Chevron

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October 9, 1989

Mr. Scott Seery
Alameda County Health Department
80 Swan Way, Rm. 200
Oakland, CA 94621

Re: Former Chevron SS #9-2960
2416 Grove Way
Castro Valley, California

Dear Mr. Seery:

Per your request, enclosed are copies of the assessment reports generated for the referenced site. The following is a listing and brief description of the reports:

BLAINE TECH SERVICES REPORTS dated July 10, August 5 (#1), August 5 (#2), August 21, September 9 and September 11, 1986 document the tank and piping removal and sampling of the tank and piping pits after significant over excavation. Over excavation was performed to remove contaminated soils.

EMCON ASSOCIATES REPORT dated November 4, 1986 documenting the installation of four ground water monitoring wells.

EA ENGINEERING'S REPORT of Investigation and Risk Assessment dated November 11, 1987. EA's work was performed to direct next appropriate actions that should be taken. Based on the data available at that time EA concluded that the existing contamination presented no risk to human health or the environment and as such recommend that ground water monitoring be our only next action.

GETTLER-RYAN'S SUMMARY of monitoring data, March 6, 1987 thru August 26, 1988, dated September 27, 1988.

As I mentioned to you in our phone conversation, monitoring at this site stopped in September 1988 because of the wells being inadvertently covered during site regrading. Subsequent to our phone conversation, Gettler Ryan was successful in locating and uncovering all the wells. We will have Gettler Ryan begin quarterly sampling of the wells for laboratory analysis. We will forward all reports.

ALAMEDA COUNTY
DEPT. OF ENVIRONMENTAL HEALTH

This sampling information will be used to direct our next action at this site.

If you have any questions, please call me at 842-9625.

Very truly yours,

C.G. TRIMBACH

By Randall
John Randall, Engineer

JMR/jsp:V1-136
Enclosure

EA Project CHV 72L

REPORT OF INVESTIGATION AND RISK ASSESSMENT FORMER CHEVRON SS 9-2960 REDWOOD ROAD AND GROVE WAY CASTRO VALLEY, CALIFORNIA

Prepared for

Chevron U.S.A. Inc.
San Ramon, California

Prepared by

EA Engineering, Science, and Technology, Inc.
Lafayette, California

Roger Greensfelder
Roger Greensfelder, Ph.D., P.G.
Geologist #003011

11-11-87
Date

Robert E. Hinchee, Ph.D., P.E.
Civil Engineer #C 039606

11-11-87
Date

R. W. GREENSFELDER

November 1987

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1. INTRODUCTION

1.1 SCOPE

At the request of Chevron U.S.A., EA Engineering, Science, and Technology, Inc. (EA) has conducted a risk assessment to evaluate the significance of hydrocarbon contamination at former Chevron Service Station 9-2960 in Castro Valley, California. This risk assessment includes

1. review of existing site data and the appropriate available literature
2. inventory of existing wells within 0.5 mile of the site
3. sampling of existing site monitoring wells
4. development of a hydrogeological model for evaluating ground water transport of contaminants
5. evaluation of the hazards to receptors in the area and to the ground water user nearest to the site.

1.2 SITE SETTING

The site of former Chevron Service Station 9-2960 is located at Redwood Road and Grove Way, Castro Valley, Alameda County, California (Figure 1). **Chevron abandoned the station in 1986. The buildings and other above-ground facilities have been razed. On 19 June 1986, the fuel underground storage tanks (USTs), the waste oil UST, and the product lines were removed.** Because contamination was found in the tank field, the tank hole was excavated to 25 feet, the depth at which ground water was encountered, and the contaminated soil was stockpiled on the site to aerate. By September 1986, the tank pit had been backfilled

backfilled w/ stockpile
or import??

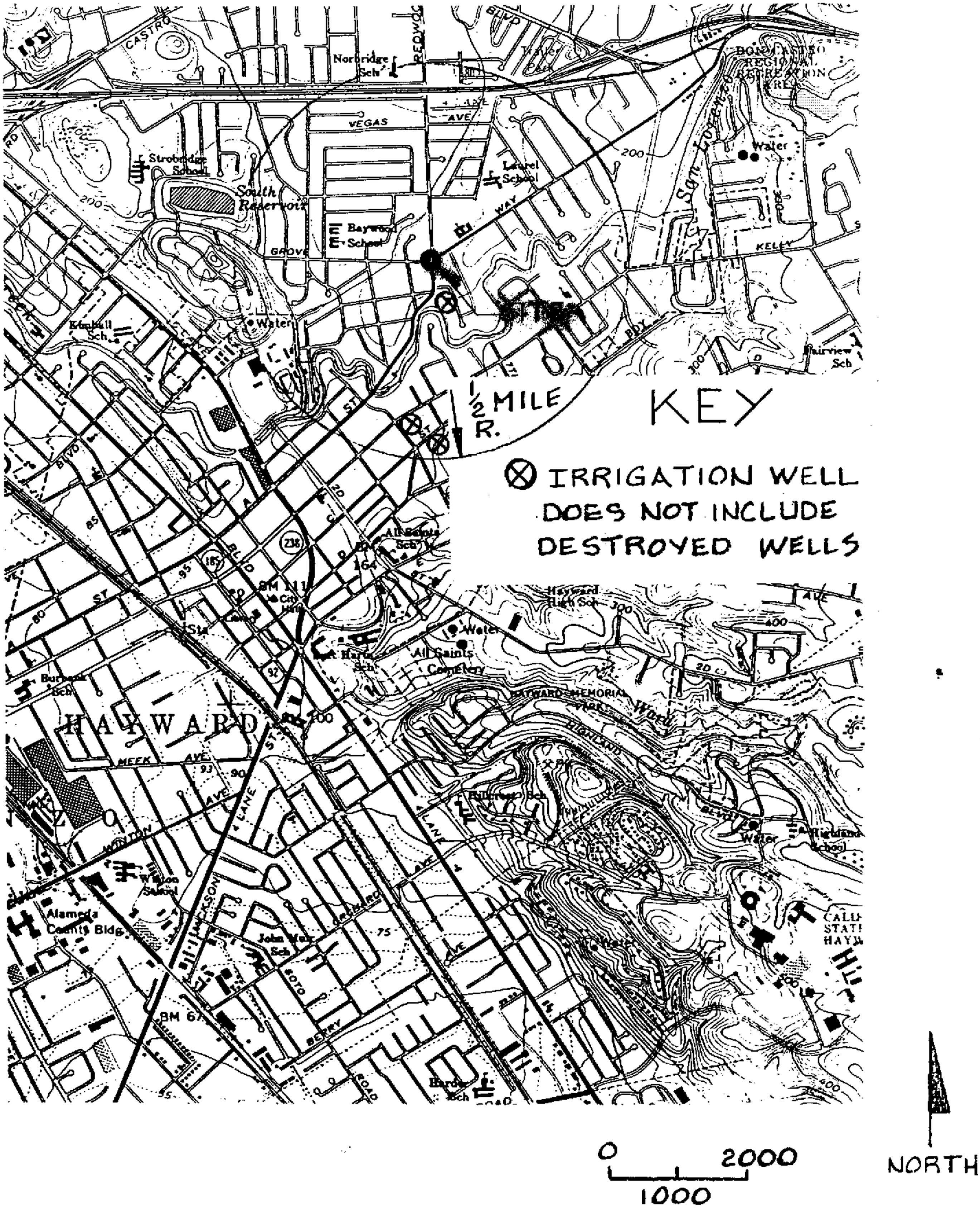

Figure 1. Location of former Chevron Service Station 9-2960, Redwood Road at Grove Way, Castro Valley, California, showing water wells within one-half mile.

and Testing Engineers, Inc., had completed compaction tests at six locations.

The site is located in a mixed commercial and residential district (Figure 2). The nearest houses are approximately 200 feet east of the site, on North Sixth Street. There are two schools within 0.25 miles of the site: Baywood School, to the west, and Laurel School, to the northeast. There are no fuel USTs in the immediate vicinity of the site.

The land surface in the vicinity of the site slopes down to the northwest at a gradient of about 2 percent. The site is approximately 150 feet above mean sea level. The nearest mapped drainage (USGS 1980), a tributary of San Lorenzo Creek, passes as close as 600 feet to the south. The site lies on a drainage divide separating the two channels. Field inspection of the site vicinity revealed a culvert along N. Sixth Street, about 500 feet west of the site, which drains into San Lorenzo Creek.

An inventory of wells within one-half mile of the site was conducted, using files of well drillers' reports maintained by the Alameda County Department of Public Works and the California Department of Water Resources. The three wells found are indicated in Figure 1. The well nearest the site was drilled in 1977 for residential irrigation and has a depth of 50 feet; it is about 700 feet from the site to the south. Two additional irrigation wells are located on C Street about 1/2 mile south of the site; they also are 50 feet deep.

1.3 RISK ASSESSMENT OVERVIEW

Risk assessment (RA) is a multidisciplinary data interpretation tool for evaluating the potential threats to human health and the environment resulting from chemical releases. In recent years it has been applied extensively to Superfund sites as part of the remedial investigation/feasibility study (RI/FS) process. RAs

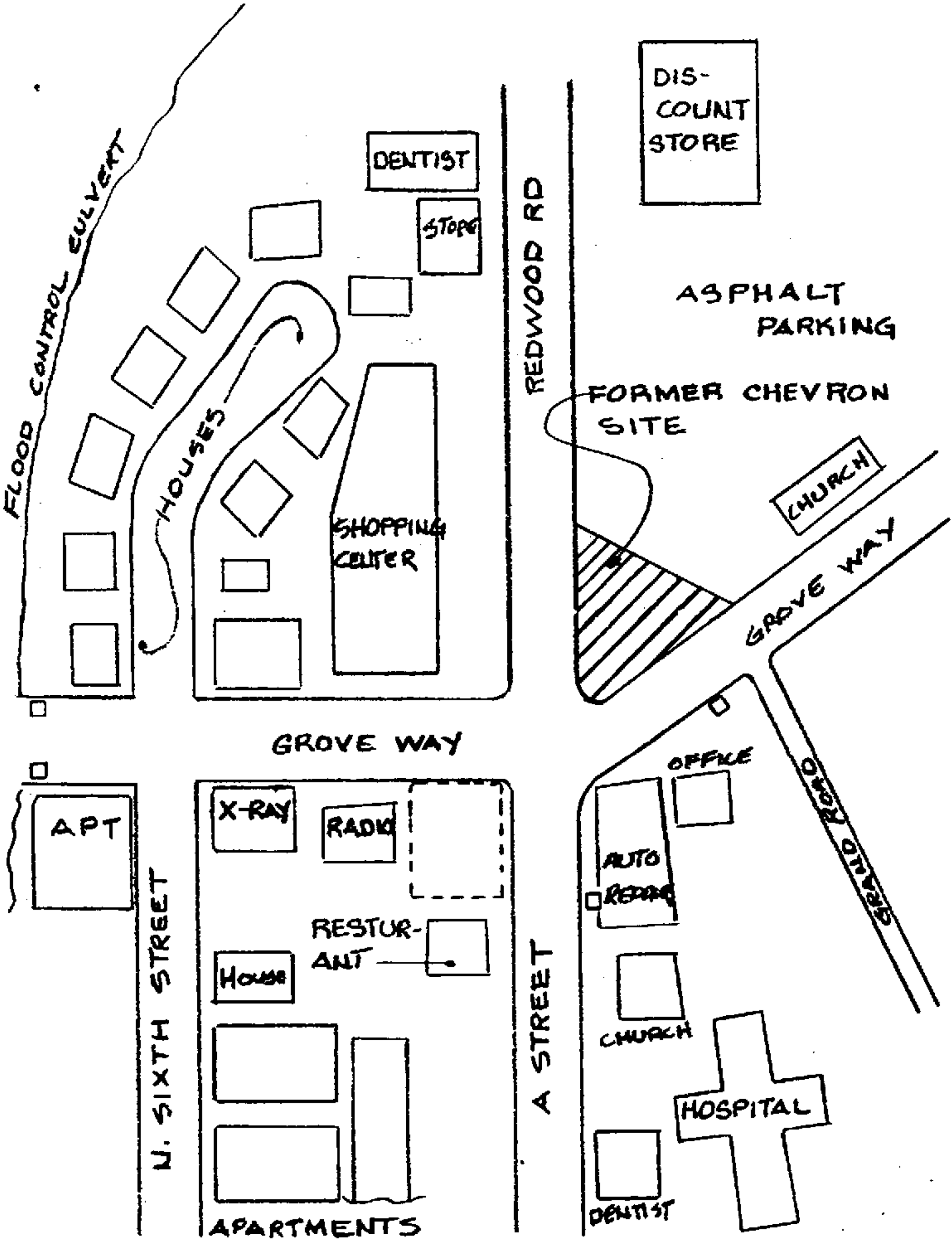

Figure 2. Land use in the vicinity of former Chevron Service Station 9-2960, Redwood Road at Grove Way, Castro Valley, CA.

are used to establish the need for site remediation and, if needed, to set quantitative cleanup goals. Since fuel-contaminated sites have many similarities to Superfund sites, RA is a tool that can be applied to fuel-contaminated sites. To date, RA has not been widely applied to these sites, perhaps because they have not been addressed under Superfund, although there is a growing recognition of the applicability of RA tools (see SWRCB 1987). In the past, the need for and objectives of cleanup of fuel-contaminated sites have often been established with little or no technical rationale. Application of RA can remove some of the ambiguity in the decision-making process and permit prudent, technically founded decisions that protect human health and the environment in a cost-effective manner.

Application of the RA process to a fuel-contaminated site can serve three purposes. First, it documents that risk to human health and the environment have been evaluated and given consideration in determining the appropriate response. Second, it provides a rational approach to determining the appropriate level of effort for investigation and remediation of the site. And third, the application of the risk assessment technique to fuel-contaminated sites help ensure that scarce resources are applied to the sites of greatest need of remediation. Following a subsurface fuel spill, the cost of the investigation phase alone may range from less than $2,500 for a few soil borings or a soil vapor survey to more than $1,000,000 for a major remedial investigation. Remediation costs may vary from $10,000 for simple free-product recovery into the millions of dollars for dissolved phase and soil clean up. The total potential costs for investigation and remediation of fuel spills nationwide is staggering. Although precise estimates are difficult to obtain, utilizing the EPA (1986a) figure of 189,000 as the number of leaking underground storage tanks in the United States, and the California Commission for Economic Development's (1986) per-site figures for the ultimate cost of investigation and remediation at leaking underground storage tank sites of $100,000, $1,000,000, and $10,000,000 at 80%, 10%, and 10% of all sites, respectively, a total cost to investigate and remediate the identified sites in the United States would be approximately 210 billion dollars. This is on the order of the United States defense budget and exceeds the gross national product of many countries. It should be pointed out that these figures include only non-farm underground fuel storage tank leaks and not pipeline leakage, aboveground spillage, or nonfuel contamination. In addition, this figure is only an estimate of currently leaking tanks and does not include abandoned tanks, past leaks, or future leaks. Although the precise figures utilized to obtain this estimate are certainly disputable, even 10% of this figure represents an enormous sum.

The RA process as applied to an underground tank site has six steps: site characterization, hazard identification, toxicity evaluation, fate and transport analysis, exposure assessment, and risk characterization. Its application to the Castro Valley site is described here:

- <u>Site Characterization</u> - This is the process of identifying the source and extent of contamination at the site in three dimensions, along with the physical features that may influence contaminant fate. The Castro Valley site is characterized in Chapter 2.

- <u>Hazard Identification</u> - Fuels are complex chemical mixtures. In the hazard identification step the components of greatest concern are identified on the basis of their concentration, toxicity, and mobility. Only the chemicals identified here are examined in later steps.

- <u>Toxicity Evaluation</u> - The potential adverse health effects of the contaminants of concern are identified.

In this report, hazard identification and toxicity evaluation have been combined.

- Fate and Transport Analysis - Fate and transport analysis identifies the pathways through which contaminants may migrate; the fates and migration rates of important compounds are estimated. The analysis includes determination of the physical properties of the compounds, the relevant site physical characteristics, and the potential ways in which the compounds and the migration pathway interact. Interactions frequently examined include solubilization, volatilization, sorption/desorption, photo-oxidation, and biodegradation. At this site the fate analysis will focus on potential ground water and vapor phase transport.

- Exposure Assessment - The exposure assessment identifies potential human receptors and activities that may result in exposure. Exposure levels can be described qualitatively or, using modeling techniques and assumptions, quantitative estimates of the daily intakes of the contaminants of concern can be developed.

- Risk Characterization - Risk characterization integrates the results of the preceding steps to describe the hazard level associated with fuel contamination at a site.

Guidelines for conducting RAs in California and the U.S. have been published in:

- California Department of Health Services Site Mitigation Tree (1986)

- California Water Resources Control Board Interim Guidance for Hazardous Substance Site Cleanup (SWRCB 1985)

- California Water Resources Control Board Draft Leaking Underground Fuel Tank (LUFT) Field Manual (SWRCB 1987)

- U.S. Environmental Protection Agency Superfund Public Health Evaluation Manual (EPA 1986b)

- U.S. EPA Draft Superfund Exposure Assessment Manual (EPA 1986c).

The RA presented in this document follows the RA process for fuel-contaminated sites described by Hinchee et al. (1986). It complies with the guidance given by the documents identified above.

2. FIELD INVESTIGATIONS

2.1 PREVIOUS INVESTIGATIONS

2.1.1 Hydrogeology

The site lies within Castro Valley, a thinly alluviated intermontane valley situated northeast of the city of Hayward. It is underlain by an unconfined aquifer of late Quaternary alluvium with a maximum thickness of approximately 80 feet (Maslonkowski 1984). Beneath this lies non-water-bearing consolidated metamorphic, sedimentary, and volcanic rocks of Jurassic to Pliocene age (CDWR 1964). Directly beneath the site, borings indicate clay or clayey sand to depths of 7 to 12 feet, underlain by interbedded sand, silt, and clay (EMCON 1986).

The shallow, unconfined aquifer has a surface area of approximately 3-1/2 square miles. It consists of layers and lenses of gravel, sand, silt, and clay deposited as part of the San Lorenzo Alluvial Cone (CDWR 1964).

The Hayward Fault, which passes approximately one mile southwest of the site, restricts the lateral movement of ground water. Regional movement of ground water is probably toward the Bay Plain (CDWR 1964), but the extent of hydraulic connection with the upper aquifers of the San Lorenzo Cone is unknown (Maslonkowski 1984). Local water table depths are approximately 16 feet, and ground-water flow has been determined to be to the southwest, in the direction of San Lorenzo Creek (EMCON 1986).

Four ground-water monitoring wells were installed on the site by EMCON on 1 October 1986 (1986). These had total depths of 30 feet and penetrated unconsolidated alluvium, as shown in Figure 3. The water table depth was approximately 17 feet. Wellhead elevations were measured by EMCON (1986), and **depths to water in the wells were observed by EA on 10 September 1987.** Water table

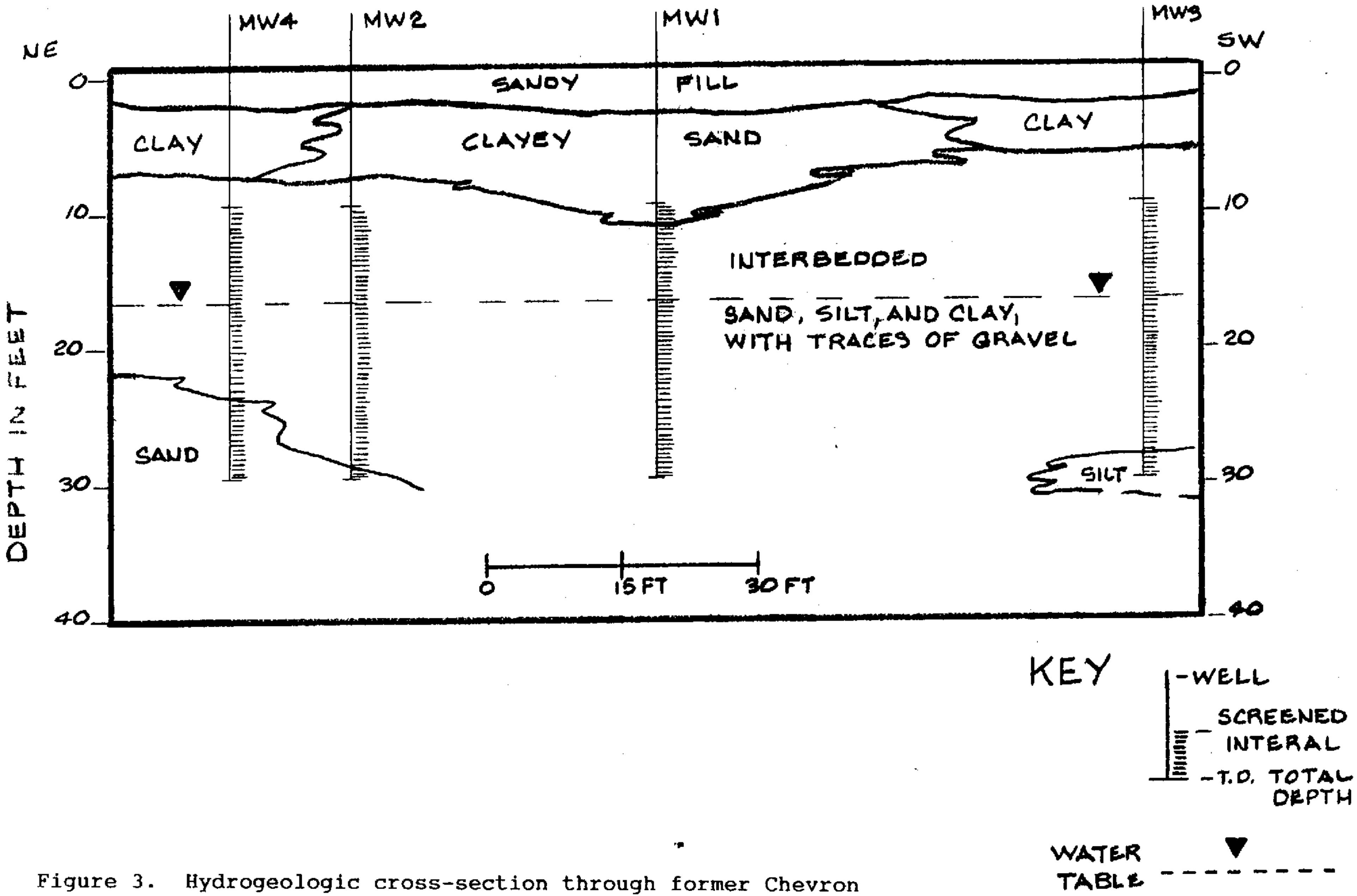

Figure 3. Hydrogeologic cross-section through former Chevron Service Station 9-2960, Castro Valley, CA.

elevations, **in these wells indicate that the gradient and direction of ground-water flow are about 0.005 and to the east.**

This direction is roughly opposite to that suggested by the topography of the site, and is therefore questionable: the site lies about 400 feet north of a topographic divide which trends southwesterly. Shallow ground water is expected to flow away from the divide, which would be westward-to-northwestward beneath the site. However, **San Lorenzo Creek passes to the east and south of the site and is about 30 feet lower in elevation. For** these reasons, **eastward flow of ground water beneath the site is not unreasonable.**

Where is the data which is this [illegible] claim? No well measurements provided (or referenced). Nov 4, 1986 Emcon report shows flow to the SW.

The pore, or linear, velocity (v) of flow beneath the site can be calculated as

$$v = Ki/n$$

where K is the hydraulic conductivity, i is the hydraulic gradient, and n is the porosity. Taking K to be 1×10^{-5} meters per second (m/s), which would characterize an average silty sand (Freeze and Cherry 1979), $i = 0.005$, and $n = 0.35$,

$$\begin{aligned} v &= 1 \times 10^{-5} \text{ m/s } (0.005)/0.35 \\ &= 1.4 \times 10^{-7} \text{ m/s, or about 14 feet per year.} \end{aligned}$$

Three wells known to be within 1/2 mile of the site have been described in Section 1.2. One of these wells is located about 600 feet south of the site and 20 feet lower in elevation; the other two wells are about 2,400 feet from the site and 10 feet lower than it.

2.1.2 Chemical Contamination

There were two prior investigations into chemical contamination at the Castro Valley site. The first was conducted by Blaine

Tech Services, Inc. (BTS) in association with the removal of the underground storage tanks. On 19 June 1986, BTS took nine soil samples during the tank removal: six from the tank field at the 18-foot level; two, one from 7 feet and the other from 9 feet, from the waste oil tank field; and one composite sample from the soil stockpile (Blaine 1986a). BTS resampled the tank pit on 8 August 1986: four samples were taken from the pit walls at depths of 16 to 20 feet and one sample was taken from the pit bottom at 23 feet. All samples from both dates were analyzed by Thermo Analytical Inc. (TMA) for total petroleum hydrocarbon (TPH) content (Table 1).

BTS also monitored the effectiveness of aeration for the excavated soils from July through September 1986. On 23 July 1986, BTS resampled the soil stockpile (Blaine 1986b). Between 23 and 29 July, the stockpile was spread across the surface of the site. BTS took composite soil samples from the surface soils (i.e., from 4 to 12 inches deep): four on 29 July 1986, one on 28 August 1986, and two on 10 September 1986. All soil samples were sent to TMA for total petroleum hydrocarbon analysis (Table 1).

EMCON Associates conducted the second investigation at the Castro Valley site (Willhite 1986). On 1 October 1986, four monitoring wells were installed on the site (Figure 4). On 9 October 1986 the wells were checked for the presence of floating product; no product was found in any of the wells. On 23 October 1986, ground-water samples were taken from the wells. TMA analyzed these samples for benzene, toluene, xylene, and TPH. The results are presented in Table 2.

2.2 DISSOLVED CONSTITUENT ANALYSIS

On 14 September 1987, EA sampled the four existing monitoring wells at the Castro Valley site. Sampling and sample handling

TABLE 1 SOIL CONCENTRATIONS (mg/kg) OF TOTAL PETROLEUM HYDROCARBONS (TPH) IN SOIL DURING AND FOLLOWING TANK EXCAVATION AT FORMER CHEVRON SERVICE STATION 9-2960, CASTRO VALLEY, CALIFORNIA, 1986

Sample Designation	Location	Depth (ft)	TPH (gm/kg)
19 June[a]			
1	gasoline tank field	18	5,200
2	gasoline tank field	18	8.0
3	gasoline tank field	18	14,000
104	gasoline tank field	18	620
105	gasoline tank field	18	1,300
106	gasoline tank field	18	490
7	waste oil tank field	7	<10
107	waste oil tank field	9	<10
8	soil stockpile[b]	1	3,900
23 July			
10A-C	soil stockpile[b]	4-8	<1
29 July			
1	soil stockpile	0.5	4.2
2	soil stockpile	0.3	<2
3	soil stockpile	0.7	4.0
4	soil stockpile	0.3	24
8 August			
B-1#1	gasoline tankpit	18	49
B-1#2	gasoline tankpit	20	170
B-1#3	gasoline tankpit	16-18	<1
B-1#4	gasoline tankpit	23	1.2
B-1#5	gasoline tankpit	19	30
28 August			
1A-D	soil surface*	0.5-1	110
10 September			
1A-D	soil surface*	0.3-0.5	3.1
2A-D	soil surface	0.3-0.5	4.9

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a. Date of tank excavation.

b. Source: Flay 1986a-f; Blaine 1986a-f.

Note: * indicates a composite sample.

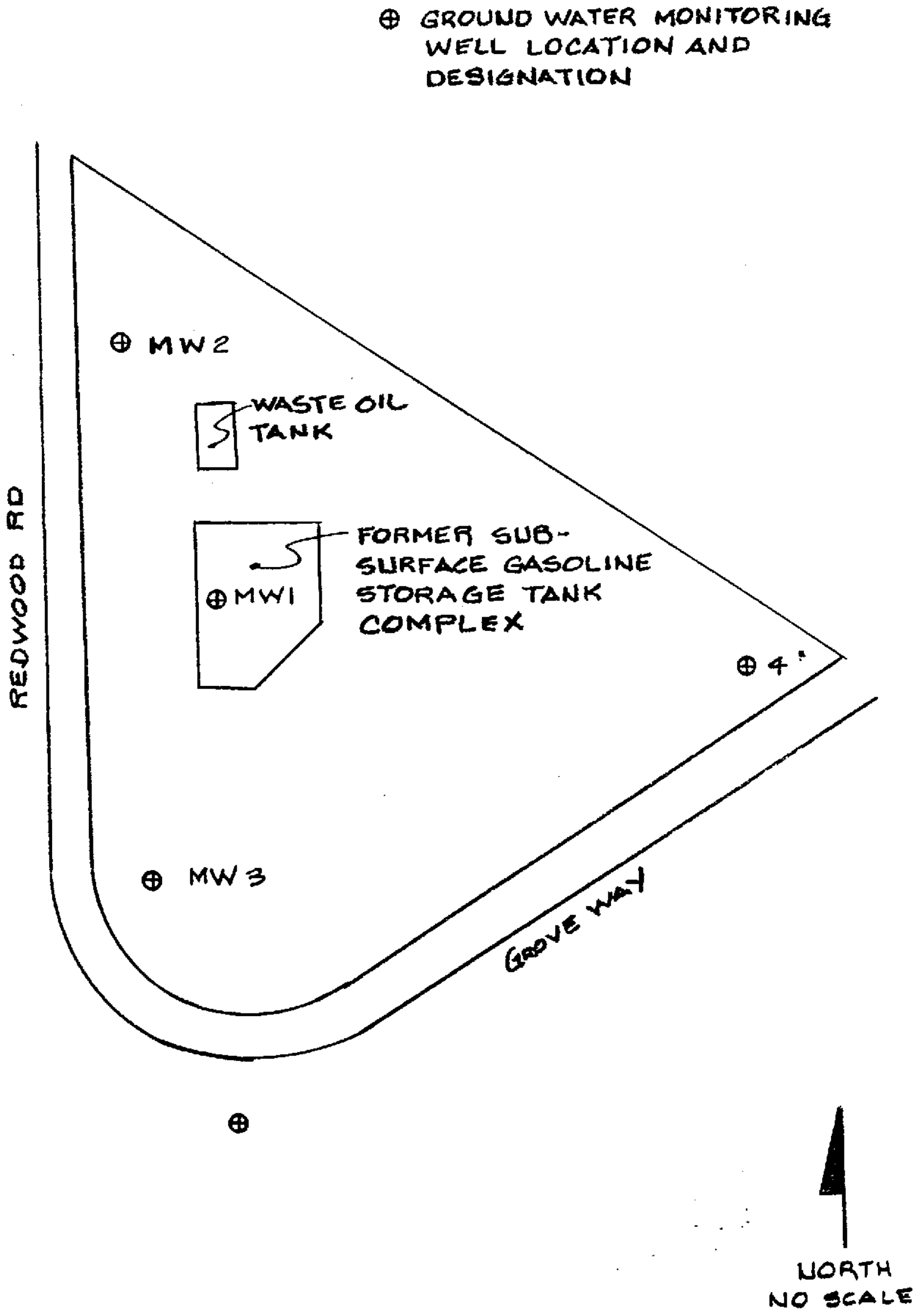

Figure 4. Map showing location of monitoring wells and former storage tanks former Chevron Service Station 9-2960, Redwood Road and Grove Way, Castro Valley, CA.

were done in accordance with EA's standard operating procedures (Appendix A). Prior to sampling, each well was hand-purged with a Teflon bailer. The volume of purged water was at least three times the volume of standing water in the well: 85 liters in MW1, MW2, and MW3 and 75 liters in MW4. Ground-water samples were taken with PVC bailers. A different bailer was used for each well to eliminate the potential for cross-contamination. Each ground water sample was split and put into a 1-quart amber glass bottle and two 40-ml VOA vials. All of the containers were placed on ice. The samples were delivered to Enseco-Cal Laboratory in Sacramento on the same day they were taken.

Enseco-Cal Laboratory analyzed the samples for TPH by the Enseco "HC by GC" method and for benzene, toluene, xylene, and ethylbenzene by a modified EPA Method 6020. The results are summarized in Table 2. The chain-of-custody forms and analytical laboratory report are reproduced in Appendix B.

2.3 DISCUSSION OF CHEMICAL INVESTIGATION RESULTS

The analytical data indicate that there was no detectable contamination of soils in the vicinity of the waste oil tank. thus, this tank probably did not leak. In contrast, the data for soils from the gasoline tank field indicate that a leak probably occurred in this area. The date or dates of product loss, the quantity lost, and the extent of resultant soil contamination cannot be estimated from available information.

The monitoring of excavated soils and the gasoline tank field pit showed rapid diminution of the total petroleum hydrocarbons in the soils. Originally the soils in the vicinity of the tank pit contained 8.8 to 14,000 mg/kg TPH. In two months the range of TPH levels in the pit had dropped to <1 to 170 mg/kg. Similar decreases were seen in the excavated soils.

TABLE 2 GROUND-WATER CONTAMINANT CONCENTRATIONS (mg/L) AT CHEVRON SERVICE STATION 9-2960, REDWOOD ROAD AND GROVE WAY, CASTRO VALLEY, CA, 1986, 1987

Sample[a]	Date	Benzene	Toluene	Xylenes	Ethyl-Benzene	Total Petroleum Hydrocarbons[b]	pH
MW1	23 OCT 86	6.4	3.7	4.3	--	37	1.58
	10 SEP 87	25	60	79	13	120	--
MW2	23 OCT 86	2.7	1.9	1.5	--	30	1.45
	10 SEP 87	2.6	2.9	2.0	0.5	14	--
MW3	23 OCT 86	0.049	0.024	0.02	--	3.3*	1.19
	11 SEP 87	0.11	0.003	<0.002	<0.002	0.2	--
MW4	23 OCT 86	0.003	0.004	0.005	--	0.57	1.19
	10 SEP 87	0.003	<0.0005	<0.0005	<0.0005	0.5*	--

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a. MW1 is designated C01; MW2, C02; MW3, C03; MW4, C04 on TMA report.
b. Reported as Total Hydrocarbons, Gasoline.

Note: * indicates a value reported by Enseco as "not related to gasoline".
-- indicates parameter not measured.

The concentrations of hydrocarbons in the ground water were measured twice, on 23 October 1986 and 10 September 1987. **The changes in hydrocarbon concentrations in MW1 probably reflect** natural fluctuations rather than any change in **the source of the** hydrocarbons. ??

The levels of hydrocarbons found in the ground water can be put into perspective by comparing them with saturation values. The San Francisco Bay Regional Water Quality Control Board (1985) sponsored a study which found that water in equilibrium with gasoline may contain benzene levels as high as 40 mg/L and toluene levels between 9 and 76 mg/L. A similar study sponsored by API (1985a) suggested that ground water in contact with gasoline will contain a sum concentration of benzene, toluene, xylenes and ethylbenzene of at least 10-20 mg/L. Thus, **the data from the 10 September 1987 investigation suggests that ground water in the** vicinity of **MW1 may be nearly saturated with hydrocarbons.** It should be noted, however, that no layer of product was observed in the well on that date, so saturation had not occurred.

3. RISK ASSESSMENT

As discussed in Section 1.4, a risk assessment (RA) for a fuel-contaminated site has six steps. The site has been characterized in Chapter 2. The four subsections below present the remaining components of the RA for the site. In this analysis, the hazard evaluation and toxicity assessment have been combined.

3.1 HAZARD EVALUATION AND TOXICITY ASSESSMENT

Gasoline and other fuels are complex mixtures of hydrocarbons. Once gasoline has been released from a tank, the composition of the mixture changes because the components have different physical and chemical properties (e.g., solubility in water, volatility, soil adsorption efficiencies) which dictate the ability of each component to migrate through the environment. Consequently, a human receptor will not be exposed to gasoline, but to various gasoline components. It is therefore appropriate to evaluate the hazards and risks associated with gasoline components rather than the complete gasoline mixture.

One of the most frequently used measurements of gasoline contamination of soils is the concentration of total petroleum hydrocarbons (TPH). TPH measurements can be used to assess the spatial extent of hydrocarbon contamination, and therefore to help determine the source of the contamination. However, the human health and environmental significance of TPH cannot be determined, because of its variable composition.

For risk-assessment purposes, gasoline constituents can be divided into four major groups: alkanes, alkenes, cycloalkenes, and aromatics. Table 3 gives several important environmental properties of these compounds. The structural similarity within each of the groups results in similar environmental behavior and toxic properties of the individual compounds in the group. For this RA, gasoline components were selected for detailed evaluation on the basis of their biological properties and environmental mobilities.

Alkanes are characterized by single bonds between carbon atoms. They may be arranged in straight chains or branched chains. The major alkanes in gasoline are n-butane, n-hexane, isobutane, isopentane, and 2-methylpentane (SWRCB 1987). In general these compounds have only moderate water solubility. The smaller straight-chained alkanes have a high tendency to volatilize but as the number of carbons increases, the vapor pressure and water solubility decrease and there is a greater tendency to bind to soil. Branched alkanes tend to have greater water solubilities than the corresponding straight-chain alkanes. In general, the alkanes have low human toxicity (Sandmeyer 1981a; NAS 1982; ACGIH 1984). There is no evidence that alkanes are mutagenic, teratogenic, or carcinogenic (Sandmeyer 1981a). Although alkanes constitute a major fraction of gasolines, they are not considered in further detail in this RA because of their low toxicities and relatively low potential to migrate from a spill site.

Alkenes are characterized by double or triple bonding between carbon atoms. On a weight basis, the alkenes make up a smaller percentage of gasoline than the alkanes. The major alkenes in gasoline are trans-2-pentene and 2-methyl-2-butene (SWRCB 1987). They have moderate water solubilities and moderate-to-high vapor pressures (based on their low boiling points). Alkenes have little inherent human toxicity (Sandmeyer 1981a; NAS 1982). Because of the generally low concentrations, their limited mobilities and very low toxicities, alkenes will not be further evaluated.

Cycloalkanes are characterized by single bonds between carbon atoms, with the carbon atoms arranged in rings. Cycloalkanes make up less than one percent of gasoline. The most abundant cycloalkane is cyclopentane (0.19-0.58 percent by weight) (SWRCB

1987). Their water solubilities and vapor pressures are both moderate-to-high. Cycloalkanes have low human toxicities and effects generally occur only at high levels of exposures. There are no reports of adverse effects resulting from exposures to environmental concentrations resulting from gasoline release (Sandmeyer 1981b), so they will not be examined in detail.

Aromatic compounds contain one or more benzene rings (a benzene ring has six carbon atoms in a ring with alternating double and single bonds between carbons). Aromatics are significant constituents of gasoline: by weight, the major aromatics are benzene (0.12-3.5%), toluene (2.73-21.80%), and xylene (3.22-8.31%) (SWRCB 1987). The aromatics have relatively high vapor pressures and water solubilities, so they may migrate from a site by transport either in ground water or soil vapor. Because of the mobilities, environmental properties, and concentrations of the aromatic compounds, the RA will evaluate these compounds, especially benzene.

Table 4 summarizes the potential appropriate or relevant and applicable regulations (ARARs), indicating acceptably non-toxic levels of petroleum constituents in air and ground water. There are no ARARs for soils. The U.S. Maximum Contaminant Level (MCL) is an enforceable drinking water standard. The U.S. recommended MCL (or MCL Goal) and the California DHS Action Level are intended as guidelines and are not enforceable. The National Ambient Air Quality Standard is an enforceable standard for outdoor air. The U.S. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit is an enforceable standard for air in a workplace. Recommendations for exposure limits have been made by the American Conference of Governmental Industrial Hygienists (ACGIH) and the U.S. National Institute of Occupational Safety and Health (NIOSH). The ACGIH Threshold Limit Value and NIOSH Criterion are nonenforceable guideline values for concentrations in air in the workplace.

3.2 FATE AND TRANSPORT ANALYSIS

3.2.1 Mechanisms of Attenuation

In ground water a number of mechanisms, including biodegradation, volatilization, and sorption, will serve to attenuate the dissolved hydrocarbons (API 1985a).

Biodegradation

Fuel hydrocarbons, represented here by benzene, C_6H_6, are readily biodegraded under aerobic conditions (Raymond et al. 1976). Stoichiometrically, this degradation occurs according to the following reaction:

$$C_6H_6 + 7\text{-}1/2\ O_2 \text{ --> } 6CO_2 + 3H_2O$$

Complete oxidation requires an oxygen/hydrocarbon ratio (by weight) of approximately 3/1. Typically, following a subsurface spill the first hydrocarbons to contact ground water rapidly deplete the available oxygen, resulting in anaerobic conditions. Assuming an initial oxygen content of 8 mg/l, approximately 2.6 mg/L of hydrocarbons may be degraded in this fashion.

Anaerobic biodegradation of fuel hydrocarbons has recently been documented both in field and laboratory research (Battermann and Werner 1984; Schink 1985; Choteau et al. 1982; Kuhn and Zeyer 1986; Vogel and Grbic-Galic 1986; Wilson et al. 1986), although generally at rates lower and somewhat less predictable than those characterizing aerobic biodegradation (Healy and Daugherton 1986).

Laboratory and field evidence suggests that microbial populations can utilize minute amounts of oxygen to initiate hydrocarbon oxidation and that subsequent oxidation is sustained by alternative electron acceptors, such as nitrate or sulfate. Swain et al. (1971) reported that <u>Pseudomonas aeruginosa</u> degraded octane by aerobic oxidation and denitrification if a trace amount of oxygen (<0.05 mg/L) was present. When oxygen was entirely excluded, however, degradation did not proceed. Kuznetsova and Gorlenko (1965) reported that aerobic Pseudomonas initiate attack on hydrocarbons at the upper edges or rims of oil fields, and that the partially oxidized products of this process are further oxidized by sulfate reducers with concomitant formation of H_2S.

In nature, electron acceptors are used preferentially in the order:

$$O_2 > NO_3^- > SO_4^{-2} > CO_2$$

Oxygen is preferred over nitrate, nitrate over sulfate and sulfate over carbon dioxide (methane fermentation). The reduced products of these electron acceptors are water, nitrogen gas, hydrogen sulfide, and methane, respectively.

Following depletion of oxygen in ground water, any nitrate present may be used as an electron acceptor, resulting in denitrification by the following reaction (Mitchell 1974):

$$C_6H_6 + 5NO_3 \rightarrow 6CO_2 + 2\text{-}1/2N_2 + 3H_2O$$

On a weight ratio, approximately one part of benzene is degraded for every four parts of nitrate (the ratio would be about 1/1 for nitrate reported as nitrogen). This biodegradation mechanism is the basis of remedial technology demonstrations in Germany (Battermann and Werner 1984) and Canada (Berry-Spark et al. 1986). In both of these studies nitrates were added to ground water, resulting in significantly accelerated degradation of fuel hydrocarbons. This process has not been used in the United States, probably because of restrictions on injection of nitrate (a Primary Drinking Water Standard compound) into ground water.

Volatilization

Volatilization is the process by which dissolved chemicals are transported from the aqueous phase to the vapor phase. The tendency and rate of volatilization is primarily determined by a compound's properties. A Henry's Law constant describes the partitioning of a chemical between the aqueous and vapor phases when a chemical is at dilute concentrations, such as those expected in hydrocarbon contaminated ground water. Compounds with Henry's Law constants greater than 0.001 atm·m^3/mole latilize rapidly (Lyman et al. 1982). Most of the compounds in gasoline have Henry's Law constants greater than 0.01 (Figure _), so theoretically volatilization should be a significant attenuation mechanism in ground water contaminated by petroleum hydrocarbons.

Numerous models are available to predict volatilization from ground water, but little empirical information is available regarding the rate at which volatilization reduces ground water concentrations of gasoline components. The American Petroleum Institute (API 1985b) reviewed the data available on the fate of gasoline released in both surface water and ground water. In surface spills, Leinonen and MacKay (1975) found that the rates of volatilization exceeded the rates of dissolution by 100 times for C_1-C_8 alkanes, 3 times for monocyclic aromatic hydrocarbons, and 1,000 times for C_{10}-and-greater alkanes. Other researchers have found similar results, indicate the significance of volatilization from surface waters. Smith et al. (1981) found that volatilization was the primary fate pathway for benzene and soluble non-aromatic hydrocarbons.

These surface water studies imply that volatilization from ground water will be significant, and two ground-water studies support this implication. Leinonen and MacKay (1975) found that the rates of volatilization from soil and water were similar for n-butane, n-decane, and toluene. Similarly, Wilson et al. (1981)

found that soil reduced the rate of volatilization of chlorinated organics by only one order of magnitude.

The effect of volatilization is not ordinarily incorporated into ground water transport models (Mills et al. 1985). However, Donigian et al. (1983) provide a method for estimating volatilization rates for chemicals distributed in a soil column without upward water flux. The rate of volatilization is estimated by:

$$Q_t = 2C_o \ (Dt/pi)^{0.5}$$

where

Q_t = total loss of chemical per unit area over time t, ug/cm^2

C_o = initial concentration of chemical in the soil, ug/cm^3

D = diffusion coefficient of chemical vapor in the soil air, cm^2/sec

t = time, sec.

pi = 3.14159...

It is important to note that this model underestimates volatilization in moist soils.

Sorption

Sorption is the third major potential mechanism of attenuation for petroleum hydrocarbons in ground water. Sorption is a general term which encompasses the processes of absorption, adsorption, and desorption by which a compound partitions itself between the aqueous and soil phases of an aquifer. It affects fate and transport by reducing dissolved concentrations of contaminants, reducing rates of volatilization, and altering rates of biodegradation (Mills et al. 1985).

Sorption is generally reversible: once the dissolved concentration decreases, the soils may release the sorbed chemical back to the aqueous phase. Thus, the effect of sorption is a retardation of the contaminant's migration rate compared to ground water velocity.

At low dissolved contaminant concentrations, sorption can be modeled as a linear equilibrium concentration for estimating the magnitude of retardation; for organic compounds, the retardation factor (R) (Donigian et al. 1983; Mills et al. 1985) is defined by

$$R = 1 + (B/N)(K_d)$$

where

B = bulk density, g/cc

N = effective porosity in the saturated zone, dimensionless

K_d = soil-water partitioning coefficient, ml/g.

An R-value of 1 implies that the contaminant will move at the same velocity as ground water, while an R-value of 10 implies it moves at 1/10 the velocity of ground water.

The soil-water partitioning coefficient (K_d) is the major determinant of retardation (Donigian et al. 1983). A joint function of properties of the chemical and of the soil, it is estimated by

$$K_d = (K_{oc})(f_{oc})$$

where

K_{OC} = organic partitioning coefficient (ml/g)

f_{OC} = fraction of organic carbon in soils.

The K_{OC} of a chemical can be measured, or it can be estimated from either the octanol-water partitioning coefficient or water solubility (Lyman et al. 1982). The K_{OC}'s of some important petroleum hydrocarbons (EPA 1986) are

	Benzene	Toluene	Xylene
K_{OC} (ml/g)	83	300	240

The fraction of organic carbon in subsoils is rarely measured, especially for subsurface soils. The values for typical surficial soils vary from <0.04 to about 0.1, but they rapidly decrease with depth. For many subsurface soils, a value for the fraction of organic carbon of 0.005 or less may be reasonable (Donigian et al. 1983).

In addition to estimating the change in velocity, the K_{OC} and retardation factor can be used to estimate the relative amounts of a compound in the dissolved and sorbed phases by (Mills et al. 1985):

$$1/R = C/(C+S*B/N)$$

where

C = total dissolved pollutant concentration
S = value mass of sorbed pollutant per unit mass of soil.

Values for R of 10 and 100 imply that 10% and 1% of a substance, respectively, is in the dissolved phase.

3.2.2 Transport of Fuel Constituents

3.2.2.1 Model Selection

Several models are available to estimate transport in air and ground water. As in any environmental modeling, a number of assumptions are required to develop solutions. The approach used in this risk assessment was:

1. Define Objectives (often the most crucial part of the modeling)--In this case the objective was to address the question "What will the concentration of gasoline constituents (e.g., benzene) be in the well nearest the site?"

2. Select Modeling Approach and Develop Model Input Data--A variety of ground-water transport models are available. These vary in complexity from simple models to estimate dilution to highly sophisticated computerized models which estimate the effects of multiple fate and transport processes on contaminant concentrations. All models necessarily abstract and simplify real environmental processes. Generally, the sophisticated models provide more accurate estimates of environmental concentrations if the contaminants and the hydrogeological environment are well characterized. If many of the data input values are unknown and must be estimated, the certainty and accuracy of sophisticated model predictions can drop markedly; in that case, selection of a less-sophisticated approach is indicated. For this assessment, a ground-water transport model was selected on the basis of the quantity and quality of available input data compared to model requirements. A simpler model was selected because some site-specific data were absent or insufficient to justify more complex models. Nevertheless, some model inputs had to be

inferred from the limited hydrogeological information. Inferred model values were selected conservatively, that is, so that the ground-water concentration would be over estimated rather than underestimated.

3.2.2.2 Ground-Water Transport

The transport of contaminants from the site to the nearest known producing water well was modeled with the RESSQ ground water transport computer program (Javandel et al. 1984). Required input to RESSQ includes

1. relative position, volume flow rate, and diameter of contaminant sources and production wells

2. aquifer thickness, porosity, and linear flow velocity of ground water.

The output of the model includes arrival times for streamlines from the source reaching the production wells and the contaminant concentration at these wells, based on that at the source. The RESSQ model assumes considers two-dimensional (horizontal) advective transport in a uniform aquifer. Vertical transport, dispersion, and molecular diffusion are not included; neither are the attenuation mechanisms described in Section 3.2.

At the Castro Valley site, the source volume flow rate is estimated as the product of the linear ground-water velocity (2.5 feet per year) and a cross-sectional area of 1,000 ft^2 for the contaminated aquifer beneath the site. This cross-section is based on an estimated 100-foot diameter and 10-foot thickness of contaminated aquifer. Thus, the source flow rate (Q) is

$$\begin{aligned} Q &= vA = 14 \text{ ft/year} \times 1{,}000 \text{ ft}^2 \\ &= 14{,}000 \text{ feet}^3 \text{ per year} \\ &= 0.045 \text{ m}^3\text{/hour (for RESSQ input).} \end{aligned}$$

The average concentration of benzene in the source region is estimated to be 14 mg/L, based on data from MW1 and MW2.

The nearest known well is located approximately 630 feet south 18° west of the site (see Figure 1). This is a backyard irrigation well with a depth of 50 feet and a pumping rate estimated here as 0.1 gallons per minute (about 150 gallons per day), or 0.02 m^3/hour.

The RESSQ simulation (Appendix C) indicates that the plume of contaminated water from the source never reaches the well. When the model was run with different postulated regional groundwater flow directions, it was found that contamination could reach the well, in some 200 years, but only if the regional flow direction lay within 20 degrees of the source-to-well azimuth. (In actuality, dispersion would broaden the plume's azimuthal range beyond 20 degrees.) Although the amount of broadening is unknown, it is not likely to exceed 20 degrees. Thus, it is very unlikely that the plume would ever reach the well.

3.3 EXPOSURE ASSESSMENT

3.3.1 Soils Exposures

Humans become exposed to contaminants in soils through a number of potential pathways, including incidental soil ingestion, inhalation of soil particles, and dermal contact. These direct exposure routes are associated with surface soils (approximately the top 6 to 12 inches). [redacted]
This gravel creates a surface with a high density of nonerodible elements which protects the soil below from wind erosion. Wind-generated emissions from such surfaces decrease sharply with time as the limited reservoir of erodible particles is depleted (Cowherd et al. 1985). Thus, as long as this surface remains

intact, exposures to contaminants remaining in the surface soils are expected to be negligible.

3.3.2 Ground-water Exposure

The nearest well to the Castro Valley site is used for irrigation, so the most probable route of exposure to contaminants is through bioaccumulation by plants and animals exposed to the ground water. Benzene, toluene, xylenes, and ethylbenzene have very low bioaccumulation potentials, because of their high volatilities. Garten and Trabalka (1983) developed a screening-level model for evaluating the food-chain behavior of organic chemicals. They found that chemicals which have low octanol-water partitioning coefficients (K_{OW}), i.e., log K_{OW} less than 3.5, did not bioaccumulate in mammalian and avian fat. While bioaccumulation in plant tissue is less well studied, work by Briggs et al. (1982) indicates that log K_{OW} is also a good indicator of plant root uptake, which is directly related to bioaccumulation.

The log K_{OW} of compounds at the Castro Valley site (EPA 1986) are

Benzene	Toluene	Xylenes	Ethylbenzene
2.12	2.73	2.95-3.26	3.15

Because of these low bioaccumulation potentials and the low concentrations expected at the well, human exposures resulting from ground-water contamination are expected to be negligible.

3.4 RISK CHARACTERIZATION

A release of hydrocarbons probably occurred in the tank field at former Chevron SS 9-2960 in Castro Valley, California. In June 1986, the soils in the tank field were excavated and allowed to aerate to decrease the hydrocarbon content. By August 1986, the soil concentrations of TPH had dropped from a high of 14,000 mg/kg to a high of 170 mg/kg. Since then the tank field pit has been filled, the aerated soils spread across the site surface, and the surface covered with gravel.

The soils remaining on site are not expected to result in unacceptable risks because of the low exposure potential and the low levels of contaminants remaining in these soils. The levels of dissolved hydrocarbons in the ground water are not expected to result in unacceptable risks. A model of the transport of contaminated ground water from the site to the nearest well predicts that this plume would never reach the well.

4. CONCLUSIONS AND RECOMMENDATIONS

The foregoing investigation and risk assessment indicates the following:

1. Fuel hydrocarbons were probably released in the area of the underground storage tanks formerly located on this site.
2. Soil cleanup operations in 1986 have probably reduced the threat of continued ground-water contamination to a minor level.
3. Computer simulation of contaminant transport in ground water indicates that the contaminant plume will never reach the nearest well.
4. Based on the preceding conclusions, the risks to human health and environmental safety posed by the release of fuels on the subject site are not significant.

It is recommended that no further action be taken at this site, except for continued annual sampling and analysis of water from the four monitoring wells on the site, coupled with semiannual inspection and gauging of the wells for floating product.

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5. DETERMINATION OF WATER LEVEL

Water level relative to a noted reference must be determined in all wells to be sampled prior to initiation of ANY purging and sampling activities. Because these data are often used to construct water table maps, it is essential that they be as accurate as possible. All water level determinations must be made to the nearest 0.01 ft. Water level determinations should be sequenced such that the least contaminated wells are addressed first. EA currently determines water level using a variety of devices. Utilization of each device is provided in the sections that follow.

Upon arrival at each well, unlock the lock and remove the cap. Wells installed by EA have a permanent reference for water levels established at the time of construction. This reference is described on boring logs and identified in the field sampling plan. For sites which do not have established reference elevations, the following protocol should be followed. Measure the height of the stick up (or stick down) to the nearest 0.01 ft relative to the ground surface and record same on the Field Record of Well Gauging, Purging, and Sampling (Figure 5-1) along with the location of the stick up reference. This reference should then be used in all subsequent measurements. This having been accomplished, apply the appropriate technique from the following according to the specifications in the project sample plan. Note, in particular, Section 5.5 (Cleansing).

Wells with strong organic odors or which are otherwise suspected of containing a floating organic phase (i.e., gasoline or diesel) should be appropriately gauged to determine product thickness as well as water level. This can be accomplished by either using probes designed for that purpose (as described in Section 5.3) or by utilizing a clear or opaque bottom-filling bailer carefully lowered through the liquid interface. Unless directed otherwise by the project manager no well containing a measurable layer of floating product should be either purged or sampled.

Purging and sampling wells with raw product serves no real purpose save determination of the water solubility of the compounds in the product which is generally available in a chemistry reference. Such purging and sampling also heavily contaminates gear. thereby increasing the potential for cross-contamination. If samples are being split with another party who is conducting the purging, and they collect samples from wells containing floating product. a sample should be collected and the presence of product noted in the field activities report.

5.1 ELECTRONIC SOUNDERS

EA currently uses several types of electronic water level sounders all of which function based on completion of an electrical circuit (conductivity). Penetration of water is indicated by activation of an audible tone. light. or meter. These electrical sounders are highly efficient and effective in most instances. An exception to this is a well in which floating hydrocarbon is present (i.e., gasoline or oil). These materials serve as insulators and not only does the sounder fail to indicate the level of the floating hydrocarbon but the hydrocarbon coats the probe and renders it ineffective in determining the level of the water. In instances when floating hydrocarbon is anticipated a steel tape or interface probe should be employed.

Determination of water level using an electronic sounder is made by lowering the pre-cleaned (wipe probe and cable with methanol) probe of the sounder into the well slowly until the indicator (audible tone. light. or meter) is activated. Contact between the probe and the well casing should be avoided as condensation may cause an erroneous reading. After a positive indication of water penetration has been achieved. the probe should be slowly raised and lowered until the indicator accurately registers the water surface. The water level should be measured from the reference on the casing marked when the casing stick up was measured. This reference should be permanently marked so that future measurements the Emtec which is a float operated probe. The float responds differentially to water and materials less dense than water. The Emtec probe has a visual and auditory indicator system. It is equipped with a red and green light and with a beeper. When the probe is immersed in water, both lights shine and a steady beep is heard. When the probe is immersed in material less dense than water only the red light shines and the beeping is intermittent. When using the Emtec, the probe, which is attached to a steel tape, is lowered into the well until it activates (lights and beeps) which is an indication that it has penetrated a liquid. The type of liquid is determined according to the pattern described above. If the indication is that a material less dense than water has been encountered the tape is referenced to the casing, the value recorded to the nearest 0.01 ft, and the probe is lowered until it indicates penetration of the water/hydrocarbon interface. The tape is again referenced to the casing and the value recorded to the nearest 0.01 ft. The thickness of the floating material is determined by difference. When making water level determinations with the Emtec it is necessary to add approximately 1.65 ft to all readings to correct for the length of the probe. This length must be field measured and verified as it may change slightly depending on the method of attachment to the tape. Caution must be exercised in using the Emtec as its sensors are in the probe head and when a substantial layer of floating material is present or the depth to liquid is very deep the lights are difficult to see and the beeps difficult to hear.

The second type of interface probe available is MCC Oil-Water Interface Probe. This probe operates on the principal of sonic conductivity. The MCC probe produces an audible signal when immersed in liquid. The signal is continuous when the probe is immersed in material less dense, and less sonically conductive than water (i.e., gasoline) and is intermittent when immersed in water. The signal is produced in the tape reel mechanism and thus the problems associated with the Emtec are absent. The MCC probe is attached to a steel tape housed in a reel and therefore determination of floating material and water levels is made as described above for the

5.5 CLEANSING

Much of the ground-water work in which EA is involved requires contaminant assessment at the ug/L or lower level. It is therefore essential that every effort be made to avoid cross-contamination. This can best be done by assuring that no equipment coated with or containing contaminants from one well be introduced into another well. The criticality of this step lies in the fact that as little as one drop of contaminant has the potential to contaminate a well to the mg/L level and to possibly render the well unsuited for future monitoring.

In order to ensure that cross-contamination via water level sounding equipment does not occur it is necessary to decontaminate the equipment prior to each field effort and between **EACH** well. This is done by wiping the tape with a paper towel saturated with methanol as it is retrieved. A fresh towel must be used for each well. Probes such as the Emtec. Oil Recovery System's. and MMC must be methanol rinsed (a wash bottle can be used) and fully immersed in a pail of clean water between wells. Fresh water must be used for cleansing between wells. All equipment should again be cleaned in accordance with this section immediately after it is last used for the day. Potentially contaminated equipment must never be stored or transported.

6. WELL PURGING

Prior to sample acquisition it is necessary to purge the well in order to ensure that the sample collected is as representative as possible of the ground water in the aquifer. Failure to purge may result in collection of water that has been isolated from the aquifer in the well casing for an extended period of time any may no longer be representative of the aquifer. Purging is typically accomplished by pumping or bailing. Pumping is done with submersible pumps, centrifugal pumps, or with peristaltic pumps. Bailing is generally done using a bottom-filling bailer. All purging equipment should be handled in a manner which avoids contact with potentially contaminating materials (i.e., generators, fuel containers, the ground, vehicle exteriors, etc.). The manner in which wells are purged is a function of well diameter, depth to water, volume of water, and yield. It is the responsibility of the project manager to determine the purging technique most appropriate for a given project and to specify same in the project sampling plan.

After the method has been selected, the appropriate procedure from among the following should be followed. In order to assure representative ground-water measurements all water level determinations must be completed prior to purging of any wells at a given site.

Unless specifically directed otherwise, <u>no</u> well containing a measurable quantity (not just a sheen) of floating organic phase (i.e., gasoline or diesel) should be purged or sampled; this is of importance to minimize cross-contamination potential.

6.1 DETERMINATION OF VOLUME PURGED

It is EA´s routine practice to purge a volume of water equal to four times the volume of standing water in the casing or to dryness. This is consistent with U.S. EPA guidance as stated in the Resource Conservation

The volume is converted to gallons by multiplying $ft^3 \times 7.48$, or by:

$V(gal) = hF$

where

h = height of water column in feet
F = 0.16 for a 2-in. diameter well
0.65 for a 4-in. diameter well
1.47 for a 6-in. diameter well
2.61 for an 8-in. diameter well
5.87 for a 12-in. diameter well

After this volume has been calculated, it is multiplied by the number of casing volumes to be purged. This represents the volume that must be removed from the well. Under no circumstances should purging be initiated prior to water level determination in ALL wells under observation at the site.

6.2 PURGING WITH PUMPS

6.2.1 Three and Seven-Eighths and Four-Inch Submersible Pumps

Four-inch and larger diameter wells with an adequate yield are generally purged by an AC-powered submersible pump of appropriate diameter. These pumps are powered with a portable generator and are equipped with a safety line to prevent loss in a well should a pump hose or power cord break and to make retrieval easier should the pump become jammed in the well.

Wells should be purged in order of least to most contaminated. It is the project manager's responsibility to specify this order in the project sampling plan and again at the pre-sampling briefing. It is the field

In the event the well dewaters prior to evacuation of the required volume, the well is allowed 15 minutes to recover and pumping is re-initiated. If the well again dewaters, the pump is removed from the well, as above, and the volume purged is recorded.

6.2.2 Keck Submersible Pumps

If the well diameter will not accommodate a standard submersible pump, the water level is greater than 20 ft below grade, and the well is accessible by a 4-wheel drive vehicle, the Keck Geophysical Instruments, Inc. SP-84 pump and reel can be used for purging. This pump will fit a 2-in. diameter well and is rated from about 1.5 gpm (10-ft head) to about 0.5 gpm (150-ft head). The pump is a progressive cavity pump and will pass silt and fine sand. The SP-84 operates from a 12-volt DC battery. Virgin polyethylene 0.5-in. diameter flexible discharge pipe should be used in each well. Purging with an SP-84 should be done according to the protocol described in Section 6.2.1.

6.2.3 Back-Pack Submersible Pumps

If access to the well is limited or the well diameter will not accommodate a standard submersible pump, a back-pack pump fitted with a head of appropriate diameter can be used for purging. The back-pack pumps have 1.5 and 2-in. heads and self-contained power sources. They can be charged to operate continuously for up to 5 hours. Back-pack submersible pumps should be used according to the procedure described in Section 6.2.1.

All submersible pumps should be equipped with foot values to preclude backflow and carry over.

and hot water is pumped through the system to clean the interior. It is generally necessary to pump 5 to 10 gallons to obtain a clean pump. The pump should be allowed to purge itself and the hose between wells. Except for jacketed cables on 3-7/8 and 4-in. submersible pumps, a new length of safety line should be attached to the pump between wells.

The peristaltic pump is cleansed between wells by installing new tubing. The used tubing should be retained and disposed of at the office or in an appropriate receptacle if available onsite.

No pump which has come into contact with a non-aqueous liquid phase (i.e., hydrocarbon) will be reused until thoroughly hot water washed and hot water purged. All purging equipment will be thoroughly cleaned upon return from the field and prior to storage.

6.3 PURGING WITH BAILERS

In some situations well yield and volume are sufficiently low to make purging with a bailer feasible. A bailer of appropriate size and composition is selected and fitted with an appropriate length of line. For purging, bottom filling polyvinyl chloride (PVC) or poly carbonate bailers may be used. The bailer is lowered into the well, allowed to fill, retrieved, and the contents emptied downgradient or contained as specified in the project plan. This process is repeated until the desired volume has been evacuated or the well dewaters. In the event the well dewaters the protocol described in Section 6.2.1 is followed. New line should be used for each well. A separate bailer should be used for each well if possible. If, however, this is not possible the bailer must be cleaned between wells. This is accomplished by scrubbing the interior and exterior (disassemble bailer if possible) with hot soapy (Alconox) water and a scrub brush. After scrubbing, the bailer is rinsed twice with hot tap water and three times with de-ionized water. Following the de-ionized water rinses, the bailer is rinsed with methanol

7. GROUND-WATER SAMPLING

Most ground-water sampling is accomplished with bottom filling bailers. However, under some circumstances samples may be collected from taps or from peristaltic pumps. Samples should never be collected from a pump discharge as they generally cannot be considered representative. The sample collection phase of the field effort is critical. It is at this stage that the greatest potential for contamination exists. Only sampling gear that has been certified clean should be used. All sampling gear including sample containers, bailers, line, and pump tubing should be handled as if they were sterile. They **MUST NOT** be transported with purging gear, such as generators and fuel containers, due to the potential for contamination (i.e., gasoline). The sampling personnel must take care to ensure that their hands are clean initially and that they are washed between wells. Whenever possible, it is desirable to use disposable gloves for handling sampling gear. This minimizes the potential for contamination and also protects sampling personnel from contaminants that may be present in the samples. New gloves should be worn for each well sampled. Care should be exercised to ensure that sample does not contact the gloves, as materials used to fabricate them have the potential to produce artifact contamination.

7.1 SAMPLING WITH A BAILER

Unless otherwise directed by the project manager, no well containing a measurable layer (not just a sheen) of floating non-aqueous liquid (i.e., gasoline or diesel) will be sampled. This is of importance to reduce the potential for cross-contamination.

Most ground-water sampling is accomplished with a bailer. When this is the case, only cleaned bottom-filling teflon bailers (or a project-specific material) should be used. A clean dedicated piece of non-contaminating (cf. project plan) line is attached to the bailer and (i.e., from a recovery well depression pump) is a special case tap sample. The discharge should be discharged to ensure it has been flowing at least 15 minutes prior to sampling. The flow rate should be estimated and recorded (bucket and a stopwatch technique is adequate).

Sampling Municipal or Industrial Wells

It is desirable to sample as close to the well source as possible. Samples should be taken directly from the well head whenever possible. This will eliminate chlorination or other interferences, possible changes within the piping, mixing of water from other wells, and so on.

Large capacity wells which are "on-line" and producing prior to the visit may be sampled immediately.

Municipal wells which are temporarily shut down at the time of visit must be pumped to waste prior to sampling. Fifteen minutes or more is suggested. Access to municipal well systems, well houses etc., invariably requires the assistance of a water department employee. Prior notification is essential.

Sampling Domestic Wells

Samples should be taken as close to the pumping well as possible. Therefore, basement faucets or outside faucets are preferable.

The well owner should be questioned about any treatment equipment installed on his system. Softening, iron removal, turbidity removal, disinfection, pH adjustment and other equipment is often used; these will give misleading analyses, depending on the parameters one is sampling for. Home carbon filters for the removal of organics also are increasingly popular. Basement and outside faucets will usually avoid such treated water.

8. FIELD FILTRATION

It is sometimes necessary to filter selected sample aliquots in the field (i.e., trace metals). When this is the case, filtration apparatus is supplied by the laboratory. Two types of apparatus are available. The first is an all glass system with vacuum supplied by an AC-powered pump. A trap and the sampling glassware are attached to the pump and a laboratory-washed 0.45-u filter is applied to the receiver. Care must be taken to avoid touching the filter. About 100 ml of de-ionized water are passed through the system and discarded. The receiver is then charged with about 50 ml of sample which is also discarded. The sample is then filtered and the appropriate container is filled. Between samples, the glassware is rinsed three times with de-ionized water and the washes are discarded. A wash blank is prepared every ten samples by filtering de-ionized water.

The second type of filtration apparatus is a polycarbonate pressure system. In this system the sample is drawn into the receiver through a silicone tube attached to a three-way stopcock. The stopcock is switched and the sample is filtered through a laboratory-prepared 0.45-u filter cartridge into the sample container. A fresh cartridge is used for each sample. Between samples the system is washed three times with de-ionized water. Wash blanks are prepared every ten samples as described above.

APPENDIX B

Laboratory Report for Ground Water Analysis Conducted in September 1987

California Analytical Laboratory
Enseco Incorporated

CHV72L
Castro Valley

RECEIVED
OCT 27 1987
EA [illegible] AND
[illegible]

Enseco

CHV72L
JS

October 21, 1987
Lab ID: 31339

Jan Stepek
E.A. Engineering Inc.
41 Lafayette Circle, Ste A
Lafayette, CA 94549

Dear Ms. Stepek:

Enclosed is the report for the four water samples for your Project ID CHV 72L which were received at Enseco-Cal Lab on 14 September 1987.

The report consists of the following sections:

- I Sample Description
- II Analysis Request
- III Quality Control Report
- IV Analysis Results

No problems were encountered with the analysis of your samples.

If you have any questions, please feel free to call.

Sincerely,

Ben N. Buechler
Director of
Chromatography Services

dmc

2544 Industrial Boulevard
West Sacramento, California 95691
916/372-1393 Facsimile: 916/372-1059

I Sample Description

Lab ID	Client ID	Matrix	Date Sampled	Containers
31339-001	C1	Water	10-Sep-87	3-CNTNERS.
-002	C2	Water	10-Sep-87	3-CNTNERS.
-003	C3	Water	11-Sep-87	3-CNTNERS.
-004	C4	Water	10-Sep-87	3-CNTNERS.

The samples were received under chain-of-custody.

II Analysis Request

The following analytical tests were requested.

Lab ID	Analysis Description
31339-1 thru 4	Aromatic Volatile Organics Total Petroleum Hydrocarbons

III Quality Control

A. **Project Specific QC.** No project specific QC (i.e., spikes and/or duplicates) was requested.

B. **Method Blank Results.** A method blank is a laboratory-generated sample which assesses the degree to which laboratory operations and procedures cause false-positive analytical results for your samples.

No target parameters were detected in the method blanks associated with your samples at the reporting limit levels noted on the data sheets in the Analytical Results section.

C. **Laboratory Control Samples.** An LCS is a well-characterized matrix (blank water, sand or celite) which is spiked with certain target parameters and analyzed at approximately 10% of the sample load in order to establish method-specific control limits. The LCS results associated with your samples follow:

Test: 602 LCS
LCS ID: 602M150987EF
Concentration Units: ug/L

	Concentration			Accuracy				Precision	
		Measured		% Recovery				RPD	
Parameter	Spike	LCS1	LCS2	LCS1	LCS2	Av.	Limits	LCS	Limit
Benzene	5.0	4.9	4.9	98	98	89	NC	0	NC
Toluene	5.0	4.8	4.8	96	96	96	73-107	0	10

NC = not calculated

Test: PH-GC Water LCS
LCS ID: PH230987A/B
Concentration Units: ug/L

	Concentration			Accuracy				Precision	
		Measured		% Recovery				RPD	
Parameter	Spike	LCS1	LCS2	LCS1	LCS2	Av.	Limits	LCS	Limit
gasoline	5.0	4.0	2.7	81	55	68	54-121	38	48

Accuracy is measured by Percent Recovery as in:

$$\% \text{ recovery} = \frac{(\text{measured concentration})}{(\text{actual concentration})} \times 100$$

Precision is measured using duplicate tests by Relative Percent Difference (RPD) as in:

$$\text{RPD} = \frac{(\% \text{ recovery test 1} - \% \text{ recovery test 2})}{(\% \text{ recovery test 1} + \% \text{ recovery test 2})/2} \times 100$$

Control limits for accuracy (percent recovery) are based on the average, historical percent recovery +/-3 standard deviation units. Control limits for precision (relative percent difference) range from 0 (identical duplicate LCS results) to the average, historical relative percent difference + 3 standard deviation units. These control limits are updated on a quarterly basis.

IV Analysis Results

Test methods prefaced by "Enseco" indicate that minor modifications of published EPA Methods were made such as reporting limits or parameter lists. Reporting limits are adjusted to reflect dilution of the sample, when appropriate. Solid and waste samples are reported on an "as received" basis; i.e., no correction is made for moisture content. All data is "blank corrected" by subtracting the level of contamination, if any, found in the laboratory method blank from the analytical result before it is reported.

Results are on the attached data sheets.

TOTAL PETROLEUM HYDROCARBONS

Enseco Method HC by GC

Client Name: E.A. Engineering Inc.
Matrix: Water Sampled: NA Received: 14-Sep-87 Authorized: 14-Sep-87

Lab ID	Results	Units	Reporting Limit	Date Prepared	Date Analyzed
31339-MB	ND	mg/L	0.1	23-Sep-87	25-Sep-87
-001	120(1)	mg/L	0.1	23-Sep-87	25-Sep-87
-002	14(2)	mg/L	0.1	23-Sep-87	25-Sep-87
-003	0.2(3)	mg/L	0.1	23-Sep-87	25-Sep-87
-004	0.5(4)	mg/L	0.1	23-Sep-87	25-Sep-87

(1) Gasoline

(2) Gasoline

(3) The HC in this sample represents an unknown mixture in the range of about C_7-C_{22}. Quantitation based on gasoline.

(4) The HC in this sample represents an unknown mixture in the range of about C_{12} -C_{20}. Quantitation was based on gasoline.

ND=Not Detected
NA=Not Applicable

Reported by: KSS

Approved by: KP

The cover letter is an integral part of this report.
Rev 098787

AROMATIC VOLATILE ORGANICS

Enseco Method 602

Client Name: E.A. Engineering, Inc.
Client ID: Method Blank
Lab ID: 31339-MB
Enseco ID: NA
Matrix: Water
Sampled: NA
Received: NA
Authorized: NA
Prepared: NA
Analyzed: 16-Sep-87

Parameter	Result	Units	Reporting Limit
Benzene	ND	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
m-Xylene	ND	ug/L	0.50
o & p-Xylenes	ND	ug/L	0.50
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

ND=Not Detected
NA=Not Applicable

Reported by: ERS/PBJ

Approved by: BG

The cover letter is an integral part of this report.
Rev 230787

AROMATIC VOLATILE ORGANICS

Enseco Method 602

Client Name:	E.A. Engineering, Inc.				
Client ID:	C1				
Lab ID:	31339-001	Enseco ID:	NA		
Matrix:	Water	Sampled:	10-Sep-87	Received:	14-Sep-87
Authorized:	14-Sep-87	Prepared:	NA	Analyzed:	16-Sep-87

Parameter	Result	Units	Reporting Limit
Benzene	25000	ug/L	1000
Toluene	60000	ug/L	1000
Chlorobenzene	ND	ug/L	1000
Ethyl benzene	13000	ug/L	1000
m-Xylene	56000	ug/L	1000
o & p-Xylenes	23000	ug/L	1000
1,3-Dichlorobenzene	ND	ug/L	1000
1,4-Dichlorobenzene	ND	ug/L	1000
1,2-Dichlorobenzene	ND	ug/L	1000

ND=Not Detected
NA=Not Applicable

Reported by: ERS/PBJ Approved by: BG

The cover letter is an integral part of this report.
Rev 230787

AROMATIC VOLATILE ORGANICS

Enseco Method 602

Client Name:	E.A. Engineering, Inc.				
Client ID:	C2				
Lab ID:	31339-002	Enseco ID:	NA		
Matrix:	Water	Sampled:	10-Sep-87	Received:	14-Sep-87
Authorized:	14-Sep-87	Prepared:	NA	Analyzed:	16-Sep-87

Parameter	Result	Units	Reporting Limit
Benzene	2600	ug/L	50
Toluene	2900	ug/L	50
Chlorobenzene	ND	ug/L	50
Ethyl benzene	500	ug/L	50
m-Xylene	1200	ug/L	50
o & p-Xylenes	800	ug/L	50
1,3-Dichlorobenzene	ND	ug/L	200 *
1,4-Dichlorobenzene	ND	ug/L	200 *
1,2-Dichlorobenzene	ND	ug/L	200 *

* - Reporting limit raised due to matrix interference.

ND=Not Detected
NA=Not Applicable

Reported by: ERS/PBJ

Approved by: BG

AROMATIC VOLATILE ORGANICS

Enseco Method 602

Client Name:	E.A. Engineering, Inc.				
Client ID:	C3				
Lab ID:	31339-003	**Enseco ID**:	NA		
Matrix:	Water	**Sampled**:	11-Sep-87	**Received**:	14-Sep-87
Authorized:	14-Sep-87	**Prepared**:	NA	**Analyzed**:	16-Sep-87

Parameter	Result	Units	Reporting Limit
Benzene	110	ug/L	2.0
Toluene	2.6	ug/L	2.0
Chlorobenzene	ND	ug/L	2.0
Ethyl benzene	ND	ug/L	2.0
m-Xylene	ND	ug/L	2.0
o & p-Xylenes	ND	ug/L	2.0
1,3-Dichlorobenzene	ND	ug/L	2.0
1,4-Dichlorobenzene	ND	ug/L	2.0
1,2-Dichlorobenzene	ND	ug/L	2.0

ND=Not Detected
NA=Not Applicable

Reported by: ERS/PBJ Approved by: BG

The cover letter is an integral part of this report.
Rev 230787

AROMATIC VOLATILE ORGANICS

Enseco Method 602

Client Name:	E.A. Engineering, Inc.		
Client ID:	C4		
Lab ID:	31339-004	Enseco ID: NA	
Matrix:	Water	Sampled: 10-Sep-87	Received: 14-Sep-87
Authorized:	14-Sep-87	Prepared: NA	Analyzed: 16-Sep-87

Parameter	Result	Units	Reporting Limit
Benzene	3.0	ug/L	0.50
Toluene	ND	ug/L	0.50
Chlorobenzene	ND	ug/L	0.50
Ethyl benzene	ND	ug/L	0.50
m-Xylene	ND	ug/L	0.50
o & p-Xylenes	ND	ug/L	0.50
1,3-Dichlorobenzene	ND	ug/L	0.50
1,4-Dichlorobenzene	ND	ug/L	0.50
1,2-Dichlorobenzene	ND	ug/L	0.50

ND=Not Detected
NA=Not Applicable

Reported by: ERS/PBJ

Approved by: BG

The cover letter is an integral part of this report.
Rev 230787

Enseco

Page 1 of 1

CHAIN-OF-CUSTODY RECORD

SAMPLER: (Signature)

Phone (415) 283-7077

Date Shipped 09/11/87

Airbill No.

Carrier Fed Express

Cooler No. 1

SHIP TO:

Enseco-Cal Lab
2544 Industrial Blvd.
West Sacramento, CA 95691
(916) 372-1393

ATTENTION:

SEND RESULTS TO:

Client Name IAN STEPEK
Company EA ENGINEERING
Address 41 LAFAYETTE CIRCLE
LAFAYETTE, CA 94549
Phone (415) 283-7077

PROJECT NAME CHICO VALLEY PROJECT NO. CHV 72 L P.O. NO.

Relinquished by: (Signature)	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Received by: (Signature) M Livingston	Date 9/14/87	Time 09:25
Relinquished by: (Signature)	Received at lab by: (Signature)	Date	Time
Relinquished from lab by: (Signature)	Received by: (Signature)	Date	Time

ANALYSIS REQUEST

Sample ID Number	Sample Description	Date/Time Sampled	Analysis Requested	Sample Condition Upon Receipt
C1	Water x 3	9/11/87 13:00	TPH, BTXE	
C2	water x 3	9/11/87 14	TPH, BTXE	
C3	water x 3	9/11/87 12	TPH, BTXE	
C4	water x 2	9/11/87 15	TPH, BTXE	
			as per GC-FID and	
			EPA 8020	
			mg/L	

Special Instructions/Comments:

SAMPLES RECEIVED
IN GOOD CONDITION
CUSTODY SEAL INTACT

NOTE: UNUSED PORTIONS OF NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

Analytical [illegible] Immediate [illegible]

[illegible] Attention [illegible] RUSH [illegible] Standard

Client ID Number [illegible]

[illegible] White Copy Only

```
                 CHV72L   SS 9-2960 CASTRO VALLEY



       PRACTICAL SYSTEM OF UNITS IS USED

      REGIONAL FLOW, PORE VELOCITY     =       4.30 M/YR

      ORIENTATION OF REGIONAL FLOW     =       0.00 DEGREES

      THICKNESS OF THE AQUIFER         =      15.00 METERS

      POROSITY                         =      35.00 PERCENT

      PERIOD STUDIED                   =     200.00 YEARS

      INITIAL AQUIFER CONCENTRATION    = 0.000E-01        MG

      DEFAULT INJECTION CONCENTRATION = 0.000E-01        MG

      STREAMLINE STEP LENGTH           =       5.00 METERS

      ADSORPTION CAPACITY OF ROCK      =      00.00 PERCENT



                              1 INJECTION WELLS

      WELL NAME        X          Y       FLOW-RATE CONCENTRATION RADIUS INDICATOR
                     METERS     METERS     M3/H              MG   METERS

     SOURCE           0.00       0.00       0.05     0.00E-01   1.50E+01      0

                             1 PRODUCTION WELLS

      WELL NAME        X          Y       FLOW-RATE     RADIUS   INDICATOR
                     METERS     METERS     M3/H        METERS

     WELL            61.00    -183.00       0.02     5.00E-02        0
```

```
STREAMLINES DEPARTING FROM INJECTION WELL SOURCE

 NUMBER OF      WELL          TIME OF         ANGLE BETA
STREAMLINE     REACHED        ARRIVAL         IN DEGREES

     1       +++none+++    201.1 YEARS           0.0
     2       +++none+++    201.1 YEARS           5.0
     3       +++none+++    201.1 YEARS          10.0
     4       +++none+++    200.0 YEARS          15.0
     5       +++none+++    200.1 YEARS          20.0
     6       +++none+++    200.2 YEARS          25.0
     7       +++none+++    200.3 YEARS          30.0
     8       +++none+++    200.4 YEARS          35.0
     9       +++none+++    200.6 YEARS          40.0
    10       +++none+++    200.8 YEARS          45.0
    11       +++none+++    201.0 YEARS          50.0
    12       +++none+++    200.1 YEARS          55.0
    13       +++none+++    200.4 YEARS          60.0
    14       +++none+++    200.7 YEARS          65.0
    15       +++none+++    201.1 YEARS          70.0
    16       +++none+++    200.5 YEARS          75.0
    17       +++none+++    201.0 YEARS          80.0
    18       +++none+++    200.5 YEARS          85.0
    19       +++none+++    200.0 YEARS          90.0
    20       +++none+++    200.6 YEARS          95.0
    21       +++none+++    201.0 YEARS         100.0
    22       +++none+++    200.3 YEARS         105.0
    23       +++none+++    200.9 YEARS         110.0
    24       stagnation     10.3 YEARS         115.0
    25       stagnation      7.0 YEARS         120.0
    26       stagnation      5.6 YEARS         125.0
    27       stagnation      4.8 YEARS         130.0
    28       stagnation      4.3 YEARS         135.0
    29       stagnation      3.9 YEARS         140.0
    30       stagnation      3.6 YEARS         145.0
    31       stagnation      3.4 YEARS         150.0
    32       stagnation      3.2 YEARS         155.0
    33       stagnation      3.0 YEARS         160.0
    34       stagnation      3.0 YEARS         165.0
    35       stagnation      2.9 YEARS         170.0
    36       stagnation      2.9 YEARS         175.0
    37       stagnation      2.8 YEARS         180.0
    38       stagnation      2.9 YEARS         185.0
    39       stagnation      2.9 YEARS         190.0
    40       stagnation      3.0 YEARS         195.0
    41       stagnation      3.1 YEARS         200.0
    42       stagnation      3.2 YEARS         205.0
    43       stagnation      3.4 YEARS         210.0
    44       stagnation      3.6 YEARS         215.0
    45       stagnation      3.9 YEARS         220.0
    46       stagnation      4.3 YEARS         225.0
    47       stagnation      4.9 YEARS         230.0
    48       stagnation      5.7 YEARS         235.0
    49       stagnation      7.2 YEARS         240.0
    50       stagnation     10.9 YEARS         245.0
    51       +++none+++    200.1 YEARS         250.0
    52       +++none+++    200.4 YEARS         255.0
    53       +++none+++    201.1 YEARS         260.0
    54       +++none+++    200.6 YEARS         265.0
    55       +++none+++    200.1 YEARS         270.0
    56       +++none+++    200.6 YEARS         275.0
    57       +++none+++    201.1 YEARS         280.0
    58       +++none+++    200.5 YEARS         285.0
    59       +++none+++    200.1 YEARS         290.0
    60       +++none+++    200.8 YEARS         295.0

    61       +++none+++    200.5 YEARS         300.0
    62       +++none+++    200.1 YEARS         305.0
    63       +++none+++    201.0 YEARS         310.0
    64       +++none+++    200.8 YEARS         315.0
    65       +++none+++    200.6 YEARS         320.0
    66       +++none+++    200.5 YEARS         325.0
    67       +++none+++    200.3 YEARS         330.0
    68       +++none+++    200.2 YEARS         335.0
    69       +++none+++    200.1 YEARS         340.0
    70       +++none+++    200.0 YEARS         345.0
    71       +++none+++    201.1 YEARS         350.0
    72       +++none+++    201.1 YEARS         355.0
```

BLAINE
TECH SERVICES

P.O. BOX 574
SAN JOSE CA 9515
(408) 723-397

September 24, 1986

Chevron USA, Inc.
2 Annabel Lane, Suite 200
San Ramon, CA 94583

Attention: Vicki Hobbs

Re: Sampling of stockpiled soil at

Chevron Station #2960
Redwood Road & Grove Way
Castro Valley, CA
on
September 10, 1986

SAMPLING REPORT

Sampling was performed in accordance with approved methodology at the locations shown on the accompanying site diagram. The lab numbers assigned to the samples are given on the site diagram. Samples were collected in appropriate containers, which were sealed, chilled and transported to the laboratory for analysis. Analytical services were provided by Thermo Analytical Inc/ERG with a separate report and billing invoice referencing their lab numbers.

Tanks

age -- unspecified

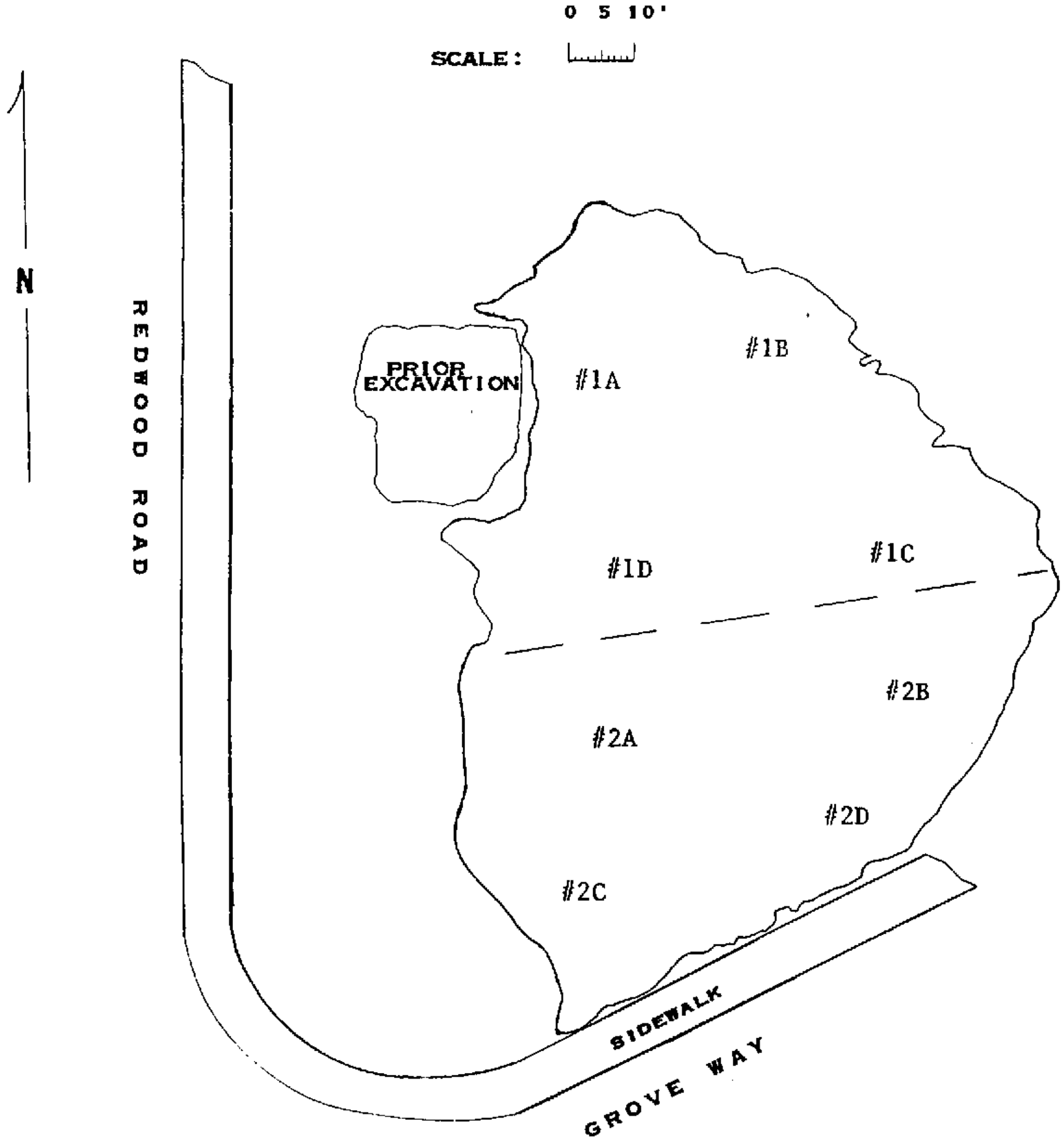
type -- one 550 gallon waste oil
one 2,000 gallon gasoline
two 7,500 gallon gasoline

reason for removal -- discontinuation of on site storage

Reportage

Submission to the Regional Water Quality Control Board and the Fire Department should include copies of both the sampling report and the laboratory report. The property owner should attach a cover letter and submit all documents together in a package.

SAMPLING REPORT 86253F1 9-10-86 CHEVRON STN. NO. 2960, REDWOOD & GROVE, CASTRO VALLEY, CA



MAP REF: THOMAS BROS.
ALAMEDA COUNTY
P. 28 E-6

#1 STOCKPILE SOIL COMPOSITE
FROM SAMPLE POINTS A-D
- A. 6" BELOW SURFACE
  150 PPM-VAPOR
- B. 4" BELOW SURFACE
  50 PPM-VAPOR
- C. 3" BELOW SURFACE
  75 PPM-VAPOR
- D. 6" BELOW SURFACE
  55 PPM-VAPOR

ANALYSIS FOR GASOLINE AT
THERMO ANALYTICAL INC/ERG
TMA/ERG LAB NO. 9287-1

#2 STOCKPILE SOIL COMPOSITE
FROM SAMPLE POINTS A-D
- A. 4" BELOW SURFACE
  275 PPM-VAPOR
- B. 4" BELOW SURFACE
  250 PPM-VAPOR
- C. 3" BELOW SURFACE
  225-PPM-VAPOR
- D. 6" BELOW SURFACE
  200 PPM-VAPOR

ANALYSIS FOR GASOLINE
TMA/ERG LAB NO. 9287-2

SAMPLING PERFORMED BY
FRANK A. CLINE

DIAGRAM PREPARED BY
TAMMIE STALLINGS

Tammie Stallings

The following addresses have been listed here for your convenience:

Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Room 6040
Oakland, CA 94607
ATTN: Dale Bowyer

Alameda County Health
Hazardous Materials Management
Oakland, Ca 94612
Attn: Edgar Howell

If I can be of any further assistance, please call.

Richard C. Blaine

RCB/tls

FR6

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

Include ALL of the following designation in lab reports and invoices
86253F1
Chevron #2960
At Redwood & Grove
Castro Valley

EVERYTHING written above this line is the project designation

Field sampling completed 8:13 a hrs. 9-10 86 performed by

RELEASED BY			ACCEPTED BY		
9:01 hrs.	9-10-86		9:00 hrs.	9-10-86	C Schulthes
__:__ hrs.	- -86		__:__ hrs.	- -86	
__:__ hrs.	- -86		__:__ hrs.	- -86	
__:__ hrs.	- -86		__:__ hrs.	- -86	

I.D.	TYPE	ANALYSIS	LAB #	PRELIMS	FINAL
1A	Soil	Gasoline			
1B					
1C					
1D					
2A					
2B					
2C					
2D					

Composite 1A thru 1D into 1 sample
" 2A " 2D into 1 sample.

TURN AROUND 24 hrs

REPORT TO: Chevron USA

Attn Vicki Hobbs
Phone

BILLING INVOICE TO: Same

Attn
Verbal/Ref PO From:

cc BLAINE TECH SERVICES (always)
cc OTHER:

SPECIAL INSTRUCTIONS

( ) Phone results to BTS
( ) Phone results to client direct

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

September 11, 1986

Chevron USA
2 Annabel Lane
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9287 Release #56

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of n-heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The results are displayed in the table below:

ERG #	CLIENT ID	CONCENTATION (mg/kg)
9287-1 A-D (composite)	86253 F1 1A-1D	3.1
9287-2 A-D	86253 F1 2A-D	4.9

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

September 11, 1986

Chevron USA
2 Annabel Lane
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9287 Release #56

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of n-heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The results are displayed in the table below:

ERG #	CLIENT ID	CONCENTATION (mg/kg)
9287-1 A-D (composite)	86253 F1 1A-1D	3.1
9287-2 A-D	86253 F1 2A-D	4.9

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

September 2, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9235 Release #49

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

RE: One (1) soil composite sample submitted on August 28, 1986 for rush gasoline analysis.

Procedure: The sample is analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The sample is concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of gasoline. The limit of detection for this method of analysis is one part per million (mg/kg).

The result is displayed in the table below:

TMA/ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9235-1A - 1D	86240 M1 1A - D	110

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

August 12, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Atention: Vicki Hobbs

Report #9103 Release #43

Site Location: Chevron Station #2960, Redwood Road and Grove Way, Castro Valley.

RE: Five (5) soil samples submitted on August 8, 1986 for rush gasoline analysis.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The results are displayed in the attached table.

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9103-1	86220 B1 #1	49
9103-2	86220 B1 #2	170
9103-3	86220 B1 #3	ND(1)
9103-4	86220 B1 #4	1.2
9103-5	86220 B1 #5	30

ND = None detected. The limit of detection is in ( ).

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

July 31, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9029 Release #43

Site Location: Chevron Station #2960, Castro Valley.

RE: Four (4) soil samples submitted on July 29, 1986 for rush gasoline analysis.

Procedure: The samples are analyzed for gasoline by following a method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45). The limit of detection for this method of analysis is two parts per million (mg/kg).

The result is displayed in the table below:

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9029-1	86210 F1 #1	4.2
9029-2	86210 F1 #2	ND(2)
9029-3	86210 F1 #3	4.0
9029-4	86210 F1 #4	24

ND = None detected. The limit of detection is in ( ).

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

July 29, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9007 Release #43

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

RE: One (1) soil composite sample submitted on July 23, 1986 for rush total hydrocarbon response analysis.

Procedure: The sample is analyzed for total hydrocarbon response by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The sample is concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The result is displayed in the table below:

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9007-Comp	86204 F3, 10A, 10B, 10C	ND(1)

ND = None detected. The limit of detection is in ( ).

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

June 23, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #8004 Release #33

Site Location: Chevron Station #2960, Castro Valley.

RE: Seven (7) soil samples submitted on June 19, 1986 for rush gasoline analysis; also two (2) samples for waste oil analysis.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of gasoline. The limit of detection for this method of analysis is one part per million (mg/kg).

The samples are analyzed for waste oil by following a modified EPA Method 3510 extraction procedure. The samples are extracted three (3) times with hexane. The solvent is removed from the combined extracts and carbon disulfide is added. The solution is injected into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against a solution made from a known concentration of light machine oil. The limit of detection for this method of analysis is ten parts per million (mg/kg).

The results are summarized in Table I.

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TABLE I

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
8004-1	86170 M2 #1	5200*
8004-2	86170 M2 #2	8.8***
8004-3	86170 M2 #3	14000*
8004-5	86170 M2 #104	620*
8004-7	86170 M2 #105	1300*
8004-9	86170 M2 #106	490*
8004-10	86170 M2 #7	ND(10)**
8004-11	86170 M2 #107	ND(10)**
8004-12	86170 M2 #8	3900*

*gasoline.

**waste oil, by extraction.

***originally reported 3.3, may have a matrix problem.

ND = None detected. The limits of detection are in ( ).

BLAINE
TECH SERVICES

P.O. BOX 574
SAN JOSE, CA 951
(408) 723-397

September 9, 1986

Chevron USA, Inc.
2 Annabel Lane, Suite 200
San Ramon, CA 94583

Attention: Vicki Hobbs

Re: Sampling of stockpiled soil at
Chevron Station #2960
Redwood Road & Grove Way
Castro Valley, CA
on
August 28, 1986

SAMPLING REPORT

Sampling was performed in accordance with approved methodology at the locations shown on the accompanying site diagram. The lab numbers assigned to the samples are given on the site diagram. Samples were collected in appropriate containers, which were sealed, chilled and transported to the laboratory for analysis. Analytical services were provided by Thermo Analytical Inc/ERG with a separate report and billing invoice referencing their lab numbers.

Tanks

age -- unspecified

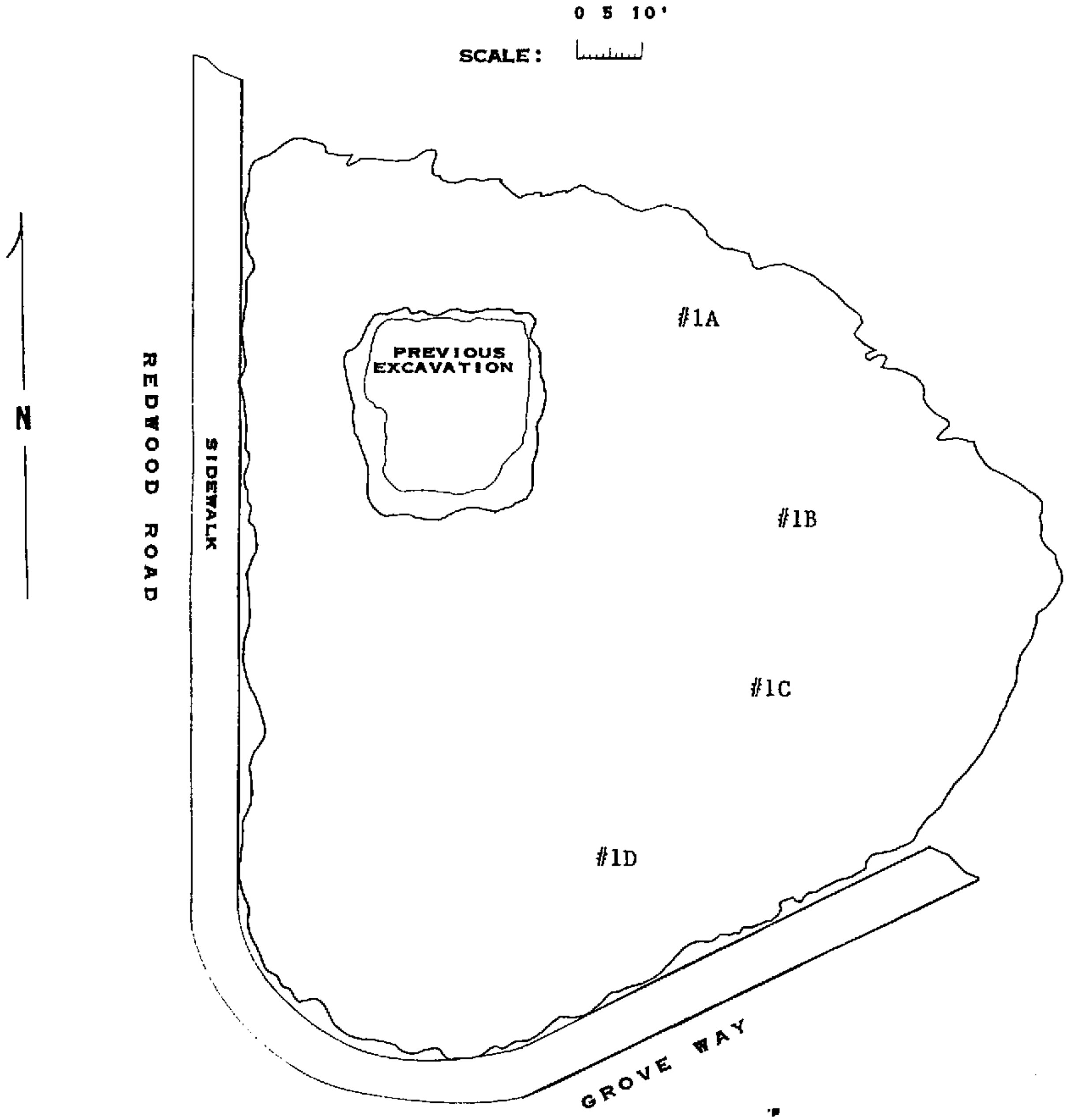
type -- one 550 gallon waste oil
one 2,000 gallon gasoline
two 7,500 gallon gasoline

reason for removal -- discontinuation of on site storage

Reportage

Submission to the Regional Water Quality Control Board and the Fire Department should include copies of both the sampling report and the laboratory report. The property owner should attach a cover letter and submit all documents together in a package.

SAMPLING REPORT 86240M1 8-28-86 CHEVRON STATION NO. 2960, REDWOOD & GROVE, CASTRO VALLEY, CA



MAP REF: THOMAS BROS.
ALAMEDA COUNTY
P. 28 E-6

#1 STOCKPILE SOIL COMPOSITE
FROM SAMPLE POINTS A-D
AT 6-12" BELOW SURFACE
A = 75 PPM-VAPOR
B = 2,000 PPM-VAPOR
C = 3,250 PPM-VAPOR
D = 1,500 PPM-VAPOR
ANALYSIS FOR GASOLINE AT
THERMO ANALYTICAL INC/ERG
TMA/ERG LAB NO. 9235-1A-1D

SAMPLING PERFORMED BY
HELEN MAWHINNEY

DIAGRAM PREPARED BY
TAMMIE STALLINGS

Tammie Stallings

The following addresses have been listed here for your convenience:

Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Room 6040
Oakland, CA 94607
ATTN: Dale Bowyer

Alameda County Health
Hazardous Materials Management
Oakland, Ca 94612
Attn: Edgar Howell

If I can be of any further assistance, please call.

Richard C. Blaine

RCB/tls

ERG 9235

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

Include ALL of the following designation in lab reports and invoices
86240 MI
Chevron STN 2960
AT Redwood & Grove
CASTRO VALLEY

EVERYTHING written above this line is the project designation

Field sampling completed 16:07 hrs. 8-28-86 performed by Kelly McKinney

RELEASED BY			ACCEPTED BY		
17:05 hrs.	8-28-86	Kelly McKinney	17:05 hrs.	8-28-86	Debbie Fisher
___:___hrs.	- -86		___:___hrs.	- -86	
___:___hrs.	- -86		___:___hrs.	- -86	
___:___hrs.	- -86		___:___hrs.	- -86	

I.D.	TYPE	ANALYSIS	LAB #	PRELIMS	FINAL
Analyze/composite All samples #1A	Soil	Gasoline			
as one Analysis #1B					
#1C					
#1D					

TURN AROUND By Wednesday

REPORT TO:
CHEVRON USA

Attn VICKY HOBBS
Phone 415/-838-5232

BILLING INVOICE TO:

Attn
Verbal/Ref PO From:

cc BLAINE TECH SERVICES (always)
cc OTHER:

SPECIAL INSTRUCTIONS
#1A, 1B, 1C, 1D is A Stockpile composite

( ) Phone results to BTS
( ) Phone results to client direct

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

September 2, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9235 Release #49

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

RE: One (1) soil composite sample submitted on August 28, 1986 for rush gasoline analysis.

Procedure: The sample is analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The sample is concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of gasoline. The limit of detection for this method of analysis is one part per million (mg/kg).

The result is displayed in the table below:

TMA/ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9235-1A - 1D	86240 M1 1A - D	110

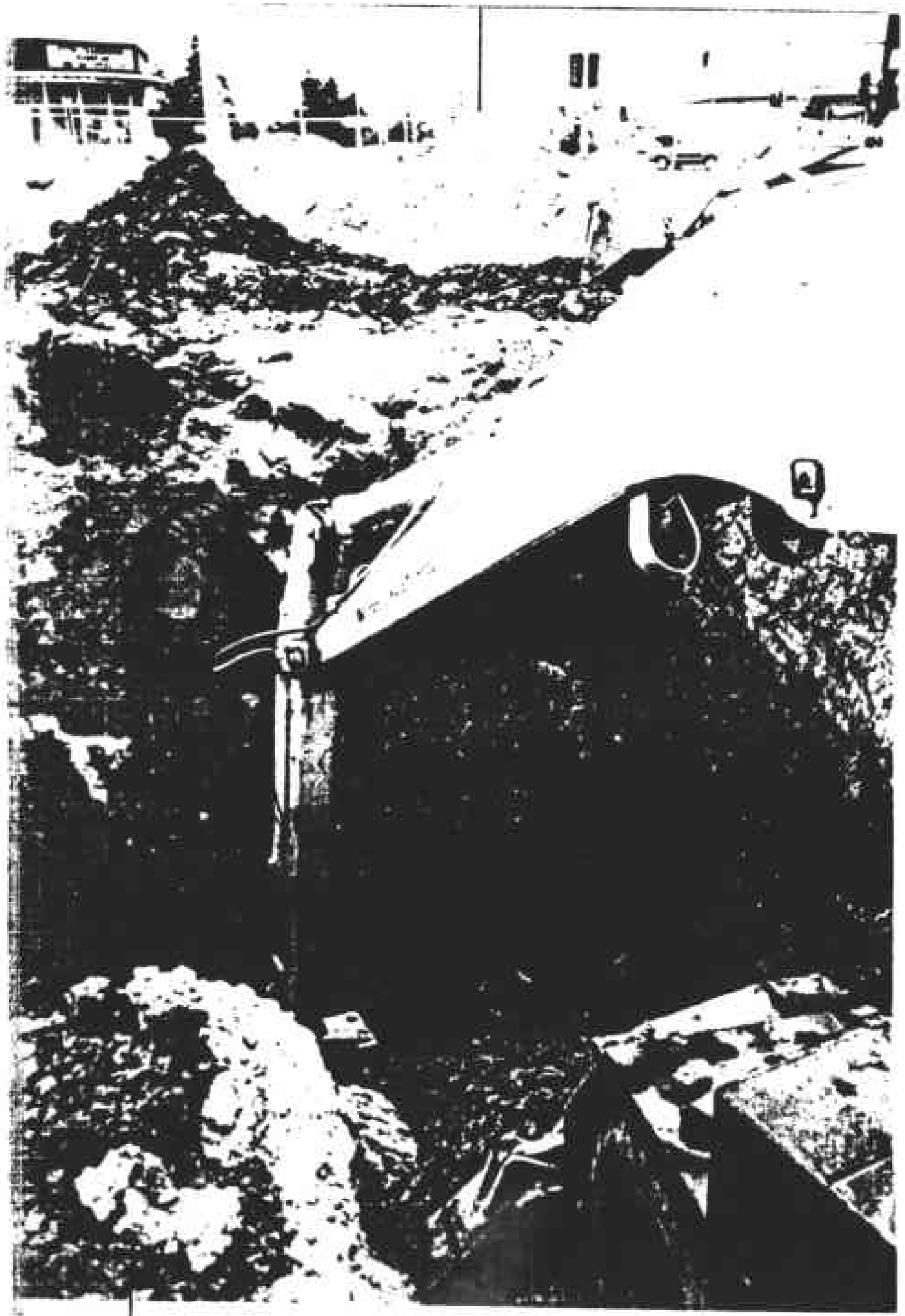
Submitted by:

Robert B. Flay

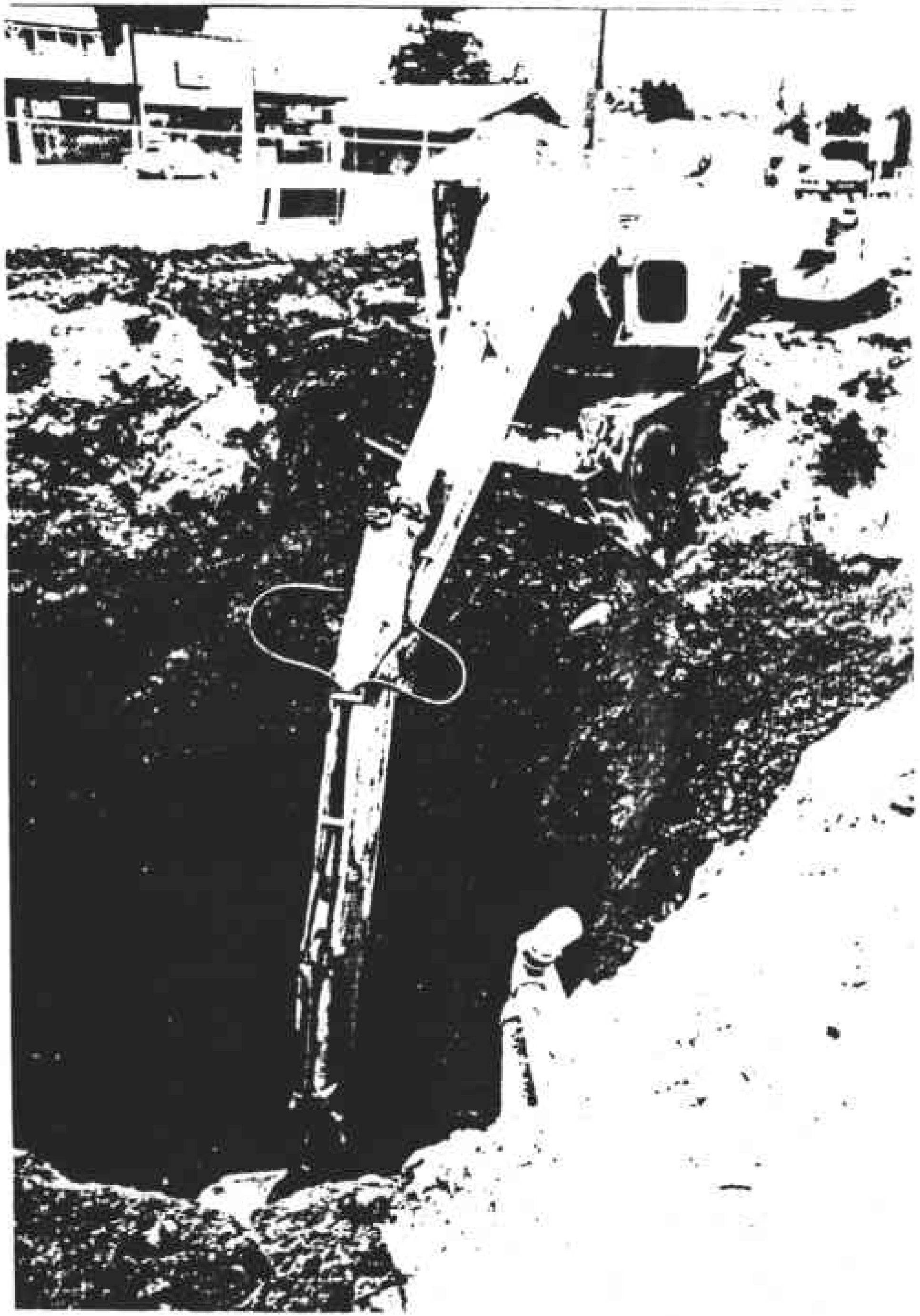
Robert B. Flay
Manager, Organics Department

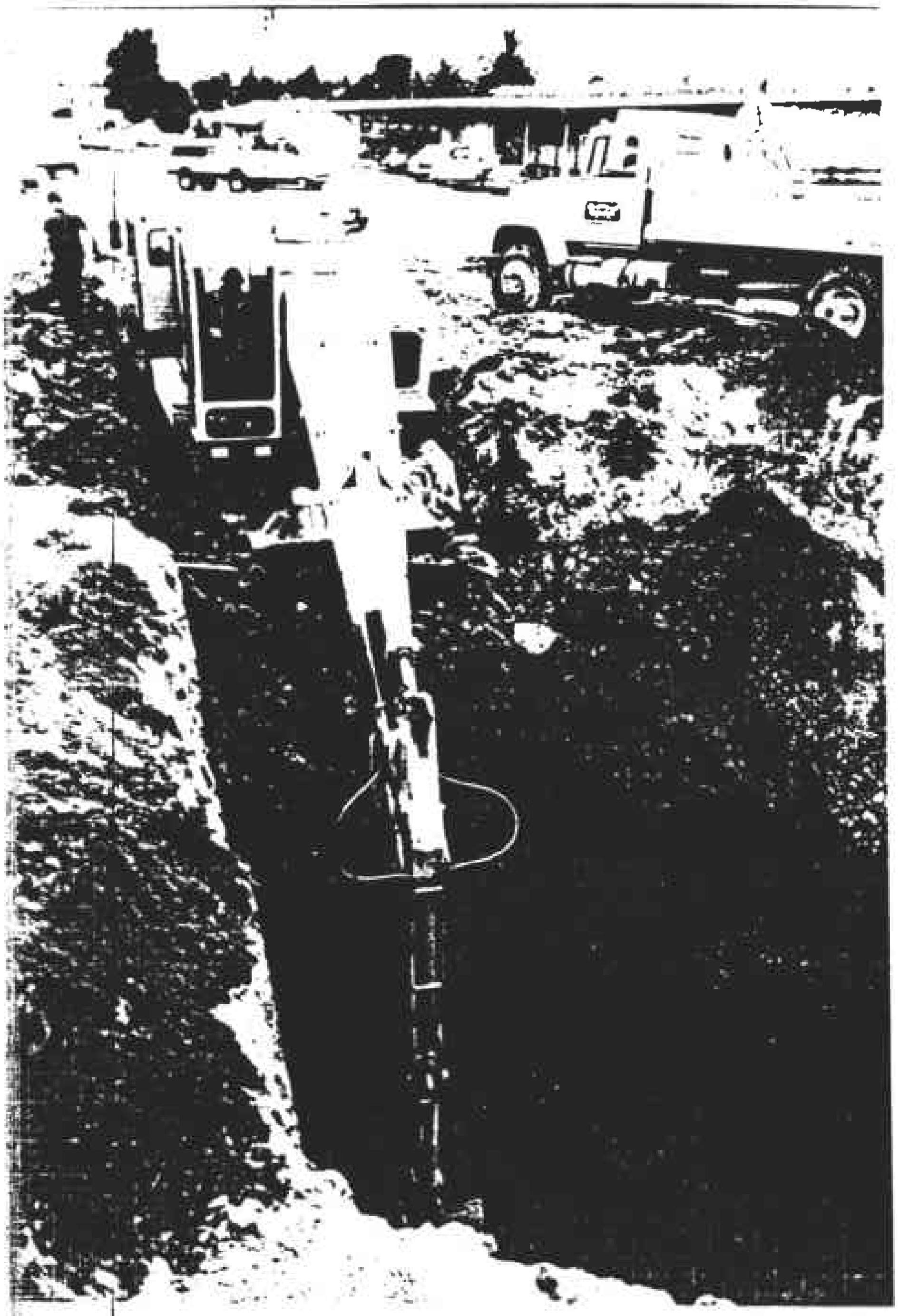
RBF:sml

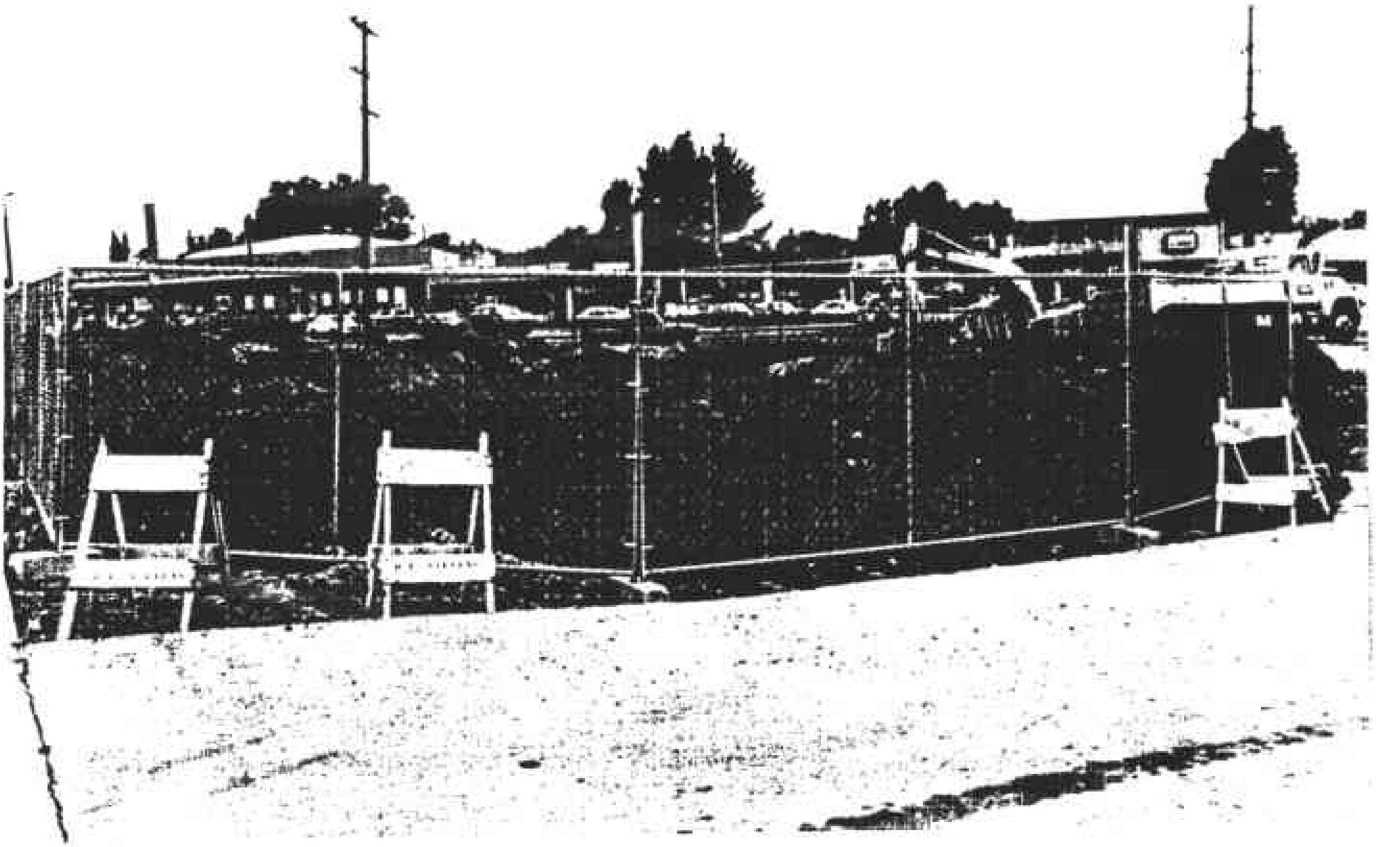
cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150




WARNER · SWASEY · H550








R.L. STEVENS
R.L.STEVEN

**BLAINE
TECH SERVICES**

P.O. BOX 5746
SAN JOSE, CA 95150
(408) 723-3914

August 21, 1986

Chevron USA, Inc.
2 Annabel Lane, Suite 200
San Ramon, CA 94583

Attention: Vicki Hobbs

Re: Field sampling at

Chevron Station #2960
Redwood Road & Grove Way
Castro Valley, CA
on
August 8, 1986

over-ex samples

SAMPLING REPORT

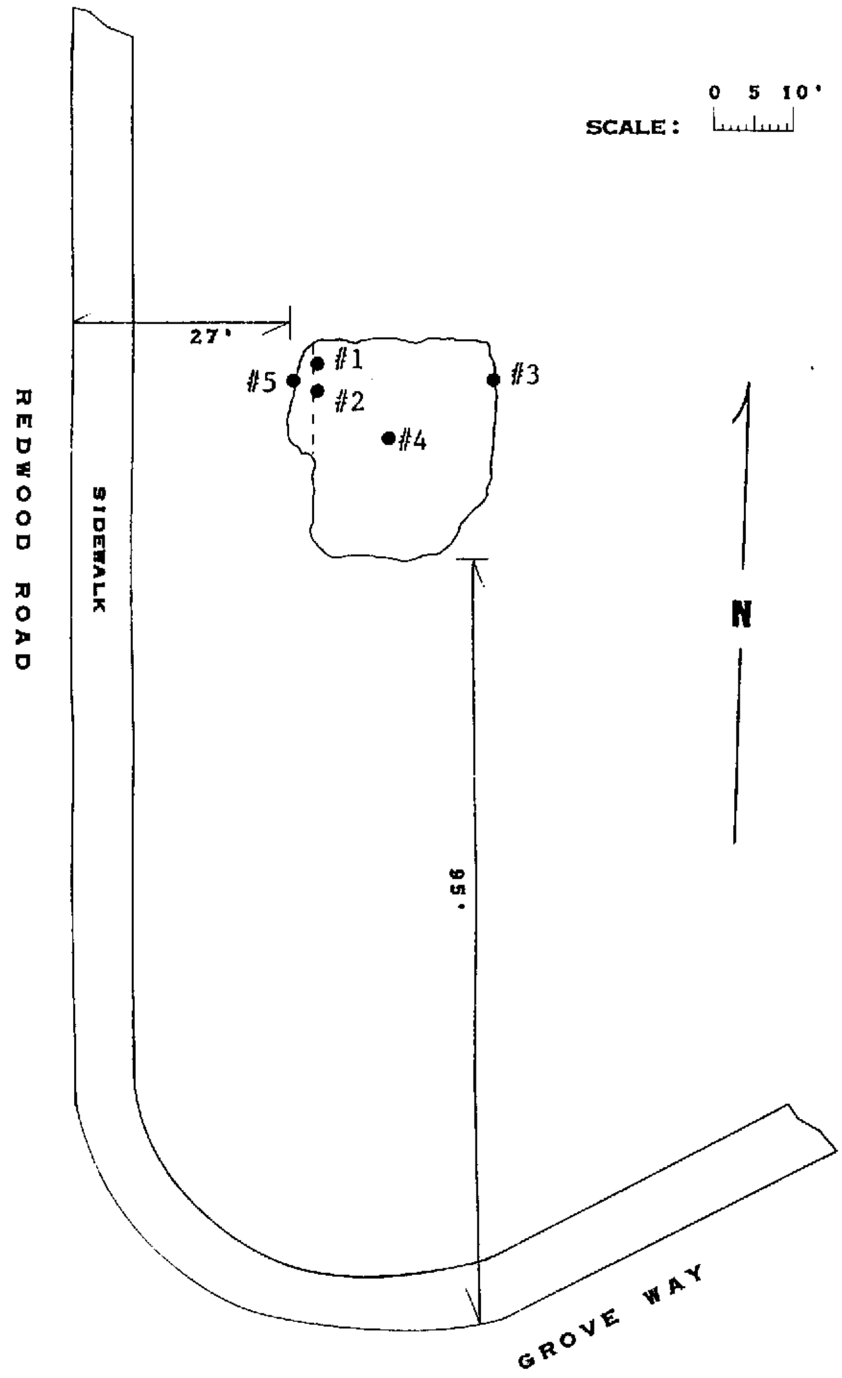
Sampling was performed in accordance with approved methodology at the locations shown on the accompanying site diagram. The lab numbers assigned to the samples are given on the site diagram. Samples were collected in appropriate containers, which were sealed, chilled and transported to the laboratory for analysis. Analytical services were provided by Thermo Analytical Inc/ERG with a separate report and billing invoice referencing their lab numbers.

Reportage

Submission to the Regional Water Quality Control Board and the Fire Department should include copies of both the sampling report and the laboratory report. The property owner should attach a cover letter and submit all documents together in a package.

BLAINE
TECH SERVICES

SAMPLING REPORT 86220B1 8-8-86 CHEVRON STN. NO. 2960, REDWOOD & GROVE, CASTRO VALLEY, CA



MAP REF: THOMAS BROS.
ALAMEDA COUNTY
P. 28 E-6

#1 SOIL FROM 18'
2,000 PPM-VAPOR
ANALYSIS FOR GASOLINE AT THERMO
ANALYTICAL INC/ERG
TMA/ERG LAB NO. 9103-1

#2 SOIL FROM CAPILLARY ZONE AT 20'
ANALYSIS FOR GASOLINE
TMA/ERG LAB NO. 9103-2

#3 SOIL FROM PIT WALL AT 16-18'.
550 PPM-VAPOR
ANALYSIS FOR GASOLINE
TMA/ERG LAB NO. 9103-3

#4 SOIL FROM 23'
550 PPM-VAPOR
ANALYSIS FOR GASOLINE
TMA/ERG LAB NO. 9103-4

#5 SOIL FROM EXTENDED PIT WALL AT 19'
1,500 PPM-VAPOR
ANALYSIS FOR GASOLINE
TMA/ERG LAB NO. 9103-5

SAMPLING PERFORMED BY
RICHARD C. BLAINE

DIAGRAM PREPARED BY
TAMMIE STALLINGS

The following addresses have been listed here for your convenience:

Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Room 6040
Oakland, CA 94607
ATTN: Hossain Kazemi

Alameda County Health
Hazardous Materials Management
Oakland, Ca 94612
Attn: Edgar Howell

If I can be of any further assistance, please call.

Richard C. Blaine

RCB/tls

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

Include ALL of the following designation in lab reports and invoices

862201B1

CHEVRON STATION #2960
REDWOOD RD & GROVE WAY
CASTRO VALLEY

EVERYTHING written above this line is the project designation

Field sampling completed 12:37 hrs. 8-8-86 performed by

RELEASED BY		ACCEPTED BY	
13:34 hrs. 8-8-86		13:41 hrs. 8-8-86	Sue Lentz
__:__ hrs. - -86		__:__ hrs. - -86	
__:__ hrs. - -86		__:__ hrs. - -86	
__:__ hrs. - -86		__:__ hrs. - -86	

I.D.	TYPE	ANALYSIS	LAB #	PRELIMS	FINAL
#1	SOIL	GASOLINE	9103	49 ppm	
#2	↓	↓		170 ppm	
#3	↓	↓		ND	1
#4	↓	↓		62	ppm
#5	↓	↓		30	ppm

TURN AROUND ~~ROUTINE~~ 1 WEEK

REPORT TO:

CHEVRON, USA INC

Attn VICKI HOBBS
Phone (415) 838 5230

BILLING INVOICE TO:

SAME

Attn Vicki Hobbs
Verbal/Ref PO From:

cc BLAINE TECH SERVICES (always)
cc OTHER:

SPECIAL INSTRUCTIONS

( ) Phone results to BTS
( ) Phone results to client direct

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

August 12, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon,CA 94583

Atention: Vicki Hobbs

Report #9103 Release #43

Site Location: Chevron Station #2960, Redwood Road and Grove Way, Castro Valley.

RE: Five (5) soil samples submitted on August 8, 1986 for rush gasoline analysis.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The results are displayed in the attached table.

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9103-1	86220 B1 #1	49
9103-2	86220 B1 #2	170
9103-3	86220 B1 #3	ND(1)
9103-4	86220 B1 #4	1.2
9103-5	86220 B1 #5	30

ND = None detected. The limit of detection is in ( ).

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652 2300

July 29, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9007 Release #43

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

RE: One (1) soil composite sample submitted on July 23, 1986 for rush total hydrocarbon response analysis.

Procedure: The sample is analyzed for total hydrocarbon response by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The sample is concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The result is displayed in the table below:

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9007-Comp	86204 F3, 10A, 10B, 10C	ND(1)

ND = None detected. The limit of detection is in ( ).

Submitted by:

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608 2946
415 662 2300

June 23, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #8004 Release #33

Site Location: Chevron Station #2960, Castro Valley.

RE: Seven (7) soil samples submitted on June 19, 1986 for rush gasoline analysis; also two (2) samples for waste oil analysis.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of gasoline. The limit of detection for this method of analysis is one part per million (mg/kg).

The samples are analyzed for waste oil by following a modified EPA Method 3510 extraction procedure. The samples are extracted three (3) times with hexane. The solvent is removed from the combined extracts and carbon disulfide is added. The solution is injected into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against a solution made from a known concentration of light machine oil. The limit of detection for this method of analysis is ten parts per million (mg/kg).

The results are summarized in Table I.

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TABLE I

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
8004-1	86170 M2 #1	5200*
8004-2	86170 M2 #2	8.8***
8004-3	86170 M2 #3	14000*
8004-5	86170 M2 #104	620*
8004-7	86170 M2 #105	1300*
8004-9	86170 M2 #106	490*
8004-10	86170 M2 #7	ND(10)**
8004-11	86170 M2 #107	ND(10)**
8004-12	86170 M2 #8	3900*

*gasoline.

**waste oil, by extraction.

***originally reported 3.3, may have a matrix problem.

ND = None detected. The limits of detection are in ( ).

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 9515
(408) 723-3974

August 5, 1986

Chevron USA, Inc.
2 Annabel Lane, Suite 200
San Ramon, CA 94583

Attention: Vicki Hobbs

Re: Field sampling at
Chevron Station #2960
Redwood Rd. & Grove Way
Castro Valley, CA
on
July 29, 1986

stockpile ?

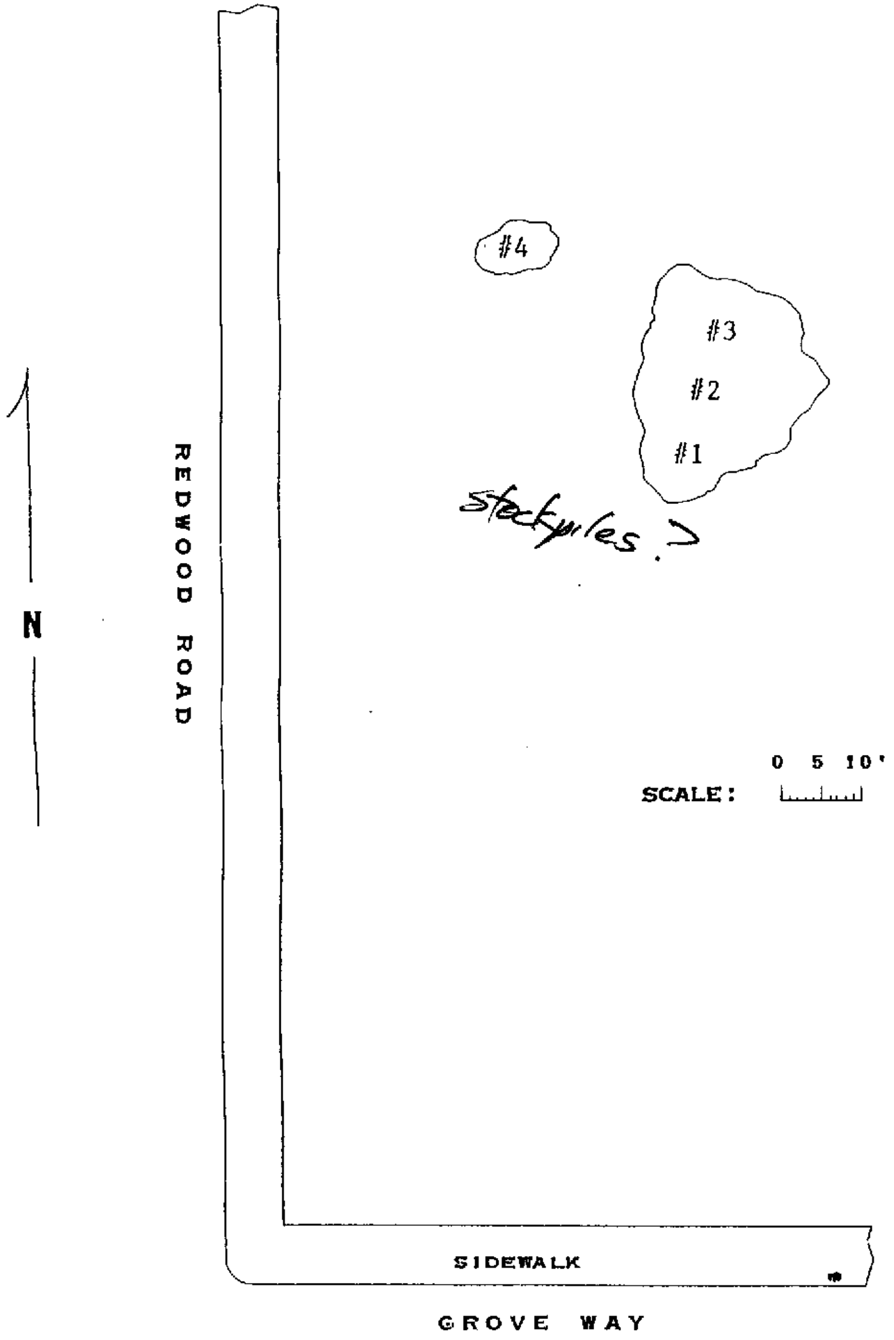
SAMPLING REPORT

Sampling was performed in accordance with approved methodology at the locations shown on the accompanying site diagram. The lab numbers assigned to the samples are given on the site diagram. Samples were collected in appropriate containers, which were sealed, chilled and transported to the laboratory for analysis. Analytical services were provided by Thermo Analytical Laboratory with a separate report and billing invoice referencing their lab numbers.

Reportage

Submission to the Regional Water Quality Control Board and the Fire Department should include copies of both the sampling report and the laboratory report. The property owner should attach a cover letter and submit all documents together in a package.

SAMPLING REPORT 86210F1 7-29-86 CHEVRON STATION NO. 2960, REDWOOD RD. & GROVE WAY, CASTRO VALLEY, CA



MAP REF: THOMAS BROS.
ALAMEDA COUNTY
P. 28 E-6

#1 SOIL FROM 6"
APPROXIMATELY 100 PPM-VAPOR
ANALYSIS FOR GASOLINE AT THERMO
ANALYTICAL INC/ERG

#2 SOIL FROM 4"
APPROXIMATELY 100 PPM-VAPOR
ANALYSIS FOR GASOLINE AT THERMO
ANALYTICAL INC/ERG

#3 SOIL FROM 8"
APPROXIMATELY 100 PPM-VAPOR
ANALYSIS FOR GASOLINE AT THERMO
ANALYTICAL INC/ERG

#4 SOIL FROM 4"
APPROXIMATELY 400 PPM-VAPOR
ANALYSIS FOR GASOLINE AT THERMO
ANALYTICAL INC/ERG

NOTE: THERMO ANALYTICAL INC/ERG
PROJECT NUMBER 9029

SAMPLING PERFORMED BY
FRANK A. CLINE

DIAGRAM PREPARED BY
TAMMIE STALLINGS

Tammie L Stallings

The following addresses have been listed here for your convenience:

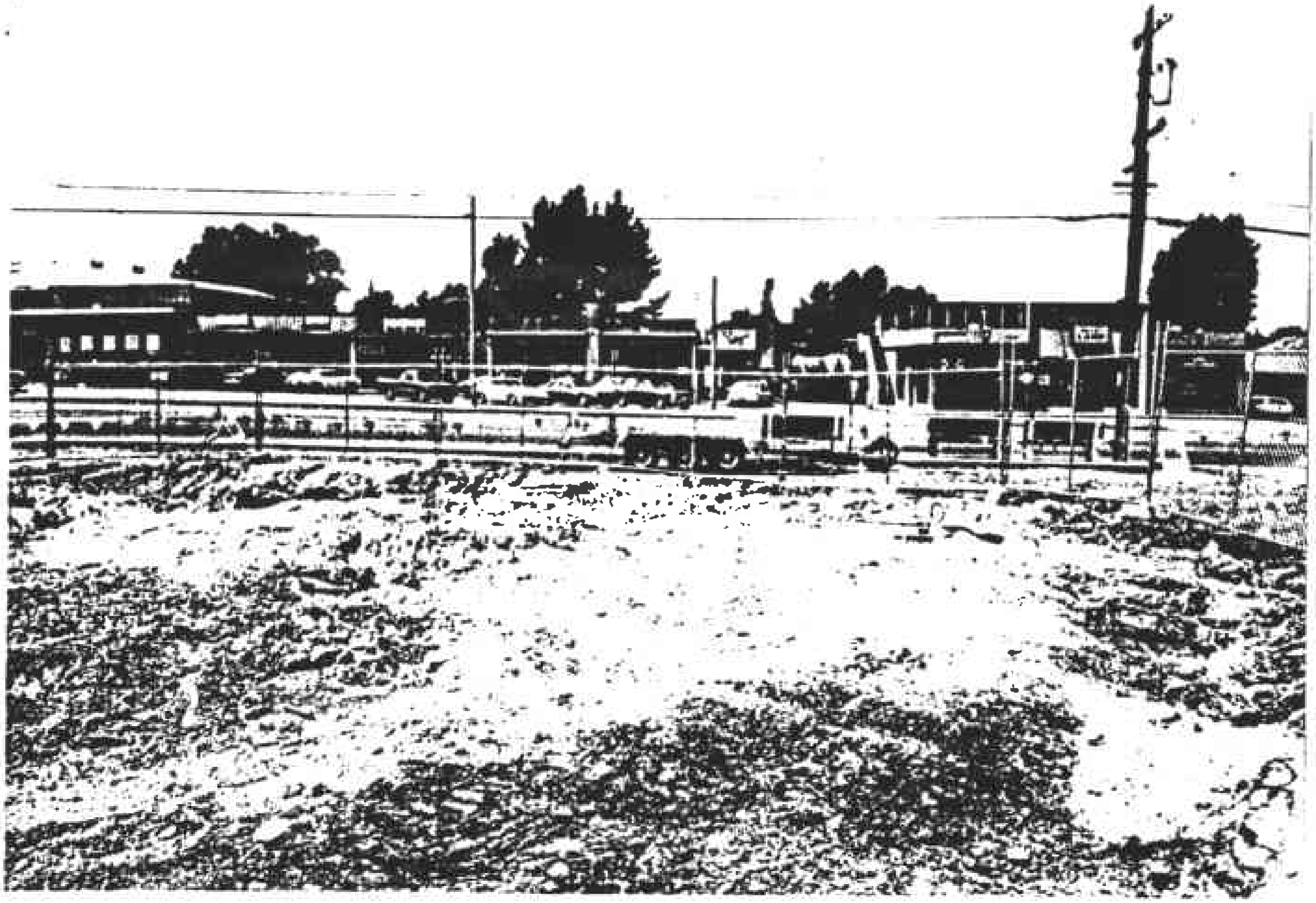
Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Room 6040
Oakland, CA 94607
ATTN: Dale Bowyer

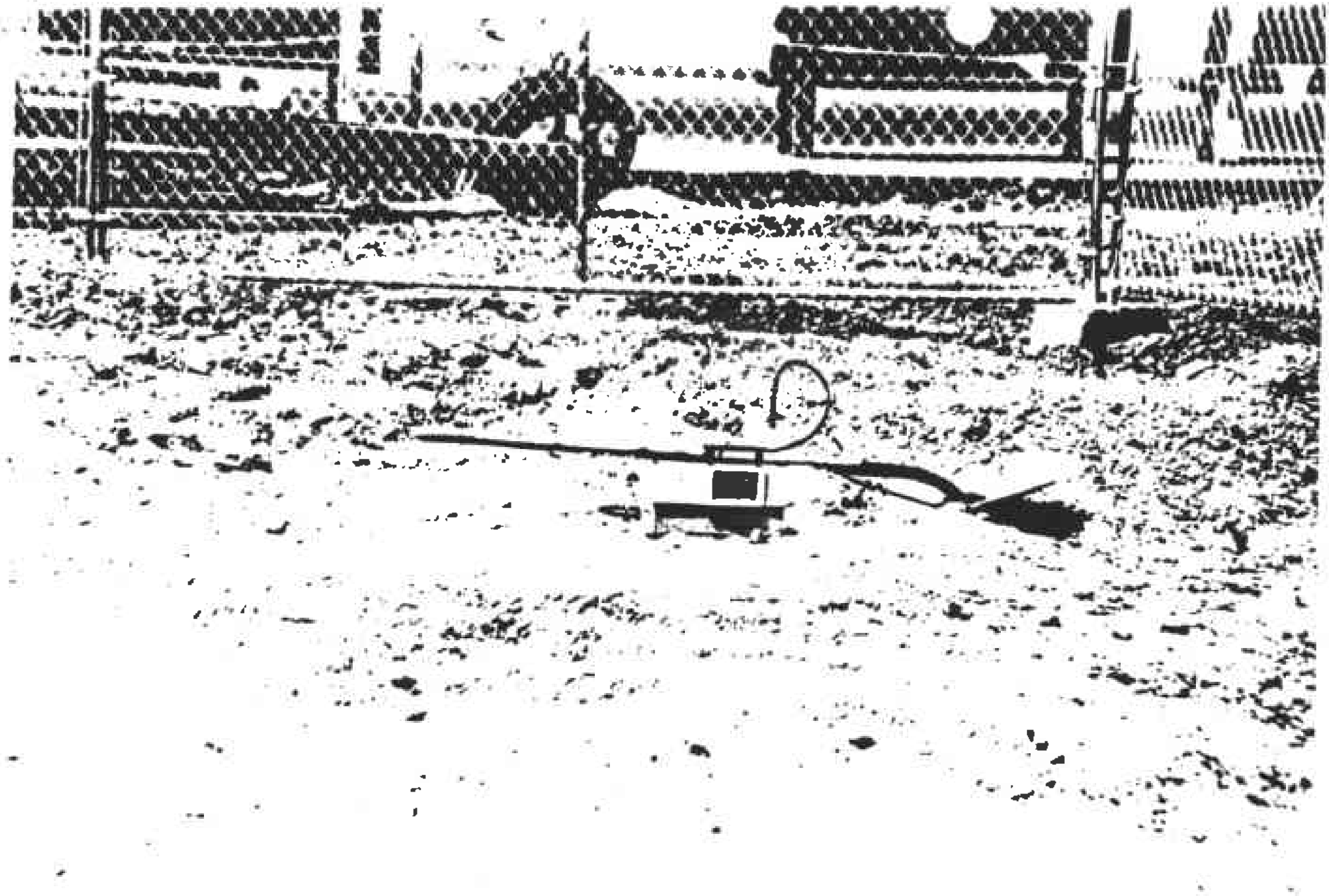
Alameda County Health
Hazardous Materials Management
Oakland, Ca 94612
Attn: Edgar Howell

If I can be of any further assistance, please call.

Richard C. Blaine

RCB/tls





TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

September 11, 1986

Chevron USA
2 Annabel Lane
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9287 Release #56

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of n-heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The results are displayed in the table below:

ERG #	CLIENT ID	CONCENTATION (mg/kg)
9287-1 A-D (composite)	86253 F1 1A-1D	3.1
9287-2 A-D	86253 F1 2A-D	4.9

Submitted by:

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608 2946
415-652-2300

September 2, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9235 Release #49

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

RE: One (1) soil composite sample submitted on August 28, 1986 for rush gasoline analysis.

Procedure: The sample is analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The sample is concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of gasoline. The limit of detection for this method of analysis is one part per million (mg/kg).

The result is displayed in the table below:

TMA/ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9235-1A - 1D	86240 M1 1A - D	110

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608 2946
(415) 652-2300

August 12, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon,CA 94583

Atention: Vicki Hobbs

Report #9103 Release #43

Site Location: Chevron Station #2960, Redwood Road and Grove Way, Castro Valley.

RE: Five (5) soil samples submitted on August 8, 1986 for rush gasoline analysis.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The results are displayed in the attached table.

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9103-1	86220 B1 #1	49
9103-2	86220 B1 #2	170
9103-3	86220 B1 #3	ND(1)
9103-4	86220 B1 #4	1.2
9103-5	86220 B1 #5	30

ND = None detected. The limit of detection is in ( ).

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608 2946
(415) 652-2300

July 31, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9029 Release #43

Site Location: Chevron Station #2960, Castro Valley.

RE: Four (4) soil samples submitted on July 29, 1986 for rush gasoline analysis.

Procedure: The samples are analyzed for gasoline by following a method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45). The limit of detection for this method of analysis is two parts per million (mg/kg).

The result is displayed in the table below:

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9029-1	86210 F1 #1	4.2
9029-2	86210 F1 #2	ND(2)
9029-3	86210 F1 #3	4.0
9029-4	86210 F1 #4	24

ND = None detected. The limit of detection is in ( ).

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

ERG 8004

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

continues on another page

Include ALL of the following designation in lab reports and invoices
\# 861170 ma
CHEVRON STN#960
CASTRO VALLEY

EVERYTHING written above this line is the project designation

Field sampling completed 16:08 hrs. 6-19-86 performed by

RELEASED BY		ACCEPTED BY	
17:12 hrs. 6-19-86		:12 hrs. 6-11-86	
__:__ hrs. - -86		__:__ hrs. - -86	
__:__ hrs. - -86		__:__ hrs. - -86	
__:__ hrs. - -86		__:__ hrs. - -86	

I.D.	TYPE	ANALYSIS	LAB #	PRELIMS	FINAL
#1 24 HR	Soil	Gasoline	8004-1		
#2 24HR		" "	8004-2		
#3 24 HR		" "	8004-3		
#4 Hold					
~~#5~~ #104 24hR			8004-5		
~~#6~~ #5 Hold					
~~#7~~ #105 24 hr			8004-7		
~~#8~~ #6 Hold					
~~#9~~ #106 24hR			8004-9		
~~#10~~ Continued					

TURN AROUND 24 hr #1, 2, 3, #104, #105, #106, #8
HOLD #4, 5, 6, ~~8~~
#7 #107 48 hR

REPORT TO:
CHEVRON USA INC
2 ANNABEL LANE, SUITE 200
SAN RAMON, CA 94583

BILLING INVOICE TO:
SAME

Attn VICKI HOBBS
Phone (415) 838-5232

Attn
Verbal/Ref PO From:

cc BLAINE TECH SERVICES (always)
cc OTHER:

SPECIAL INSTRUCTIONS

( ) Phone results to BTS
( ) Phone results to client direct

ERC 8004

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

Include ALL of the following designation in lab reports and invoices Chevron STN # 2960
86170 ma2 Continued CASTRO VALLEY
EVERYTHING written above this line is the project designation

Field sampling completed 16:08 hrs. 6-19-86 performed by Kelly Mawhinney

RELEASED BY				ACCEPTED BY		
17:12 hrs.	6-19-86	Kelly Mawhinney		17:12 hrs.	6-19-86	Ernest A. Cu
__:__ hrs.	- -86			__:__ hrs.	- -86	
__:__ hrs.	- -86			__:__ hrs.	- -86	
__:__ hrs.	- -86			__:__ hrs.	- -86	

I.D.	TYPE	ANALYSIS	LAB #	PRELIMS	FINAL
#7 48 hR	Soil	Waste Oil	8004-10		ND
# 107 48HR		Waste Oil	8004-11		ND
24hr #8 stockpile composite layered	24 hr	Gasoline	8004-12		390

TURN AROUND

REPORT TO: Chevron USA
2 ANNABEL LANE Suite 200
SAN RAMON CA
94583
Attn Vicki Hobbs
Phone 415 838 5232

BILLING INVOICE TO:
- Same -
Attn
Verbal/Ref PO From:

cc BLAINE TECH SERVICES (always)
cc OTHER:

SPECIAL INSTRUCTIONS

( ) Phone results to BTS
( ) Phone results to client direct

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

June 23, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #8004 Release #33

Site Location: Chevron Station #2960, Castro Valley.

RE: Seven (7) soil samples submitted on June 19, 1986 for rush gasoline analysis; also two (2) samples for waste oil analysis.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of gasoline. The limit of detection for this method of analysis is one part per million (mg/kg).

The samples are analyzed for waste oil by following a modified EPA Method 3510 extraction procedure. The samples are extracted three (3) times with hexane. The solvent is removed from the combined extracts and carbon disulfide is added. The solution is injected into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against a solution made from a known concentration of light machine oil. The limit of detection for this method of analysis is ten parts per million (mg/kg).

The results are summarized in Table I.

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TABLE I

ERG #	CLIENT ID	CONCENTRATION (mg/kg)	
8004-1	86170 M2 #1	5200*	18' BG
8004-2	86170 M2 #2	8.8***	
8004-3	86170 M2 #3	14000*	18' BG
8004-5	86170 M2 #104	620*	
8004-7	86170 M2 #105	1300*	18' BG
8004-9	86170 M2 #106	490*	
8004-10	86170 M2 #7	ND(10)**	
8004-11	86170 M2 #107	ND(10)**	
8004-12	86170 M2 #8	3900*	stockpile

*gasoline.

**waste oil, by extraction.

***originally reported 3.3, may have a matrix problem.

ND = None detected. The limits of detection are in ( ).

BLAINE
TECH SERVICES

P.O. BOX 574
SAN JOSE, CA 9515
(408) 723-397

August 5, 1986

Chevron USA, Inc.
2 Annabel Lane, Suite 200
San Ramon, CA 94583

Attention: Vicki Hobbs

Re: Field sampling at

stockpile

Chevron Station #2960
Redwood Rd. & Grove Way
Castro Valley, CA
on
July 23, 1986

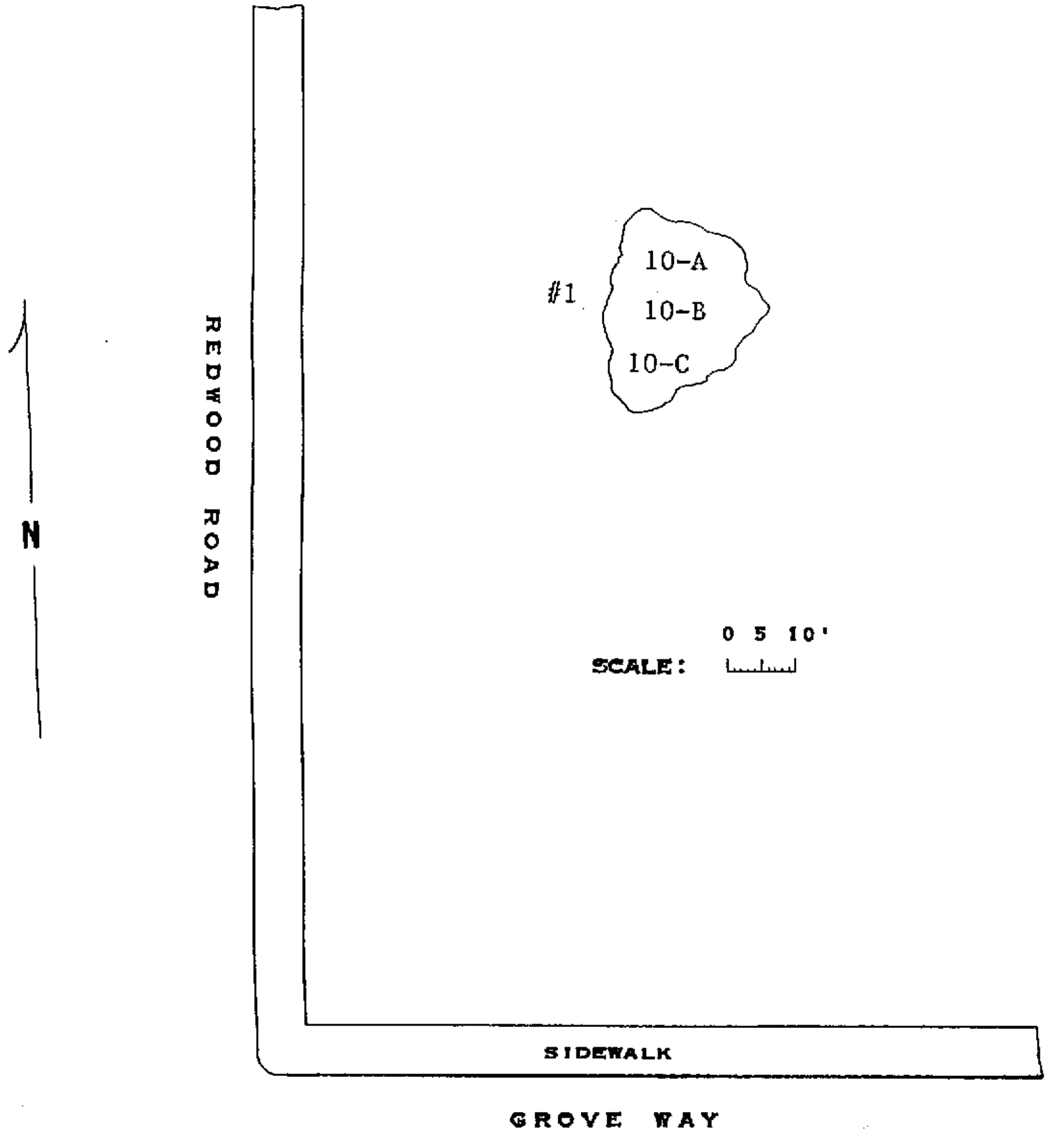
SAMPLING REPORT

Sampling was performed in accordance with approved methodology at the location shown in the accompanying site diagram. The lab number assigned to the sample is given on the site diagram. The sample was collected in an appropriate container, which was sealed, chilled and transported to the laboratory for analysis. Analytical services will be provided by Thermo Analytical Laboratory with a separate report and billing invoice referencing their lab number.

Reportage

Submission to the Regional Water Quality Control Board and the Fire Department should include copies of both the sampling report and the laboratory report. The property owner should attach a cover letter and submit all documents together in a package.

SAMPLING REPORT 86204F3 7-23-86 CHEVRON STATION NO. 2960, REDWOOD RD. & GROVE WAY, CASTRO VALLEY, CA



MAP REF: THOMAS BROS.
ALAMEDA COUNTY
P. 28 E-6

#1 STOCKPILE SOIL COMPOSITE FROM SAMPLE POINTS 10-A -- 10-C AT 4-8" BELOW SURFACE ANALYSIS FOR GASOLINE, BENZENE, TOLUENE AND XYLENE AT THERMO ANALYTICAL, INC/ERG TMA/ERG LAB NO. 9007

SAMPLING PERFORMED BY
FRANK A. CLINE

DIAGRAM PREPARED BY
TAMMIE STALLINGS

Tammie L Stallings

The following addresses have been listed here for your convenience:

Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Room 6040
Oakland, CA 94607
ATTN: Dale Bowyer

Alameda County Health
Hazardous Materials Management
Oakland, Ca 94612
Attn: Edgar Howell

If I can be of any further assistance, please call.

Richard C. Blaine

RCB/tls

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

Include ALL of the following designation in lab reports and invoices
862041F3

Chevron 2960
Redwood & Grove
Castro Valley

EVERYTHING written above this line is the project designation

Field sampling completed 13:45 hrs. 7-23-86 performed by

RELEASED BY			ACCEPTED BY		
14:16 hrs.	7-23-86		14:17 hrs.	7-23-86	Sue Lentz
__:__ hrs.	- -86		__:__ hrs.	- -86	
__:__ hrs.	- -86		__:__ hrs.	- -86	
__:__ hrs.	- -86		__:__ hrs.	- -86	

I.D.	TYPE	ANALYSIS	LAB #	PRELIMS	FINAL
#10-A	Soil	Gas/BTX		Gas N.D. @ 1	
#10-B			9007		
#10-C					

Composite into one Sample

TURN AROUND As per Vicki Hobbs

REPORT TO: Chevron USA

Attn Vicki Hobbs
Phone

BILLING INVOICE TO: Same

Attn
Verbal/Ref PO From:

cc BLAINE TECH SERVICES (always)
cc OTHER:

SPECIAL INSTRUCTIONS

( ) Phone results to BTS
( ) Phone results to client direct

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

July 29, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #9007 Release #43

Site Location: Chevron Station #2960, Redwood and Grove, Castro Valley.

RE: One (1) soil composite sample submitted on July 23, 1986 for rush total hydrocarbon response analysis.

Procedure: The sample is analyzed for total hydrocarbon response by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The sample is concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45). The limit of detection for this method of analysis is one part per million (mg/kg).

The result is displayed in the table below:

ERG #	CLIENT ID	CONCENTRATION (mg/kg)
9007-Comp	86204 F3, 10A, 10B, 10C	ND(1)

ND = None detected. The limit of detection is in ( ).

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

BLAINE
TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

July 18, 1986

Chevron USA, Inc.
2 Annabel Lane, Suite 200
San Ramon, CA 94583

Attention: Vicki Hobbs

Re: Field sampling at

Chevron Station #2960
Redwood Rd. & Grove Way
Castro Valley, CA
on
June 16, 1986.

SAMPLING REPORT

Sampling was performed in accordance with approved methodology at the locations shown on the accompanying site diagram. The lab numbers assigned to the samples are given on the site diagram. Samples were collected in appropriate containers, which were sealed, chilled and transported to the laboratory for analysis. Analytical services were provided by Thermo Analytical Inc/ERG with a separate report and billing invoice referencing their lab numbers.

Tanks

age -- unspecified

type -- one 550 gallon waste oil
one 2,000 gallon gasoline
two 7,500 gallon gasoline

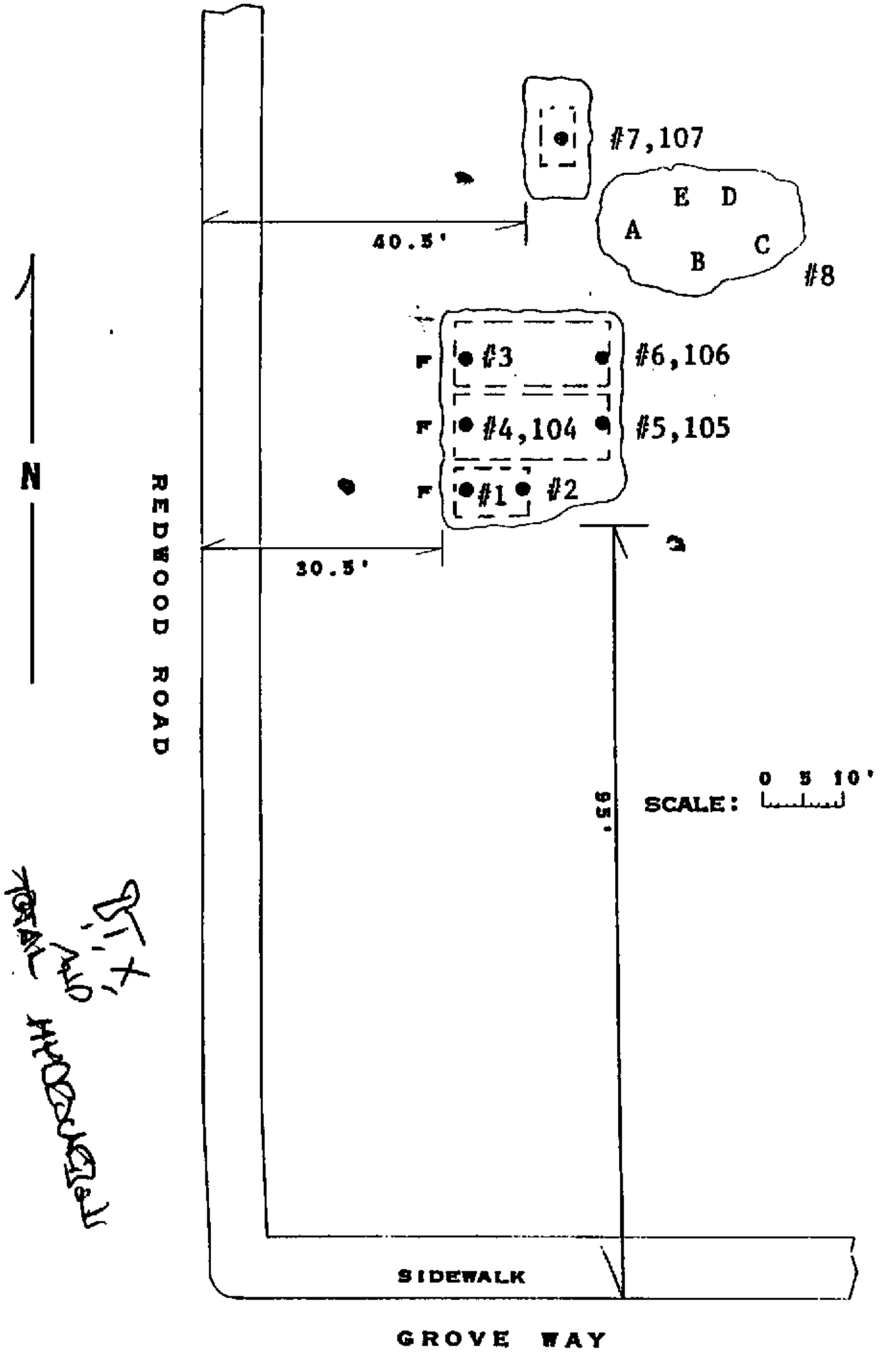
reason for removal — discontinuation of on site storage

Reportage

Submission to the Regional Water Quality Control Board and the Fire Department should include copies of both the sampling report and the laboratory report. The property owner should attach a cover letter and submit all documents together in a package.

BLAINE TECH SERVICES

SAMPLING REPORT 86170M2 6-19-86 CHEVRON STN. NO. 2960, REDWOOD RD. & GROVE WAY, CASTRO VALLEY, CA -



B,T,X, and TOTAL HYDROCARBONS

MAP REF: THOMAS BROS.
ALAMEDA COUNTY
P. 28 E-6

LEGEND: F = FILL END

#1	SOIL FROM 18' ANALYSIS FOR GASOLINE AT THERMO ANALYTICAL INC/ERG TMA/ERG LAB NO. 8004-1
#2	SOIL FROM 18' ANALYSIS FOR GASOLINE TMA/ERG LAB NO. 8004-2
#3	SOIL FROM 18' ANALYSIS FOR GASOLINE TMA/ERG LAB NO. 8004-3
#4	SOIL FROM 12'6" ANALYSIS FOR GASOLINE SAMPLE PLACED ON 'HOLD'
#104	SOIL FROM 18' ANALYSIS FOR GASOLINE TMA/ERG LAB NO. 8004-5
#5	SOIL FROM 12'6" ANALYSIS FOR GASOLINE SAMPLE PLACED ON 'HOLD'
#105	SOIL FROM 18' ANALYSIS FOR GASOLINE TMA/ERG LAB NO. 8004-7
#6	SOIL FROM 12'6" ANALYSIS FOR GASOLINE SAMPLE PLACED ON 'HOLD'
#106	SOIL FROM 18' ANALYSIS FOR GASOLINE TMA/ERG LAB NO. 8004-9
#7	SOIL FROM 7' ANALYSIS FOR WASTE OIL TMA/ERG LAB NO. 8004-10
#107	SOIL FROM 9' ANALYSIS FOR WASTE OIL TMA/ERG LAB NO. 8004-11
#8	STOCKPILE SOIL COMPOSITE FROM SAMPLE POINTS A-E AT 12" BELOW SURFACE ANALYSIS FOR GASOLINE TMA/ERG LAB NO. 8004-12

SAMPLING PERFORMED BY
HELEN MAWHINNEY

DIAGRAM PREPARED BY
TAMMIE STALLINGS

Tammie Stallings

The following addresses have been listed here for your convenience:

Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Room 6040
Oakland, CA 94607
ATTN: Dale Bowyer

Alameda County Health
Hazardous Materials Management
Oakland, Ca 94612
Attn: Edgar Howell

If I can be of any further assistance, please call.

Richard C. Blaine

RCB/tls

ERG-8004

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

continues on another page

Include ALL of the following designation in lab reports and invoices
86170 m2
CHEVRON STN #5960
CASTRO VALLEY

EVERYTHING written above this line is the project designation

Field sampling completed 16:08 hrs. 6-19-86 performed by Helen Mawkinney

RELEASED BY			ACCEPTED BY		
11:12 hrs.	6-19-86	Helen Mawkinney	__:12 hrs.	6-11-86	Bruce J. C
__:__ hrs.	- -86		__:__ hrs.	- -86	
__:__ hrs.	- -86		__:__ hrs.	- -86	
__:__ hrs.	- -86		__:__ hrs.	- -86	

I.D.	TYPE	ANALYSIS	LAB #	PRELIMS	FINAL
#1 24 HR	Soil	Gasoline	8004-1		
#2 24HR		" "	8004-2		
#3 24HR		" "	8004-3		
#4 Hold					
#104 24hR			8004-5		
#5 Hold					
#105 24 hr			8004-7		
#6 Hold					
#106 24hR			8004-9		
Continued					

TURN AROUND 24 hr #1, #2, #3, #104 #105, #106, #8
HOLD #4, 5, 6, #

REPORT TO:
CHEVRON USA INC.
2 ANNABEL LANE, SUITE 200
SAN RAMON, CA 94583

BILLING INVOICE TO: #7 #107 48 hR
[illegible]

Attn VICK HOBBS
Phone (415) 838-5232

Attn
Verbal/Ref PO From:

cc BLAINE TECH SERVICES (always)
cc OTHER:

SPECIAL INSTRUCTIONS

( ) Phone results to BTS
( ) Phone results to client direct

ERC 8004

BLAINE TECH SERVICES

P.O. BOX 5745
SAN JOSE, CA 95150
(408) 723-3974

Include ALL of the following designation in lab reports and invoices
86170 ma Continued Chevron STN # 2960 CASTRO VALLEY
EVERYTHING written above this line is the project designation

Field sampling completed 16:08 hrs. 6-19-86 performed by Kelly Mawhinney

RELEASED BY		ACCEPTED BY	
17:12 hrs. 6-19-86	Kelly Mawhinney	17:12 hrs. 6-19-86	Ernest A. C
__:__ hrs. - -86		__:__ hrs. - -86	
__:__ hrs. - -86		__:__ hrs. - -86	
__:__ hrs. - -86		__:__ hrs. - -86	

I.D.	TYPE	ANALYSIS	LAB #	PRELIMS	FINAL
#7 48 hR	Soil	Waste Oil	8004-10		N.D
#107 48HR		Waste Oil	8004-11		N.D
24hr #8 stock pile composite failured	24 hr	Gasoline	8004-12		340

TURN AROUND

REPORT TO:	BILLING INVOICE TO:
Chevron USA	
2 ANNABEL LANE Suite 200	
SAN RAMON CA	
94583	- Same -
Attn Vicki Hobbs	Attn
Phone 415 838 5232	Verbal/Ref PO From:

cc BLAINE TECH SERVICES (always)
cc OTHER:

SPECIAL INSTRUCTIONS

( ) Phone results to BTS
( ) Phone results to client direct

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

June 23, 1986

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

Attention: Vicki Hobbs

Report #8004 Release #33

Site Location: Chevron Station #2960, Castro Valley.

RE: Seven (7) soil samples submitted on June 19, 1986 for rush gasoline analysis; also two (2) samples for waste oil analysis.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against known concentrations of gasoline. The limit of detection for this method of analysis is one part per million (mg/kg).

The samples are analyzed for waste oil by following a modified EPA Method 3510 extraction procedure. The samples are extracted three (3) times with hexane. The solvent is removed from the combined extracts and carbon disulfide is added. The solution is injected into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against a solution made from a known concentration of light machine oil. The limit of detection for this method of analysis is ten parts per million (mg/kg).

The results are summarized in Table I.

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Rich Blaine
Blaine Tech Service
P.O. Box 5745
San Jose, CA 95150

TABLE I

ERG #	CLIENT ID	CONCENTRATION (mg/kg)	
8004-1	86170 M2 #1	5200*	
8004-2	86170 M2 #2	8.8***	
8004-3	86170 M2 #3	14000*	
8004-5	86170 M2 #104	620*	
8004-7	86170 M2 #105	1300*	
8004-9	86170 M2 #106	490*	
8004-10	86170 M2 #7	ND(10)**	
8004-11	86170 M2 #107	ND(10)**	
8004-12	86170 M2 #8	3900*	stockpile

*gasoline.

**waste oil, by extraction.

***originally reported 3.3, may have a matrix problem.

ND = None detected. The limits of detection are in ( ).

SS 9-2960 .002/F/08/09/87

EMCON
ASSOCIATES
Consultants in Wastes
Management and
Environmental Control

MEMORANDUM

~~November 4, 1986~~
Project 800-85.01

Gettler-Ryan Inc.
1992 National Avenue
Hayward, California 94545

Attention: Mr. Jeffrey M. Ryan

Re: Former Chevron Service
Station, Redwood Road
and Grove Way,
Castro Valley, California
Station # 2960

Gentlemen:

This memorandum documents the installation of four ground-water monitoring wells (C-1 through C-4) on October 1, 1986 by EMCON Associates at the former Chevron service station located at Redwood Road and Grove Way in Castro Valley, California. The locations of the monitoring wells are shown on the attached Figure 1.

The borings for Wells C-1 through C-4 were drilled using continuous-flight hollow-stem auger drilling equipment, and were logged by an EMCON geologist. Soil samples for logging were obtained from auger return materials and by advancing a California modified split-spoon sampler into undisturbed soil beyond the tip of the auger. Upon completion, all borings were converted to 3-inch monitoring wells. Well details accompany the attached Exploratory Boring Logs.

The borings encountered primarily clay to clayey sand to a depth of 7 to 12 feet, underlain by sand and interbedded sand, silt, and clay to the total depth explored of 30-1/2 feet. Ground water was encountered at a depth of approximately 17 feet. Strong product odor was noted in soils from Borings C-1 and C-3 in the depth interval of 9 to 20-1/2 feet. Faint product odor was noted in soils from Boring C-2 at a depth of 9 feet, and in soils from Boring C-1 at 24 feet.

The monitoring wells were field-checked for water level and presence of floating product by Gettler-Ryan on October 9, 1986. No floating product

Headquarters:
1921 Ringwood Avenue, San Jose, California 95131, (408) 275-1444
Branch office: 445 W. Garfield Avenue, Glendale, California 91204

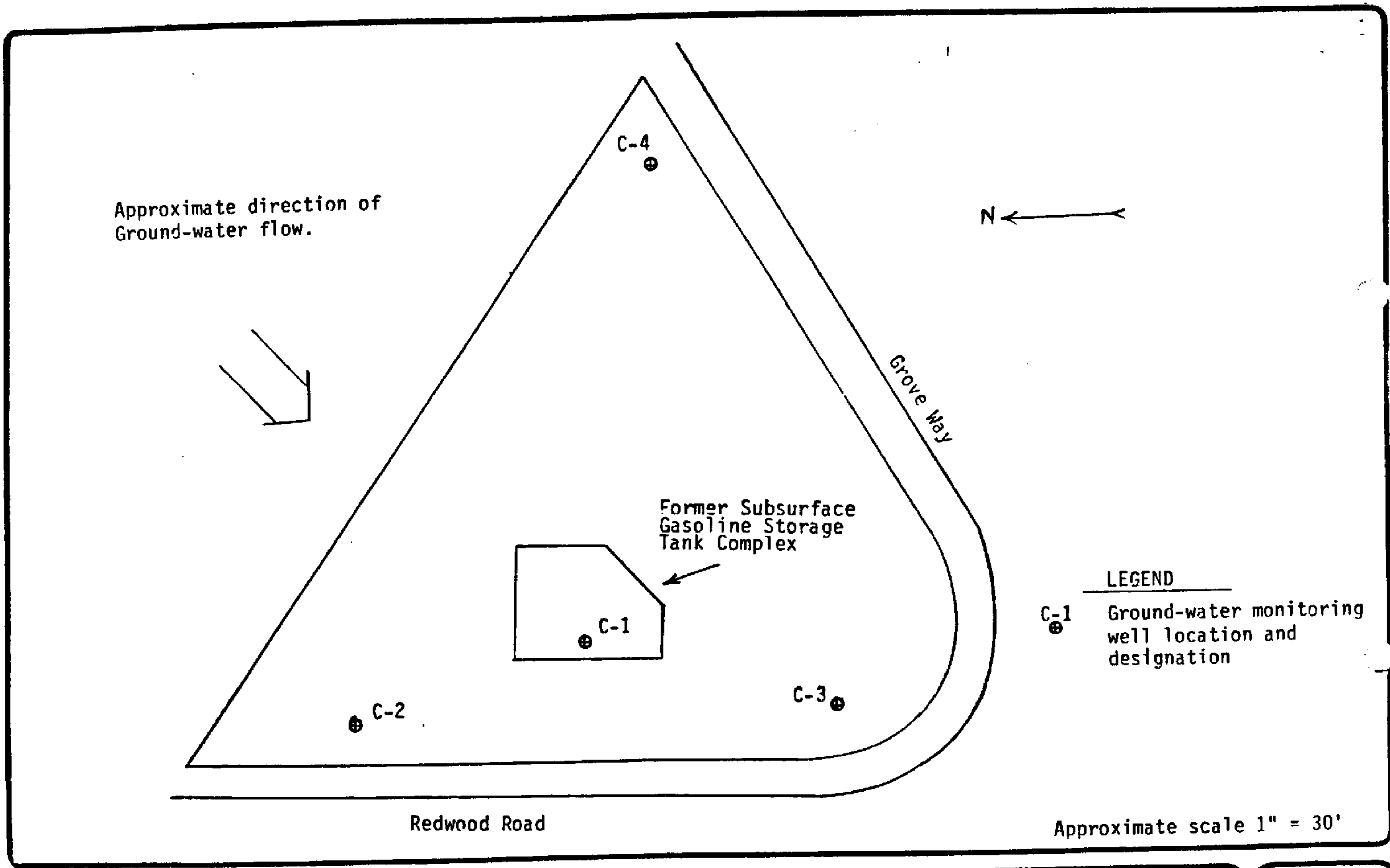
was found in any of the wells, although a strong product odor was noted in water from Well C-1.

On October 23, 1986, ground-water samples were collected from all site monitoring wells. At Chevron's request, the samples were analyzed for gasoline and BTX (benzene, toluene and xylenes) compounds by ERG Laboratory. Dissolved gasoline concentrations ranged from 0.57 parts per million (ppm) in Well C-4 to 37 ppm in Well C-1, located in the former tank complex.

If you have any questions regarding the contents of this memorandum, please do not hesitate to call.

Susan M. Willhite

DRAFT



EMCON Associates
San Jose, California

Gettler-Ryan Inc.
Subsurface Hydrogeologic Investigation
Former Chevron Service Station, Redwood Road & Grove Way, Castro Valley, California

Monitoring Well Location Map

FIGURE
1
PROJECT NO.
800-85.01

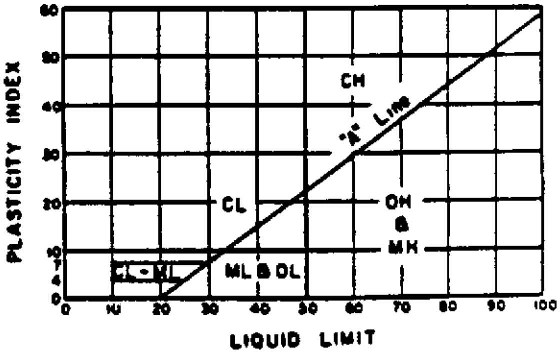
MAJOR DIVISIONS		SYMBOLS	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 1/2 of soil > no. 200 sieve size)	**GRAVELS** (More than 1/2 of coarse fraction > no. 4 sieve size)	GW	Well graded gravels or gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < no. 4 sieve size)	SW	Well graded sands or gravelly sands, little or no fines
		SP	Poorly graded sands or gravelly sands, little or no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than 1/2 of soil < no. 200 sieve size)	**SILTS & CLAYS** LL < 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL > 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils

CLASSIFICATION CHART

(Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U. S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse medium fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

GRAIN SIZE CHART



PLASTICITY CHART

METHOD OF SOIL CLASSIFICATION

EMCON ASSOCIATES

NOTES:	Logs of Exploratory Borings
2.5 YR, 6/2	Denotes color as field checked to Munsell Soil Color Charts (1975 Edition)
▨	Denotes undisturbed sample taken in 2-inch split-spoon sampler.
☒	Denotes disturbed sample (bag sample).
▽	Denotes first observation of groundwater.
▼	Denotes static ground-water level.
Penetration	Sample drive hammer weight = 140 pounds, drop = 30 inches. Blows required to drive sampler 1 foot are indicated on logs.

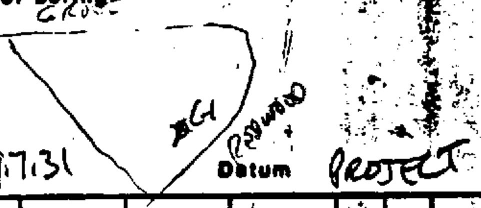
EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT No. 80-85.01 Date 10-01-86
CLIENT G.R. CHEVRON
LOCATION REDWOOD: GROVE CASTRO VLY.
LOGGED BY RRL DRILLER BAYLAND

BORING No. C-1
Sheet 1 of 1

Field location of boring:



Ground Elev. 97.31 Datum PROJECT

Drilling method H-S AUGER
Hole dia. 8"

Casing installation data SLOTTED 3" PVC FROM 30 to 10 FEET; SOLID to SURFACE; SAND PACK to 8 FEET; BENTONITE to 7 FT; CONCRETE to SURFACE.

Water level	16.8'	16.41' (BOX)	16.47	
Time	1030	1227	1550	
Date	10-1-86	10-1-86	10-1-86	

Pocket Torr vane TSF	Pocket Penetrometer TSF	Blows/ft. or Pressure PSI	Type of Sample	Sample Number	Depth	Sample	Soil Group Symbol (U.S.C.S.)	DESCRIPTION
					2		SC-SM	CLAYEY SAND to SILTY SAND FILL; DARK BROWN (10YR, 4/3) 20-30% FINES; FINE to COARSE SAND, TRACE GRAVEL; WOOD FRAGMENTS; MEDIUM DENSE; DRY; NPD.
		10/12/12	DR-L 100%	①	4–6	▨		
		6/9/9	DR-L 100%	②	10	▨		@ 9 FT: MOIST; STRONG GASOLINE ODOR.
CHANGE AT 12 FT.					12			
	2.5	7/5/7	DR-L 100%	③	14–16	▨	SP/CL/SW	SAND, CLAY - INTERBEDDED: OLIVE GRAY (5Y, 4/2): MOIST; STRONG GASOLINE ODOR; SP: FINE GRAINED; TRACE MEDIUM GRAINED; LOOSE; CLAY: VERY STIFF; SW: FINE TO COARSE GRAINED; LOOSE.
		6/10/20	DR-L 100%	④	20	▨		@19 FT: SP AND SW: DENSE(?); WET; STRONG GASOLINE ODOR [illegible]
		7/12/40	DR-L 100%	⑤	24–26	▨		@24 FT: SP, SW: VERY DENSE, [illegible] PRODUCT ODOR.
		25/40 12"	DR-L 100%	⑥	30	▨		@ 29 FT: SP: 5-10% FINES; SW: TRACE GRAVEL; NO PRODUCT ODOR
								BOTTOM OF BORING AT 30 FEET.

PRELIMINARY

WELL DETAILS

EMCON ASSOCIATES

PROJECT NUMBER 800-85.01

PROJECT NAME G.-R. Chevron, Castro Vly.

COUNTY Alameda

WELL PERMIT NO.

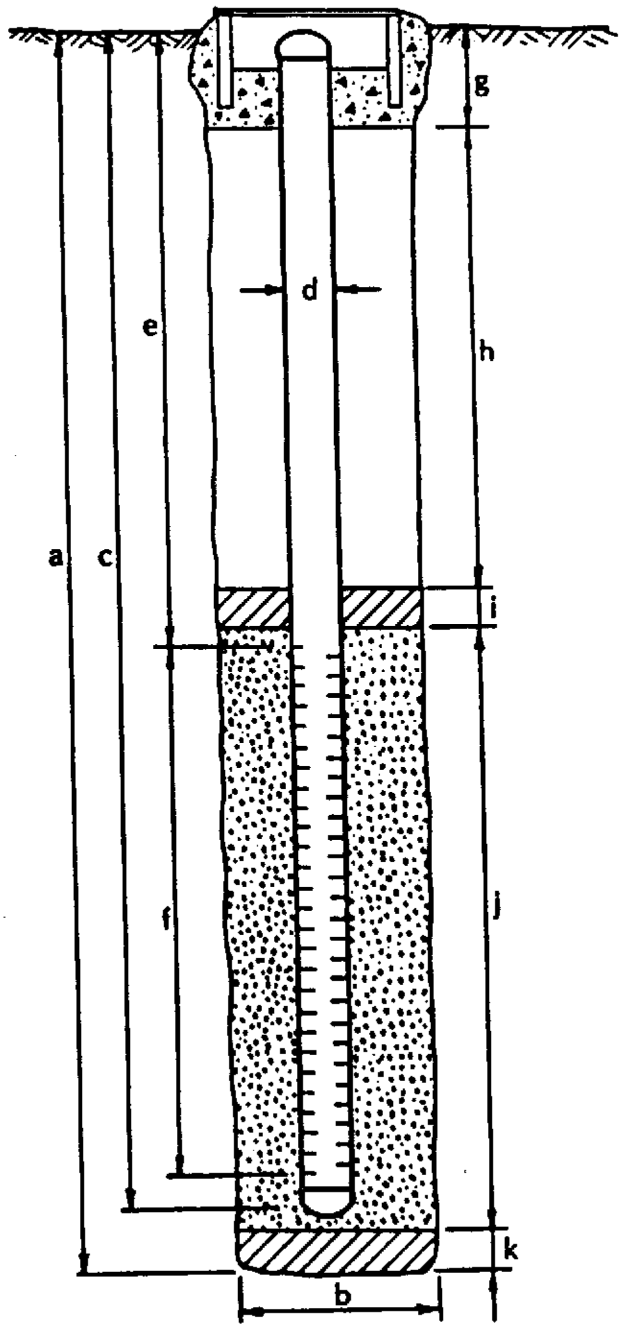
BORING / WELL NO. C-1

TOP OF CASING ELEV. 97.31

GROUND SURFACE ELEV.

DATUM Project

G-5 vault box (Std.)



EXPLORATORY BORING

a. Total depth 30 ft.

b. Diameter 8 in.

Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Casing length 30 ft.

Material Schedule 40 PVC

d. Diameter 3 in.

e. Depth to top perforations 10 ft.

f. Perforated length 20 ft.

Perforated interval from 10 to 30 ft.

Perforation type Machined Slot

Perforation size 0.020 inch

g. Surface seal 7 ft.

Seal material Concrete

h. Backfill - ft.

Backfill material - -

i. Seal 1 ft.

Seal material Bentonite

j. Gravel pack (30 to 8 ft.) 22 ft.

Pack material Coarse Aquarium Sand

k. Bottom seal - ft.

Seal material - -

DRAFT

PLATE

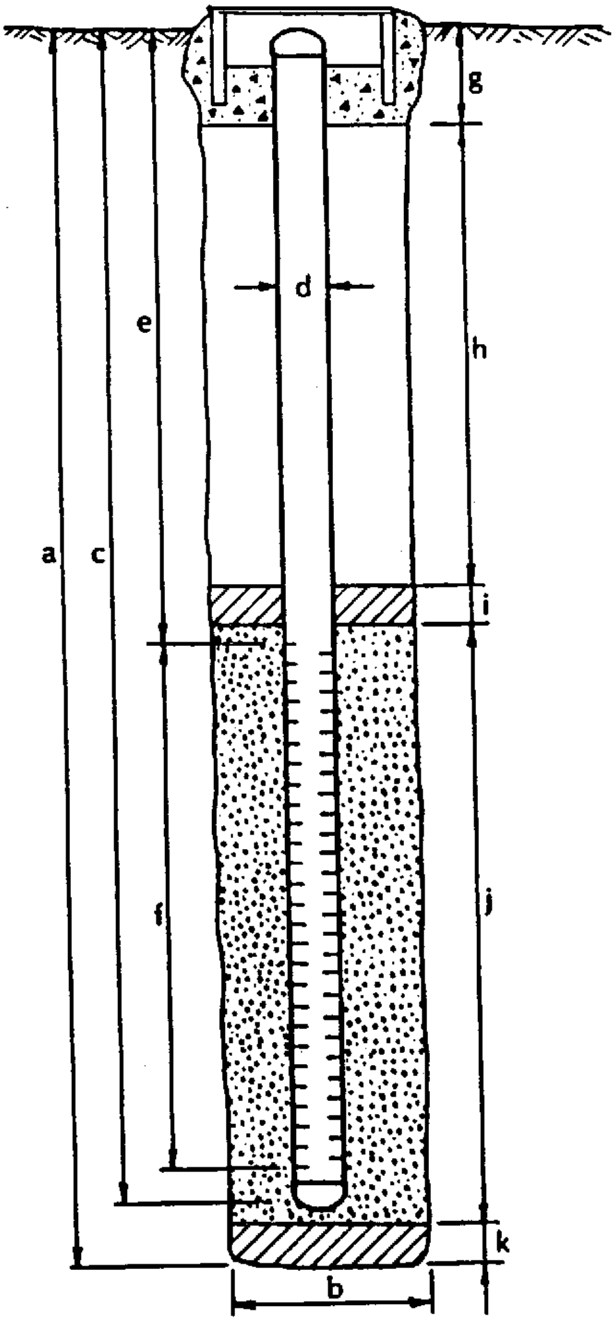
WELL DETAILS

EMCON ASSOCIATES

PROJECT NUMBER 800-85.01
PROJECT NAME G.-R. Chevron, Castro Vly.
COUNTY Alameda
WELL PERMIT NO.

BORING / WELL NO. C-2
TOP OF CASING ELEV. 96.33
GROUND SURFACE ELEV.
DATUM Project

G-5 vault box (Std.)



EXPLORATORY BORING

a. Total depth 30.5 ft.
b. Diameter 8 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Casing length 30 ft.
Material Schedule 40 PVC
d. Diameter 3 in.
e. Depth to top perforations 10 ft.
f. Perforated length 20 ft.
Perforated interval from 10 to 30 ft.
Perforation type Machined Slot
Perforation size 0.020 inch
g. Surface seal 7 ft.
Seal material Concrete
h. Backfill - ft.
Backfill material - -
i. Seal 1 ft.
Seal material Bentonite
j. Gravel pack (30 to 8 ft.) 22 ft.
Pack material Coarse Aquarium Sand
k. Bottom seal - ft.
Seal material - -

DRAFT

PLATE

EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT No. 804-85.C **DATE** 10-01-86

CLIENT G.R. CHEVRON

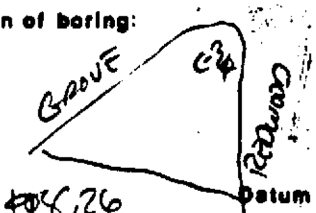
LOCATION REDWOOD: GROVE, CASTRO VLY

LOGGED BY EBL **DRILLER** BAYLAND

BORING No. C-3

Sheet 1 **of** 1

Field location of boring:



Ground Elev. 408,26 **Datum** PROJECT

Drilling method H.S AUGER

Hole dia. 8"

Casing installation data SLOTTED 3" PVC FROM 30 to 10 FT. SOLID to SURFACE; SAND PACK to 8 FT, BENTONITE to 7 FT, CONCRETE to SURFACE

Water level	17.75			
Time (BOX)	1553			
Date	10-1-86			

Pocket Torr vane TSF	Pocket Penetrometer TSF	Blows/ft. or Pressure PSI	Type of Sample	Sample Number	Depth	Sample	Soil Group Symbol (U.S.C.S.)	DESCRIPTION
								SAND, CLAY, & GRAVEL - FILL
					2			
	4.5	5/15/25	DR-L 100%	①	4	■	CH	CLAY: DARK YELLOWISH BROWN (10YR, 4/6); 5-10% FINE to COARSE SAND; 5-10% FINE GRAVEL; HARD; MOIST; NPO
					6			
					8		SC	
	3.0	11/40	DR-L 100%	②	10	■		CLAYEY SAND; DARK YELLOWISH BROWN (10YR, 4/6); 30-40% HIGH PLASTICITY FINES; FINE to COARSE SAND; 10-20% FINE to MEDIUM GRAVEL; VERY DENSE; MOIST; NPO.
					12			
		12/13/30	DR-L 100%	③	14	■	SP	SAND: OLIVE GRAY (5Y, 4/2); 5-10% FINES; FINE SAND; TRACE FINE to COARSE GRAVEL; DENSE; WET; ~~STRONG~~ GASOLINE ODOR.
					16			
					18		SW	
		12/24/15	DR-L 100%	④	20	■	SP	SAND- INTERBEDDED; YELLOWISH BROWN (10YR, 5/6); DENSE, WET, NO PRODUCT ODOR; SW: FINE to COARSE GRAINED; TRACE FINE GRAVEL; SP: FINE GRAINED.
					22			
		12/25/17	DR-L 100%	⑤	24	■		@ 24 FT; VERY DENSE; NPO.
					26			
					28			@ 29 FT; NO PRODUCT ODOR.
	2.5	12/40	DR-L 100%	⑥	30	■	ML	SILT; BROWN (10YR, 5/3); 10-20% FINE SAND; VERY STIFF; WET; NPO.
					32			BOTTOM OF BORING AT 30 ½ FT.

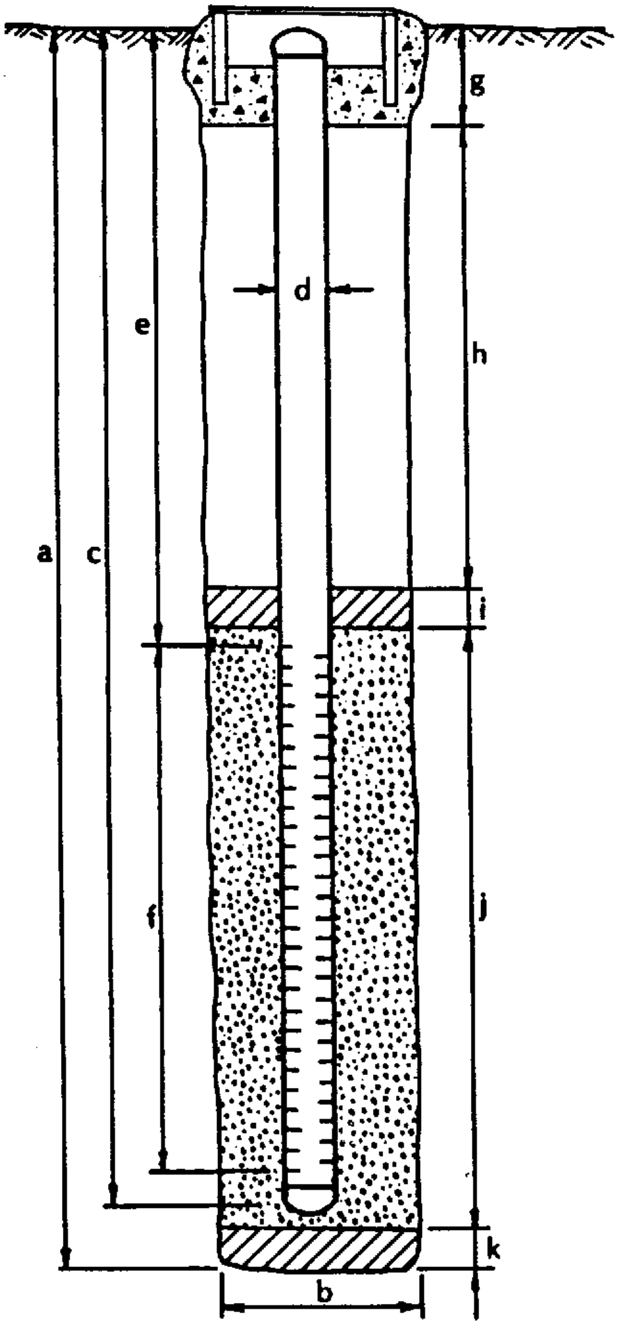
PRELIMINARY

WELL DETAILS

PROJECT NUMBER 800-85.01
PROJECT NAME G.-R. Chevron, Castro Vly.
COUNTY Alameda
WELL PERMIT NO.

BORING / WELL NO. C-3
TOP OF CASING ELEV. 98.26
GROUND SURFACE ELEV.
DATUM Project

G-5 vault box (Std.)



EXPLORATORY BORING

a. Total depth 30 ft.
b. Diameter 8 in.
Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Casing length 30 ft.
Material Schedule 40 PVC
d. Diameter 3 in.
e. Depth to top perforations 10 ft.
f. Perforated length 20 ft.
Perforated interval from 10 to 30 ft.
Perforation type Machined Slot
Perforation size 0.020 inch
g. Surface seal 7 ft.
Seal material Concrete
h. Backfill - ft.
Backfill material - -
i. Seal 1 ft.
Seal material Bentonite
j. Gravel pack (30 to 8 ft.) 22 ft.
Pack material Coarse Aquarium Sand
k. Bottom seal - ft.
Seal material - -

DRAFT

PLATE

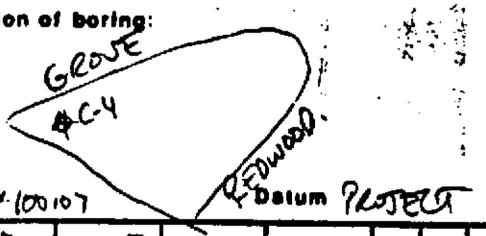
EMCON ASSOCIATES

LOG OF EXPLORATORY BORING

PROJECT No. 800-85.4 DATE 10-01-86
CLIENT G.R. CHEVRON
LOCATION REDWOOD : GROVE, CASTRO VLY.
LOGGED BY EEL DRILLER BAYLAND

BORING No. C-4
Sheet 1 of 1

Field location of boring:



Ground Elev. 100.07 Datum PROJECT

Drilling method H-S AUGER
Hole dia. 8"

Casing installation data SLOTTED 3" PVC FROM 30 to 10 FT; SOLID to SURFACE; SAND PACK TO 8 FT; BENTONITE to 7 FT; CONCRETE to SURFACE.

Water level	17.02			
Time (SOP)	10:20			
Date	10-1-86			

Pocket Torr vane TSF	Pocket Penetrometer TSF	Blows/ft. or Pressure PSI	Type of Sample	Sample Number	Depth	Sample	Soil Group Symbol (U.S.C.S.)	DESCRIPTION
								SAND; GRAVEL; CLAY-FILL.
					2			
	1.5	4/7/11	DR-L 100%	(1)	4		CH	CLAY, DARK YELLOWISH BROWN (10YR, 4/4) 5-10% FINE to COARSE SAND; STIFF; MOIST; NPO, ROOT HOLES.
					6			
					8			
	2.5	11/20/30	DR-L 100%	(2)	10		SC	CLAYEY SAND; DARK YELLOWISH BROWN (10YR, 4/4); 20-25% HIGH PLASTICITY FINES; FINE to COARSE SAND; 10-20% FINE to COARSE GRAVEL; VERY STIFF; MOIST; NPO.
					12			
	1.5	20/46 12"	DR-L 100%	(3)	14			@ 14 FT, STIFF; DAMP; NPO.
					16			
					18			
	2.0	15/40 12"	DR-L 100%	(4)	20			@ 19 FT; VERY STIFF, WET; NPO.
					22			
		20/32/50	DR-L 100%	(5)	24		SP-SM	SAND TO SILTY SAND; YELLOWISH BROWN (10YR, 5/6); 5-12% LOW PLASTICITY FINES, FINE GRAINED; TRACE COARSE GRAINED; VERY DENSE; WET; NPO
					26			
					28			@ 29 FT. DENSE; NPO.
		15/30 12"	DR-L 75%	(6)	30			BOTTOM OF BORING AT 30 FT.

PRELIMINARY

WELL DETAILS

EMCON ASSOCIATES

PROJECT NUMBER 800-85.01

PROJECT NAME G.-R. Chevron, Castro Vly.

COUNTY Alameda

WELL PERMIT NO.

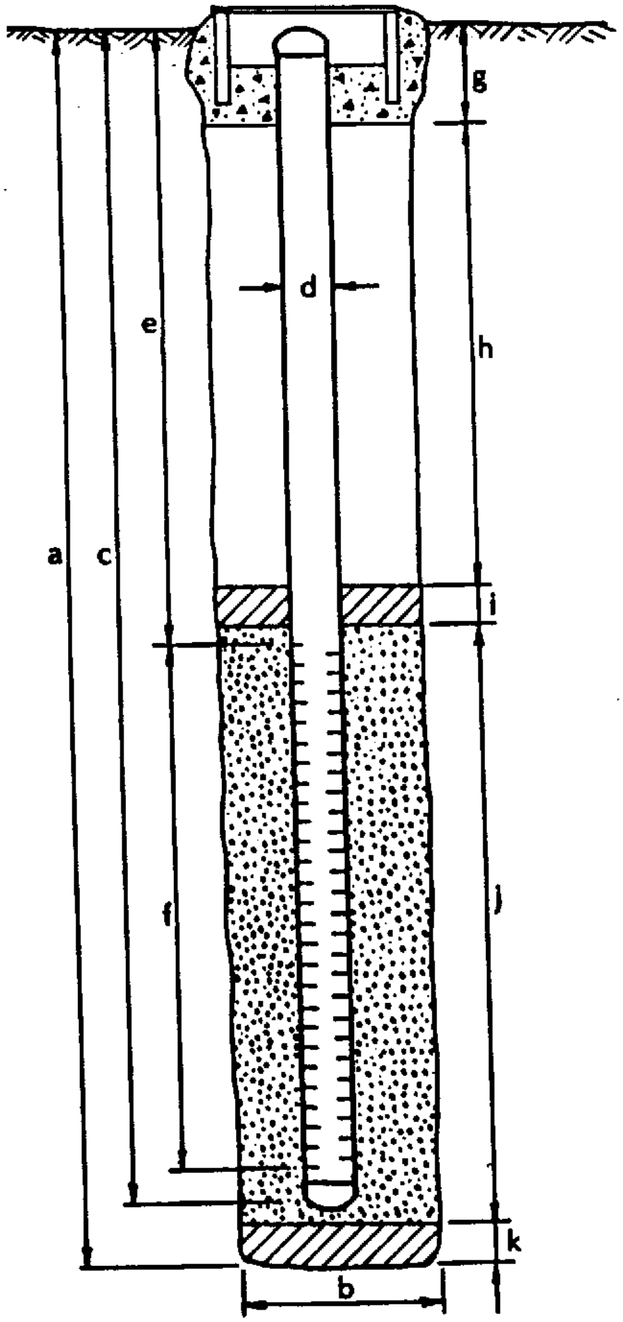
BORING / WELL NO. C-4

TOP OF CASING ELEV. 100.07

GROUND SURFACE ELEV.

DATUM Project

G-5 vault box (Std.)



EXPLORATORY BORING

a. Total depth 30 ft.

b. Diameter 8 in.

Drilling method Hollow-Stem Auger

WELL CONSTRUCTION

c. Casing length 30 ft.

Material Schedule 40 PVC

d. Diameter 3 in.

e. Depth to top perforations 10 ft.

f. Perforated length 20 ft.

Perforated interval from 10 to 30 ft.

Perforation type Machined Slot

Perforation size 0.020 inch

g. Surface seal 7 ft.

Seal material Concrete

h. Backfill - ft.

Backfill material - -

i. Seal 1 ft.

Seal material Bentonite

j. Gravel pack (30 to 8 ft.) 22 ft.

Pack material Coarse Aquarium Sand

k. Bottom seal - ft.

Seal material - -

DRAFT

PLATE

TMA
Thermo Analytical Inc.

TMA/ERG
1400 West 53rd Street
Suite 460
Emeryville, CA 94608-2946
(415) 652-2300

[illegible]
[illegible]

Chevron USA
2 Annabel Lane, Suite #200
San Ramon, CA 94583

October 28, 1986
Report #9548
Release #68

Attention: Wayne Smith

RE: Two (2) water samples submitted on October 25, 1986 for rush total hydrocarbon response, BTX and pH analysis.

Procedure: The samples are analyzed for gasoline by following the method described in Attachment 2, Analytical Procedures for Fuel Leak Investigations. The samples are concentrated on a Tekmar LSC-2 automatic sample concentrator prior to injected into a gas chromatograph fitted with a flame ionization detector. Quantitation is performed, as total hydrocarbon response, against solutions made from a known concentration of gasoline. The limit of detection for this method of analysis is 0.2 parts per million (mg/L).

The aromatic levels are determined by following the modified EPA Method 602 procedure. The volatile components of the samples are concentrated with a Tekmar LSC-2 automatic sample concentrator prior to injection into a gas chromatograph fitted with a photoionization detector. Quantitation is performed against solutions made from knwon concentrations of aromatic compounds. The limit of detection is 2 parts per billion (ug/L).

The results are displayed in the attached table.

Submitted by:

Robert B. Flay

Robert B. Flay
Manager, Organics Department

RBF:sml

cc: Getler Ryan
1992 National Ave.
Hayward, CA 94545

Attention: Bill Knudson

cc: Emcon
1921 Ringwood Ave.
San Jose, CA 95131

Attention: Keoni Murphy

Concentration (mg/L)

TMA/ERG #	CLIENT ID	BENZENE	TOLUENE	XYLENES	TOTAL HYDROCARBON GASOLINE	pH*
9548-1	C01	6.4	3.7	4.3	37	1.58
9548-2	C02	2.7	1.9	1.5	30	1.45
9548-3	C03	0.049	0.024	0.020	3.3	1.19
9548-4	C04	0.003	0.004	0.005	0.57	1.19

*units at 25°C

Quality Assurance Services
Materials Consulting

Testing Engineers, Inc.

Work Request No. G-0077 & G-0094

INSPECTION REPORT

Week Ending 9-26-86

Project No. 15429

Project : Chevron Station #2960
2416 Grove Way
Castro Valley, CA

Type of Inspection
Nuclear Field Density Testing

Place of Inspection
Jobsite

Date	9-22-86	9-23-86					
Hours	4	8					
Miles/Zone	Zone 2	Zone 2					
Inspector	Denney	Denney					

Report:

9-22-86 (G-0077)

Reported to Mr. John Paulson at the jobsite.

A sample of material to be tested was obtained and delivered to the Diablo Valley laboratory for determination of maximum density in accordance with ASTM D-1557.

Compaction at area to be tested was incomplete.

9-23-86 (G-0094)

Reported to Mr. Stevens at the jobsite.

Six (6) in-place density tests were performed in accordance with ASTM D-2922 and D-3017 at the request of Ms. Vicki Hobbs. Relative compaction was calculated using previously determined maximum density data. See the attached summary sheet for test results. Test results were reported to excavator's representative on 9-23-86.

Reviewed by William D. Weegar
William D. Weegar, Dept. Manager

Charles J. Kanapicki, C.E. #23869

Attachment: Summary sheet

2cc: Chevron USA

Work Request No.:	G-0094	COMPACTION TEST SUMMARY SHEET	Date: 9-26-86
TEI Project No.:	15429	Project Data:	Chevron Station #2960

Test #	Date	Location	Elev.	Curve No. & Method	In-Place Density g/cc	In-Place Moisture %	Relative Comp.	Project Specs.
1	9-23-86	Left of center of excavation	Curb -11'	1C	2.00	8.0	95	90
2	9-23-86	Right of center of excavation	Curb -9½'	1C	2.08	8.2	99	90
3	9-23-86	Center of excavation	Curb -7½'	1C	2.10	7.6	100	90
4	9-23-86	Left of center of excavation	Curb -4'	1C	2.10	7.1	100	90
5	9-23-86	Right of center of excavation	Curb -2'	1C	1.93	9.3	91	90
6	9-23-86	Adjacent to center of excavation	Curb	1C	2.01	8.5	95	90

*Below project specifications

TEST METHOD		Maximum Density g/cc	Optimum Moisture %	Material Description	Lab Ref. No.
	1.	2.11	8.1	Brown gray sandy clayey silt	D3149
A. CA 216F	2.				
B. CA 216G	3.				
C. ASTM D-1557	4.				
D. AASHO T130	5.				

NOTE: Test results constitute the reporting of factual information derived from test(s) made by our laboratory following prescribed procedures. These test results should not be considered as an engineering opinion with respect thereto.

Testing Engineers, Incorporated
Quality Assurance Services
Materials Consulting

Chevron Service Station 9-2960, Redwood Road and Grove Way, Castro Valley, CA (mgL and mg/kg)

Sample	Depth/Date	Benzene	Toluene	Xylenes	Ethyl-benzene	Total Petroleum Hydrocarbons	EDB	pH
MW C1(1) Ground water[a]		6.4	3.7	4.3	–	37(5)	–	1.58
MW C2(2) Ground water[a]		2.7	1.9	1.5	–	30(5)	–	1.45
MW C3(3) Ground water[a]		0.049	0.024	0.02	–	3.3(5)	–	1.19
MW C4(4) Ground water[a]		0.003	0.004	0.005	–	0.57(5)	–	1.19
Soil Sample[b],(22,24)								
#1	18'	–	–	–	–	5,200(9)	–	–
#2	18'	–	–	–	–	8.8(8,9)	–	–
#3	18'	–	–	–	–	1,400(9)	–	–
#7	7'	–	–	–	–	<10(7)	–	–
#8	Composite of samples at 12" below surface(6)		–	–	–	3,900(9)	–	–
#104	18'	–	–	–	–	620(9)	–	–
#105	18'	–	–	–	–	1,300(9)	–	–
#106	18'	–	–	–	–	490(9(	–	–
#107	9'	–	–	–	–	<10(7)	–	–
Soil Sample[c]								
#1	Composite: 3-6" below surface	–	–	–	–	3.1(12)	–	–
#2	Composite: 3-6" below surface	–	–	–	–	4.9(12)	–	–
Soil Sample[d]								
TMA/ERG# 9235-1A-1D(15)	6-12" below surface		–	–	–	110(14)	–	–
Soil Sample[e],(23)								
#1	No depth given	–	–	–	–	49(16)	–	–
#2	No depth given	–	–	–	–	170(16)	–	–
#3	No depth given	–	–	–	–	>1(16)	–	–
#4	No depth given	–	–	–	–	1.2(16)	–	–
#5	No depth given	–	–	–	–	30(16)	–	–

Sample	Depth/Date	Benzene	Toluene	Xylenes	Ethyl-benzene	Total Petroleum Hydrocarbons	EDB	pH
Soil Sample[f]								
ERG #9029-1(17)	6"	–	–	–	–	4.2(16)	–	–
9029-2(18)	4"	–	–	–	–	<2(16)	–	–
9029-3(19)	8"	–	–	–	–	4(16)	–	–
9029-4(20)	4"	–	–	–	–	24(16)	–	–
Soil Sample[g]								
ERG #9007(21)	Composite, 4.8" below surface(25)		–	–	–	<1(16)	–	–

1. Designated as C01 on TMA/ERG lab report.
2. Designated as C02 on TMA/ERG lab report.
3. Designated as C03 on TMA/ERG lab report.
4. Designated as C04 on TMA/ERG lab report. Also, R. Fay states that two samples were submitted for rush analysis, but four are shown on the table attached to his letter.
5. Reported as total hydrocarbon gasoline.
6. Stockpile soil composite from sample points A-E on Blaine Tech Services map dated 6/19/86.
7. Reported as waste oil, by extraction.
8. Note on report says this was "originally reported 3.3, may have a matrix problem".
9. Reported as gasoline.
10. ERG #9287-1 A-D, client ID #86253 F1 1A-1D. Stockpile soil composite taken from points 1A-1D on Blain Tech Services map dated 9/10/86.
11. ERG #9287-2 A-D, client ID #86253 F1 2A-2D. Stockpile soil composite taken from points 2A-2D on Blaine Tech Services map dated 9/10/86.
12. Reported as total hydrocarbon response, against known concentrations of n-heptane-isooctane (55/45).
13. No accompanying map.
14. Reported as total hydrocarbon response against known quantities of gasoline.
15. Client ID #86240 M1 1A-D; sample locations shown on Blaine map dated 8/28/86.
16. Reported as total hydrocarbon response, against known concentrations of heptane-isooctane (55/45).
17. Client ID #86210 F1 #1. Shown on Blaine Tech Services map dated 7/29/86.
18. Client ID #86210 F1 #2. Shown on Blaine Tech Services map dated 7/29/86.
19. Client ID #86210 F1 #3. Shown on Blaine Tech Services map dated 7/29/86.
20. Client ID #86210 F1 #4. Shown on Blaine Tech Services map dated 7/29/86.
21. Composite sample, Client ID #'s 86204 F3, 10A, 10B, 10C.
22. Sample locations shown on Blaine Tech Services map dated 6/19/86.
23. Client ID#'s 86220 B1 #1, 86220 B1 #2, 86220 B1 #3, 86220 B1 #4, and 86220 B1 #5.
24. Client ID#'s 86170 M2 #1, 86170 M2 #2, 86170 M2 #3, 86170 M2 #104, 86170 M2 #105, 86170 M2 #106, 86170 M2 #7, 86170 M2 #107, and 86170 M2 #8.
25. Sample locations shown on Blaine Tech Services map dated 7/23/86.

Data Source List

a. Flay, R. 1986. Letter-report from Thermo Analytical, Inc. (TMA/ERG) to Wayne Smith, Chevron, U.S.A., dated 28 October 1986.

b. Flay, R. 1986. Letter-report from TMA/ERG to Vicki HObbs, Chevron, U.S.A. dated 23 June 1986.

c. Flay, R. 1986. Letter-report from TMA/ERG to Vicki Hobbs, Chevron, U.S.A. dated 11 September 1986.

d. Flay, R. 1986. Letter-report from TMA/ERG to Vicki HObbs, Chevron, U.S.A. dated 2 September 1986.

– e. Flay, R. 1986. Letter-report from TMA/ERG to Vicki Hobbs, Chevron, U.S.A., dated 12 August 1986.

f. Flay, R. 1986. Letter-report from TMA/ERG to Vicki Hobbs, Chevron, U.S.A., dated 31 July 1986.

g. Flay, R. 1986. Letter-report from TMA/ERG to Vicki Hobbs, Chevron, U.S.A., dated 29 July 1986.