97	9,060	136	244	34	126	< 50	< 0.5	NA
	06/25/97	600	<0.5	1.1	<0.5	3.0	NA	< 0.5	< 5.0
	10/14/97	2,400	1.8	13	7.8	18	NA	< 0.5	< 5.0
	1/30/98	5,900	<0.5	<0.5	<0.5	<0.5	NA	NA	44
MW-4	09/07/93	440	2.7	1.2	1	1.9	330 (2)	NA	NA
	12/07/93	610	6.6	0.5	0.61	2.5	460 (2)	NA	NA
	03/04/94	110	< 0.5	< 0.5	< 0.5	0.63	56 (5)	NA	NA
	06/06/94	68	< 0.5	< 0.5	< 0.5	< 0.5	68 (4)	NA	NA
	11/09/94	90	0.7	1.1	0.5	2.1	< 50	NA	NA
	12/20/94	130	2.2	33	4.8	27	< 50	NA	NA
	03/29/95	< 50	< 0.5	0.5	< 0.5	<0.5	< 50	NA	NA
	05/24/95	< 50	< 0.5	<0.5	<0.5	0.6	< 50	NA	NA
	08/30/95	< 50	<0.5	< 0.5	< 0.5	< 0.5	< 50	NA	NA
	11/29/95	100	< 0.5	< 0.5	< 0.5	< 0.5	< 50	NA	NA
	05/01/96	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 50	< 0.5	NA
	08/05/96	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 50	< 0.5	NA
	12/10/96	65	< 0.5	< 0.5	0.5	0.6	< 50	< 0.5	NA
	03/06/97	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 50	< 0.5	NA
	06/25/97	200	< 0.5	< 0.5	< 0.5	< 0.5	NA	< 0.5	< 5.0
	10/14/97	< 50	< 0.5	< 0.5	< 0.5	< 0.5	NA	< 0.5	< 5.0
	1/30/98	< 50	< 0.5	< 0.5	< 0.5	< 0.5	NA	NA	< 5.0

NOTES:
- 1,2-DCE = 1,2-Dichloroethane
- TCB = 1,1,2,2-Tetrachlorobenzene
- TPH-g = Total Petroleum Hydrocarbons as gasoline
- TPH-d = Total Petroleum Hydrocarbons as diesel
- MTBE = Methyl tertiarybutyl ether reported in µg/L (5)
- µg/L = micrograms per liter or parts per billion (ppb)
- MCL = Maximum Contaminant Level for Drinking Water Standards for the state of California
- SNARL = EPA Suggested No-Adverse-Response Levels
- NSFP = Not Sampled - Free Product present
- NSL = Not Samples - well could not be located
- NSR = Not Sampled - well could not be reached
- NA = Not Analyzed
- NE = Not Established

- (1) = Results typical of a non-diesel mixture (<C16)
- (2) = Results typical of a diesel and non-diesel mixture (<C16)
- (3) = Results typical of weathered gasoline
- (4) = Results typical of diesel and unidentified hydrocarbons <C14)
- = Results typical of unidentified hydrocarbons (<C14)

TABLE 4 (Cont.)

GROUNDWATER ANALYTICAL RESULTS

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

ell Number	Sample Date	TPH as Gasoline (µg/L) MCL=NE SNARL=NE	Benzene (µg/L) MCL=1.0 SNARL=200(10-day)	Toluene (µg/L) MCL=150 SNARL=1,000	Ethyl Benzene (µg/L) MCL=700 SNARL=700	Xylene (Total) (µg/L) MCL=1,750 SNARL=10,000	TPH as Diesel (µg/L) MCL=NE SNARL=(10-day 49)	HVOCs (µg/L)	MTBE (µg/L) MCL=SNARL=20-200
MW-5	09/07/93	37,000	2,700	1,700	870	4,600	1,700 (2)	NA	NA
	12/07/93	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	03/04/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	06/06/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	11/09/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	12/20/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	03/29/95	54,000	6,800	3,600	1,500	7,600	7,500	NA	NA
	05/24/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	08/30/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	11/29/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	05/01/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	08/05/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	12/10/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	03/06/97	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	06/25/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NSFP	NSFP
	10/14/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NSFP	NSFP
	1/30/98	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NA	NSFP
MW-6	09/07/93	10,000	1,300	540	370	1,600	1,400 (2)	NA	NA
	12/07/93	17,000	4,300	1,200	600	2,700	2,400 (2)	NA	NA
	03/04/94	21,000	4,600	1,000	460	1,800	1,800 (4)	NA	NA
	06/06/94	12,000	5,400	350	< 0.5	1,200	1,600 (4)	NA	NA
	11/09/94	29,000	4,600	1,600	820	3,600	7,500	NA	NA
	12/20/94	66,000	5,800	2,200	1,100	4,600	1,100	NA	NA
	03/29/95	25,000	8,000	780	450	1,300	1,300	NA	NA
	05/24/95	56,000	1,600	1,300	1,200	7,200	40,000	NA	NA
	08/30/95	68,000	16,000	3,400	1,900	6,800	4,900	NA	NA
	11/29/95	57,000	15,000	2,900	2,500	10,000	< 900	NA	NA
	05/01/96	39,500	7,400	2,540	1,270	4,470	< 50	1,2-DCE-(73)	NA
	08/05/96	71,200	22,600	4,000	2,100	7,030	< 50	1,2-DCE-(157)	NA
	12/10/96	49,200	10,900	2,180	1,880	6,720	< 50	1,2-DCE-(210)	NA
	03/06/97	65,300	10,300	2,500	1,940	5,770	< 50	< 0.5	NA
	06/25/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NSFP	NSFP
	10/14/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NSFP	NSFP
	1/30/98	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NA	NSFP

NOTES:
- 1,2-DCE = 1,2-Dichloroethane
- TCB = 1,1,2,2-Tetrachlorobenzene
- TPH-g = Total Petroleum Hydrocarbons as gasoline
- TPH-d = Total Petroleum Hydrocarbons as diesel
- MTBE = Methyl tertiarybutyl ether reported in µg/L(5)
- µg/L = micrograms per liter or parts per billion (ppb)
- MCL = Maximum Contaminant Level for Drinking Water Standards for the state of California
- SNARL = EPA Suggested No-Adverse-Response Levels
- NSFP = Not Sampled - Free Product present
- NSL = Not Samples - well could not be located
- NSR = Not Sampled - well could not be reached
- NA = Not Analyzed
- NE = Not Established

- (1) = Results typical of a non-diesel mixture (<C16)
- (2) = Results typical of a diesel and non-diesel mixture (<C16)
- (3) = Results typical of weathered gasoline
- (4) = Results typical of diesel and unidentified hydrocarbons <C14)
- = Results typical of unidentified hydrocarbons (<C14)

TABLE 4 (Cont.)

GROUNDWATER ANALYTICAL RESULTS

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

ell Number	Sample Date	TPH as Gasoline (µg/L) MCL=NE SNARL=NE	Benzene (µg/L) MCL=1.0 SNARL=200(10-day)	Toluene (µg/L) MCL=150 SNARL=1,000	Ethyl Benzene (µg/L) MCL=700 SNARL=700	Xylene (Total) (µg/L) MCL=1,750 SNARL=10,000	TPH as Diesel (µg/L) MCL=NE SNARL=(10-day 49)	HVOCs (µg/L)	MTBE (µg/L) MCL= SNARL=20-200
MW-7	09/07/93	24,000	6,000	4,800	490	2,300	1,300	NA	NA
	12/07/93	95,000	28,000	24,000	1,600	8,700	2,200	NA	NA
	03/04/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	06/06/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	11/09/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	12/20/94	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	03/29/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	05/24/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	08/30/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	11/29/95	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	05/01/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	08/05/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	12/10/96	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	03/05/97	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NSFP	NA
	06/25/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NSFP	NSFP
	10/14/97	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NA	NSFP
	1/30/98	NSFP	NSFP	NSFP	NSFP	NSFP	NA	NA	NSFP
MW-8	11/29/95	7,400	260	40	140	190	< 80	NA	NA
	05/01/96	270	1.02	<0.5	1.10	1.87	< 50	< 0.5	NA
	08/05/96	1,100	22.6	3.4	11.2	12.7	< 50	TCB-2.5	NA
	12/10/96	442	17.2	2.7	5.9	5.6	< 50	< 0.5	NA
	03/05/97	765	33.2	7.2	9.3	11.1	525	< 0.5	NA
	06/25/97	700	36	5.1	8.0	8.0	NA	NA	10
	10/14/97	660	29	6.6	10	13	NA	< 0.5	<5.0
	1/30/98	430	24	3.1	5.7	8.4	NA	NA	< 5.0
MW-9	11/29/95	1,500	590	2	3	20	< 50	1,2-DCE-46	NA
	05/01/96	230	142	0.78	< 0.5	1.17	< 50	< 0.5	NA
	08/05/96	180	3.1	0.5	0.5	2.3	< 50	< 0.5	NA
	12/10/96	157,000	13.6	320	135	500	50	1,2-DCE-5.0	NA
	03/05/97	2,710	940	4.6	20.2	12.4	< 50	1,2-DCE-19.2	NA
	06/25/97	8,000	4,600	190	100	30	NA	NA	220
	10/14/97	910	480	8.1	2.4	5.0	NA	< 0.5	46
	1/30/98	2,400	1,100	< 0.5	<0.5	< 0.5	NA	NA	< 5.0
MW-10	11/29/95	< 50	< 0.5	< 0.5	< 0.5	<0.5	< 950	NA	NA
	05/01/96	NSR	NSR	NSR	NSR	NSR	NSR	NSR	NA
	08/05/96	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 50	Chloroform (13.2)	NA
	12/10/96	<50	< 0.5	< 0.5	< 0.5	< 0.5	< 50	1,2-DCE-10.1	NA
	03/05/97	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 50	< 0.5	NA
	06/25/97	< 50	< 0.5	< 0.5	< 0.5	< 0.5	NA	NS	< 5.0
	10/14/97	< 50	1.2	2.5	< 0.5	1.7	NA	Chloroform-1.5	< 5.0
	1/30/98	< 50	< 0.5	< 0.5	< 0.5	< 0.5	NA	NA	< 5.0
MW-11	11/29/95	3,200	14	31	15	570	< 50	NA	NA
	05/01/96	79	< 0.5	< 0.5	< 0.5	< 0.5	107	< 0.5	NA
	08/05/96	6,660	5,040	< 0.5	51.6	< 0.5	< 50	1,2-DCE-16.0	NA
	12/10/96	68,000	800	260	200	1,160	< 50	< 0.5	NA
	03/05/97	340	4.2	0.6	3.1	5.3	< 50	< 0.5	NA
	06/25/97	300	3.5	0.9	2.7	5.0	NA	NS	< 5.0
	10/14/97	510	4.0	8.7	21	23	NA	< 0.5	< 5.0
	1/30/98	1,800	22	3.4	66	65	NA	NA	42

NOTES:
1,2-DCE = 1,2-Dichloroethane
TCB = 1,1,2,2-Tetrachlorobenzene
TPH-g = Total Petroleum Hydrocarbons as gasoline
TPH-d = Total Petroleum Hydrocarbons as diesel
MTBE = Methyl tertiarybutyl ether reported in µg/L (5)
µg/L = micrograms per liter or parts per billion (ppb)
MCL = Maximum Contaminant Level for Drinking Water Standards for the state of California
SNARL = EPA Suggested No-Adverse-Response Levels
NSFP = Not Sampled - Free Product present
NSL = Not Samples - well could not be located
NSR = Not Sampled - well could not be reached
NA = Not Analyzed
NE = Not Established

(1) = Results typical of a non-diesel mixture (<C16)
(2) = Results typical of a diesel and non-diesel mixture (<C16)
(3) = Results typical of weathered gasoline
(4) = Results typical of diesel and unidentified hydrocarbons <C14)
= Results typical of unidentified hydrocarbons (<C14)

TABLE 5
VAPOR EXTRACTION PILOT TEST: RESPONSE WELL DATA

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Extraction Well	Time		Pressures					Comments
	Actual (H:MM)	Elapsed (H:MM)	SV-1 (in. wc.)	MW-4 (in. wc.)	MW-5 (in. wc.)	MW-6 (in. wc.)	MW-7 (in. wc.)	
SV-1	14:30	0:00	0.0	0.000	0.000	0.000	0.000	Start of Test
	15:00	0:30	51.0	-0.010	0.180	-0.200	-0.050	
	15:15	0:45	50.0	-0.020	0.470	-0.170	-0.050	
	15:30	1:00	50.0	-0.020	0.210	-0.170	-0.050	
	15:45	1:15	50.0	-0.010	0.200	-0.170	-0.050	
	16:00	1:30	50.0	-0.010	0.210	-0.150	-0.050	End of Test
MW-4	13:02	0:00	0.000	0.0	0.000	0.000	0.000	Start of Test
	13:13	0:11	-0.020	-30.0	0.000	0.000	0.000	End of Test
MW-6	13:33	0:00	0.000	0.000	0.000	0.0	0.000	Start of Test
	13:43	0:10	-0.020	-0.070	0.040	-30.0	0.320	End of Test
MW-7	14:03	0:00	0.000	0.000	0.000	0.000	0.0	Start of Test
	14:10	0:07	-0.030	-0.020	0.260	-0.370	-35.0	End of Test

Notes: H:MM = Hours:Minutes
in. wc. = Inches water column pressure

TABLE 6
VAPOR EXTRACTION PILOT TEST: EXTRACTION WELL DATA

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

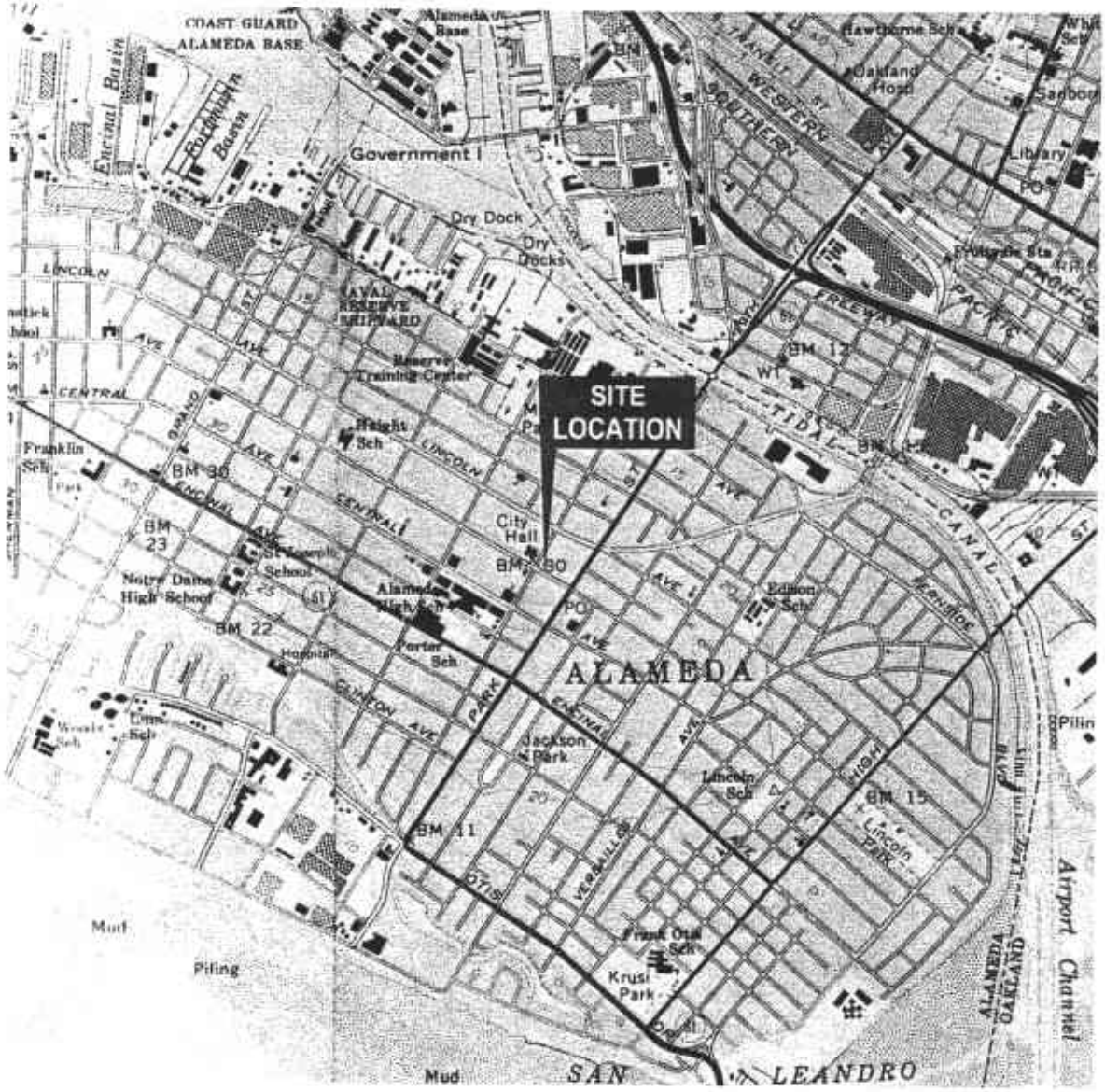
Extraction Well	Time		Field Data			Laboratory Data					Comments
	Actual (H:MM)	Elapsed (H:MM)	Extraction Flow (scfm)	Extraction Well Vacuum (in. wc.)	PID TPH (mg/kgv)	TPH-g (mg/kgv)	Benzene (mg/kgv)	Toluene (mg/kgv)	Ethyl-benzene (mg/kgv)	Total Xylenes (mg/kgv)	
	14:30	0:00	0	0.0							Start of Test
	14:38	0:08	8	50.0	10,000						
	15:00	0:30	11	51.0	10,000						
	15:15	0:45	11	50.0	9,000						
	15:30	1:00	11	50.0	8,400						
	15:45	1:15	13	50.0	7,200						
	16:00	1:30	13	50.0	7,000	9,000	390	650	92	430	End of Test
MW-4	12:50	0:00	0	0.0							Start of Test
	13:00	0:10	18	50.0	10						End of Test
MW-6	13:14	0:00	0	0.0							Start of Test
	13:24	0:10	4	30.0	950						End of Test
MW-7	13:53	0:00	0	0.0							Start of Test
	14:00	0:07	3	35.0	10,000						End of Test

Notes:
H:MM = Hours:Minutes
scfm = Standard cubic feet per minute
in. wc. = Inches water column pressure
mg/kgv = milligrams per kilogram volume
TPH = Total petroleum hydrocarbons as measured using a photoionization detector (PID)
TPH-g = Total petroleum hydrocarbons as gasoline

TABLE 7
REMEDIAL ALTERNATIVE EVALUATION

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

Alternative	Ranking						
		Effectiveness	Implementability	Reliability	Cost	Duration	Overall Ranking
No Action		-1	+1	-1	+1	-1	0
Excavation		0	-1	-1	0	+1	-1
In-situ Biodegradation		+1	+1	0	-1	-1	0
Dual-media Extraction		+1	+1	+1	0	0	+3



USGS 7.5 MINUTE
OAKLAND EAST & WEST,
CALIFORNIA QUADRANGLE

NORTH

0 1000 2000

FEET

ENSR

DRAWN BY: S. Hale	REVISED BY:
DATE: November 13, 1997	DATE:

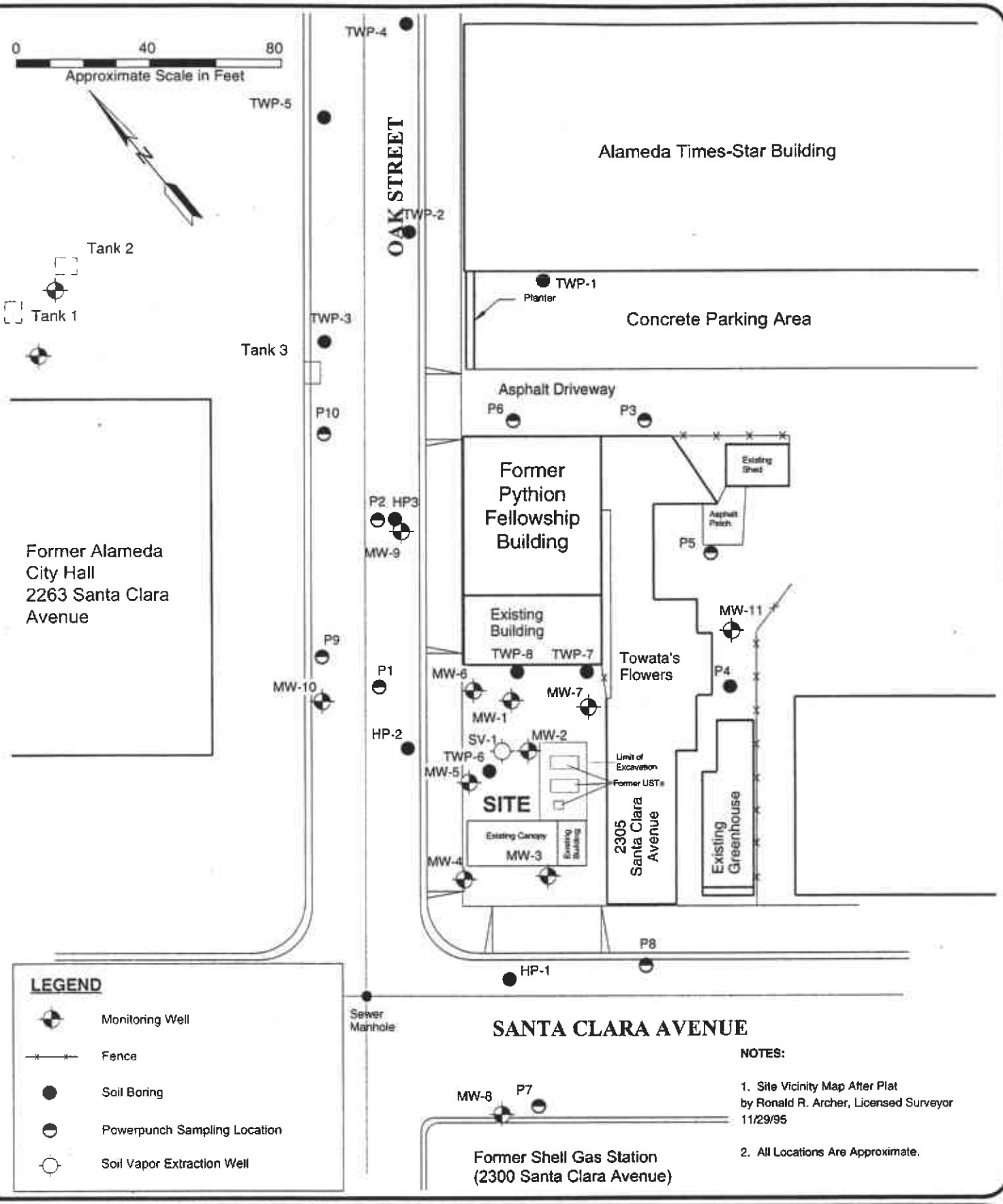
ENSR\8700\752\Site_inf.dsf

SITE LOCATION MAP

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

FIGURE
1

PROJECT NUMBER
8700-752



ENSR

DRAWN BY:	REVISED BY:
J. Paradis	S. Hale
DATE: October 31, 1998	DATE: June 10, 1998

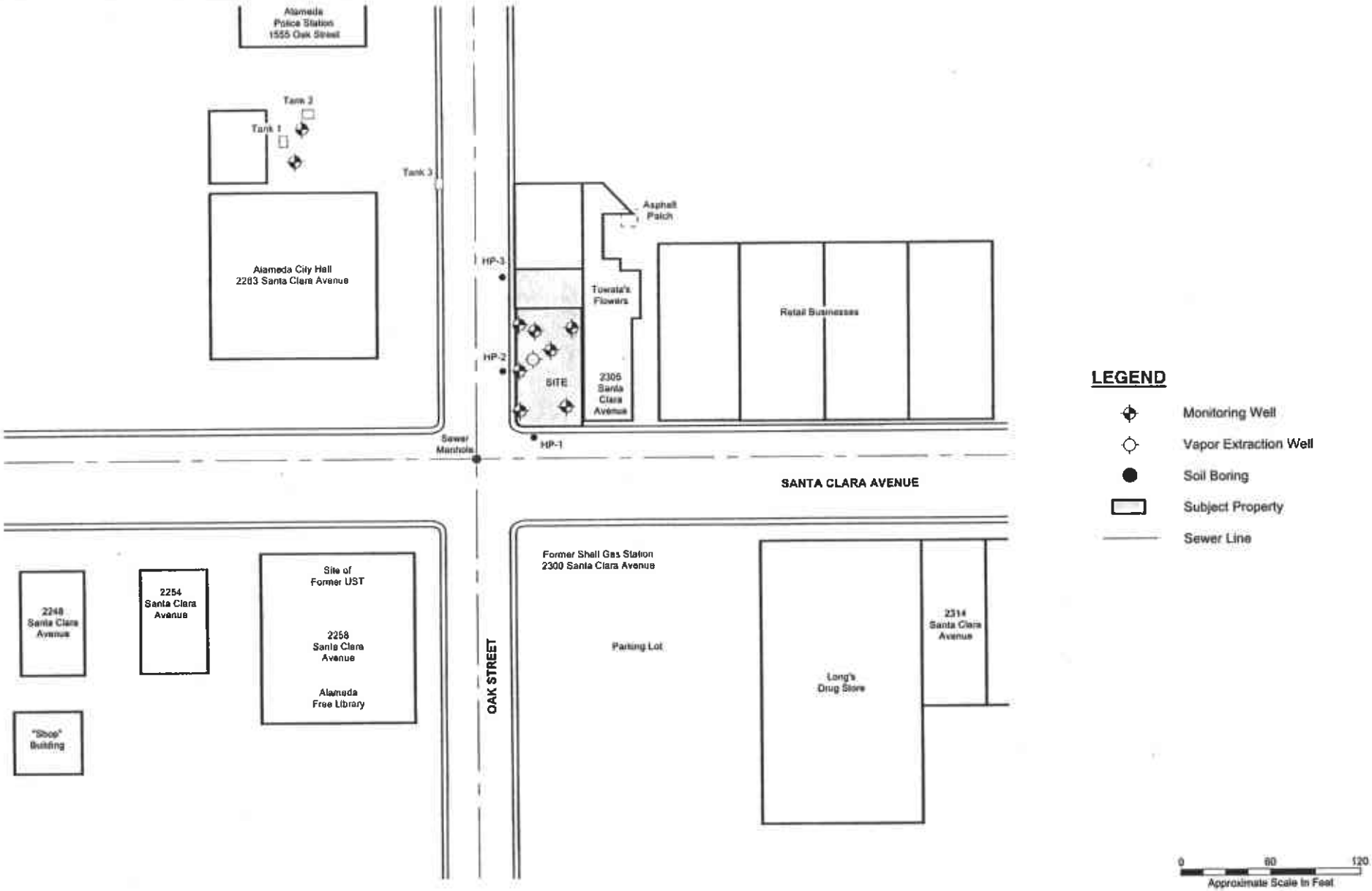
ENSR\8700\752\Site_inf.dsf

SITE VICINITY

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

FIGURE
2

PROJECT NUMBER
8700-752



NOTES

Drawn from Field Sketch

All Locations are Approximate

ENSR

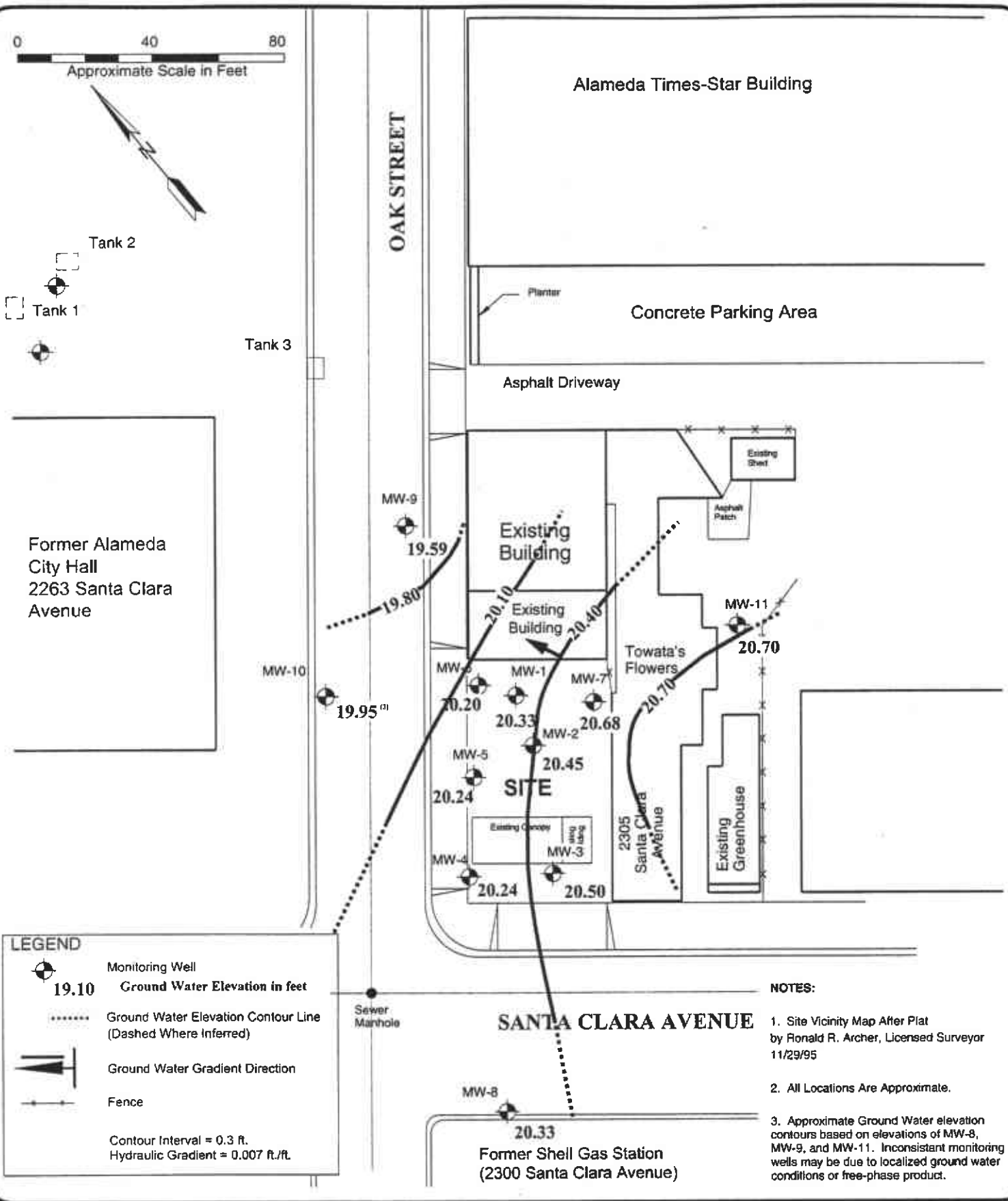
DRAWN BY: S. Hale	REVISED BY:
DATE: MAY 13, 1998	DATE:
FILE: 8700\752\SITE_INF.DSF	

AREA MAP

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

FIGURE
2A

PROJECT NUMBER:
8700-752



ENSR

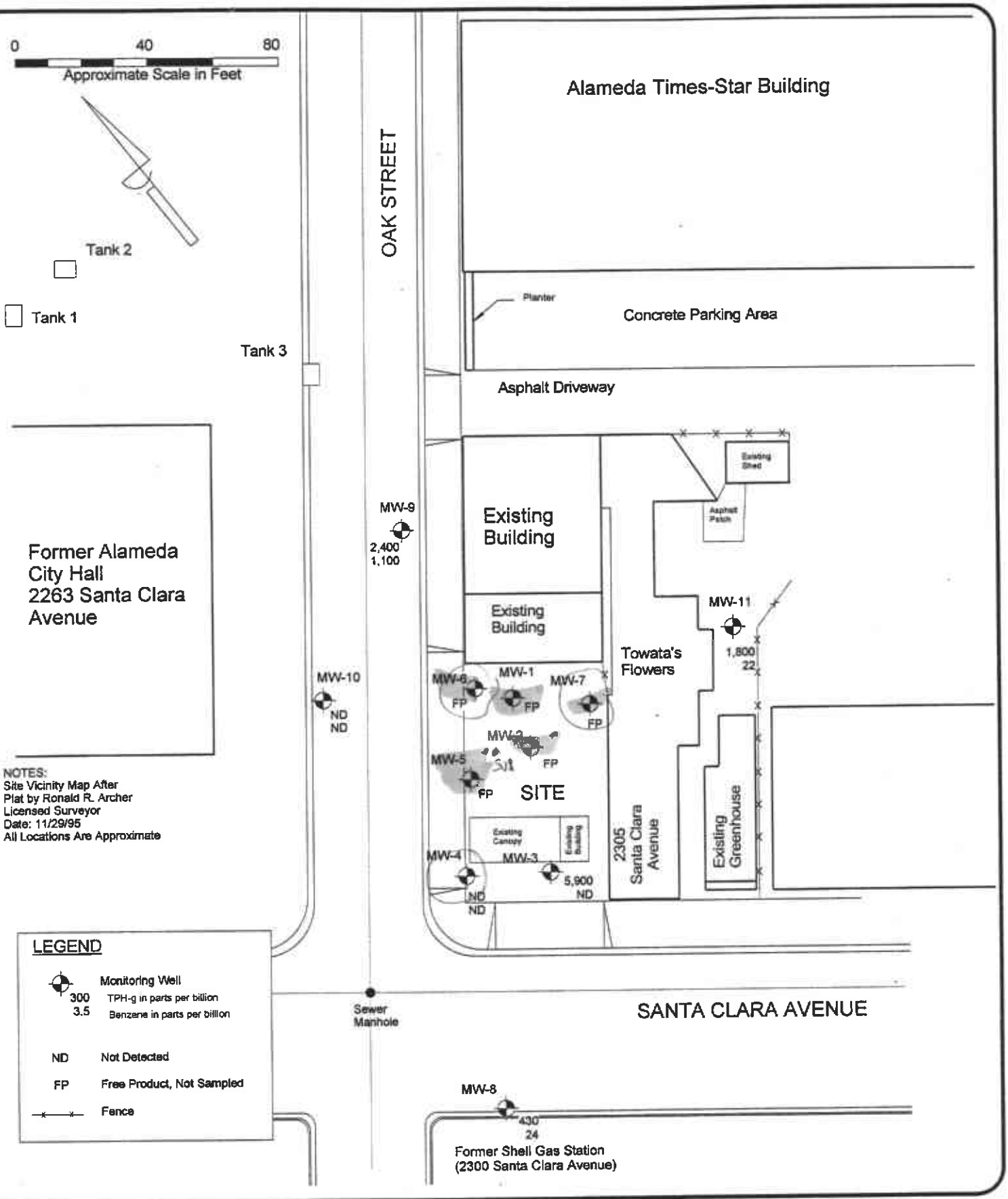
POTENTIOMETRIC SURFACE MAP
January 30, 1998

FIGURE 3

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

DRAWN BY:	REVISED BY:	PROJECT NUMBER:
J. Paradis	S. Hale	8700-752
DATE: October 31, 1996	DATE: May 13, 1998	

ENSR\8700752\Fig3.DSF



ENSR

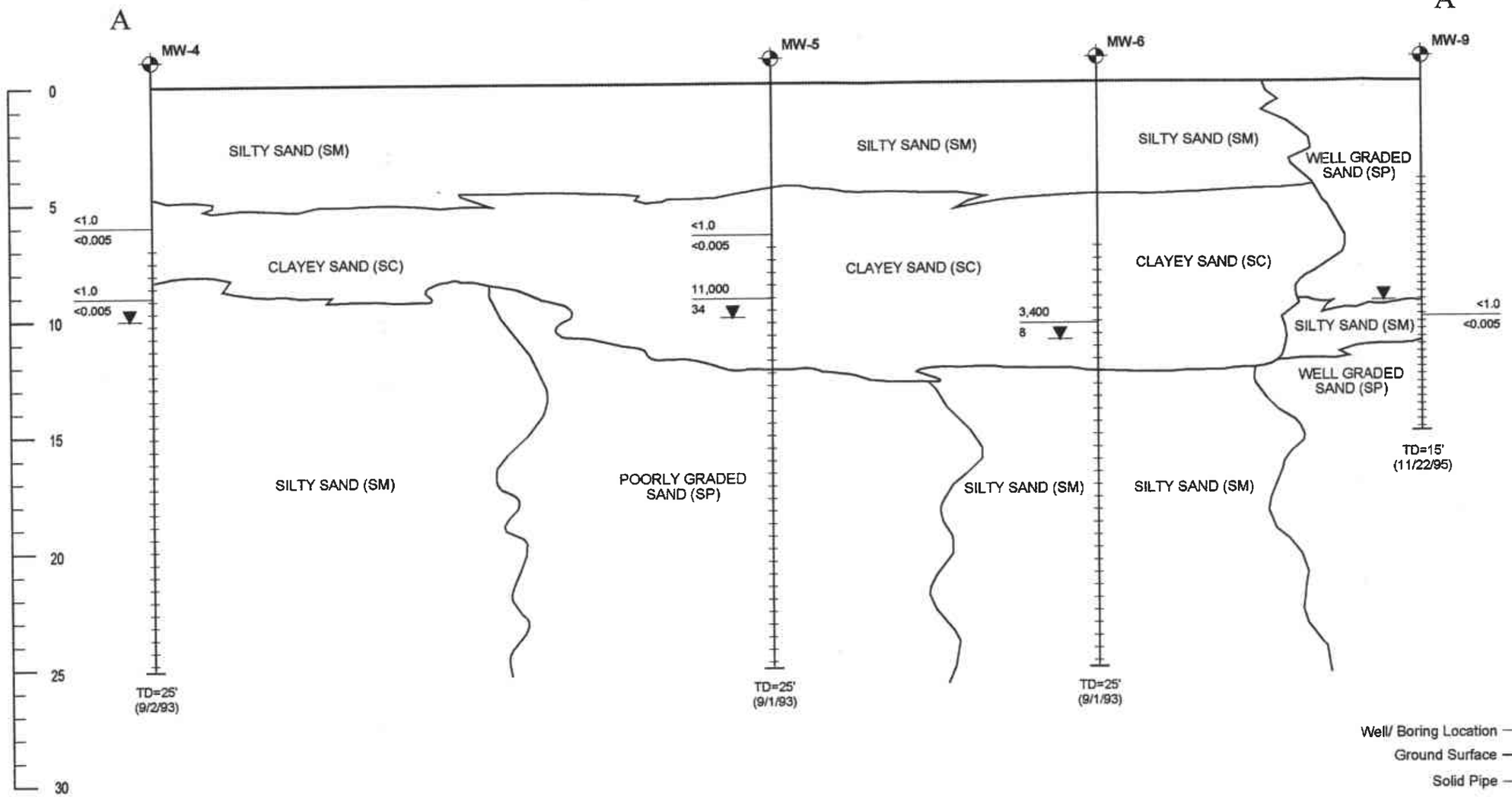
DRAWN BY: J. Paradis
REVISED BY: S. Hale
DATE: October 31, 1996
DATE: February 20, 1998

DISTRIBUTION MAP OF TOTAL PETROLEUM HYDROCARBONS AS GASOLINE AND BENZENE IN GROUNDWATER January 30, 1998

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

FIGURE 4

PROJECT NUMBER: 8700-752



ENSR

DRAWN BY: S. Hale	REVISED BY:
DATE: March 16, 1998	DATE:

8700752/FS/FIG78_X-SEC.DSF

GEOLOGIC CROSS SECTION A - A'

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

FIGURE 7

PROJECT NUMBER: 8700-752

B

B'

MW-10

MW-5

MW-7

MW-11

0

5

10

15

20

25

30

WELL GRADED SAND (SW)

SILTY SAND (SM)

SILTY SAND (SM)

SILTY SAND (SM)

WELL GRADED SAND (SW)

<1.0
<0.005

11,000
34

CLAYEY SAND (SC)

CLAYEY SAND (SC)

<1.0
<0.005

SILTY SAND (SM)

13,000
250

154
<0.13

TD=15'
(11/22/95)

TD=15'
(11/22/95)

POORLY GRADED SAND (SP)

POORLY GRADED SAND (SP)

<1.0
0.038

SILTY SAND (SM)

TD=25'
(9/1/93)

TD=25'
(9/1/93)

SAND (SP)

SILT (ML)

SCALE

HORIZONTAL
feet
10

VERTICAL
feet
5

LEGEND

Well/ Boring Location
Ground Surface
Solid Pipe
Slotted Pipe — <1.0 - TPHg in mg/kg (soil)
<0.005 - Benzene in mg/kg
Depth to Water
Total Depth — TD=45'
Completion Date — (2/20/97)

ENSR

DRAWN BY: S. Hale
REVISED BY:
DATE: March 16, 1998
DATE:

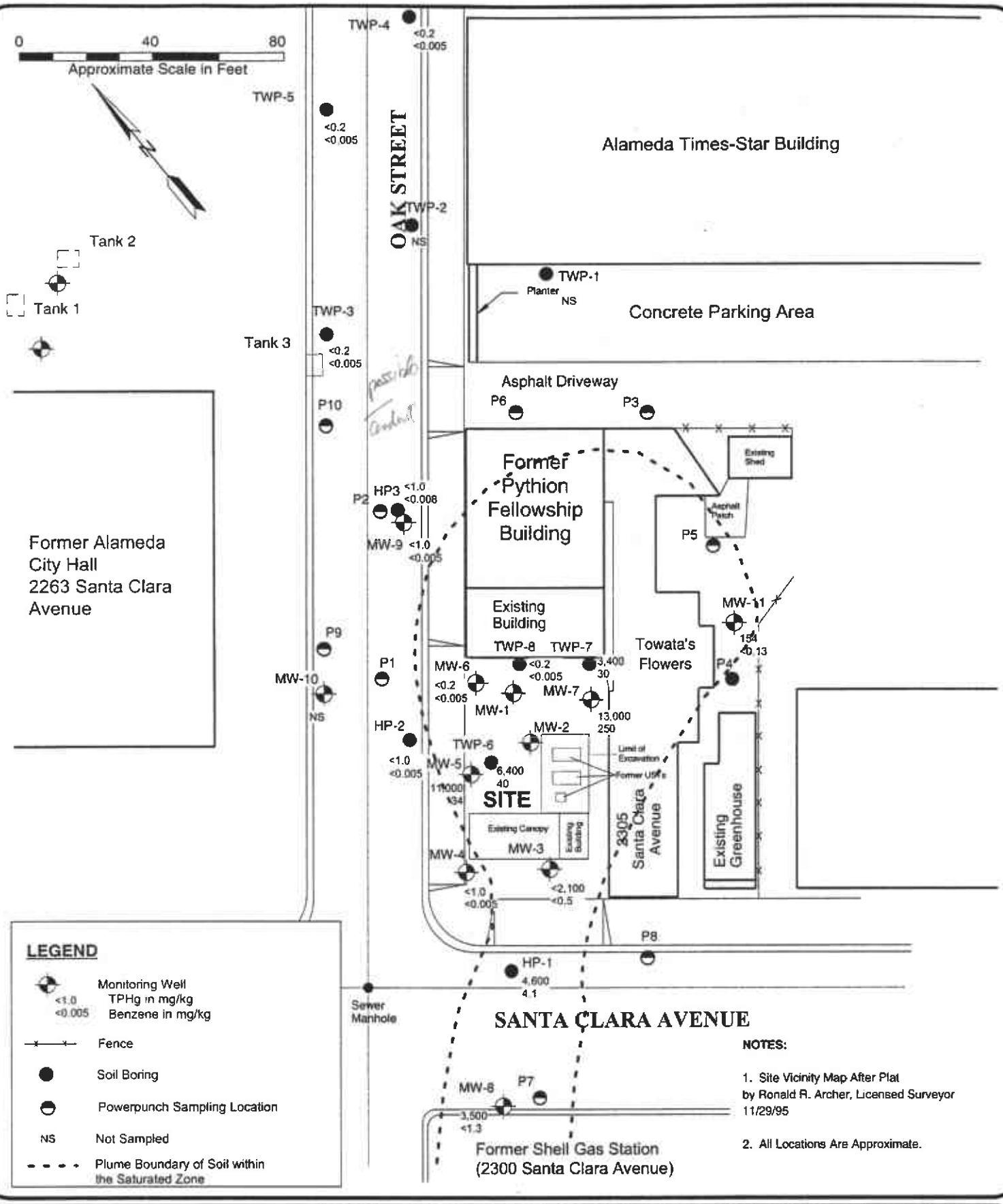
GEOLOGIC CROSS SECTION B - B'

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

8700/752/FS/FIG78_X-SEC.DSF

FIGURE
8

PROJECT NUMBER:
8700-752



ENSR

TPHg AND BENZENE CONCENTRATIONS IN SOIL WITHIN THE SATURATED ZONE BETWEEN 9 AND 11' BELOW SURFACE GRADE

FIGURE 9

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, California

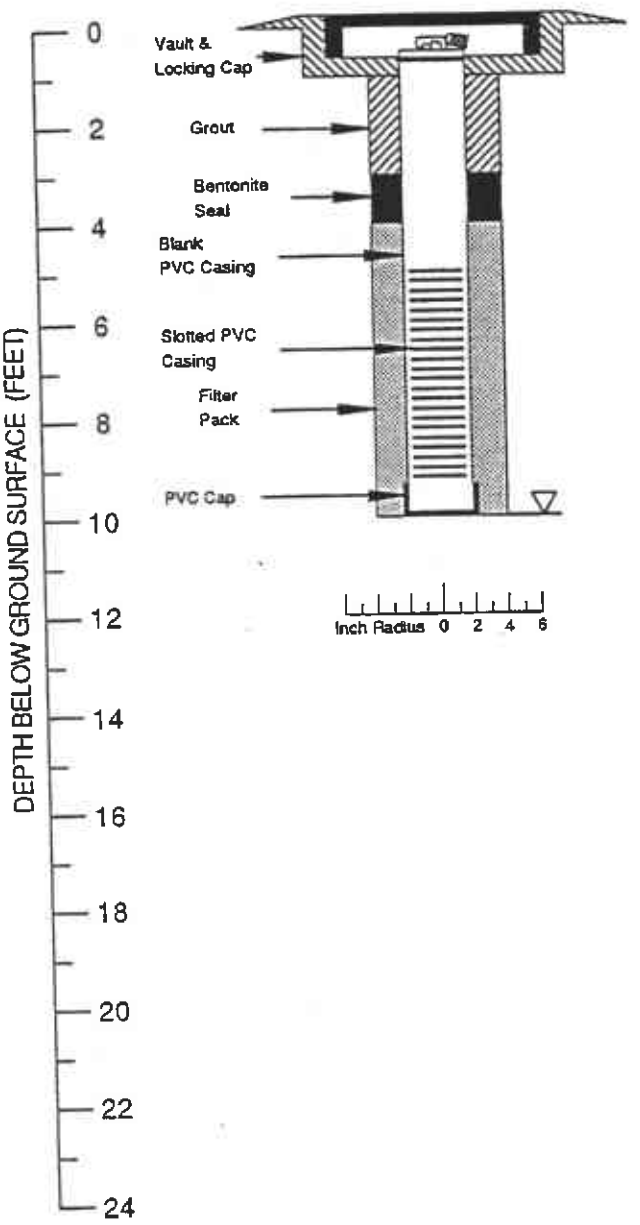
DRAWN BY:	REVISED BY:	PROJECT NUMBER
J. Paradis	S. Hale	8700-752
DATE: October 31, 1996	DATE: May11, 1998	

ENSR\8700752\FS\FIG569.DSF

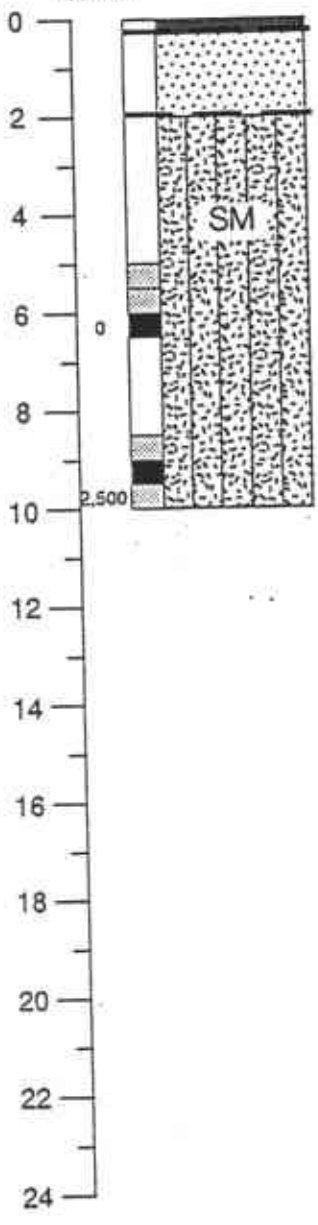
APPENDIX A

SOIL BORING LOGS

WELL CONSTRUCTION DETAIL



GRAPHIC LOG



DESCRIPTION

Asphalt

Base Fill Material

Brown silty SAND, loose, fine grained, no odor

Brown to grey silty SAND, fine grained, semi loose, damp, no odor

Grey to green silty SAND, fine grained, wet, loose, strong petroleum odor

Total depth = 10 feet

Logged by:	S. Osborn	Drilling Company:	West Hazmat	Completion Time:	09:59 hrs
Project Mgr:	S. Boudreau	Drilling Method:	Hollow Stem Auger	Type of Sampler:	Split Spoon
Date Drilled:	August 30, 1994	Driller:	Gene Nunes	TD (Total Depth):	10'

Explanation

- Water level in completed well
- First water found during drilling
- Location of recovered drill sample
- Location of sample sealed for chemical analysis
- Sieve sample
- Continuous Core

Contacts:

- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- Hachured where gradational
- est K — Estimated permeability (hydraulic conductivity) 1K= primary, 2K= secondary
- NR — No Recovery

Vadose Well 1

Bill Chun's Service Station
2301 Santa Clara Avenue
Alameda, Ca

FUGRO

Drawn By: D. Hada
Date: August 31, 1994
Revised By:
Date:

Page: 1 of 1

Well Number: SV-1

Job Number: 94-37-7622

Environmental Science & Engineering, Inc.

BORING LOG AND WELL COMPLETION SUMMARY

MW-4

Page 1 of 1

WELL COMPLETION

Completion Depth: 25 Feet

	Size/Type	From	To
Casing:	2" Blank PVC	0 Feet	7 Feet
Screen:	2" Slotted (0.020") PVC	7 Feet	25 Feet
Filter:	2/12 Sand	6 Feet	25 Feet
Seal:	Bentonite	5 Feet	6 Feet
	Cement	0 Feet	5 Feet

Well Cap or Box:

Project Name: Bill Chun Project No: 6-93-5112

Location: 2301 Santa Clara Avenue
Alameda, California

Driller: Soils Exploration Services, Inc.
Method: Hollow Stem Auger
Hole Diameter: 8" Total Depth: 25 Feet
Ref. Elevations:
Logged By: Chris Valcheff

Dates:
Start: 9-2-93
Finish: 9-2-93

Depth (ft)	Lithologic Description	USC	Graphic Log: Sample/Blows	Graphic Log: Lithology	Graphic Log: Well Installation	Vapor	Remarks: Water, drilling/completion, summary, sample type
0	CONCRETE						
	FILL, gravel						
	SILTY SAND, dark brown, dense, damp, 20-30% fines, fine to medium grained sand, no odor.	SM					
	As above, light brown.	SM					
5	CLAYEY SAND, brownish orange, very dense, 20-30% fines, medium grained sand, no odor.	SC	12 19 27			0	Sample @ 6.0 Feet
	SILTY SAND, brown, dense, 20-30% fines, damp, no odor.	SM	31 50 72				Sample @ 9.0 Feet
10							Water @ 10.0 Feet
	As above, grey, wet, strong hydrocarbon odor.	SM					
	As above, light brown, no odor.						
15		ML	9 17 31				Standard Pen
20							
25	As above.						TOTAL DEPTH = 25 FEET
30							
35							

REGISTERED GEOLOGIST
MICHAEL E. QUILLIN
#5315
STATE OF CALIFORNIA

Environmental Science & Engineering, Inc.

BORING LOG AND WELL COMPLETION SUMMARY

MW-5

Page 1 of 1

WELL COMPLETION

Completion Depth: 25 Feet

	Size/Type	From	To
Casing:	2" Blank PVC	0 Feet	7 Feet
Screen:	2" Slotted (0.020") PVC	7 Feet	25 Feet
Filter:	2/12 Sand	6 Feet	25 Feet
Seal:	Bentonite	5 Feet	6 Feet
	Cement	0 Feet	5 Feet

Well Cap or Box:

Project Name: Bill Chun Project No: 6-93-5112

Location: 2301 Santa Clara Avenue
Alameda, California

Driller: Soils Exploration Services, Inc.
Method: Hollow Stem Auger
Hole Diameter: 8" Total Depth: 25 Feet
Ref. Elevations:
Logged By: Chris Valcheff

Dates:
Start: 9-1-93
Finish: 9-1-93

Depth (ft)	Lithologic Description	USC	Graphic Log: Sample/Blows	Graphic Log: Lithology	Graphic Log: Well Installation	Vapor	Remarks (Water, drilling/completion, summary, sample type)
0	ASPHALT						
	FILL gravel						
	SILTY SAND, dark brown, dense, damp, 20-30% fines, fine to medium grained sand, no odor.	SM					
	CLAYEY SAND, brown, dense, 20-30% fines, fine to medium grained sand, damp, no odor.	SC					
5	As above, grey-green, strong hydrocarbon odor.	SC	9, 20, 31			34	Sample @ 6.0 Feet
			29, 34, 50			2500	Sample @ 9.0 Feet
10	As above, saturated with water.	SC					Water @ 10.0 Feet
	SAND, brown, fine to medium grained, dense, wet, no odor.	SP					
15			24, 31, 37			0	No Sample, Standard Pen
20							
25	As above.						TOTAL DEPTH = 25 FEET
30							
35							

REGISTERED GEOLOGIST
MICHAEL E. QUILLIN
#5315
STATE OF CALIFORNIA

Environmental Science & Engineering, Inc.

BORING LOG AND WELL COMPLETION SUMMARY

MW-6

Page 1 of 1

WELL COMPLETION

Completion Depth: 25 Feet

	Size/Type	From	To
Casing:	2" Blank PVC	0 Feet	7 Feet
Screen:	2" Slotted (0.020") PVC	7 Feet	25 Feet
Filter:	2/12 Sand	6 Feet	25 Feet
Seal:	Bentonite	5 Feet	6 Feet
	Cement	0 Feet	5 Feet

Well Cap or Box: EMCO-Wheaton Traffic Rated Flush Mounted

Project Name: Bill Chun Project No: 6-93-5112

Location: 2301 Santa Clara Avenue, Alameda, California

Driller: Soils Exploration Services, Inc.
Method: Hollow Stem Auger
Hole Diameter: 8" Total Depth: 25 Feet
Ref. Elevations:
Logged By: Chris Valcheff

Dates: Start: 9-1-93 Finish: 9-1-93

Depth (ft)	Lithologic Description	USC	Graphic Log: Sample/Blows	Graphic Log: Lithology	Graphic Log: Well Installation	Vapor	Remarks (Water, drilling/completion, summary, sample type)
0	ASPHALT FILL, crushed rock SILTY SAND, dark brown, dense, damp, 20-30% fines, fine to medium grained sand, no odor.	SM					
	CLAYEY SAND, orange, very dense, 20-30% fines, fine to medium grained sand, damp, no odor.	SC					
5			17 27 13			0	
	As above, grey, 30-40% fines, dense, strong hydrocarbon odor.	SC					
10	As above.	SC	25 50			233	Sample @ 10.0 Feet Water @ 10.5 Feet
	SILTY SAND, light brown, very dense, 20-30% fines, saturated, fine to medium grained sand, no odor.	SM					
15			13 32 29			0	No Sample, Standard Pen
20	As above.	SM					No Sample Taken
	CLAYEY SAND, light brown, very dense, saturated, 20-30% clay, medium to coarse grained sand, no odor.	SC					
25							TOTAL DEPTH = 25 FEET
30							
35							

REGISTERED GEOLOGIST
MICHAEL E. QUILLIN
#5315
STATE OF CALIFORNIA

Environmental Science & Engineering, Inc.

BORING LOG AND WELL COMPLETION SUMMARY

MW-7

Page 1 of 1

WELL COMPLETION

Completion Depth: 25 Feet

	Size/Type	From	To
Casing:	2" Blank PVC	0 Feet	7 Feet
Screen:	2" Slotted (0.020") PVC	7 Feet	25 Feet
Filter:	2/12 Sand	6 Feet	25 Feet
Seal:	Bentonite	5 Feet	6 Feet
	Cement	0 Feet	5 Feet

Well Cap or Box: EMCO-Wheaton Traffic Rated Flush Mounted

Project Name: Bill Chun Project No: 6-93-5112

Location: 2301 Santa Clara Avenue, Alameda, California

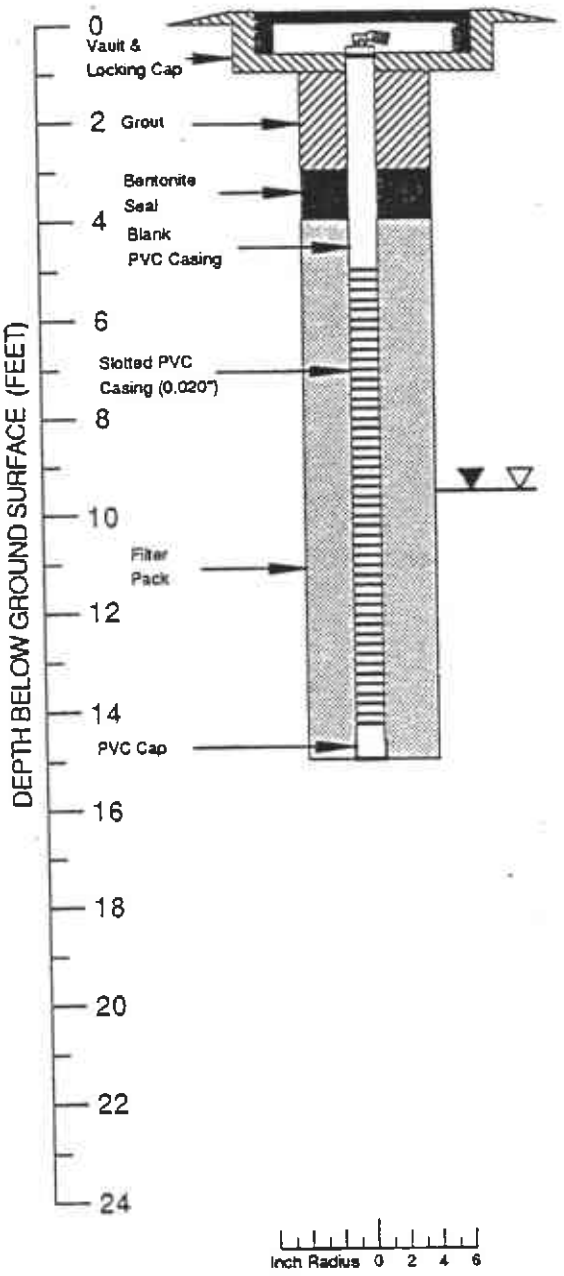
Driller: Soils Exploration Services, Inc.
Method: Hollow Stem Auger
Hole Diameter: 8" Total Depth: 25 Feet
Ref. Elevations:
Logged By: Chris Valcheff

Dates:
Start: 9-1-93
Finish: 9-1-93

Depth (ft)	Lithologic Description	USC	Graphic Log: Sample/Blows	Graphic Log: Lithology / Well Installation	Vapor	Remarks (Water, drilling/completion, summary, sample type)
0	ASPHALT					
	Fill					
	SILTY SAND, dark brown, dense, damp, 20-30% fines, fine to medium grained sand, no odor.	SM				
5			17, 24, 30		1321	
	As above, gray, strong hydrocarbon odor.					Sample @ 6.0 Feet
	As above, light brown.	SM			1332	
	As above, light brown, very strong hydrocarbon odor, 10-20% fines, moist.	SM	27, 34, 32			
10						Sample @ 9.5 and 10.0 Feet
						Water @ 10.5-11 Feet
					2178	
15	As above, no odor, saturated.	SM	23, 27, 41			No Sample, Standard Pen
20	As above.	SM	17, 27, 40			Sample @ 20.0 Feet
25						TOTAL DEPTH = 25 FEET
30						
35						

REGISTERED GEOLOGIST
MICHAEL E. QUILLIN
#5315
STATE OF CALIFORNIA

WELL CONSTRUCTION DETAIL



Blow Counts	PID (ppmv)	GRAPHIC LOG	DESCRIPTION
			Asphalt 3", Baserock (sand & gravel to 3/4") 5"
		SW	SAND: brown, fine to medium, loose, dry, minor silt
5			
9			
13	110	SM	Silty SAND: brown, fine to medium, dense, moist, small pockets of grey sand, medium
15			SAND: grey, medium dense, moist, fine to medium, strong gasoline odor
21	275		SAND: brown, loose, moist, fine to medium
33			SAND: grey, medium dense, moist, fine to medium, strong gasoline odor
18	390	SW	As above, wet
27			Grey SAND in cuttings to 15', wet
35			Total depth = 15 feet

Logged by:	W. Bassett	Drilling Company:	V & W Drilling	Completion Time:	
Project Mgr:	W. Bassett	Drilling Method:	Hollow Stem Auger	Type of Sampler:	Calif. Split Spoon
Date Drilled:	November 22, 1995	Driller:	Robert Vickery	TD (Total Depth):	15'

Explanation

- Water level in completed well
- First water found during drilling
- Location of recovered drill sample
- Location of sample sealed for chemical analysis
- Sieve sample
- Continuous Core

Contacts:

- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- Hachured where gradational
- est K — Estimated permeability (hydraulic conductivity) 1K= primary, 2K= secondary
- NR — No Recovery

Monitoring Well MW-8

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, Ca

FUGRO

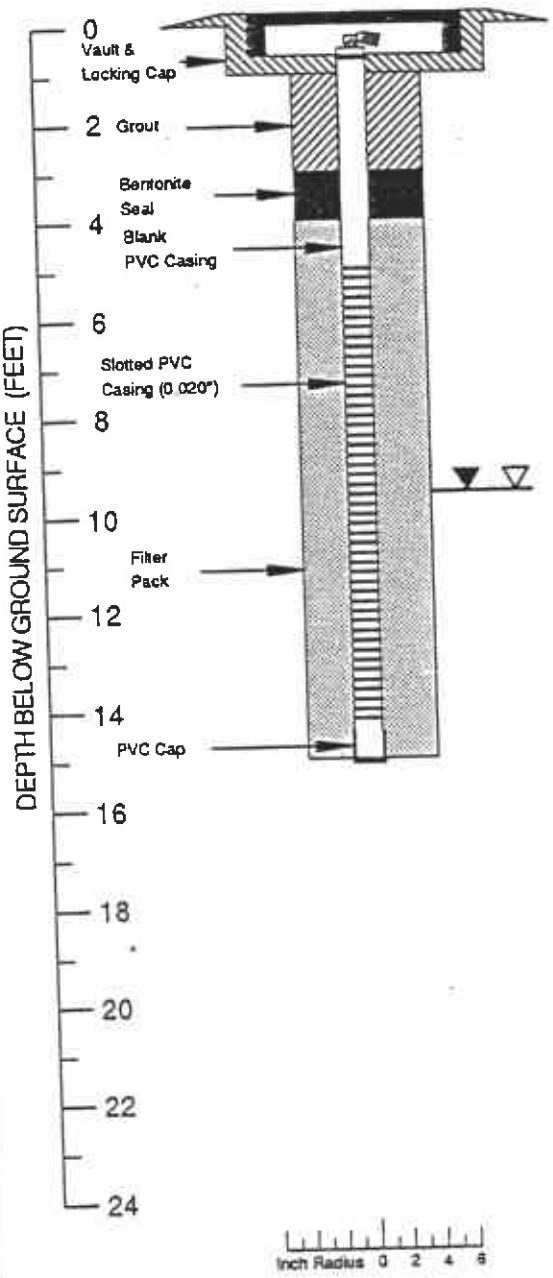
Drawn By:	J. Paradis
Date:	November 30, 1995
Revised By:	
Date:	

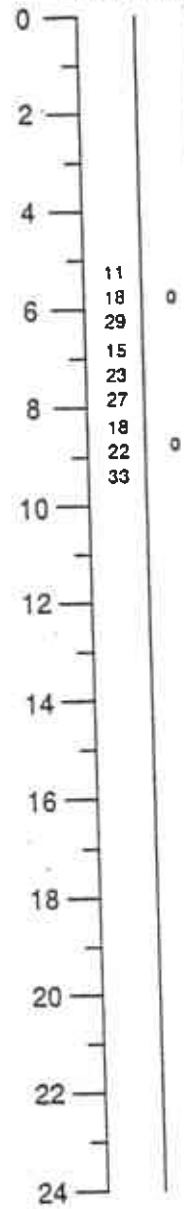
Page: 1 of 1

Well Number: MW-8

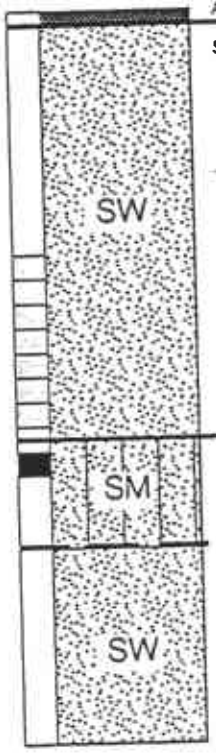
Job Number: 95-37-0431

WELL CONSTRUCTION DETAIL





GRAPHIC LOG



DESCRIPTION

Asphalt 2", Baserock (sand & gravel to 1.5") 4"

SAND: brown, loose, dry, fine to medium

SAND: brown, medium dense, moist, fine to medium, small pockets of grey sand, medium

- as above

Silty SAND: grey, medium dense, fine to medium, moist

As above, wet

Grey **SAND** and brown sand in cuttings, wet

Total depth = 15 feet

Logged by:	W. Bassett	Drilling Company:	V & W Drilling	Completion Time:	
Project Mgr:	W. Bassett	Drilling Method:	Hollow Stem Auger	Type of Sampler:	Calif. Split Spoon
Date Drilled:	November 22, 1995	Driller:	Robert Vickery	TD (Total Depth):	15'

Explanation

- Water level in completed well
- First water found during drilling
- Location of recovered drill sample
- Location of sample sealed for chemical analysis
- Sieve sample
- Continuous Core

Contacts:

- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- Hachured where gradational
- est K — Estimated permeability (hydraulic conductivity) 1K= primary, 2K= secondary
- NR — No Recovery

Monitoring Well MW-9

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, Ca

FUGRO

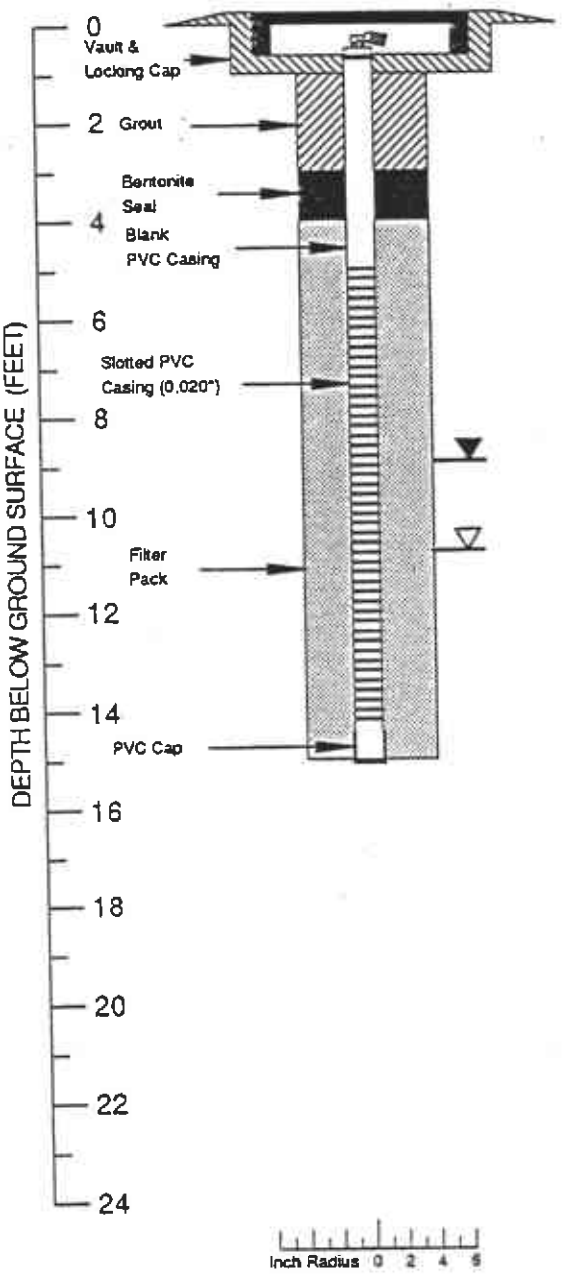
Drawn By:	J. Paradis
Date:	November 30, 1995
Revised By:	
Date:	

Page: 1 of 1

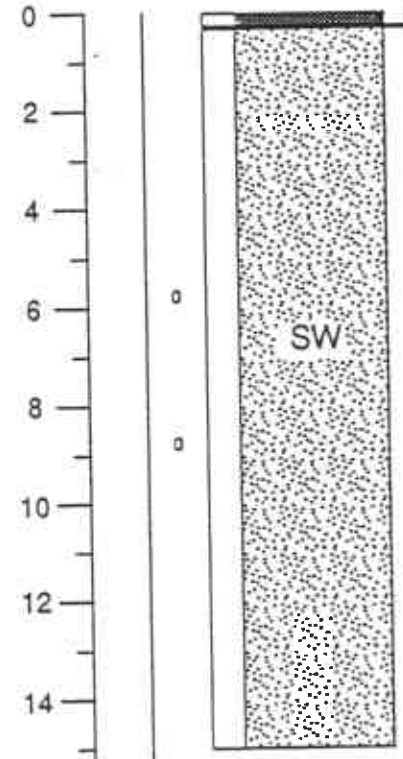
Well Number: MW-9

Job Number: 95-37-0431

WELL CONSTRUCTION DETAIL



Blow Counts | PID (ppmv) | GRAPHIC LOG | DESCRIPTION



Asphalt 2", Baserock (sand & gravel to 1") 4"

SAND: brown, loose, dry, fine to medium

Observed cuttings only from here to bottom of boring

SAND: brown, moist, fine to medium

SAND: grey, wet, fine to medium

SAND: brown, wet, fine to medium (on augers)

Total depth = 15 feet

Logged by:	W. Bassett	Drilling Company:	V & W Drilling	Completion Time:	
Project Mgr:	W. Bassett	Drilling Method:	Hollow Stem Auger	Type of Sampler:	Calif. Split Spoon
Date Drilled:	November 22, 1995	Driller:	Robert Vickery	TD (Total Depth):	15'

Explanation

- Water level in completed well
- First water found during drilling
- Location of recovered drill sample
- Location of sample sealed for chemical analysis
- Sieve sample
- Continuous Core

Contacts:

- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- Hachured where gradational
- est K — Estimated permeability (hydraulic conductivity) 1K= primary, 2K= secondary
- NR — No Recovery

Monitoring Well MW-10

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, Ca

FUGRO

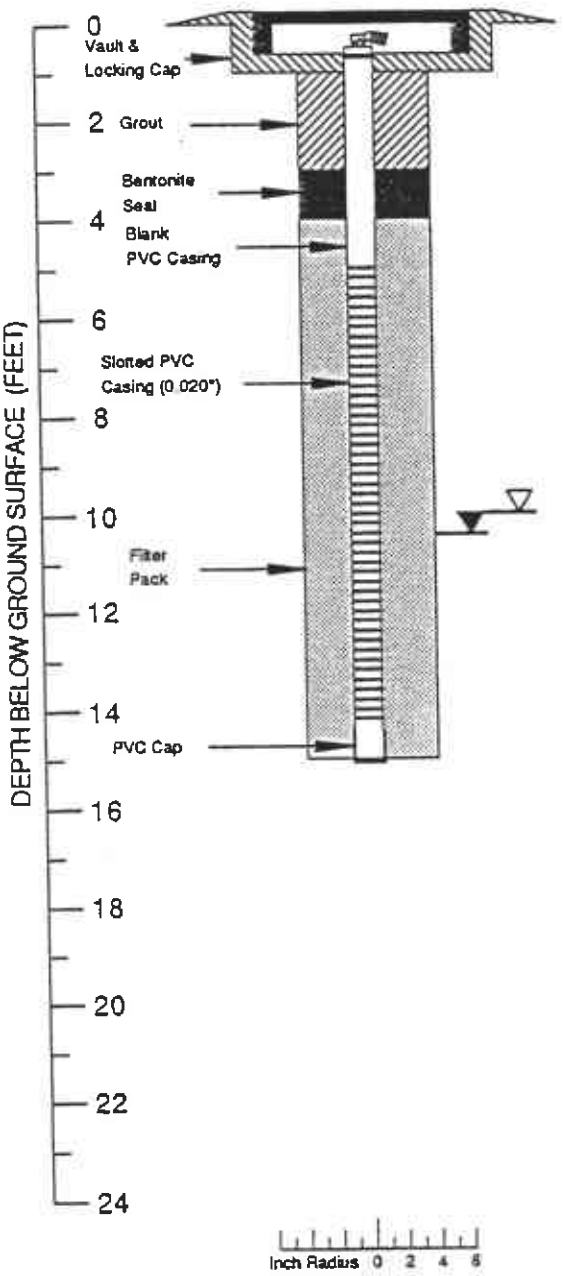
Drawn By:	J. Paradis
Date:	November 30, 1995
Revised By:	
Date:	

Page: 1 of 1

Well Number: MW-10

Job Number: 95-37-0431

WELL CONSTRUCTION DETAIL



Blow Counts	PID (ppmv)	GRAPHIC LOG	DESCRIPTION
			Asphalt 2", Baserock (sand & gravel to 3/4") 2"
7			SAND: brown, loose, dry, fine to medium
11	10	SW	
21			
13			- as above, moist
18	70		
27			- as above, with pockets of grey sand, fine to medium
8			
13	185		- as above, wet, moderate gasoline odor
16			Cuttings: brown and minor grey sand, wet
			Total depth = 15 feet

Logged by:	W. Bassett	Drilling Company:	V & W Drilling	Completion Time:	
Project Mgr:	W. Bassett	Drilling Method:	Hollow Stem Auger	Type of Sampler:	Calif. Split Spoon
Date Drilled:	November 22, 1995	Driller:	Robert Vickery	TD (Total Depth):	15'

Explanation

- Water level in completed well
- First water found during drilling
- Location of recovered drill sample
- Location of sample sealed for chemical analysis
- Sieve sample
- Continuous Core

Contacts:

- Solid where certain
- Dotted where approximate
- Dashed where uncertain
- Hachured where gradational
- est K — Estimated permeability (hydraulic conductivity) 1K= primary, 2K= secondary
- NR — No Recovery

Monitoring Well MW-11

Former Bill Chun Service Station
2301 Santa Clara Avenue
Alameda, Ca

FUGRO

Drawn By:	J. Paradis
Date:	November 30, 1995
Revised By:	
Date:	

Page: 1 of 1

Well Number: MW-11

Job Number: 95-37-0431

APPENDIX B

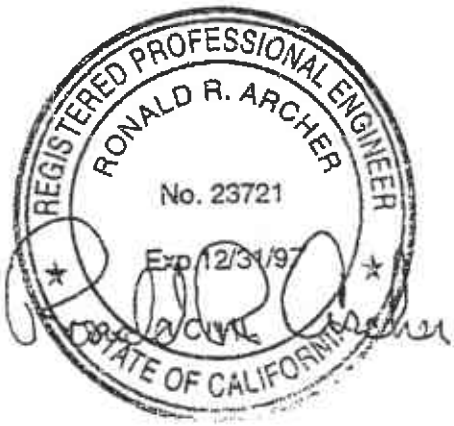
MONITORING WELLS
ELEVATION SURVEY

RON ARCHER

CIVIL ENGINEER INC.

CONSULTING • PLANNING • DESIGN • SURVEYING

4133 Mohr Ave., Suite E • Pleasanton, CA 94566
Phone: (510) 462-9372 Fax: (510) 462-4454



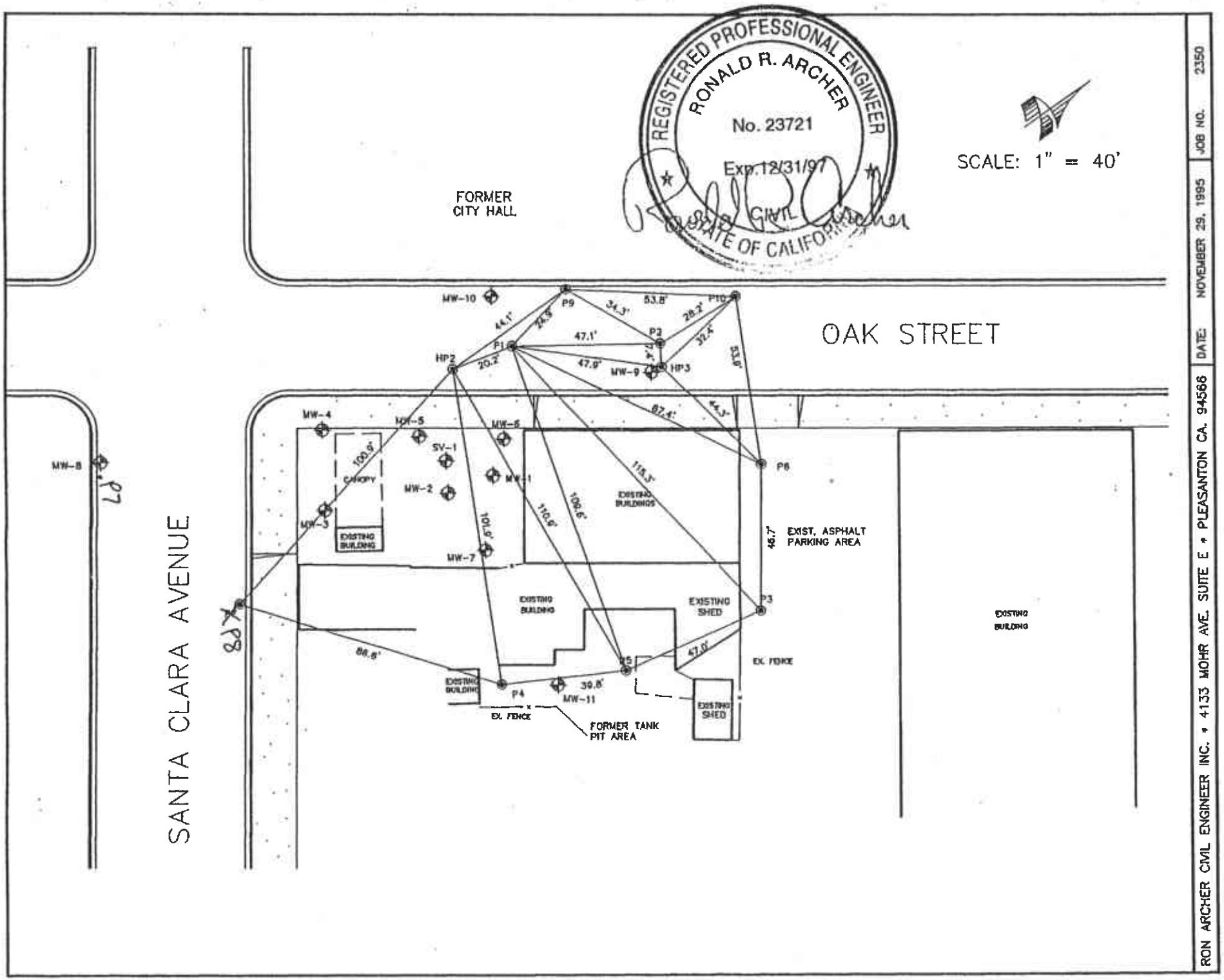
NOVEMBER 29, 1995 JOB NO 2350

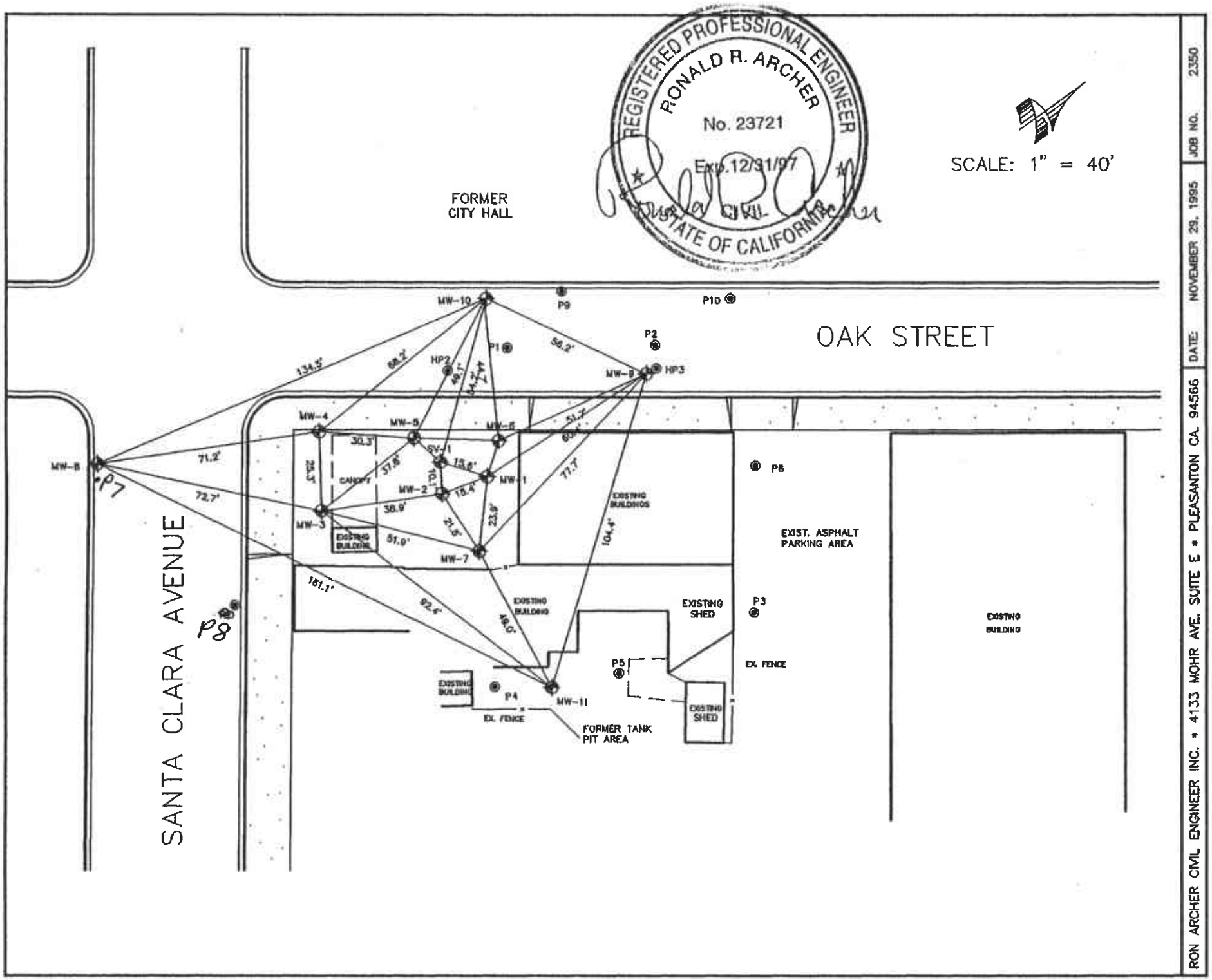
ELEVATIONS OF EXISTING MONITORING WELLS AT THE FORMER "BILL CHUNS" SERVICE STATION, LOCATED AT 2301 SANTA CLARA AVENUE AT OAK STREET, CITY OF ALAMEDA, ALAMEDA COUNTY, CALIFORNIA.

FOR: ***FUGRO WEST***

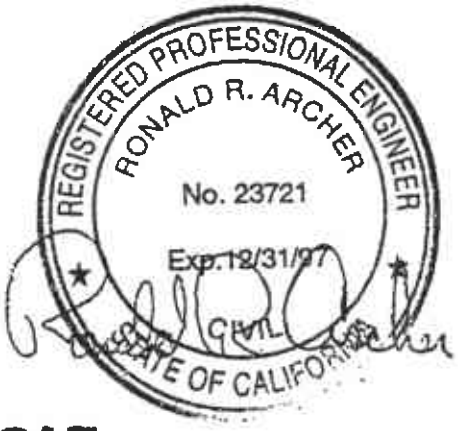
BENCHMARK:

A FOUND "CUT-CROSS" IN THE TOP OF THE DEPRESSED CURB AT THE MID RETURN OF THE NORTHWEST CORNER OF THE INTERSECTION OF SANTA CLARA AVENUE AND OAK STREET. ELEVATION TAKEN AS 28.455' M.S.L.


REGISTERED PROFESSIONAL ENGINEER
RONALD R. ARCHER
No. 23721
Exp. 12/31/97
CIVIL
STATE OF CALIFORNIA
SCALE: 1" = 40'
FORMER CITY HALL
OAK STREET
SANTA CLARA AVENUE
MW-10
P9
P10
P1
P2
HP2
HP3
MW-9
MW-4
MW-5
MW-6
SV-1
MW-1
MW-2
MW-3
MW-7
MW-8
P7
P8
P6
P5
P4
P3
MW-11
CANOPY
EXISTING BUILDING
EXISTING BUILDINGS
EXISTING SHED
EXIST. ASPHALT PARKING AREA
EX. FENCE
FORMER TANK PIT AREA
44.1'
24.8'
34.3'
53.8'
28.7'
47.1'
32.4'
20.2'
47.9'
87.4'
44.3'
100.9'
101.9'
110.6'
109.6'
118.3'
45.7'
86.6'
39.8'
47.0'
RON ARCHER CIVIL ENGINEER INC. • 4133 MOHR AVE. SUITE E • PLEASANTON CA. 94566
DATE: NOVEMBER 29, 1995
JOB NO. 2350



RON ARCHER CIVIL ENGINEER INC. * 4133 MOHR AVE. SUITE E * PLEASANTON CA. 94566 | DATE: NOVEMBER 29, 1995 | JOB NO. 2350



MONITORING WELL DATA TABLE

WELL DESIGNATION	TOP OF CASING ELEVATION	GROUND ELEVATION
MW-1	28.49	28.96
MW-2	28.47	28.89
MW-3	28.78	28.98
MW-4	28.53	28.78
MW-5	28.33	28.62
MW-6	28.36	28.64
MW-7	28.44	28.86
MW-8	28.17	28.45
MW-9	27.45	27.66
MW-10	27.32	27.78
MW-11	28.56	29.20
SV-1	28.42	28.78