

Aquatic & Environmental Applications

December 15, 1999

3582

REF: 1004-T2.RPT

Mr. Barney Chan
Environmental Health
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1131 Harbor Bay Pkwy
Alameda, CA 94502-6577

**SUBJECT: TIER 2 RISK ASSESSMENT FOR MOTOR PARTNERS,
1234 40TH AVE., OAKLAND, CA.**

Dear Barney:

I have enclosed a copy of the Tier 2 Risk Assessment completed for the Motor Partners site, 1234 40th Avenue, Oakland, California. The results of the risk assessment suggest that hydrocarbon contamination at the Motor Partners site does not provide a significant risk to human health and the environment. It is recommended that the site be considered for closure.

If you have any questions or comments, please give me a call.

Sincerely,



Gary Rogers, Ph.D.
Environmental Consultant

cc: Bill Owens

ENVIRONMENTAL
PROTECTION
99 DEC 22 PM 6: 16

**TIER 2
RISK ASSESSMENT**

PROJECT SITE:

**MOTOR PARTNERS SITE
1234 40TH AVE., OAKLAND, CA
StID #3682**

PREPARED FOR:

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SUBMITTED TO:

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PROJECT NO. 1004.95

December 15, 1999

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1.0 BACKGROUND INFORMATION

1.1 PROJECT DESCRIPTION

This study was conducted to determine the potential future health risks of contaminants in ground water and sediments at the Motor Partners site, 1234 40th Avenue, Oakland, California. This report presents the results of a Tier 2 Risk Assessment.

The analysis has been conducted to determine the risk of residual chemicals at the site especially down gradient of the former underground storage tank area. A Risk Based Corrective Action (RBCA) approach in accordance with the American Society for Testing and Materials (ASTM) Standard Guidance for Risk-Based Corrective Action Applied at Petroleum Release Sites (E 1739-95) has been used to evaluate the potential risk. The RBCA Toolkit for Chemical Releases supplied by Groundwater Services, Inc. (GSI) has been used in this evaluation.

1.2 PROJECT SITE INFORMATION

The project site is known as Motor Partners, 1234 40th Avenue, Oakland, California (Figure 1), located in a commercial/light industrial area. The elevation of the site is approximately 25 feet above mean sea level.

Motor Partners is located near Nimitz Highway (880) in the Fruitvale District of Oakland, California (Figure 1). The BART rail tracks are about 500 feet west of the site and San Leandro Bay is less than one mile to the southwest.

Motor Partners utilized the site for auto repair shops. Two underground storage tanks were maintained outside the 1234 40th Avenue building. A 1,000-gallon underground gasoline tank and a 500-gallon underground waste oil tank were located below the sidewalk (Figure 2). No reliable records exist to determine if inventory was lost.

1.3 TANK REMOVALS

On Oct. 12, 1990, Semco, Inc. of Modesto, California removed both the 1,000-gallon gasoline tank and the 500-gallon waste oil tank. The concentration of total petroleum hydrocarbons in the gasoline range (TPH-G) below the 1,000-gallon tank was 1,600 mg/Kg. The TPH-G and TPH-D concentrations below the 500-gallon tank were 570 mg/Kg and 650 mg/Kg, respectively. There was no record of groundwater in the excavations. The excavations were backfilled to grade with original spoils.

In January, 1994, SEMCO re-excavated the area to remove contaminated soil, and dispose of the contaminated backfill. During the course of over excavation, it was noted that contamination extended beneath the building and into the street. Utilities prevented further excavation. The over excavation was halted and samples taken from the sidewalls of each excavation. An

extraction well casing was installed in each excavation. Clean imported soil was used to backfill the two areas and the sidewalk was resurfaced with Christy boxes housing the two extraction casings.

Sampling conducted on January 11, 1994 indicated levels of TPH-gasoline for the former waste oil tank area between 100 and 700 ppm. Levels of TPH-gasoline for the former gasoline tank area ranged from 150 to 1,200 ppm.

1.4 SOIL BORINGS

GROWTH Environmental completed soil borings at the property between May and June of 1994. Eleven borings were drilled and three monitoring wells were installed. Both soil and groundwater samples were collected from the borings. Soil and groundwater contamination was found in nearly every boring. Levels of TPH-D up to 2,700 ppm were observed on the west side of the building. A sample from inside the building had a TPH-D level of 520 ppm.

Groundwater samples had highest concentrations near the former tank excavations. The highest level of TPH-G was 64,000 ppb. BTEX compounds were found in groundwater samples from all the borings. Three monitoring wells were installed on June 14-15, 1994. Two of the wells were located in the street (40th Avenue) and one well was inside the building (see Figure 2 for location).

The monitoring wells were sampled on June 17, 1994 and December 7, 1994. Contamination was reported in all three wells. Levels of TPH-G were up to 17,000 ppb and Benzene levels were up to 1,200 ppb in MW-1.

A quarterly monitoring sampling event was completed on November 29, 1995. All of the wells showed increased TPH-G and BTEX levels when compared to the previous sampling event. TPH-G levels were up to 67,000 ppb in MW-1. The groundwater gradient was calculated to be in a southwesterly direction.

Additional geoprobe borings were completed along 40th Avenue between November, 1995 and February, 1996 to determine the extent of contamination.

On February 1, 1996, Bay Area Exploration drilled a soil boring across the street from the former underground storage tank excavations at the Motor Partners site (location shown in Figure 3). A two-inch groundwater monitoring well (MW-4) was installed in the boring. The monitoring well was installed according to State of California Water Resource Control Board standards to a depth of 25 feet below grade surface (bgs) and screened from 5 to 25 feet bgs.

On February 11, 1998, HK2, Inc./SEMCO drilled a soil boring inside the building and down gradient from the former underground storage tank excavations (location shown in Figure 3). A two-inch groundwater monitoring well (MW-5) was installed in the boring. The monitoring well was installed to a depth of 21 feet below grade surface (bgs) and screened from 6 to 21 feet bgs.

After purging and sampling the wells on September 24, 1998, Aquatic & Environmental Applications implemented a program of enhanced natural attenuation at the site by installing Oxygen Release Compound (ORC[®]) filter packs in three of the five wells. Monitoring of microbiological and chemical parameters is on-going at the site.

See Appendix 1

1.5 GEOLOGY AND HYDROGEOLOGY

Regional Geology.

The site is located on the East Bay Plain about 1.0 mile west of the Oakland Hills, about 1.0 mile east of the San Francisco Bay, and about 0.5 miles north of San Leandro Bay. The property is bounded on the northeast by 14th Street.

The site rests on Quaternary Deposits of various physical and compositional properties. The predominant formation is the Temescal Formation consisting of contemporaneous alluvial units of different origin, lithology, and physical properties. The material ranges from irregularly bedded clay, silt, sand and gravel to lenses of clay, silt, sand, and gravel with Claremont Chert.

The Hayward Fault is approximately 1.5 miles East of the site and is an active historic Fault. The Hayward Fault is the only active fault in the Oakland East Quadrangle.

Regional Hydrogeology.

The site is located within the East Bay Plain which makes up the ground water reservoir in the area. The water bearing capacity varies within the area due to the juxtaposed positions of the various types of soils and strata encountered underneath the East Bay Plain.

In General the water bearing capacities of the Younger Alluvium range from moderately permeable to low permeable soils. Below the Younger Alluvium at a depth of approximately 70 feet lies the Older Alluvium, which yields large to small quantities of well water.

Site Geology. The site soils were characterized using the United Soil Classification System (USCS). During on-site subsurface drilling, CEC (GROWTH) encountered up to two feet of baserock (fill) followed by a 4 to 5 foot layer of dark sandy clay (CL). Below the dark clay to a depth between 7 and 15 feet, a grey sandy gravel was found. Below the sandy gravel the soil varied between a clayey sand to a sandy silty clay (SC). The gravels are poorly sorted, angular to rounded clasts ranging in size from 0.2 cm to 3.0 cm.

Site Hydrogeology. The depth of first water ranged from 8 to 10 feet below the ground surface (bgs) in the borings. Groundwater was encountered within the grey clayey sandy gravel layers.

2.0 INPUT DATA FOR TIER 2 RISK ANALYSIS

The methods for this risk analysis follow the guidelines presented in the ASTM document, ASTM E-1739, "Standard Guide for Risk-Based Corrective Action (RBCA) Applied at Petroleum Release Sites." The RBCA process includes EPA risk assessment practices in addition to site investigation activities to determine cost-effective methods for protection of environmental health and resources. For this study, the RBCA Toolkit for Chemical Releases (Groundwater Services, Inc.) computer model was used in the risk evaluation.

2.1 Summary of Previous Data

Tables 1 through 6 present all of the data gathered from soil and groundwater sampling completed at the Motor Partners site. The following summaries list information and analytical results that have been used in this Risk Analysis. Additional information is available in the referenced documents.

SITE DESCRIPTION		
Motor Partners, 1234 40th Ave., Oakland, California		
Subject	Discussion	Reference
Site Address	1234 40th Avenue, Oakland, California	CEC, 1994a
Site Owner/Contact	Bill Owens 2221 Olympic Blvd. Walnut Creek, California	CEC, 1994a
Agency Contacts	Barney Chan Alameda County Environmental Health 1131 Harbor Bay Parkway Alameda, California	CEC, 1994a
Local Land Use	Commercial Property	CEC, 1994a
Topography	Flat Surface Topography Sloping Slightly toward San Francisco Bay	CEC, 1994a
Surface Water Characterization	San Francisco Bay approximately 1 mile to west	CEC, 1994a

SITE ACTIVITY RECORD Motor Partners Site, 1234 40th Ave., Oakland, California		
Subject	Discussion	Reference
Materials Handling Activities	Former Underground Fuel Tank and Waste Oil Tank	CEC, 1994a
Waste Disposal Practices	Unknown	
Active Site or Vacant?	Site currently used for Mexican Restaurant business; previously used by Motor Partners as an auto repair facility.	CEC, 1994a
Potential Sources for Spills	Two Underground Storage Tanks at the site until 1990. Duration, time and volume of leak unknown.	CEC, 1994a
Potential Off-site Sources	Plume at Motor Partners site co-mingled with plume from across 40th Avenue -- Hausauer Site (3927 E 14th Street).	Kelleher

SUMMARY OF SITE ACTIVITIES
Motor Partners Site, 1234 40th Ave., Oakland, California

Subject	Discussion	Reference
Underground Tanks Removed	<p>One 1,000 gallon underground gasoline tank removed on October 12, 1990</p> <p>One 500 gallon underground waste oil tank removed on October 12, 1990</p>	CEC, 1994a
Over Excavation Performed	<p>January 1994 area re-excavated. Utilities limited over excavation.</p> <p>Approximately 100 tons of soil was removed and stockpiled offsite.</p>	CEC, 1994a
Site Investigation	<p>Eleven (11) soil borings inside building and in the street (40th Ave.) completed between May and June, 1994</p> <p>Additional borings in November 1995 and February 1996</p>	CEC, 1994c
Monitoring Wells Installed	<p>Three wells installed on June 14-15, 1994 in vicinity of the former USTs. (MW-1, MW-2, and MW-3)</p> <p>One additional well installed on February 1, 1996 across 40th Ave., in street. (MW-4)</p> <p>One additional well installed inside building February 11, 1998. (MW-5)</p>	<p>CEC, 1994c</p> <p>RES, 1996a</p> <p>AEA, 1998c</p>

SUMMARY OF SITE ACTIVITIES
Motor Partners Site, 1234 40th Ave., Oakland, California

Subject	Discussion	Reference
Sampling of Wells	Wells sampled quarterly	RES, 1995a AEA, 1997c RES, 1996a AEA, 1998c RES, 1996b AEA, 1998d RES, 1996d AEA, 1998e RES, 1996e AEA, 1999a RES, 1997a AEA, 1999b RES, 1997b AEA, 1999c AEA, 1997b AEA, 1999d
Groundwater Pumping	4" extraction casings installed in each of former UST areas. However, no groundwater has been pumped from the extraction casings. 500 gallons of groundwater was pumped from MW-1 during aquifer pump test	RES, 1996c
Pilot Tests	Aquifer pump test completed in May 1996 Soil vapor extraction pilot test completed in November, 1996	RES, 1996c RES, 1996f
Enhanced Bioremediation	Program of enhanced bioremediation initiated in February 1998 by installing ORC filter socks in wells.	AEA, 1998b

HYDROGEOLOGIC CONDITIONS		
Motor Partners Site, 1234 40th Ave., Oakland, California		
Subject	Discussion	Reference
Regional Geology	Quaternary deposits, part of Temescal Formation. Interbedded clay, silt, sand and gravel. Hayward fault about 1.5 miles to east. Elevation of site approximately 20 above msl.	CEC, 1994a
Regional Hydrogeology	East Bay Plain groundwater reservoir.	CEC, 1994a
Depth to Groundwater	The depth to groundwater is approximately 8-10 feet	CEC, 1994a
Site Geology	Up to 2' baserock 4-5' layer clay 7-15' sandy gravel below 15' - clay	CEC, 1994a
Site Hydrogeology	Groundwater flow and direction, calculated using MW-1, MW-2, and MW-3, has trended to the south-southwest at 0.0029 to 0.0098 ft/ft. Average gradient of 0.0067 ft/ft.	AEA, 1999d
Groundwater Quality	Hydrocarbon contamination documented in vicinity of former USTs. Levels of Benzene from the well inside building have ranged from 11 (1999) to 1300 ppb (1997).	CEC, 1994c RES, 1997b AEA, 1999d

ANALYTICAL SUMMARY							
Motor Partners Site, 1234 40th Ave., Oakland, California							
Subject	Media	Benzene	Toluene	Xylenes	Ethyl benzene	TPH-G	TPH-D
Analytical Method	Soil	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8015M	EPA 8015M
	Groundwater	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8015M	EPA 8015M
Reporting Limits	Soil (ppm)	0.005	0.005	0.005	0.005	1.0	1.0
	Groundwater (ppb)	0.5	0.5	0.5	0.5	50	50
Summary of Data	Max. Soil (ppm), date, location	5/17/94 15 B-5-2	6/1/94 8.4 B-4-3	6/1/94 71 B-4-3	6/1/94 36 B-2-2	6/1/94 1,900 B-2-2	5/17/94 2,700 B-5-2
	Max. Groundwater (ppb), date, location	9/2/97 1300 MW-1	6/17/94 220 MW-1	11/29/95 3,100 MW-1	11/29/95 1,300 MW-1	11/29/95 67,000 MW-1	11/29/95 53,000 MW-1
Input Data for Tier 2 Assessment	Soil levels inside bldg (ppm)	0.49	0.53	13	3.9	260	140
	Average GW levels inside bldg as of 10-99 (ppb)	73	3.7	48.5	38	795	470

ND = Not detected

NA = Not analyzed

ppm = parts per million

ppb = parts per billion

2.2 Well Survey

A well survey was completed previously for a half mile radius around the Motor Partners property. (RES, 1997c. Tier 1 Risk Assessment completed for Motor Partners, 1234 40th Avenue, Oakland, California. August 13, 1997). The following table summarizes the results.

Well Inventory Summary (Within 0.5 mile radius of Site) Motor Partners Site, 1234 40th Ave., Oakland, California		
Type of Well	Total Number of Wells (Within 0.5 mile radius of Site)	Number in Downgradient Direction of Site
Public/Municipal (MUN)	0	0
Industrial (IND)	1 ^a	0
Domestic (DOM)	1 ^b	1 ^b
Agricultural (IRR)	3 ^c	1 ^d

a - 4701 San Leandro Street

b - 500 High Street

c - 39th Avenue

4251 E 14th Street

3701 E 8th Street

d - 3801 E 8th Street

2.3 Constituents of Concern

2.3.1 Media of Concern

In general, air, soil, and groundwater are the media through which exposure to contaminants may occur. For the Motor Partners site, exposure may occur by way of the air (from contaminants that may volatilize from contaminated soil or ground water) or by direct exposure to contaminated soils. In addition, direct groundwater exposure is possible and was considered in this study.

2.3.2 Contaminants of Concern

Samples from soil and groundwater were collected at the time of tank removals. In addition, site investigations and well sampling has been completed on several occasions. The major contaminants at the site are petroleum hydrocarbons (Total Petroleum Hydrocarbons as Diesel and

Gasoline as well as Benzene, Ethylbenzene, Toluene, and Xylenes). Of the reported chemicals, benzene is the most hazardous chemical at the site and has been found in both soil and groundwater samples. According to the U.S. EPA, benzene is classified as a carcinogen.

2.3.3 Concentrations of Chemicals of Concern Used in the Risk Assessment

The results of consecutive quarterly monitoring events since 1995 have shown that hydrocarbon contamination is decreasing at the site. Groundwater samples from each of the monitoring wells have reported decreases in TPH-D, TPH-G and Benzene.

2.4 Exposure Assessment

2.4.1 Exposure Pathways

The potential exposure pathways for the Motor Partners site include; inhalation of volatile substances and direct contact with contaminated soil (entry through the skin). Drinking water and irrigation wells are located in the area. Therefore, exposure from contact with groundwater was also considered.

2.4.2 Potentially Exposed Population

Because contamination is localized in a small area and soil lithology has prevented significant movement of contaminants, there should be no offsite exposure pathways. In addition, the only known potential for onsite exposure would be in the case of excavation activities. Present site activities should pose no hazard since contamination is confined to a small subsurface area.

2.4.3 Exposure Point Concentration Estimates

The RBCA Toolkit for Chemical Releases (Groundwater Services, Inc.) was used in this study to assess the potential future health risks of the known contaminants at the site. The Tier 2 Risk Assessment utilized average groundwater values from MW-1 and MW-5 for the last quarterly monitoring event (3rd Quarter, 1999) and subsurface soil sample results from within the contaminated area (B-6).

2.4.4 Exposure Frequency and Duration

The exposure period was assumed to be a 70-year lifetime. Other parameters for frequency and duration are presented in Appendix A.

3.0 TIER 2 RISK ANALYSIS RESULTS

Output data sheets from the RBCA Toolkit for Chemical Releases analysis are presented in Appendix A. The following discussion summarizes the results.

3.1 Risk Characterization

The potential health risks to humans exposed to the chemical constituents of concern (COC) are quantified by calculating the average daily intake rates and the toxicological effects for both carcinogenic and noncarcinogenic risks. The toxicological data for each COC is classified as carcinogen (Class A, B, or C), systemic toxicant, or both.

3.1.1 Carcinogenic Risks

The carcinogenic risks are estimated using the following equation that considers chronic exposure to a carcinogen.

$$R = CDI \times SF$$

where, R is the excess lifetime cancer risk, CDI is the chronic daily intake of the carcinogen, and SF is the slope factor for the COC. An excess lifetime cancer risk of 1×10^{-6} indicates an individual has a one in one million chance of developing cancer as a result of exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

The Baseline Risk Summary Table in Appendix A presents the estimated cancer risks for the Motor Partners site. The carcinogenic risk estimate for the critical exposure pathway was 8.7×10^{-6} . This number is less than the target carcinogenic risk of 1.0×10^{-5} .

3.1.2 Hazard Index

The hazard index (HI) is calculated by summing the individual hazard quotients (HQ) for all contaminants within a medium. Both the HI and HQ are used to describe the noncarcinogenic effect of a contaminant. The HQ is calculated using the following equation that describes exposure to a systemic toxicant.

$$HQ = I/RfD$$

where, HQ is hazard quotient, I is the average daily chemical intake for the toxicant, and RfD is the reference dose. The hazard index (HI) is estimated by adding the HQ's. For only one compound, the HQ is equal to the HI. If the HI value is greater than 1.0, exposure could result in adverse health effects. The Baseline Risk Summary Table in Appendix A summarizes the estimated HQ's and HI's for the chemicals of concern at Motor Partners. The estimated HQ is 3.9×10^{-1} , and the HI is 4.0×10^{-1} . Each of these values is less than the target index of 1.0.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The results of this Tier 2 risk assessment suggest that hydrocarbon contamination at the Motor Partners site does not provide a significant risk to human health and the environment. This assessment is based on the following observations and findings:

- 1) Levels of hydrocarbon contamination have decreased at all of the monitoring wells.
- 2) The carcinogenic risk estimate for the critical exposure pathway was 8.7×10^{-6} . This number is less than the target carcinogenic risk of 1.0×10^{-5} .
- 3) The estimated Hazard Quotient is 3.9×10^{-1} , and the Hazard Index is 4.0×10^{-1} . Each of these values is less than the target index of 1.0.

4.2 Recommendations

The results of the risk assessment suggest that hydrocarbon contamination at the Motor Partners site does not provide a significant risk to human health and the environment. The site should be considered a low risk groundwater site. It is recommended that the site be considered for closure.

5.0 REFERENCES

- CEC, 1994a. Work Plan for Remediation, 1234 40th Avenue, Oakland, CA. Prepared by Certified Environmental Consulting, Inc., March 15, 1994.
- CEC, 1994b. Amendments to Work Plan for Remediation, 1234 40th Avenue, Oakland, CA. Prepared by Certified Environmental Consulting, Inc., April 6, 1994.
- CEC, 1994c. Report of Phase I Site Investigation, 1234 40th Avenue, Oakland, CA. Prepared by Certified Environmental Consulting, Inc., September 21, 1994.
- Growth, 1995a. Work Plan for Phase II Site Characterization of Groundwater, 1234 40th Avenue, Oakland, CA. Prepared by Growth Environmental Services, Inc., February 15, 1995.
- Growth, 1995b. Site Investigation Report, 1234 40th Avenue, Oakland, CA. Prepared by Growth Environmental Services, Inc., 1995.
- VISTA, 1995. Site Assessment Plus Report, 1234 40th Avenue, Oakland, CA. Prepared by VISTA Information Services, November 20, 1995.
- RES, 1995a. Report of Quarterly Sampling, 1234 40th Avenue, Oakland, CA. Prepared by Rogers Environmental Services, December 8, 1995.
- RES, 1995b. Revised Work Plan for Phase II Investigation, 1234 40th Avenue, Oakland, CA. Prepared by Rogers Environmental Services, December 19, 1995.
- RES, 1996a. Report of Monitoring Well Installation and Quarterly Sampling, 1234 40th Avenue, Oakland, CA. Prepared by Rogers Environmental Services, February 27, 1996.
- RES, 1996b. Report of Quarterly Monitoring at 1234 40th Avenue, Oakland, CA. Prepared by Rogers Environmental Services, May 28, 1996.
- RES, 1996c. Aquifer Pump Test Report, 1234 40th Avenue, Oakland, CA. Prepared by Rogers Environmental Services, June 1996.
- RES, 1996d. Report of Quarterly Monitoring at 1234 40th Avenue, Oakland, CA. Prepared by Rogers Environmental Services, August 29, 1996.
- RES, 1996e. Quarterly Monitoring Report, 1234 40th Avenue, Oakland, CA. Prepared by Rogers Environmental Services, December 3, 1996.
- RES, 1996f. Report of Soil Vapor Extraction Pilot Test Completed at 1234 40th Avenue, Oakland, CA. Prepared by Rogers Environmental Services, December 16, 1996.

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Aquatic & Environmental Applications, 1998e. Report of Quarterly Monitoring at 1234 40th Avenue, Oakland, CA. October 10, 1998.

Aquatic & Environmental Applications, 1999a. Report of Quarterly Monitoring at 1234 40th Avenue, Oakland, CA. January 4, 1999.

Aquatic & Environmental Applications, 1999b. Report of Quarterly Monitoring at 1234 40th Avenue, Oakland, CA. April 1, 1999.

Aquatic & Environmental Applications, 1999c. Report of Quarterly Monitoring at 1234 40th Avenue, Oakland, CA. July 9, 1999.

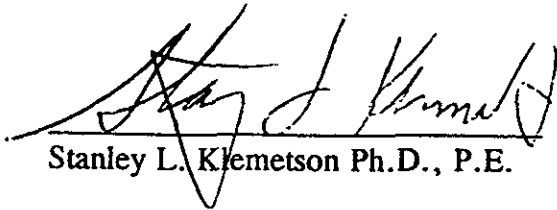
REFERENCES (CONTINUED)

Aquatic & Environmental Applications, 1999d. Report of Quarterly Monitoring at 1234 40th Avenue, Oakland, CA. October 11, 1999.

6.0 LIMITATIONS

This report has been prepared in accordance with generally accepted environmental, geological and engineering practices. No warranty, either expressed or implied is made as to the professional advice presented herein. The analysis, conclusions, and recommendations contained in this report are based upon site conditions as they existed at the time of the investigation and they are subject to change.

The conclusions presented in this report are professional opinions based solely upon visual observations of the site and vicinity, and interpretation of available information as described in this report. The scope of services performed in execution of this investigation may not be appropriate to satisfy the needs of other users and any use or reuse of this document or its findings, conclusions or recommendations presented herein is at the sole risk of the said user.



Stanley L. Klemetson Ph.D., P.E.



7.0 FIGURES

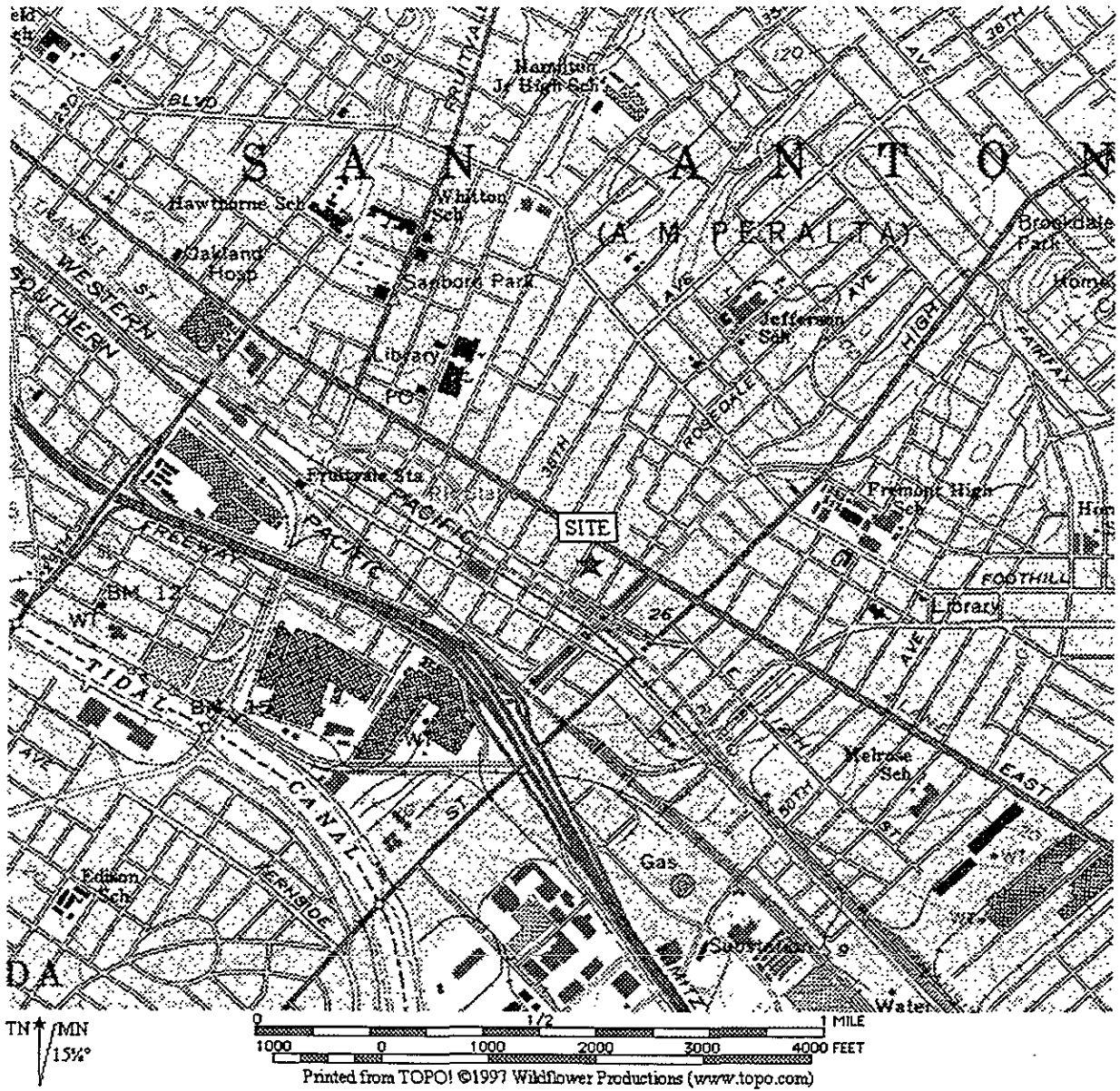
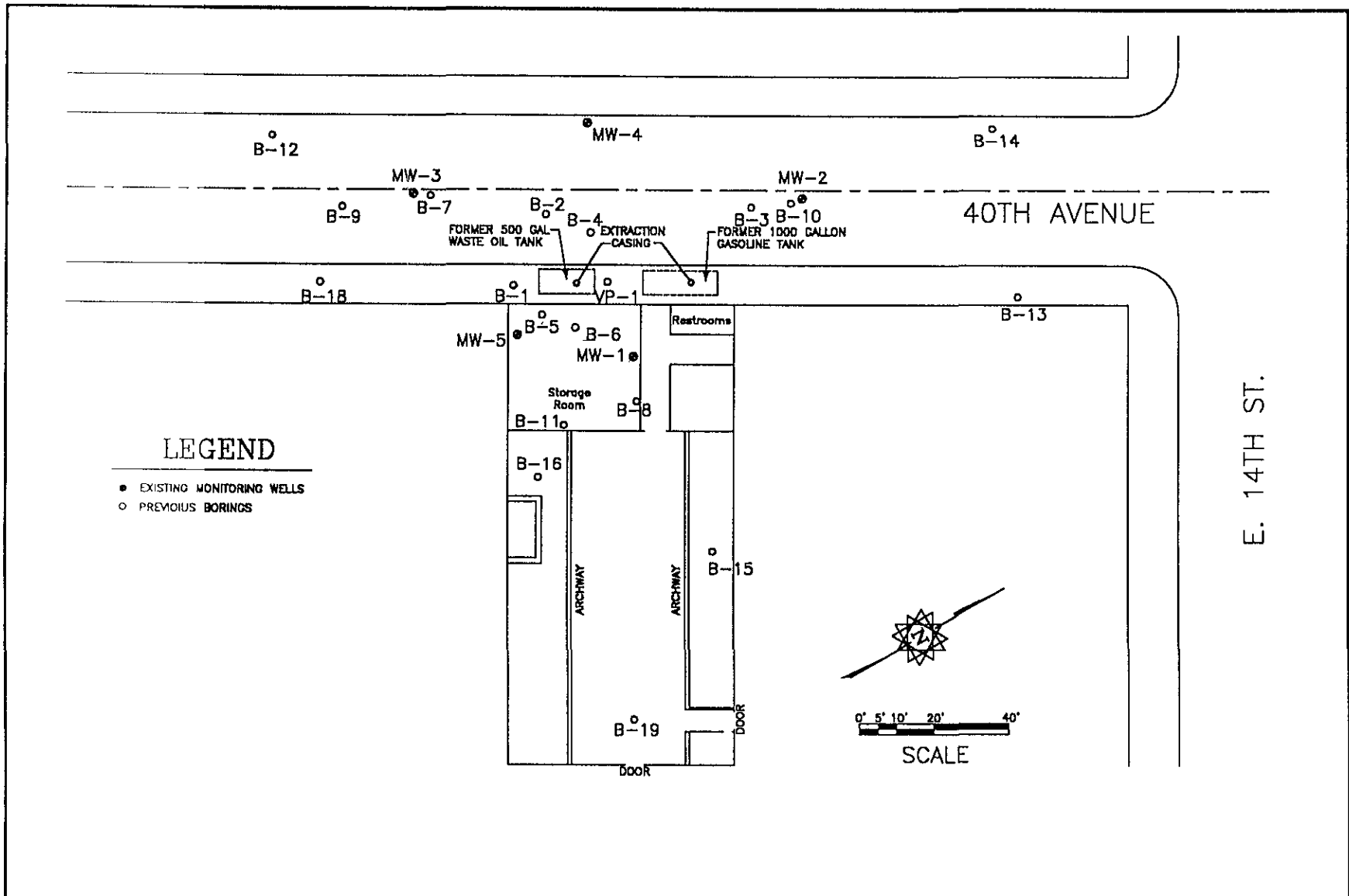
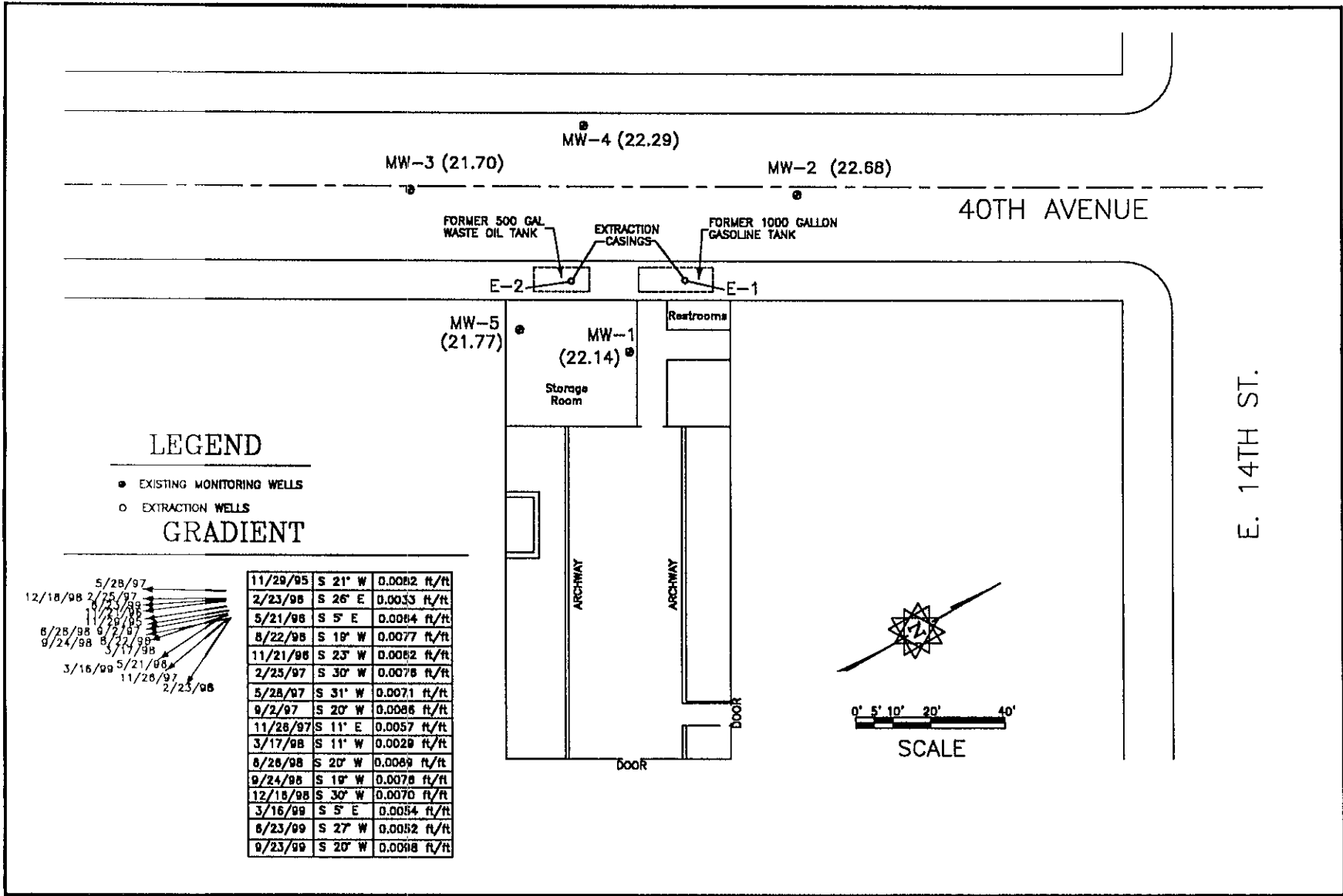


Figure 1. Site Location Map



AQUATIC & ENVIRONMENTAL APPLICATIONS 38053 DAVY CT. FREMONT, CA 94536 (510) 791-7157	DRAWN BY GLR	PROJECT NUMBER 1004	DESCRIPTION Site Layout	FIGURE 2
	DRAWING DATE 12/13/99	FILE NAME 1004-T2.DWG		
	REVISION BY	PROJECT MANAGER GLR	PROJECT/LOCATION Motor Partners 1234 40th Ave., Oakland	
	REVISION BY	CHECKED BY		



AQUATIC & ENVIRONMENTAL APPLICATIONS 38053 DAVY CT. FREMONT, CA 94536 (510) 791-7157	DRAWN BY GLR	PROJECT NUMBER 1004	DESCRIPTION Ground Water Gradient	FIGURE 3	
	DRAWING DATE 12/13/99	FILE NAME 1004-T2.DWG			
	REVISION BY	PROJECT MANAGER GLR	PROJECT/LOCATION Motor Partners 1234 40th Ave., Oakland		
	REVISION BY	CHECKED BY			

8.0 TABLES

Table 1. Summary of Soil Sampling Results
Motor Partners Site, 1234 40th Ave., Oakland, California

Sample I.D. Number	Date Collected	Depth (ft)	TPH-D (mg/kg)	TPH-G (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl Benzene (mg/kg)	Total Xylenes (mg/kg)
B-1-2 @ 9'	5-17-94	9	260	850	0.55	0.63	0.42	3.6
B-2-2 @ 9.5'	6-1-94	9.5	1,000	1,900	ND	5.0	36	29
B-3-1 @ 6'	5-17-94	6	ND	910	ND	0.026	0.049	0.092
B-4-1 @ 3'	6-1-94	3	ND	ND	ND	ND	ND	ND
B-4-2 @ 7.5'	6-1-94	7.5	44	83	0.087	0.20	0.21	0.46
B-4-3 @ 11'	6-1-94	11	450	1,000	5.6	8.4	15	71
B-5-2 @ 12'	5-17-94	12	2,700	1,100	15	3.7	13	24
B-6-1 @ 9.5'	5-17-94	9.5	140	260	0.49	0.53	3.9	13
B-7-1 @ 6'	6-1-94	6	ND	3.0	0.01	ND	ND	0.019
B-7-2 @ 10.5'	6-1-94	10.5	280	1,100	0.38	1.9	3.4	5.9
B-8-1 @ 6'	6-1-94	6	ND	ND	ND	ND	ND	ND
B-8-2 @ 11'	6-1-94	11	ND	ND	ND	ND	ND	ND
B-9-1 @ 6'	6-2-94	6	ND	ND	ND	ND	ND	0.008
B-9-2 @ 11'	6-2-94	11	ND	1.8	ND	ND	ND	0.01
B-10-1 @ 4'	6-2-94	4	ND	ND	ND	ND	ND	ND
B-10-2 @ 9'	6-2-94	9	ND	2.3	ND	ND	0.007	0.01
B-11-1 @ 4.5'	6-2-94	4.5	ND	ND	ND	ND	ND	ND
B-11-2 @ 9.5'	6-2-94	9.5	520	30	ND	ND	ND	0.073
B-16-3	11-30-95	11.5	640	190	0.1	0	0	3.2
B-15-3	11-30-95	14.5	0	0	0	0	0	0
B-19-2	11-30-95	14.5	0	0	0	0	0	0
B-14-2	2-7-96	12	0	0	0	0	0	0
B-13-2	2-7-96	11	0	0	0	0	0	0
B-12-2	2-7-96	11	150	200	0	0.084	0.62	0.8
B-18-2	2-7-96	11	0	0	0	0	0	0
MW-4-2	2-1-96	10	350	470	0.05	0.14	4.3	1.8
VP-1-1	2-7-96	2.5	240	31	0.01	0	0.24	0.038
VP-1-2	2-7-96	7.5	0	0	0	0	0	0

Notes:

All soil results in mg/kg (ppm)

ND = Not Detected

NA = Not Analyzed

**Table 2. Summary of Groundwater Sampling Results
Motor Partners Site, 1234 40th Ave., Oakland, California**

Sample I.D. Number	Date Collected	TPH-D ($\mu\text{g/L}$)	TPH-G ($\mu\text{g/L}$)	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethyl Benzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)
B-1-W-1	5-17-94	16,000	16,000	210	46	150	190
B-2-W	6-1-94	7,000	8,100	220	34	220	60
B-3-W-4	5-17-94	620	910	5.3	2.5	3.0	5.0
B-4-W	6-1-94	4,900	38,000	3,200	1,800	2,000	7,100
B-5-W-2	5-17-94	2,100	3,700	370	25	180	160
B-6-W-3	5-17-94	8,600	64,000	2,900	5,200	3,800	13,000
B-7-W	6-1-94	4,500	12,000	380	36	520	170
B-8-W	6-1-94	470	570	6.8	3.2	1.7	5.7
B-9-W	6-2-94	ND	160	2.8	0.62	ND	0.61
B-10-W	6-2-94	1,700	6,100	28	29	14	62
B-11-W	6-2-94	94	750	6.8	3.2	1.7	5.7
B-16	11/30/95	300	2000	0	2	0	65
B-15	11/30/95	80	0	0	0	0	0
B-19	11/30/95	0	0	0	0	0	0
B-14	2/7/96	0	0	0	0	0	0
B-13	2/7/96	0	400	3	0	2	3
B-12	2/7/96	16000	22000	250	7	210	120
B-18	2/7/96	0	0	0	0	0	0
California Drinking Water MCL ($\mu\text{g/L}$)		None Listed	None Listed	1.0	1000	680	1750
Detection Limit		50	50	0.5	0.5	0.5	0.5

Notes:

All groundwater results in $\mu\text{g/L}$ (ppb)

ND = Not Detected

NA = Not Analyzed

**Table 3. Monitoring Well Construction Data
Motor Partners Site, 1234 40th Ave., Oakland, California**

	MW-1	MW-2	MW-3	MW-4	MW-5
Date Drilled	6/15/94	6/14/94	6/14/94	2/1/96	2/11/98
Total Depth	22.5 ft.	22.0 ft.	23.0 ft.	23.0 ft.	21.0 ft.
Bore Diameter	10 inches	10 inches	10 inches	10 inches	6 inches
Casing Diameter	2 inch	2 inch	2 inch	2 inch	2 inch
Well Seal Type	Bentonite Pellets	Bentonite Pellets	Bentonite Pellets	Bentonite Pellets	Bentonite Pellets
Well Seal Interval	5.0 - 6.0 bgs	5.0 - 6.0 bgs	5.0 - 6.0 bgs	3.0 - 4.0 bgs	4.0 - 5.0 bgs
Filter Pack Material	2/14 Lonestar Sand	2/14 Lonestar Sand	2/14 Lonestar Sand	2/14 Lonestar Sand	2/14 Lonestar Sand
Filter Pack Interval	6.0 - 17.0 bgs	9.0 - 20.0 bgs	6.5 - 20.0 bgs	4.0 - 25.0 bgs	5.0 - 21.0 bgs
Screen Slot Size	0.020 in.	0.020 in.	0.020 in.	0.010 in.	0.020 in.
Screened Interval	7.0 - 17.0 bgs	10.0 - 20.0 bgs	7.0 - 20.0 bgs	5.0 - 25.0 bgs	6.0 - 21.0 bgs
Well Elevation ¹	31.44 ft.	31.06 ft.	31.43 ft.	31.37 ft.	31.15 ft.

¹TOC -Top of Casing Elevations for MW-1, MW-2, MW-3, and MW-4 were surveyed on 8/22/96 by Kier & Wright Civil Engineers & Surveyors, Inc. TOC. Elevation for MW-5 surveyed on 3/20/98 by AEA.

**Table 4. Groundwater Elevation Results at Motor Partners Site
1234 40th Ave., Oakland, California**

	DATE	MW-1	MW-2	MW-3	MW-4	GRADIENT
TOC		31.44 ft	31.06 ft	30.43 ft.	30. 37 ft.	
SWL	11/29/95	10.13	9.31	9.53		S 21° W
GSE		21.31	21.75	20.90		0.0082 ft/ft
SWL	2/23/96	4.59	3.77	3.56	3.17	S 26° E
GSE		26.85	27.29	26.87	27.20	0.0033 ft/ft
SWL	5/21/96	6.04	5.24	5.29	4.68	S 5° E
GSE		25.40	25.82	25.14	25.69	0.0064 ft/ft
SWL	8/22/96	8.46	7.66	7.88	7.10	S 19° W
GSE		22.98	23.40	22.55	23.27	0.0077 ft/ft
SWL	11/21/96	8.44	7.73	7.76	7.31	S 23° W
GSE		23.00	23.33	22.67	23.06	0.0062 ft/ft
SWL	2/25/97	6.53	5.78	5.97	5.06	S 30° W
GSE		24.91	25.28	24.46	25.31	0.0076 ft/ft
SWL	5/28/97	8.08	7.38	7.53	6.94	S 31° W
GSE		23.36	23.68	22.90	23.43	0.0071 ft/ft
SWL	9/2/97	9.08	8.24	9.26	7.84	S 20° W
GSE		22.36	22.82	21.17	22.53	0.0086 ft/ft
SWL	11/26/97	7.98	7.24	7.06	6.64	S 11° E
GSE		23.46	23.82	23.37	23.73	0.0057 ft/ft

TOC - Top of Casing Elevations for MW-1, MW-2, MW-3, and MW-4 were surveyed on 8/22/96 by Kier & Wright Civil Engineers & Surveyors, Inc.

SWL - Static Water Level (ft)

GSE - Groundwater Surface Elevation (feet relative to mean sea level)

Table 4 (Continued)
Groundwater Elevation Results at Motor Partners Site
1234 40th Ave., Oakland, California

	DATE	MW-1	MW-2	MW-3	MW-4	MW-5	GRADIENT
TOC		31.44 ft	31.06 ft	30.43 ft.	30. 37 ft.	31.15 ft.	
SWL	3/17/98	5.84	5.05	5.11	4.52	5.80	S 11° W
GSE		25.60	26.01	25.32	25.85	25.35	0.0029 ft/ft
SWL	6/26/98	7.09	6.24	6.52	5.52	7.07	S 20° W
GSE		24.35	24.82	23.91	24.85	24.08	0.0089 ft/ft
SWL	9/24/98	8.74	7.94	8.13	7.23	8.76	S 19° W
GSE		22.70	23.12	22.30	23.14	22.39	0.0076 ft/ft
SWL	12/16/98	7.11	6.42	6.52	5.92	7.19	S 30° W
GSE		24.33	24.64	23.91	24.45	23.96	0.0070 ft/ft
SWL	3/16/99	5.26	4.54	4.36	4.12	5.14	S 5° E
GSE		26.18	26.52	26.07	26.25	26.01	0.0054 ft/ft
SWL	6/23/99	7.62	6.87	7.06	6.42	7.66	S 27° W
GSE		23.82	24.19	23.37	23.95	23.49	0.0052 ft/ft
SWL	9/23/99	9.30	8.38	8.73	8.08	9.38	S 20° W
GSE		22.14	22.68	21.70	22.29	21.77	0.0098 ft/ft
SWL							
GSE							
SWL							
GSE							

TOC - Top of Casing Elevations for MW-1, MW-2, MW-3, and MW-4 were surveyed on 8/22/96 by Kier & Wright Civil Engineers & Surveyors, Inc. Elevation for MW-5 surveyed on 3/20/98 by AEA.

SWL - Static Water Level (ft)

GSE - Groundwater Surface Elevation (feet relative to mean sea level)

Table 5
Quarterly Groundwater Sampling Results at Motor Partners
1234 40th Ave., Oakland, California

Sample I.D. Number	Date Collected	TPH-D ($\mu\text{g/L}$)	TPH-G ($\mu\text{g/L}$)	MTBE ($\mu\text{g/L}$)	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethyl Benzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)
MW-1	6/17/94	2,400	17,000		1,200	220	1,000	2,600
	11/29/95	53,000	67,000		860	180	1,300	3,100
	2/23/96	25,000	16,000		360	ND	370	740
	5/21/96	650	11,000		290	37	600	1,300
	8/22/96	ND	13,000		270	51	540	1,400
	11/21/96	5,500	15,000		810	79	680	1,700
	2/25/97	3,900	15,000		430	36	760	1,200
	5/28/97	3,700	7,600		110	15	370	870
	9/2/97	8,200	18,000	ND	1,300	81	1,300	2,800
	11/26/97	14,000	24,000	81	760	75	660	2,100
	3/17/98	5,000	14,000	150	360	120	650	1,200
	6/26/98	1,200	2,500	ND	60	5.6	76	110
	9/24/98	2,200	5,100	310	220	27	300	590
ORC Filter Socks Installed 9/24/98 in MW-1, MW-3, and MW-5								
	12/16/98	450	1,400	ND	57	3.7	42	80
	3/16/99	270	580	ND	11	1.4	8.3	11
	6/23/99	2,600	5,400	ND<10	30	19	190	420
	9/23/99	470	1,100	ND	130	4.1	74	92
California Drinking Water MCL		None Listed	None Listed	None Listed	1.0	1,000	680	1,750
Reporting Limit		50	50	5	0.5	0.5	0.5	1.0

Notes: All results in $\mu\text{g/l}$ (ppb)
 ND = Not Detected
 NA = Not Analyzed

Table 5 (Continued)
Quarterly Groundwater Sampling Results at Motor Partners
1234 40th Ave., Oakland, California

Sample I.D. Number	Date Collected	TPH-D ($\mu\text{g/L}$)	TPH-G ($\mu\text{g/L}$)	MTBE ($\mu\text{g/L}$)	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethyl Benzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)
MW-2	6/17/94	370	990		ND	1.3	2.3	4.4
	12/07/94	ND	170		2.1	0.70	0.60	1.7
	11/29/95	200	400		ND	ND	ND	3
	2/23/96	ND	500		ND	ND	ND	ND
	5/21/96	ND	62		ND	ND	ND	1
	8/22/96	ND	120		0.58	0.62	ND	0.62
	11/21/96	89	89		0.60	0.78	ND	ND
	2/25/97	ND	250		1.2	1.0	ND	ND
	5/28/97	ND	ND		ND	ND	ND	ND
	9/2/97	ND	220	ND	ND	1.2	0.80	1.7
	11/26/97	ND	ND	ND	ND	ND	ND	ND
	3/17/98	ND	ND	ND	ND	ND	ND	ND
	6/26/98	170	260	ND	ND	0.86	ND	0.63
	9/24/98	130	240	ND	0.73	1.2	0.8	0.61
ORC Filter Socks Installed 9/24/98 in MW-1, MW-3, and MW-5								
	12/16/98	ND	ND	ND	ND	ND	ND	ND
	3/16/99	ND	ND	ND	ND	ND	ND	ND
	6/23/99	110	220	ND	0.52	0.88	0.72	ND
	9/23/99	ND	ND	ND	ND	ND	ND	ND
California Drinking Water MCL		None Listed	None Listed	None Listed	1.0	1,000	680	1,750
Reporting Limit		50	50	5	0.5	0.5	0.5	1.0

Table 5 (Continued)
Quarterly Groundwater Sampling Results at Motor Partners
1234 40th Ave., Oakland, California

Sample I.D. Number	Date Collected	TPH-D ($\mu\text{g/L}$)	TPH-G ($\mu\text{g/L}$)	MTBE ($\mu\text{g/L}$)	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethyl Benzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)
MW-3	6/17/95	2,200	9,500		330	40	100	74
	12/07/94	1,700	7,500		380	42	130	72
	11/29/95	14,000	9,000		300	49	300	16
	2/23/96	14,000	13,000		270	83	260	67
	5/21/96	350	6,600		220	48	160	66
	8/22/96	ND	4,800		120	34	44	44
	11/21/96	3,300	8,700		220	51	150	68
	2/25/97	ND	8,200		260	57	200	72
	5/28/97	1,800	7,000		140	22	44	31
	9/2/97	ND	8,100	65	240	50	170	72
	11/26/97	4,100	5,600	44	140	22	9.6	31
	3/17/98	2,100	10,000	330	270	67	260	96
	6/26/98	2,400	7,600	ND	280	56	160	73
	9/24/98	2,800	6,300	ND	260	65	130	80
ORC Filter Socks Installed 9/24/98 in MW-1, MW-3, and MW-5								
	12/16/98	1,600	4,500	ND	160	22	17	30
	3/16/99	1,900	8,000	ND	370	51	220	110
	6/23/99	2,200	7,400	ND<10	250	47	82	62
	9/23/99	1,500	3,700	ND<130	170	26	51	34
California Drinking Water MCL		None Listed	None Listed	None Listed	1.0	1,000	680	1,750
Reporting Limit		50	50	5	0.5	0.5	0.5	1.0

Table 5 (Continued)
 Quarterly Groundwater Sampling Results at Motor Partners
 1234 40th Ave., Oakland, California

Sample ID. Number	Date Collected	TPH-D ($\mu\text{g/L}$)	TPH-G ($\mu\text{g/L}$)	MTBE ($\mu\text{g/L}$)	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethyl Benzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)
MW-4	2/23/96	3,000	6,000		58	36	6	28
	5/21/96	78	1,200		18	2.5	6.2	12
	8/22/96	ND	400		8.6	3.4	1.8	2.6
	11/21/96	87	170		3.6	1.1	1.7	2.3
	2/25/97	ND	120		5.4	0.64	0.93	0.80
	5/28/97	55	150		5.6	0.64	4.4	8.8
	9/2/97	ND	100	ND	3.2	ND	ND	0.7
	11/26/97	ND	240	ND	6.8	ND	1.8	10
	3/17/98	200	300	8.9	4.4	5.1	5.1	20
	6/26/98	66	ND	ND	7.7	0.50	0.84	0.61
	9/24/98	84	66	ND	4.2	0.59	0.63	ND
ORC Filter Socks Installed 9/24/98 in MW-1, MW-3, and MW-5								
	12/16/98	ND	ND	ND	ND	ND	ND	ND
	3/16/99	ND	ND	ND	2.1	ND	ND	ND
	6/23/99	86	190	ND	11	1.1	2.3	1.6
	9/23/99	ND	ND	ND	1.7	ND	ND	ND
California Drinking Water MCL		None Listed	None Listed	None Listed	1.0	1,000	680	1,750
Reporting Limit		50	50	5	0.5	0.5	0.5	1.0

pre-purge
 Sample
 post
 purge sample

Notes: All results in $\mu\text{g/l}$ (ppb)
 ND = Not Detected
 NA = Not Analyzed

Table 5 (Continued)
Quarterly Groundwater Sampling Results at Motor Partners
1234 40th Ave., Oakland, California

Sample I.D. Number	Date Collected	TPH-D ($\mu\text{g/L}$)	TPH-G ($\mu\text{g/L}$)	MTBE ($\mu\text{g/L}$)	Benzene ($\mu\text{g/L}$)	Toluene ($\mu\text{g/L}$)	Ethyl Benzene ($\mu\text{g/L}$)	Total Xylenes ($\mu\text{g/L}$)
MW-5	3/17/98	22,000	58,000	ND	320	590	790	2,300
	6/26/98	7,000	2,300	ND	54	20	14	41
	9/24/98	2,500	1,600	ND	31	10	6.3	22
ORC Filter Socks Installed 9/24/98 in MW-1, MW-3, and MW-5								
	12/16/98	ND	ND	ND	ND	ND	ND	ND
	3/16/99	ND	180	ND	22	0.52	ND	1.9
	6/23/99	8,400	3,200	ND<50	25	7.3	6.8	25
	9/23/99	470	490	ND<14	16	3.3	2.0	4.9
California Drinking Water MCL		None Listed	None Listed	None Listed	1.0	1,000	680	1,750
Reporting Limit		50	50	5	0.5	0.5	0.5	1.0

Notes: All results in $\mu\text{g/l}$ (ppb)
 ND = Not Detected
 NA = Not Analyzed

Table 6
Dissolved Oxygen and Redox Results
Motor Partners, 1234 40th Ave., Oakland, California

Sample I.D. Number	Date Collected	Dissolved Oxygen (mg/L)	Redox Potential (mv)
MW-1	11/26/97	1.5	56
	3/17/98	0.9	-2.0
	6/26/98	1	-64
	9/24/98	1.1	-49
	12/16/98	1	-44
	3/16/99	3.2	155
	6/23/99	2.2	120
	9/23/99	2.9	34
MW-2	11/26/97	3	162
	3/17/98	2.7	90
	6/26/98	4.3	144
	9/24/98	4	175
	12/16/98	6.5	205
	3/16/99	2.7	156
	6/23/99	2.1	125
	9/23/99	2.1	168
MW-3	11/26/97	2	67
	3/17/98	1.5	18
	6/26/98	1.8	-72
	9/24/98	1.4	-10
	12/16/98	2.1	4
	3/16/99	1.6	-14
	6/23/99	1.5	-32
	9/23/99	1.2	-56

Table 6 (Continued)
Dissolved Oxygen and Redox Results
Motor Partners, 1234 40th Ave., Oakland, California

Sample I.D. Number	Date Collected	Dissolved Oxygen (mg/L)	Redox Potential (mv)
MW-4	11/26/97	2.4	114
	3/17/98	1.7	69
	6/26/98	2.8	99
	9/24/98	2.9	78
	12/16/98	9.2	265
	3/16/99	10.5	197
	6/23/99	5.7	175
	9/23/99	6	196
MW-5	3/17/98	1.5	40
	6/26/98	0.9	-33
	9/24/98	1.3	-9
	12/16/98	4	194
	3/16/99	2.4	144
	6/23/99	1.7	151
	9/23/99	2.9	236

**Table 7. Results of Additional Bioremediation Parameters
Motor Partners, 1234 40th Ave., Oakland, California**

Sample I.D. Number	Date Collected	Ferrous Iron (mg/L)	Ammonia-N (mg/L)	Nitrate-N (mg/L)	Sulfate (mg/L)	Total Phosphorus (mg/L)
MW-1	11/26/97	1.2	<0.05	<0.05	4200	0.06
	3/17/98	2.0	0.22	<0.05	97	0.14
	6/26/98	3.0	ND	ND	2000	ND
	9/24/98	0.25	ND	2	7	0.16
	12/16/98	3.2	ND	ND	17	0.07
	3/16/99	0.21	1.8	ND	36	ND
	6/23/99	2.4	ND	ND	35	ND
	9/23/99	ND	ND	19	21	ND
	MW-2	11/26/97	ND	<0.05	1.1	3100
3/17/98		0.21	0.08	11	41	0.13
6/26/98		0.087	ND	7.2	33	ND
9/24/98		ND	ND	37	38	0.08
12/16/98		ND	ND	44	48	0.03
3/16/99		ND	1.3	41	42	ND
6/23/99		0.8	ND	41	65	0.11
9/23/99		ND	ND	55	43	ND
MW-3		11/26/97	2.8	<0.05	<0.05	4100
	3/17/98	0.31	0.06	<0.05	<2.0	0.17
	6/26/98	3.0	ND	ND	ND	ND
	9/24/98	0.11	ND	ND	ND	0.24
	12/16/98	1.3	ND	ND	9	0.16
	3/16/99	2.5	1.2	ND	ND	0.23
	6/23/99	1.9	ND	ND	34	0.12
	9/23/99	0.46	ND	55	39	0.14

**Table 7 continued. Results of Additional Bioremediation Parameters
Motor Partners, 1234 40th Ave., Oakland, California**

MW-4	11/26/97	ND	<0.05	0.66	4900	0.16
	3/17/98	0.17	0.06	7.4	33	0.07
	6/26/98	0.21	ND	7.1	32	ND
	9/24/98	ND	ND	40	37	0.09
	12/16/98	ND	ND	44	45	0.11
	3/16/99	0.17	ND	40	37	ND
	6/23/99	0.8	ND	46	44	0.23
	9/23/99	ND	ND	55	39	ND
MW-5	3/17/98	0.49	0.06	0.83	40	0.13
	6/26/98	0.26	ND	1.7	22	ND
	9/24/98	ND	ND	5	24	0.29
	12/16/98	ND	ND	17	35	0.06
	3/16/99	ND	4.1	9	18	ND
	6/23/99	0.97	ND	8	48	0.54
	9/23/99	0.11	ND	12	23	ND

Notes: All results in mg/L (ppm)
ND = Not Detected

**Table 8. Results of Microbiological Analyses
Motor Partners, 1234 40th Ave., Oakland, California**

Sample I.D. Number	Date Collected	Aerobic Hydrocarbon Degraders (cfu/ml)	Anaerobic Hydrocarbon Degraders (cfu/ml)
MW-1	9/24/98	<1 X 10 ¹	4.6 X 10 ²
	12/16/98	2.3 X 10 ³	3.8 X 10 ⁴
	3/16/99	3.3 X 10 ¹	8.2 X 10 ²
	6/23/99	1.1 X 10 ⁴	2.5 X 10 ⁴
	9/23/99	7.0 X 10 ¹	2.2 X 10 ³
MW-2	9/24/98	5.4 X 10 ²	3.4 X 10 ³
	12/16/98	4.0 X 10 ²	3.0 X 10 ³
	3/16/99	8.0 X 10 ¹	2.9 X 10 ¹
	6/23/99	2.9 X 10 ³	1.4 X 10 ⁴
	9/23/99	1.1 X 10 ¹	4.0 X 10 ¹
MW-3	9/24/98	6.5 X 10 ²	4.3 X 10 ³
	12/16/98	6.1 X 10 ²	3.5 X 10 ⁴
	3/16/99	1.2 X 10 ³	2.6 X 10 ³
	6/23/99	4.4 X 10 ³	9.0 X 10 ³
	9/23/99	1.3 X 10 ³	6.0 X 10 ³
MW-4	9/24/98	3.6 X 10 ¹	5.1 X 10 ²
	12/16/98	1.2 X 10 ³	2.0 X 10 ³
	3/16/99	5.5 X 10 ²	2.2 X 10 ³
	6/23/99	1.3 X 10 ³	7.5 X 10 ³
	9/23/99	3.0 X 10 ²	3.5 X 10 ³
MW-5	9/24/98	3.9 X 10 ¹	5.1 X 10 ³
	12/16/98	6.2 X 10 ³	1.1 X 10 ⁴
	3/16/99	2.7 X 10 ²	2.3 X 10 ³
	6/23/99	6.2 X 10 ²	8.5 X 10 ³
	9/23/99	8.0 X 10 ¹	1.7 X 10 ³

cfu/ml = colony forming units per milliliter

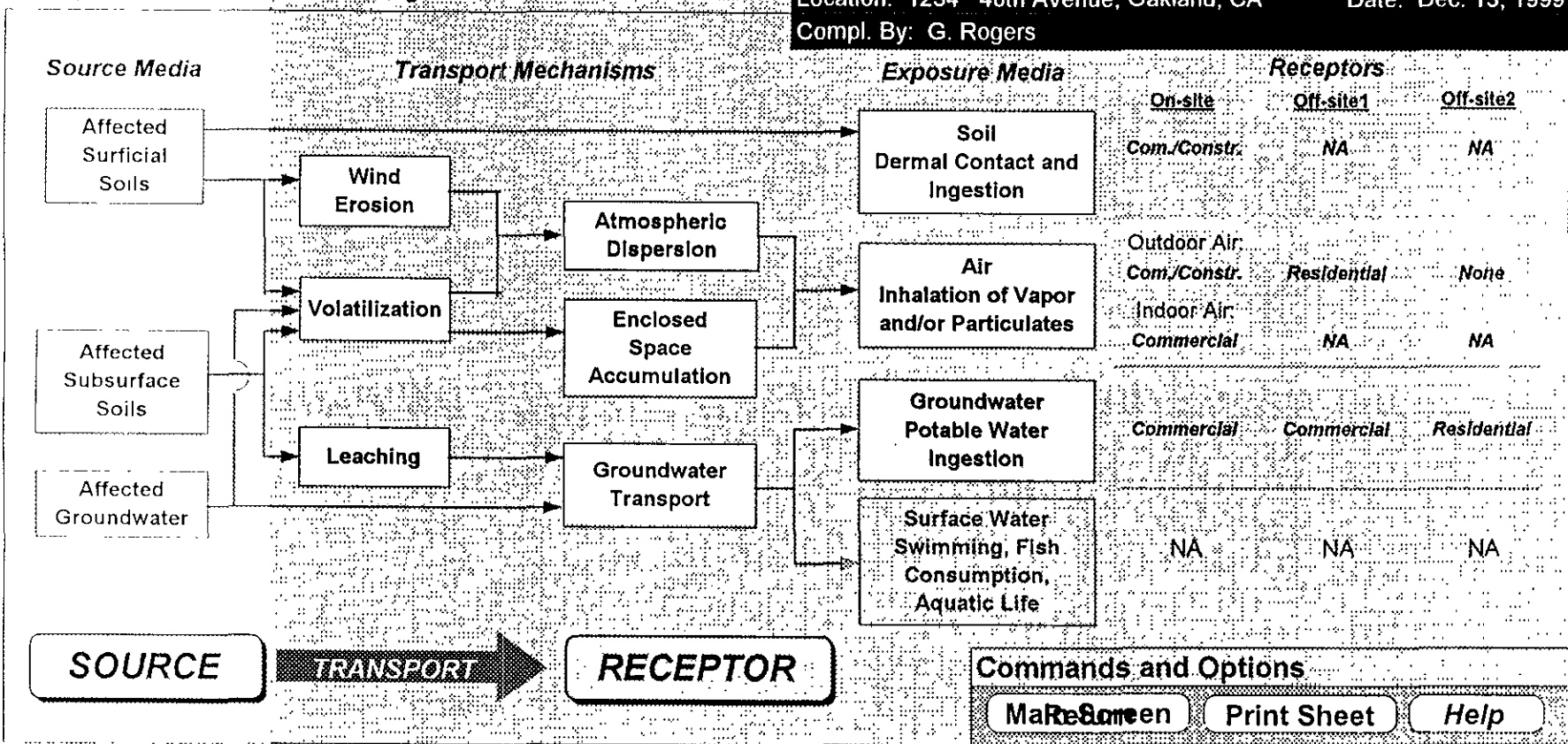
9.0 APPENDICES

APPENDIX A

Tier 2 Results

Exposure Pathway Flowchart

Site Name: Motor Partners Job ID: 1004
 Location: 1234 40th Avenue, Oakland, CA Date: Dec. 13, 1999
 Compl. By: G. Rogers



RBCA SITE ASSESSMENT

Input Parameter Summary

Site Name: Motor Partners
 Site Location: 1234 40th Avenue Oakland, CA

Completed By: G. Rogers
 Date Completed: Dec 13, 1999

Job ID: 1004

1 OF 1

Exposure Parameters	Residential			Commercial/Industrial	
	Adult (L/yr)	(1-18 yrs)		Chronic	Construc.
AT _c Averaging time for carcinogens (yr)	70				
AT _n Averaging time for non carcinogens (yr)	30			25	1
BW Body weight (kg)	70	15	35	70	
ED Exposure duration (yr)	30	8	18	25	1
t Averaging time for vapor flux (yr)	30			25	1
EF Exposure frequency (days/yr)	350			250	180
EF _D Exposure frequency for dermal exposure	350			250	
IR _w Ingestion rate of water (L/day)	2			1	
IR _s Ingestion rate of soil (mg/day)	100	200		50	100
SA Skin surface area (dermal) (cm ²)	5800		2023	5800	5800
M Soil to skin adherence factor	1				
ET _{swim} Swimming exposure time (hr/event)	3				
EV _{swim} Swimming event frequency (events/yr)	12	12	12		
IR _{swim} Water ingestion while swimming (L/hr)	0.05	0.5			
SA _{swim} Skin surface area for swimming (cm ²)	23000		8100		
IR _{fish} Ingestion rate of fish (kg/yr)	0.025				
F _{fish} Contaminated fish fraction (unitless)	1				

Surface Parameters	General	Construction	Units
A Source zone area	4.0E+3	2.2E+4	(ft ²)
W Length of source-zone area parallel to wind	4.0E+1	1.5E+2	(ft)
W _{gw} Length of source-zone area parallel to GW flow	1.0E+2		(ft)
U _{air} Ambient air velocity in mixing zone	6.4E+5		(ft/d)
δ _{air} Air mixing zone height	8.6E+0		(ft)
P _s Areal particulate emission rate	8.9E-14		(g/cm ² /s)
L ₁₁ Thickness of affected surface soils	NA		(ft)

Surface Soil Column Parameters	Value	Units	
h _{cap} Capillary zone thickness	8.9E-1	(ft)	
h _v Vadose zone thickness	7.1E+0	(ft)	
ρ _s Soil bulk density	1.7E+0	(g/cm ³)	
f _{oc} Fraction organic carbon	1.0E-2	(-)	
θ _t Soil total porosity	3.8E-1	(-)	
K _s Vertical hydraulic conductivity	8.8E-1	(cm/d)	
k _v Vapor permeability	1.1E-14	(ft ²)	
L _{gw} Depth to groundwater	8.0E+0	(ft)	
L _s Depth to top of affected soils	5.0E+0	(ft)	
L _{base} Depth to base of affected soils	1.2E+1	(ft)	
L _{soil} Thickness of affected soils	7.0E+0	(ft)	
pH Soil/groundwater pH	6.8E+0	(-)	
θ _v Volumetric water content	0.324	0.24 0.12	(-)
θ _a Volumetric air content	0.036	0.12 0.28	(-)

Complete Exposure Pathways and Receptors	On-site	Off-site 1	Off-site 2
Groundwater			
Groundwater Ingestion	Commercial	Commercial	Residential
Soil Leaching to Groundwater Ingestion	Commercial	Commercial	Residential
Applicable Surface Water Exposure Routes:			
Swimming			NA
Fish Consumption			NA
Aquatic Life Protection			NA
Soil			
Direct Ingestion and Dermal Contact	Com./Constr.		
Outdoor Air:			
Particulates from Surface Soils	Com./Constr.	Residential	None
Volatilization from Soils	Com./Constr.	Residential	None
Volatilization from Groundwater	Commercial	Residential	None
Indoor Air			
Volatilization from Subsurface Soils	Commercial	NA	NA
Volatilization from Groundwater	Commercial	NA	NA

Building Parameters	Residential	Commercial	Units
L _b Building volume/area ratio	NA	9.84E+0	(ft)
A _b Foundation area	NA	7.53E+2	(cm ²)
X _{crk} Foundation perimeter	NA	1.12E+2	(ft)
ER Building air exchange rate	NA	1.99E+1	(1/d)
L _{crk} Foundation thickness	NA	4.92E-1	(ft)
Z _{crk} Depth to bottom of foundation slab	NA	4.92E-1	(ft)
η Foundation crack fraction	NA	1.00E-2	(-)
dP Indoor/outdoor differential pressure	NA	0.00E+0	(g/cm ² /s ²)
Q _s Convective air flow through slab	NA	0.00E+0	(ft ³ /d)

Receptor Distance from Source Media	On-site	Off-site 1	Off-site 2	Units
Groundwater receptor	0	2500	150	(ft)
Soil leaching to groundwater receptor	0	2500	150	(ft)
Outdoor air inhalation receptor	0	150	NA	(ft)

Groundwater Parameters	Value	Units
δ _{gw} Groundwater mixing zone depth	8.0E+0	(ft)
i _g Net groundwater infiltration rate	3.0E+1	(cm/yr)
U _{gw} Groundwater Darcy velocity	6.9E+0	(cm/d)
V _{gw} Groundwater seepage velocity	1.8E+1	(cm/d)
K _s Saturated hydraulic conductivity	6.9E+2	(cm/d)
i Groundwater gradient	1.0E-2	(-)
S _w Width of groundwater source zone	4.0E+1	(ft)
S _d Depth of groundwater source zone	8.0E+0	(ft)
θ _{eff} Effective porosity in water-bearing unit	3.8E-1	(-)
f _{oc, 11} Fraction organic carbon in water-bearing unit	1.0E-3	(-)
pH _{gw} Groundwater pH	6.2E+0	(-)
Biodegradation considered?	No	

Target Health Risk Values	Individual	Cumulative
TR ₁₀₀ Target Risk (class A&B carcinogens)	1.0E-5	1.0E-5
TR ₁₀ Target Risk (class C carcinogens)	1.0E-5	
THQ Target Hazard Quotient (non-carcinogenic risk)	1.0E+0	1.0E+0

Transport Parameters	Off-site 1	Off-site 2	Off-site 1	Off-site 2	Units
Lateral Groundwater Transport			Groundwater Ingestion	Soil Leaching to GW	
α _{lx} Longitudinal dispersivity	2.5E+2	1.5E+1	2.5E+2	1.5E+1	(ft)
α _{ty} Transverse dispersivity	8.3E+1	5.0E+0	8.3E+1	5.0E+0	(ft)
α _z Vertical dispersivity	1.3E+1	7.5E-1	1.3E+1	7.5E-1	(ft)
Lateral Outdoor Air Transport			Soil to Outdoor Air Inhal.	GW to Outdoor Air Inhal.	
σ _y Transverse dispersion coefficient	1.6E+1	NA	1.6E+1	NA	(ft)
σ _z Vertical dispersion coefficient	1.1E+1	NA	1.1E+1	NA	(ft)
ADF Air dispersion factor	1.2E+0	NA	2.9E+0	NA	(-)

Modeling Options	
RBCA Tier	Tier 2
Outdoor air volatilization model	Surface model only
Indoor air volatilization model	Johnson & Ettinger model
Soil leaching model	ASTM leaching model
Use soil attenuation model (SAM) for leachate?	No
Air dilution factor	3-D Gaussian dispersion
Groundwater dilution-attenuation factor	Domenico model

Surface Water Parameters	Off-site 2	Units
Q _{sw} Surface water flowrate	NA	(ft ³ /d)
W _{pl} Width of GW plume at SW discharge	NA	(ft)
δ _{pl} Thickness of GW plume at SW discharge	NA	(ft)
DF _{sw} Groundwater-to-surface water dilution factor	NA	(-)

NOTE: NA = Not applicable

RBCA SITE ASSESSMENT

User-Specified COC Data

REPRESENTATIVE COC CONCENTRATIONS IN SOURCE MEDIA

CONSTITUENT	Representative COC Concentration			
	Groundwater		Soils (5 - 12 ft)	
	value (mg/L)	note	value (mg/kg)	note
Methyl t-Butyl ether	0.0E+0		0.0E+0	
Xylene (mixed isomers)	4.9E-2		1.3E+1	
Toluene	3.7E-3		5.3E-1	
Ethylbenzene	3.8E-2		3.9E+0	
Benzene	7.3E-2	0.073	4.9E-1	?

Site Name: Motor Partners
 Site Location: 1234 40th Avenue, Oakland, CA
 Completed By: G. Rogers

Date Completed: Dec. 13, 1999
 Job ID: 1004

RBCA SITE ASSESSMENT	Baseline Risk Summary-All Pathways
-----------------------------	---

Site Name Motor Partners

Completed By: G. Rogers

Site Location 1234 40th Avenue, Oakland, CA

Date Completed: Dec. 13, 1999

1 of 1

TIER 2 BASELINE RISK SUMMARY TABLE										
EXPOSURE PATHWAY	BASELINE CARCINOGENIC RISK					BASELINE TOXIC EFFECTS				
	Individual COC Risk		Cumulative COC Risk		Risk Limit(s) Exceeded?	Hazard Quotient		Hazard Index		Toxicity Limit(s) Exceeded?
	Maximum Value	Target Risk	Total Value	Target Risk		Maximum Value	Applicable Limit	Total Value	Applicable Limit	
OUTDOOR AIR EXPOSURE PATHWAYS										
Complete:	4.4E-8	1.0E-5	4.4E-8	1.0E-5	<input type="checkbox"/>	1.4E-2	1.0E+0	1.5E-2	1.0E+0	<input type="checkbox"/>
INDOOR AIR EXPOSURE PATHWAYS										
Complete:	6.9E-6	1.0E-5	6.9E-6	1.0E-5	<input type="checkbox"/>	3.9E-1	1.0E+0	4.0E-1	1.0E+0	<input type="checkbox"/>
SOIL EXPOSURE PATHWAYS										
Complete:	1.5E-7	1.0E-5	1.5E-7	1.0E-5	<input type="checkbox"/>	4.7E-3	1.0E+0	6.2E-3	1.0E+0	<input type="checkbox"/>
GROUNDWATER EXPOSURE PATHWAYS										
Complete:	8.7E-6	1.0E-5	8.7E-6	1.0E-5	<input type="checkbox"/>	2.8E-1	1.0E+0	3.0E-1	1.0E+0	<input type="checkbox"/>
SURFACE WATER EXPOSURE PATHWAYS										
Complete:	NA	NA	NA	NA	<input type="checkbox"/>	NA	NA	NA	NA	<input type="checkbox"/>
CRITICAL EXPOSURE PATHWAY (Maximum Values From Complete Pathways)										
	8.7E-6	1.0E-5	8.7E-6	1.0E-5	<input type="checkbox"/>	3.9E-1	1.0E+0	4.0E-1	1.0E+0	<input type="checkbox"/>
	<i>Groundwater</i>		<i>Groundwater</i>			<i>Indoor Air</i>		<i>Indoor Air</i>		

RBCA SITE ASSESSMENT

Site Name Motor Partners

Completed By: G. Rogers

Job ID: 1004

Site Location 1234 40th Avenue Oakland, CA

Date Completed: Dec. 13, 1999

1 OF 1

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-5

Target Risk (Class C) 1.0E-5

Target Hazard Quotient 1.0E+0

Groundwater DAF Option Domenico - No Decay
(One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("X" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration (mg/L)	Groundwater Ingestion			GW Vol. to Indoor Air	Groundwater Volatilization to Outdoor Air			Applicable SSTL (mg/L)	SSTL Exceeded? "■" if yes	Required CRF Only if "yes" left
			On-site (0 ft) Commercial	Off-site 1 (2500 ft) Commercial	Off-site 2 (0 ft) None		On-site (0 ft) Commercial	On-site (0 ft) Commercial	Off-site 1 (0 ft) Residential			
1634-04-4	Methyl t-Butyl ether	0.0E+0	1.0E+0	1.6E+3	NA	7.0E+3	>4.8E+4	>4.8E+4	NA	1.0E+0	<input type="checkbox"/>	<1
1330-20-7	Xylene (mixed isomers)	4.9E-2	>2.0E+2	>2.0E+2	NA	>2.0E+2	>2.0E+2	>2.0E+2	NA	>2.0E+2	<input type="checkbox"/>	NA
108-88-3	Toluene	3.7E-3	2.0E+1	>5.2E+2	NA	3.4E+2	>5.2E+2	>5.2E+2	NA	2.0E+1	<input type="checkbox"/>	<1
100-41-4	Ethylbenzene	3.8E-2	1.0E+1	>1.7E+2	NA	>1.7E+2	>1.7E+2	>1.7E+2	NA	1.0E+1	<input type="checkbox"/>	<1
71-43-2	Benzene	7.3E-2	9.9E-2	1.6E+2	NA	3.1E+0	1.5E+3	1.5E+3	NA	9.9E-2	<input type="checkbox"/>	<1

">" indicates risk-based target concentration greater than constituent solubility value NA = Not applicable NC = Not calculated

Handwritten:
 .099 mg/L
 1.0E-2

	CHEMICAL DATA FOR SELECTED COCs	Miscellaneous Chemical Data
--	--	------------------------------------

Constituent	Dermal		Water Dermal Permeability Data					Detection Limits				Half Life		
	Relative Absorp. Factor (unitless)	Dermal Permeability Coeff. (cm/hr)	Lag time for Dermal Exposure (hr)	Critical Exposure Time (hr)	Relative Contr of Derm Perm Coeff (unitless)	Water/Skin Derm Adsorp Factor (cm/event)	ref	Groundwater (mg/L)	ref	Soil (mg/kg)	ref	Saturated (days)	Unsaturated	ref
Methyl t-Butyl ether	0.5	-	-	-	-	-	-	-	-	-	-	360	180	H
Xylene (mixed isomers)	0.5	0.08	0.39	1.4	0.16	2.9E-1	D	0.005	S	0.005	S	360	360	H
Toluene	0.5	0.045	0.32	0.77	0.054	1.6E-1	D	0.002	S	0.005	S	28	28	H
Ethylbenzene	0.5	0.074	0.39	1.3	0.14	2.7E-1	D	0.002	S	0.005	S	228	228	H
Benzene	0.5	0.021	0.26	0.63	0.013	7.3E-2	D	0.002	S	0.005	S	720	720	H

Site Name: Motor Partners
 Site Location: 1234 40th Av

Miscellaneous Chemical Data

Constituent	Maximum Contaminant Level		Time-Weighted Average Workplace Criteria		Aquatic Life Prot. Criteria		Bioconcentration Factor (L-wat/kg-fish)
	MCL (mg/L)	ref	TWA (mg/m3)	ref	AQL (mg/L)	ref	
Methyl t-Butyl ether	-	-	6.00E+01	NIOSH	-	-	1
Xylene (mixed isomers)	1.00E+01	56 FR 3526 (30 Jan 91)	4.34E+02	ACGIH	-	-	1
Toluene	1.00E+00	56 FR 3526 (30 Jan 91)	1.47E+02	ACGIH	-	-	70
Ethylbenzene	7.00E-01	56 FR 3526 (30 Jan 91)	4.35E+02	PS	-	-	1
Benzene	5.00E-03	52 FR 25690	3.25E+00	PS	-	-	12.6

Site Name: Motor Partners

Site Location: 1234 40th Av

	CHEMICAL DATA FOR SELECTED COCs	Toxicity Data
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Constituent	Reference Dose (mg/kg/day)				Reference Conc. (mg/m3)				Slope Factors 1/(mg/kg/day)						Unit Risk Factor 1/(µg/m3)		EPA Weight of Evidence	Is Constituent Carcinogenic?
	Oral		Dermal		Inhalation		Oral		Dermal		Inhalation		Inhalation					
	RfD_oral	ref	RfD_dermal	ref	RfC_inhal	ref	SF_oral	ref	SF_dermal	ref	URF_inhal	ref	ref	ref				
Methyl t-Butyl ether	1.00E-02	31	8.00E-03	TX	3.00E+00	R	-	-	-	-	-	-	-	-	-	-	FALSE	
Xylene (mixed isomers)	2.00E+00	A,R	1.84E+00	TX	7.00E+00	A	-	-	-	-	-	-	-	-	-	D	FALSE	
Toluene	2.00E-01	A,R	1.60E-01	TX	4.00E-01	A,R	-	-	-	-	-	-	-	-	-	D	FALSE	
Ethylbenzene	1.00E-01	PS	9.70E-02	TX	1.00E+00	PS	-	-	-	-	-	-	-	-	-	D	FALSE	
Benzene	3.00E-03	R	-	-	5.95E-03	R	2.90E-02	PS	2.99E-02	TX	8.29E-06	PS	A		A	TRUE		

Site Name Motor Partners
 Site Location 1234 40th Av

CHEMICAL DATA FOR SELECTED COCs

Physical Property Data

Constituent	CAS Number	type	Molecular Weight (g/mole)		Diffusion Coefficients				log (Koc) or log(Kd) (@ 20 - 25 C)			Henry's Law Constant (@ 20 - 25 C)			Vapor Pressure (@ 20 - 25 C)		Solubility (@ 20 - 25 C)			acid pKa	base pKb	ref
			MW	ref	In air (cm ² /s)	ref	In water (cm ² /s)	ref	Dwat	ref	log(L/kg) partition	ref	(atm-m ³) mol	(unitless)	ref	(mm Hg)	ref	(mg/L)	ref			
Methyl t-Butyl ether	1634-04-4	O	88.146	5	7.92E-02	6	9.41E-05	7	1.08	Koc	A	5.77E-04	2.38E-02	-	2.49E+02	-	4.80E+04	A	-	-	-	
Xylene (mixed isomers)	1330-20-7	A	106.2	5	7.20E-02	A	8.50E-06	A	2.38	Koc	A	7.03E-03	2.90E-01	A	7.00E+00	4	1.98E+02	5	-	-	-	
Toluene	108-88-3	A	92.4	5	8.50E-02	A	9.40E-06	A	2.13	Koc	A	6.30E-03	2.60E-01	A	3.00E+01	4	5.15E+02	29	-	-	-	
Ethylbenzene	100-41-4	A	106.2	PS	7.50E-02	PS	7.80E-06	PS	2.56	Koc	PS	7.88E-03	3.25E-01	PS	1.00E+01	PS	1.69E+02	PS	-	-	-	
Benzene	71-43-2	A	78.1	PS	8.80E-02	PS	9.80E-06	PS	1.77	Koc	PS	5.55E-03	2.29E-01	PS	9.52E+01	PS	1.75E+03	PS	-	-	-	

Site Name Motor Partners

Completed By: G. Rogers

Job ID. 1004

Site Location 1234 40th Avenue, Oakland, CA

Date Completed: Dec. 13, 1999