EMCON
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March 12, 1997
Project 20805-120.007

Mr. Kyle Christie
ARCO Products Company
P.O. Box 6037
Artesia, California 90702-6037

Re: Tier 1 Risk-Based Corrective Action Evaluation for ARCO Service Station 276, 10600 MacArthur Boulevard, Oakland, California

Dear Mr. Christie:

This report presents the results of a Tier 1 risk-based corrective action (RBCA) evaluation prepared for ARCO Service Station 276, 10600 MacArthur Blvd., Oakland, California (the Site) (Figures 1 and 2). This report addresses potential exposures to current and future on-site workers, and potential receptors on a portion of the adjacent property southeast of the Site (Figure 2). The RBCA evaluation results indicate that no acceptable levels of risk are exceeded at this Site.

Since 1988, ARCO has conducted several site assessment investigations both on- and off-site to delineate the lateral and vertical extent of gasoline-impacted soils and groundwater. Gasoline-impacted groundwater has been detected on- and off-site in a perched water-bearing zone. ARCO has operated a soil vapor extraction system from 1990 to 1995 on- and off-site to address gasoline impact to soil and water. The SVE system is at asymptotic levels and has removed over 7,811 pounds of petroleum hydrocarbons. Concentrations of gasoline dissolved in groundwater have been decreasing with time. Groundwater in both the on-and off-site shallow perched water-bearing zone and a deeper water-bearing zone is monitored quarterly for gasoline. However, gasoline has been detected only in the perched water-bearing zone. The most recent quarterly results for BTEX concentrations were used to evaluate the potential risk at the site.

In addition, at the request of the Alameda County Health Care Service Agency, EMCON evaluated tetrachloroethene (PCE) detected underneath the Site, in a deeper water-bearing zone. PCE appears to have originated upgradient at an off-site dry cleaning facility. The evaluation addressed only the potential risk posed by PCE to workers at the ARCO facility.

This RBCA evaluation was prepared in accordance with the guidelines contained in the *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (American Society of Testing Materials [ASTM] E-1739-95, November, 1995). In

general, the tiered approach recommended in the ASTM guidelines is designed as a step-wise process to evaluate the potential risk posed by a chemical release, determine what corrective action, if any, is needed, and tailor that action to those risks.

The steps that make up the tiered RBCA approach are summarized in Figure 3. This report will follow these steps, and refer to information summarized in tables and figures. A historical summary of analytical results is presented in Appendix A and the *Tier 1 RBCA Tool Kit* worksheets are presented in Appendix B. This report should be read in conjunction with reviewing these worksheets.

INITIAL SITE ASSESSMENT AND SITE CLASSIFICATION

Steps 1 and 2 of RBCA are designed to screen for the possibility that the Site presents an imminent threat to public health and the environment. Chemical impact to soil and groundwater at the Site has been characterized and is summarized in Worksheet 4.2.

There are four underground storage tanks (USTs), designated T1 through T4, in the western portion of the Site. These tanks are replacements for four former USTs (FT1 through FT4) that were removed from the southern portion of the Site in February 1990. A former waste-oil tank adjacent to the northeastern wall of the station building was removed in 1988. These excavations are summarized in *Former Waste-Oil Tank Pit Analytical Results and Site Plan of ARCO Station No.* 276 (Pacific Environmental Group, Inc., February 6, 1989) and *Underground Gasoline Storage Tank Removal and Replacement as ARCO Station 276, 10600 MacArthur Boulevard, Oakland,* California (Applied GeoSystems, February 11, 1991). The locations of the former tanks, existing tanks, on- and off-site groundwater monitoring wells, and on-site vapor extraction wells are shown in Figure 2.

Adjacent to and immediately southeast of the Site is a portion of the former Truck Manufacturing Plant (now a parking lot for Foothill Square Shopping Center). Aerial photographs suggest the possible presence of fuel tanks, fuel dispensers, and storage drums on several portions of the former Truck Manufacturing Plant.

No surface releases have taken place at this site which have not been immediately contained and cleaned. Although gasoline has been detected in the subsurface, these hydrocarbons do not present a potential risk of direct contact.

Based on our review of the site conditions the station appears to have an ASTM site classification of 4, no long-term threat to human health or safety. A comparison of site-measured soil and groundwater data to conservative, site-specific, health-based screening

levels, in accordance with the ASTM RBCA guidelines, was undertaken. This is referred to in the ASTM guidelines as a Tier 1 evaluation.

TIER 1 EVALUATION

The first step in a Tier 1 evaluation is to determine the chemical nature of the release, and to characterize the extent of the impact. Definition of the on-site and off-site impact has been established, and is documented in the *Additional Subsurface Investigation and Interim Remediation at ARCO Station 276, 10600 MacArthur Boulevard in Oakland, California* (RESNA, January 29, 1993) and the *Second Quarter 1996 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, SVE System at Retail Service Station, 10600 MacArthur Boulevard, Oakland, California* (EMCON, August 20, 1996) and is summarized in Worksheet 1.1. The chemicals of concern are benzene, toluene, ethylbenzene, and xylenes (BTEX), and PCE which appears to have originated from the upgradient, off-site dry cleaners. Current benzene and PCE concentrations in groundwater are summarized in Figure 4. Soil and additional analytical information is summarized in Worksheets 5.2, 5.3, 5.5, and 5.6. The Tier 1 results are summarized in Table 1.

The next step in a Tier 1 evaluation is to identify potentially significant environmental transport pathways by which receptors may be exposed to site-related chemicals in order to identify complete exposure pathways. For a potential exposure pathway to be considered complete, it must contain the following three elements:

- a source of specific chemicals (i.e., benzene, toluene, ethylbenzene, and, xylenes [BTEX])
- a transport mechanism (e.g., groundwater migration)
- a potential receptor (e.g., groundwater must be considered potable for a groundwater ingestion exposure pathway to be considered complete)

First encountered groundwater at the Site (perched water-bearing zone) is not considered potable because this water-bearing zone is limited in extent, and is likely to be of low quality and yield. For this reason, potential exposure pathways involving groundwater (e.g., infiltration from subsurface soil to groundwater and direct groundwater ingestion) were not evaluated further. Similarly, direct exposure to surface and subsurface soil at this site is not considered a complete exposure pathway because the Site is covered by asphalt and a concrete slab structure.

Construction workers

No impacted soil is believed to be present beneath the service station because petroleum hydrocarbon-impacted soil has been documented to be present only in association with the former USTs which were located outside and downgradient of the footprint of the service station Additionally, the SVE system has successfully removed residual soil petroleum hydrocarbons down to asymptotic levels. Thus, volatilization from subsurface soil to indoor airspace is not considered a significant pathway, and will not be evaluated further.

As summarized in Worksheet 1.4, the only complete potential exposure pathways at this site are:

- Volatilization of chemicals in groundwater through the unsaturated zone to ambient air and indoor air
- Volatilization of chemicals in subsurface soil to ambient air

Representative Groundwater Concentrations

Quarterly groundwater monitoring events have shown a generally decreasing trend in BTEX levels in the groundwater (Appendix A). As a result of this trend, the most recent groundwater concentrations were used to represent the magnitude of the chemical source. BTEX concentrations from the well with the highest concentrations (i.e., off-site monitoring well MW-7) were used to represent the groundwater BTEX concentrations to which hypothetical ambient air and indoor air receptors may be exposed. These representative groundwater concentrations are presented in Table 1. This is a conservative approach because using the highest concentrations (which were measured in an off-site monitoring well) over-estimates the exposure a typical receptor, especially an on-site receptor, is likely to receive.

Ave for past 4 qtrs

The groundwater results from the monitoring well where the highest recent PCE concentrations have been detected (i.e. well MW-4) were used to develop a representative PCE level. The most recent analytical results could not be used because the results from this well have not displayed a clear downward or stable trend. For this reason, the 95 percent upper confidence interval of the mean was used. These representative groundwater concentrations are presented in Table 1. Use of this value is considered conservative because it represents the highest PCE concentration detected at the Site.

past 4 quarters

Representative Soil Concentrations

The analytical results of petroleum-related compounds remaining at the Site following the excavations of the waste oil and fuel tanks, and installation of monitoring and vapor extraction wells (Pacific Environmental Group, February 6, 1989, Applied Geosystems, February 11, 1991, and RESNA January 29, 1993) showed little or no impact until about

20 feet below ground surface (bgs). The majority of gasoline hydrocarbons in the soil on-site are located approximately 15 to 20 feet below ground surface (bgs), directly above first-encountered water within the shallow perched water-bearing zone, in the immediate vicinity of the former USTs at the Site (RESNA, January 29, 1993). Soil was sampled at 18 locations on-site that were not excavated during the removal of the USTs and associated piping. Of these, BTEX was detected at depths above 15 feet in only 3 locations. Data from samples collected at or near this depth were used to evaluate the soil-to-ambient air pathway. The analytical results for the soil samples are summarized in Table 2.

The approach used to evaluate the soil-to-ambient air pathway in the ASTM guidelines assumes a potential receptor can be exposed while standing anywhere on the site. The 95 percent upper confidence interval of the mean BTEX concentrations were used to develop a representative site-wide soil concentration for this potential exposure. These representative soil concentrations are presented in Table 1. It should be noted, that because these data represent the soil conditions prior to the completion of SVE operation, and are thus likely to over-estimate current soil BTEX levels, their use in this evaluation contributes to the conservative nature of this assessment.

The Site is currently operated as a service station, and was assumed to remain a service station for the purpose of this evaluation. Therefore, the commercial/industrial exposure scenario was used to evaluate the potential exposure of receptors to ambient and indoor air at this site. The values for the exposure parameters associated with this scenario are summarized in Worksheet 4.3.

Acceptable risk-based soil and groundwater levels were calculated based on a 1×10^{-5} (i.e., 1 in 100,000) probability of developing cancer from cancer-causing substances, and a hazard quotient of 1 for noncancer-causing substances.

The next step in this Tier 1 evaluation is to review the assumptions used to derive the risk-based screening levels (RBSLs) for contaminated media (i.e., groundwater and soil) and potential exposure routes (i.e., inhalation of indoor and ambient air), and determine whether they are likely to be conservative for this Site.

The emission and air dispersion models, and the default modeling values used in the ASTM guidelines to generate the RBSLs are suitable to generate conservative RBSLs for the following reasons:

- Losses due to biodegradation and adsorption onto soil during volatilization from the unsaturated zone are not accounted for by the models.

- Volatilization of BTEX and PCE to ambient and indoor air was considered a complete pathway for the purposes of this assessment. This assumption is extremely conservative because the site is covered by concrete and asphalt, which - although not completely impermeable, limits vapor diffusion to a much greater degree than the vapor emission model can account for.

- The Tier 1 assessment of volatile organic compound emissions from soil assumes the source is no more than 9 feet bgs. Since most of the BTEX at this site is 15 to 20 feet bgs, the model results will over-estimate the emission of BTEX into ambient and indoor air.

- The RBSLs for volatilization from soil and groundwater are based on the assumption that volatilization takes place through a sandy material. In fact, the soils at this site are a complex assemblage of interbedded materials. In addition to sands and gravels, however, the site contains interconnected lenses of silts and clays that are expected to retard volatilization of the BTEX and PCE to the surface. The RBSLs, therefore, are based on significantly higher rates of volatilization than are expected at this site.

- The mathematical models used to generate the RBSL for the subsurface soil-to-ambient air pathway assume an infinite source of BTEX in the soil. In reality, the source will decrease with time as the chemicals degrade and are lost to volatilization. The RBSLs, therefore, significantly overestimate the actual concentration corresponding to an acceptable level of risk.

The assumptions used to develop RBSLs for the pertinent potential exposure pathways are, conservative and are thus appropriate for the purpose of screening. The only modification necessary to the RBSLs presented in Table X2.1 of the ASTM guidelines is to adjust the RBSLs for benzene by multiplying them by 0.29 (California Regional Water Quality Control Board [RWQCB], San Francisco Bay Region, memorandum, January 5, 1996). For example, the adjusted RBSL from Table X2.1 for exposure to benzene through volatilization from groundwater to ambient air is presented below.

Target levels (ASTM Lookup Table X2.1) for benzene (mg/L), for the vapor intrusion from groundwater-to-ambient air pathway, given a commercial/industrial receptor scenario:

- 10^{-6} risk - (i.e., 1E-06 risk) = 1.84E+01 mg/L

The RBSL corresponding to a on-site 10^{-5} risk is:

- 1E-05 risk = 1.84E+02 mg/L or 184 mg/L

RWQCB benzene correction:

- 184 mg/L x 0.29 = 53.4 mg/L

RBSL = 53.4 mg/L

The representative Site concentrations and their corresponding Tier 1 RBSLs are summarized in Table 1. The results for the Tier 1 evaluation show that the RBSLs are not exceeded for the pathways evaluated. This evaluation is considered very conservative because, as previously described, the data used to generate representative soil concentrations for comparison to RBSLs were collected before SVE operation was completed, and the RBSLs were derived in a very conservative manner.

SUMMARY AND CONCLUSION

At ARCO Service Station 276, 10600 MacArthur Boulevard, a former waste oil tank was removed in 1988, and four fuel storage tanks, associated piping and impacted soil were removed from the site in 1990. The soil vapor extraction (SVE) system has been in operation since September 1990. A total of 7,811 pounds of total petroleum hydrocarbons as gasoline (TPHG) have been recovered from the site since system startup. The residual BTEX in the soil and groundwater associated with the former USTs, and PCE associated with an off-site source were evaluated to determine what risk, if any, they might present to current and future on-site receptors. In addition, EMCON evaluated the potential risk, if any, from BTEX detected in soil and groundwater to off-site receptors on the adjacent property located southeast of the site. These evaluations were conducted using the ASTM RBCA guidelines. The results are presented in Table 1, and show concentrations of BTEX detected in soil and groundwater, and PCE detected in groundwater at the Site do not exceed levels that correspond to an acceptable level of risk. These results indicate that no additional remedial measures, and no additional evaluations are necessary to protect the health of the current or future on-site and off-site receptors evaluated in this assessment.

Based on the results of this evaluation, we propose that future work at this site consist of annual groundwater monitoring to verify that BTEX and PCE levels continue to pose no significant risk. After two years of annual monitoring, and BTEX concentrations do not increase, EMCON will request closure for the site.

Sincerely,

EMCON

Dr. Ray Kaminsky
Environmental Chemist

John C. Young, R.G. 6407
Project Manager

Attachments: Table 1 - Tier 1 Results
Table 2 - Analytical Soil Results
Figure 1 - Site Location
Figure 2 - Site Plan
Figure 3 - Risk-Based Corrective Action Process Flowchart
Figure 4 - Benzene and Tetrachloroethene (PCE) Concentrations in Groundwater, Third Quarter of 1996
Appendix A - Historical Summary of Analytical Results, Tetrachloroethene (PCE) and Petroleum Hydrocarbons
Appendix B - ASTM RBCA Worksheets

cc: Mr. Barney Chan, ACHCSA
Mr. Kevin Graves, RWQCB
Beth Dorris, ARCO Legal Department

Table 1

Tier 1 Results
ARCO Service Station 276, 10600 MacArthur Boulevard

Compounds	Groundwater to Ambient Air Pathway			Groundwater to Indoor Air Pathway			Soil to Ambient Air Pathway		
	Representative Concentrations in Groundwater [1] (mg/L)	RBSL (mg/L)	Note	Representative Concentrations in Groundwater [1] (mg/L)	RBSL (mg/L)	Note	Representative Concentrations in Soil [3] (mg/kg)	RBSL (mg/kg)	Note
PCE	2.4 [2]	> S	RBSL Not Exceeded	2.4 [2]	3.2	RBSL Not Exceeded	--	--	
Benzene	0.074	53.4	RBSL Not Exceeded	0.074	0.214	RBSL Not Exceeded	0.95	1.33	RBSL Not Exceeded
Toluene	0.036	> S	RBSL Not Exceeded	0.036	85	RBSL Not Exceeded	0.73	RES	RBSL Not Exceeded
Ethylbenzene	0.34	> S	RBSL Not Exceeded	0.34	> S	RBSL Not Exceeded	0.73	RES	RBSL Not Exceeded
Xylenes	1.6	> S	RBSL Not Exceeded	1.6	> S	RBSL Not Exceeded	2.7	RES	RBSL Not Exceeded

1. The most recent groundwater monitoring results from well MW-7 were used.
2. The 95 percent upper confidence interval of the mean PCE concentrations were used.
3. The 95 percent upper confidence interval of the mean benzene, toluene, ethylbenzene, and xylene (BTEX) concentrations were used.

RBSL: Risk-Based Screening Level

RBSLs for benzene are for $1x10^{-5}$ risk level, and have been multiplied by 0.29 to account for California's slope factor for benzene.

PCE: Tetrachloroethene

RES: The RBSL is greater than the holding capacity of the soil, and thus the soil can be saturated and not exceed the RBSL.

>S: The RBSL is greater than the solubility of that compound in water, and thus the water can be saturated and not exceed the RBSL.

Table 2

Analytical Soil Results
ARCO Service Station 276, 10600 MacArthur Boulevard

Boring / Sample	Depth feet	Benzene mg/kg	Toluene mg/kg	Ethylbenzene mg/kg	Xylenes mg/kg
TPB1	18.5	<0.050	0.069	0.14	0.22
TPB2	18.5	<0.050	<0.050	<0.050	<0.050
TPB3	20.0	0.46	<0.05	0.086	<0.050
B2 / MW-2	20.0	7.4	36	10	62
B5 / MW-5	18.0	0.23	0.11	<0.05	0.21
B12 / MW-8	19.0	1.2	0.79	0.043	0.23
B13 / VW-1	18.0	0.084	0.013	0.034	0.14
B14 / VW-2	17.5	0.14	0.4	1	5
B15 / VW-3	18.0	0.21	0.47	0.021	0.11
B16 / VW-4	19.0	0.28	0.018	0.048	0.082
B17 / VW-5	18.0	48	160	94	420
B18 / VW-6	17.5	3	15	15	92
B19 / VW-7	17.5	<0.05	<0.05	<0.05	<0.05

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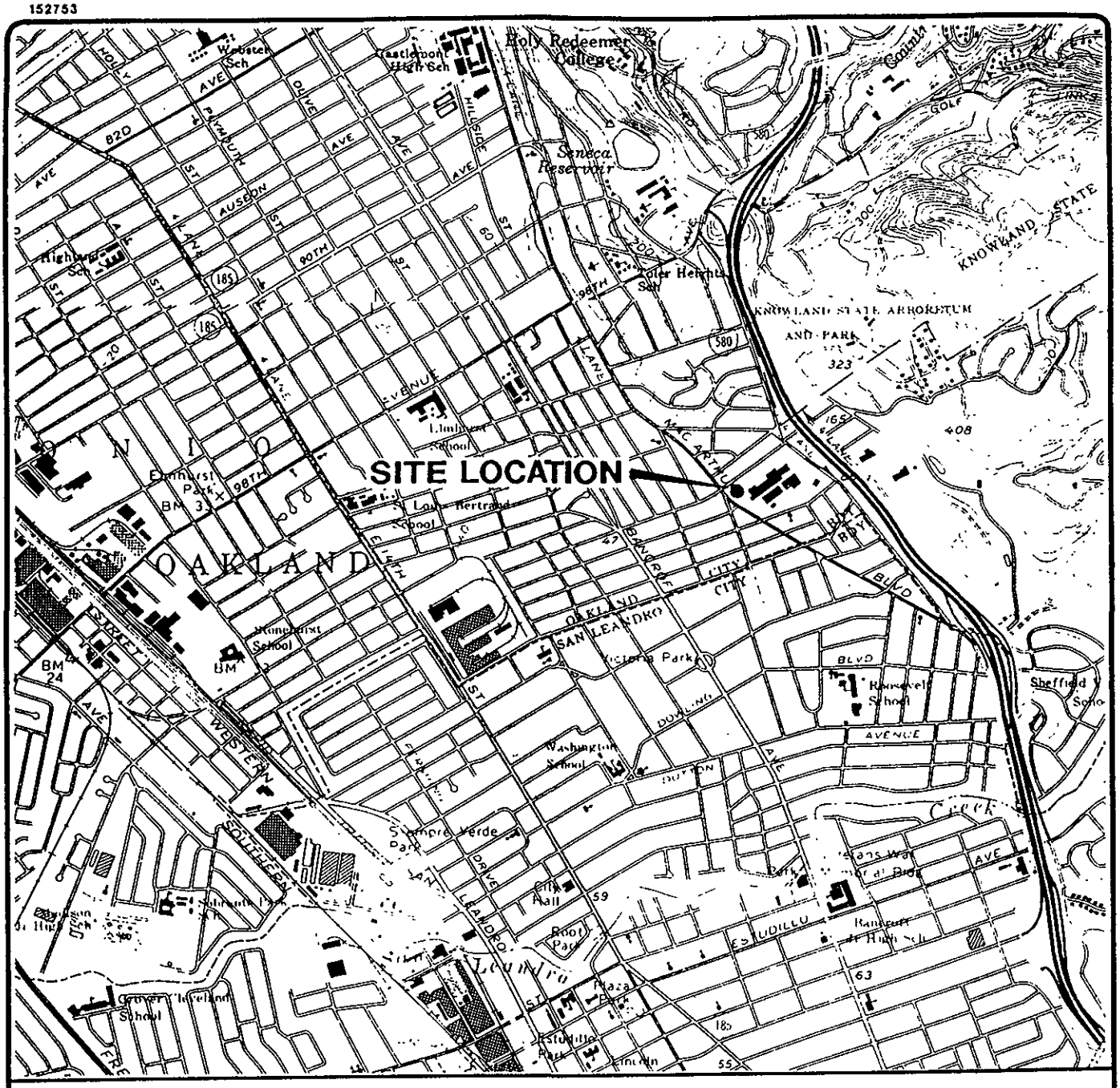

Base map from USGS 7.5' Quad. Maps:
Oakland East and San Leandro, California.
Photorevised 1980.

Scale : 0 2000 4000 Feet

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10600 AND 10700 MACARTHUR BLVD.
RETAIL SERVICE STATION
OAKLAND, CALIFORINA

SITE LOCATION

FIGURE
1

PROJECT NO.
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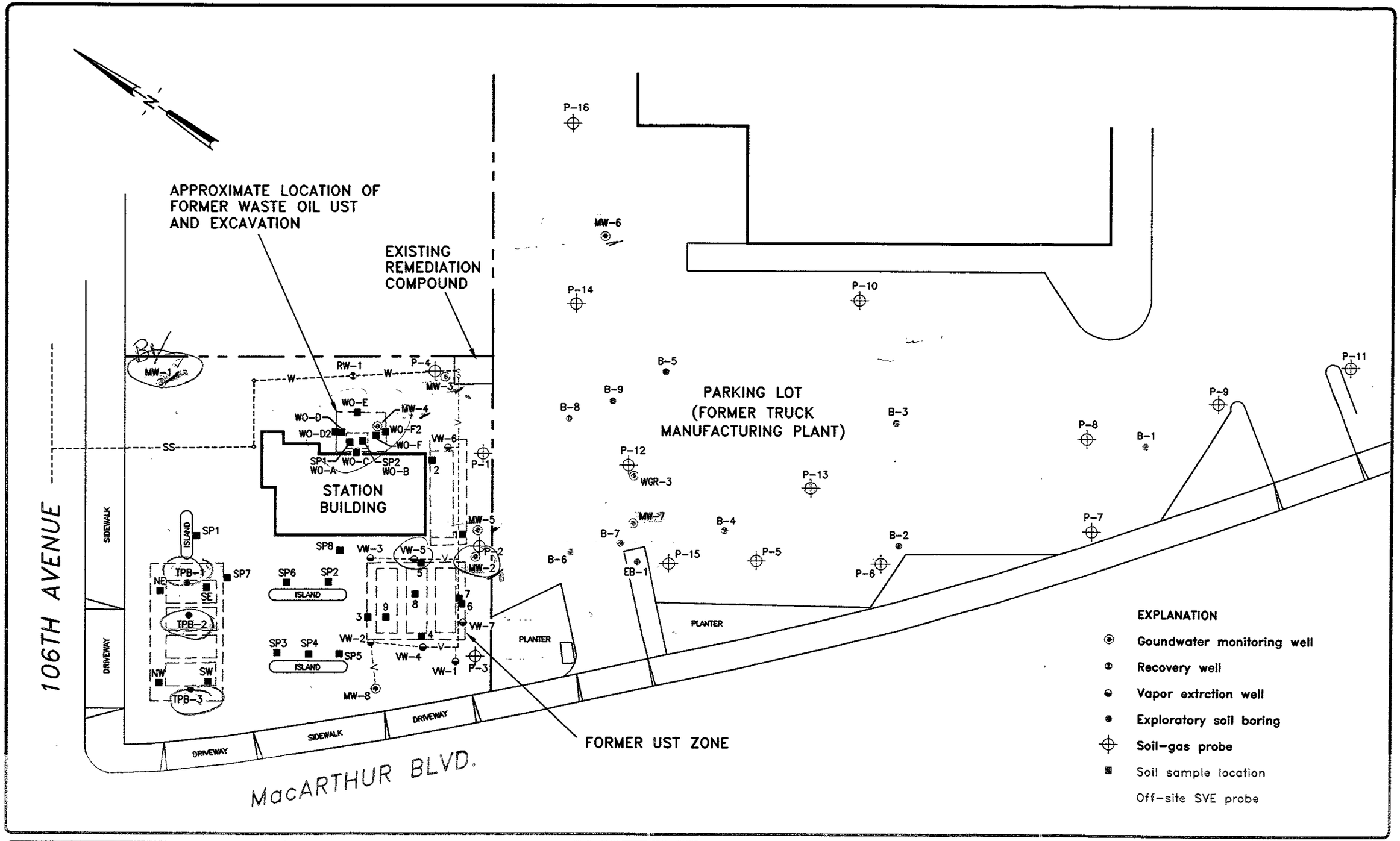

SCALE: 0 30 60 FEET

10600 AND 10700 MACARTHUR BLVD.
RETAIL SERVICE STATION
OAKLAND, CALIFORNIA

SITE PLAN

FIGURE NO.
2
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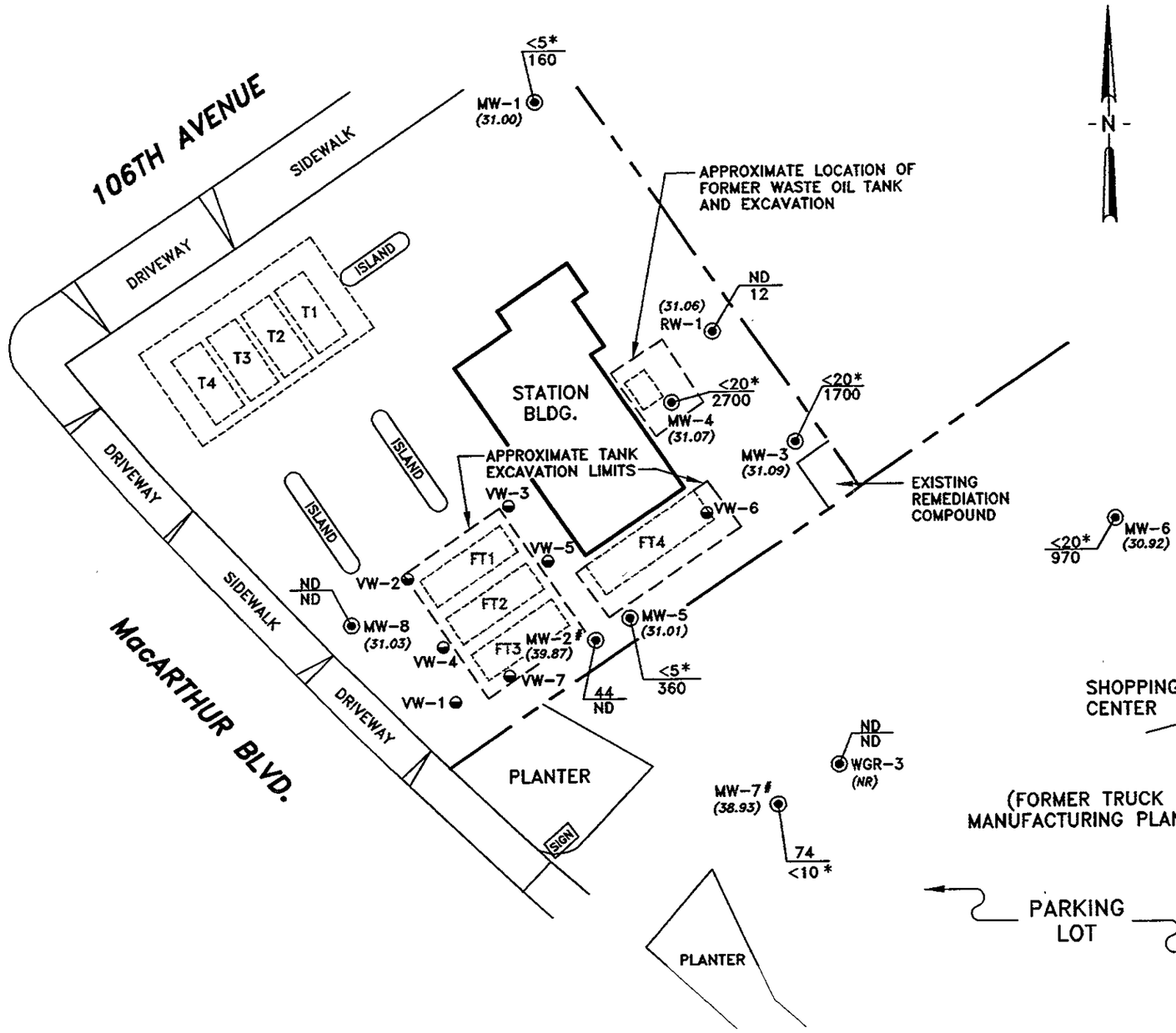

EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Existing underground storage tank
- Former underground storage tank
- (31.03) Groundwater elevation (Ft.–MSL); measured 5/28/96
- ND / ND — Benzene concentration in groundwater (ug/L); sampled 5/28/96 / PCE concentration in groundwater (ug/L); sampled 5/28/96
- * Raised method reporting limit due to high analyte concentration requiring sample dilution
- # Well screened in shallow water–bearing zone; not used in contouring
- ND Not detected at or above the method reporting limit for benzene (1 ug/L) or PCE (1 ug/L)
- NR Not recorded

Note: Not contoured because of relatively flat gradient.

Base map modified from RESNA, 1993

EMCON

SCALE: 0 30 60 FEET

10600 AND 10700 MACARTHUR BLVD.
RETAIL SERVICE STATION
OAKLAND, CALIFORNIA

BENZENE AND TETRACHLOROETHENE (PCE) CONCENTRATIONS IN GROUNDWATER
SECOND QUARTER 1996

FIGURE NO. 4

PROJECT NO. 805-120.07

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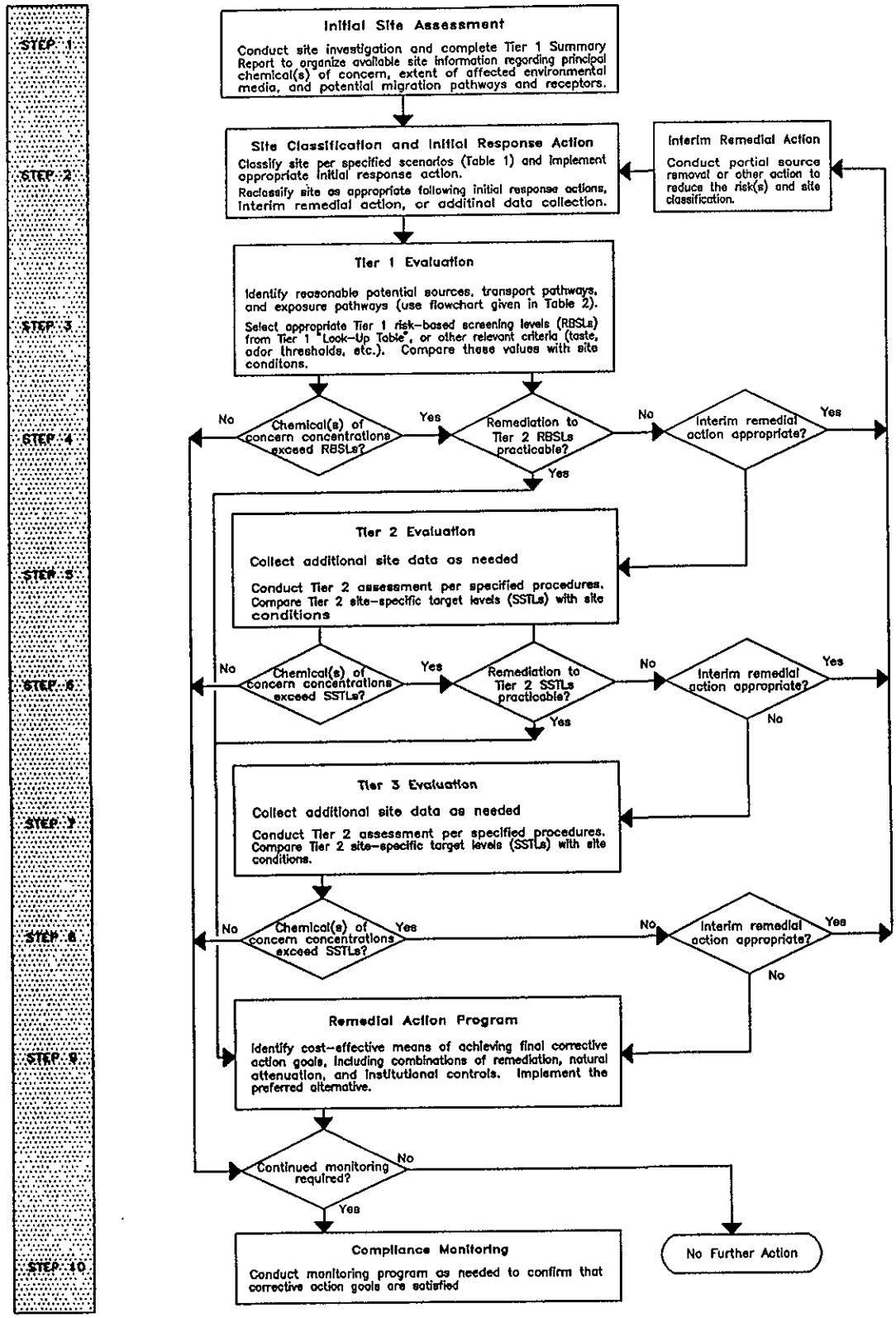

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10600 AND 10700 MACARTHUR BLVD.
RETAIL SERVICE STATION
OAKLAND, CALIFORNIA

RISK-BASED CORRECTIVE ACTION PLAN
PROCESS FLOWCHART

FIGURE NO.
3
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APPENDIX A

HISTORICAL SUMMARY OF ANALYTICAL RESULTS

Historical Groundwater Analytical Data*
Tetrachloroethene (PCE) and Petroleum Hydrocarbons

10600 and 10700 MacArthur Boulevard
Oakland, California

Date. 10-25-96

Well Designation	Water Sample Field Date	Tetrachloroethene (PCE) by EPA Method 601/8010 or 624/8240	BTEX by EPA Method 624/8240			
		Tetrachloro-ethene	Benzene	Toluene	Ethylbenzene	Total Xylenes
		µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	09-03-91	4.5	ND	ND	ND	ND
MW-1	11-06-91	<2.0	ND	ND	ND	ND
MW-1	03-10-92	8.2	ND	ND	ND	ND
MW-1	06-30-92	15	ND	ND	ND	ND
MW-1	09-09-92	6	ND	ND	ND	ND
MW-1	11-20-92	2	ND	ND	ND	ND
MW-1	02-12-93	92	ND	ND	ND	ND
MW-1	05-12-93	280	ND	ND	ND	ND
MW-1	08-18-93	120	ND	ND	ND	ND
MW-1	11-10-93	46	ND	ND	ND	ND
MW-1	02-04-94	22	<1	<1	<1	<5
MW-1	05-02-94	35	<1	<1	<1	<5
MW-1	08-03-94	14	<1	<1	<1	<5
MW-1	12-06-94	17	<1	<1	<1	<5
MW-1	03-10-95	170	<1	<1	<1	<5
MW-1	06-05-95	210	<5	<5	<5	<25
MW-1	08-29-95	130	<1	<1	<1	<5
MW-1	11-16-95	45	<1	<1	<1	<5
MW-1	02-28-96	97	<1	<1	<1	<5
MW-1	05-28-96	160	<5	<5	<5	<25
MW-2	09-03-91	Not sampled: well contained floating product				
MW-2	11-06-91	Not sampled: well contained floating product				
MW-2	03-10-92	0.9	ND	ND	ND	ND
MW-2	06-30-92	<2000	9300	18000	4200	27000
MW-2	09-09-92	Not sampled: well contained floating product				
MW-2	11-20-92	Not sampled: well contained floating product				
MW-2	02-12-93	Not sampled: well contained floating product				
MW-2	05-12-93	Not sampled: well contained floating product				
MW-2	08-18-93	Not sampled:				
MW-2	11-10-93	Not sampled: floating product entered the well during purging				
MW-2	02-04-94	<1	170	9	36	160
MW-2	05-02-94	<1	140	21	79	190
MW-2	08-03-94	Not sampled: well was inaccessible due to a parked car				
MW-2	12-06-94	<5	620	28	220	1200
MW-2	03-11-95	<1	110	12	15	240
MW-2	06-05-95	<1	83	14	72	190
MW-2	08-29-95	<5	220	26	210	450
MW-2	11-16-95	Not surveyed: well was inaccessible				
MW-2	02-28-96	<1	18	<1	13	14
MW-2	05-28-96	<1	44	<1	22	62

Historical Groundwater Analytical Data*
Tetrachloroethene (PCE) and Petroleum Hydrocarbons

10600 and 10700 MacArthur Boulevard
Oakland, California

Date: 10-25-96

Well Designation	Water Sample Field Date	Tetrachloroethene (PCE) by EPA Method 601/8010 or 624/8240	BTEX by EPA Method 624/8240			
		Tetrachloro-ethene	Benzene	Toluene	Ethylbenzene	Total Xylenes
		µg/L	µg/L	µg/L	µg/L	µg/L
MW-3	09-03-91	1600	ND	ND	ND	ND
MW-3	11-06-91	400	ND	ND	ND	ND
MW-3	03-10-92	980	ND	ND	ND	ND
MW-3	06-30-92	1500	ND	ND	ND	ND
MW-3	09-09-92	800	ND	ND	ND	ND
MW-3	11-20-92	690	ND	ND	ND	ND
MW-3	02-12-93	1200	ND	ND	ND	ND
MW-3	05-12-93	1600	ND	ND	ND	ND
MW-3	08-18-93	1300	ND	ND	ND	ND
MW-3	11-10-93	1300	ND	ND	ND	ND
MW-3	02-04-94	91	<5	<5	<5	<25
MW-3	05-02-94	1600	<20	<20	<20	<100
MW-3	08-03-94	680	<20	<20	<20	<100
MW-3	12-06-94	1100	<25	<25	<25	<125
MW-3	03-11-95	1700	<10	<10	<10	<50
MW-3	06-05-95	2500	<20	<20	<20	<100
MW-3	08-29-95	1600	<20	<20	<20	<100
MW-3	11-16-95	1100	<20	<20	<20	<100
MW-3	02-28-96	1100	<10	<10	<10	<50
MW-3	05-28-96	1700	<20	<20	<20	<100

Historical Groundwater Analytical Data*
Tetrachloroethene (PCE) and Petroleum Hydrocarbons

10600 and 10700 MacArthur Boulevard
Oakland, California

Date: 10-25-96

Well Designation	Water Sample Field Date	Tetrachloroethene (PCE) by EPA Method 601/8010 or 624/8240	BTEX by EPA Method 624/8240			
		Tetrachloro-ethene	Benzene	Toluene	Ethylbenzene	Total Xylenes
		µg/L	µg/L	µg/L	µg/L	µg/L
MW-4	07-31-90	1600	ND	ND	ND	ND
MW-4	10-30-90	3600	ND	ND	ND	ND
MW-4	01-30-91	4900	ND	ND	ND	ND
MW-4	04-30-91	2200	ND	ND	ND	ND
MW-4	08-06-91	1700	ND	ND	ND	ND
MW-4	09-03-91	2000	ND	ND	ND	ND
MW-4	11-06-91	1000	ND	ND	ND	ND
MW-4	03-10-92	2300	ND	ND	ND	ND
MW-4	06-30-92	1800	ND	ND	ND	ND
MW-4	09-09-92	1300	ND	ND	ND	ND
MW-4	11-20-92	1700	ND	ND	ND	ND
MW-4	02-12-93	1800	ND	ND	ND	ND
MW-4	05-12-93	1500	ND	ND	ND	ND
MW-4	08-18-93	1800	ND	ND	ND	ND
MW-4	11-10-93	1800	ND	ND	ND	ND
MW-4	02-04-94	1900	<20	<20	<20	<100
MW-4	05-02-94	1700	<20	<20	<20	<100
MW-4	08-03-94	1200	<20	<20	<20	<100
MW-4	12-06-94	2200	<20	<20	<20	<100
MW-4	03-11-95	2600	<20	<20	<20	<100
MW-4	06-05-95	3100	<20	<20	<20	<100
MW-4	08-29-95	2900	<20	<20	<20	<100
MW-4	11-16-95	2100	<20	<20	<20	<100
MW-4	02-28-96	2400	<20	<20	<20	<100
MW-4	05-28-96	2700	<20	<20	<20	<100

$\bar{x} \sim 2500$

Historical Groundwater Analytical Data*
Tetrachloroethene (PCE) and Petroleum Hydrocarbons

10600 and 10700 MacArthur Boulevard
Oakland, California

Date: 10-25-96

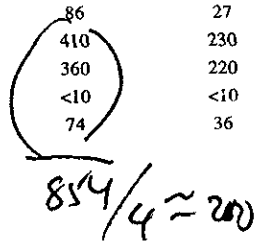
Well Designation	Water Sample Field Date	Tetrachloroethene (PCE) by EPA Method 601/8010 or 624/8240	BTEX by EPA Method 624/8240			
		Tetrachloro-ethene	Benzene	Toluene	Ethylbenzene	Total Xylenes
		µg/L	µg/L	µg/L	µg/L	µg/L
MW-5	08-06-91	7.3	ND	ND	ND	ND
MW-5	09-03-91	25	ND	ND	ND	ND
MW-5	11-06-91	12	ND	ND	ND	ND
MW-5	03-10-92	300	ND	ND	ND	ND
MW-5	06-30-92	30	ND	ND	ND	ND
MW-5	09-09-92	120	ND	ND	ND	ND
MW-5	11-24-92	93	ND	ND	ND	ND
MW-5	02-12-93	210	ND	ND	ND	ND
MW-5	05-12-93	50	ND	ND	ND	ND
MW-5	08-18-93	80	ND	ND	ND	ND
MW-5	11-10-93	42	ND	ND	ND	ND
MW-5	02-04-94	39	<1	<1	<1	<5
MW-5	05-02-94	35	<1	<1	<1	<5
MW-5	08-03-94	25	<1	<1	<1	<5
MW-5	12-06-94	1800	<20	<20	<20	<100
MW-5	03-10-95	270	<5	<5	<5	<25
MW-5	06-05-95	310	<5	<5	<5	<25
MW-5	08-29-95	240	<5	<5	<5	<25
MW-5	11-16-95	940	<5	<5	<5	<25
MW-5	02-28-96	1100	<10	<10	<10	<50
MW-5	05-28-96	360	<5	<5	<5	<25
MW-6	06-30-92	2400	ND	ND	ND	ND
MW-6	09-09-92	Not sampled: well was paved over				
MW-6	11-20-92	Not sampled: well was paved over				
MW-6	02-12-93	4200	ND	ND	ND	ND
MW-6	05-12-93	3500	ND	ND	ND	ND
MW-6	08-18-93	3000	ND	ND	ND	ND
MW-6	11-10-93	3900	ND	ND	ND	ND
MW-6	02-04-94	2900	<50	<50	<50	<250
MW-6	05-02-94	2000	<50	<50	<50	<250
MW-6	08-03-94	1400	<50	<50	<50	<250
MW-6	12-06-94	2000	<50	<50	<50	<250
MW-6	03-11-95	1300	<20	<20	<20	<100
MW-6	06-05-95	2000	<20	<20	<20	<100
MW-6	08-29-95	1300	<20	<20	<20	<100
MW-6	11-16-95	1300	<20	<20	<20	<100
MW-6	02-28-96	960	<20	<20	<20	<100
MW-6	05-28-96	970	<20	<20	<20	<100

Historical Groundwater Analytical Data*
Tetrachloroethene (PCE) and Petroleum Hydrocarbons

10600 and 10700 MacArthur Boulevard
Oakland, California

Date: 10-25-96

Well Designation	Water Sample Field Date	Tetrachloroethene (PCE) by EPA Method 601/8010 or 624/8240	BTEX by EPA Method 624/8240			
		Tetrachloro-ethene	Benzene	Toluene	Ethylbenzene	Total Xylenes
		µg/L	µg/L	µg/L	µg/L	µg/L
MW-7	06-30-92	<1000	5100	6800	2300	16000
MW-7	09-09-92	Not sampled: well contained floating product				
MW-7	11-20-92	Not sampled: well contained floating product				
MW-7	02-12-93	Not sampled: well contained floating product				
MW-7	05-12-93	Not sampled: well contained floating product				
MW-7	08-18-93	Not sampled: well contained floating product				
MW-7	11-10-93	Not sampled: floating product entered the well during purging				
MW-7	02-04-94	<50	940	950	1100	9100
MW-7	05-02-94	<50	440	400	660	5200
MW-7	08-03-94	<50	640	770	960	6200
MW-7	12-06-94	<50	230	180	750	4800
MW-7	03-11-95	Not sampled: floating product entered the well during purging				
MW-7	06-05-95	<10	86	27	420	1400
MW-7	08-29-95	<10	410	230	1100	5000
MW-7	11-16-95	<20	360	220	1700	10000
MW-7	02-28-96	<10	<10	<10	87	760
MW-7	05-28-96	<10	74	36	340	1600
MW-8	09-09-92	37	4	ND	ND	ND
MW-8	11-24-92	2	ND	ND	ND	ND
MW-8	02-12-93	<1	ND	ND	ND	ND
MW-8	05-12-93	<1	ND	ND	ND	ND
MW-8	08-18-93	<1	ND	ND	ND	ND
MW-8	11-10-93	<1	ND	ND	ND	ND
MW-8	02-04-94	<1	<1	<1	<1	<5
MW-8	05-02-94	<1	<1	<1	<1	<5
MW-8	08-03-94	<1	<1	<1	<1	<5
MW-8	12-06-94	2	<1	<1	<1	<5
MW-8	03-10-95	<1	<1	<1	<1	<5
MW-8	06-05-95	<1	<1	<1	<1	<5
MW-8	08-29-95	<1	<1	<1	<1	<5
MW-8	11-16-95	<1	<1	<1	<1	<5
MW-8	02-28-96	3	<1	<1	<1	<5
MW-8	05-28-96	<1	<1	<1	<1	<5



Historical Groundwater Analytical Data*
Tetrachloroethene (PCE) and Petroleum Hydrocarbons

10600 and 10700 MacArthur Boulevard
Oakland, California

Date: 10-25-96

Well Designation	Water Sample Field Date	Tetrachloroethene (PCE) by EPA Method 601/8010 or 624/8240	BTEX by EPA Method 624/8240			
		Tetrachloro-ethene	Benzene	Toluene	Ethylbenzene	Total Xylenes
		µg/L	µg/L	µg/L	µg/L	µg/L
RW-1	11-06-91	980	ND	ND	ND	ND
RW-1	03-10-92	400	ND	ND	ND	ND
RW-1	06-30-92	1100	ND	ND	ND	ND
RW-1	09-09-92	1500	ND	ND	ND	ND
RW-1	11-24-92	1500	ND	ND	ND	ND
RW-1	02-12-93	620	ND	ND	ND	ND
RW-1	05-12-93	500	ND	ND	ND	ND
RW-1	08-18-93	470	ND	ND	ND	ND
RW-1	11-10-93	1500	ND	ND	ND	ND
RW-1	02-04-94	2200	<20	<20	<20	<100
RW-1	05-02-94	45	<1	<1	<1	<5
RW-1	08-03-94	350	<1	<1	<1	<5
RW-1	12-06-94	340	<5	<5	<5	<25
RW-1	03-10-95	260	<5	<5	<5	<25
RW-1	06-05-95	59	<1	<1	<1	<5
RW-1	08-29-95	570	<5	<5	<5	<25
RW-1	11-16-95	140	<1	<1	<1	<5
RW-1	02-28-96	6	<1	<1	<1	<5
RW-1	05-28-96	12	<1	<1	<1	<5
WGR-3	05-02-94	<1	<1	<1	<1	<5
WGR-3	08-03-94	<1	<1	<1	<1	<5
WGR-3	12-06-94	4	<1	<1	<1	<5
WGR-3	03-11-95	<1	<1	<1	<1	<5
WGR-3	06-05-95	<1	<1	<1	<1	<5
WGR-3	08-29-95	<1	<1	<1	<1	<5
WGR-3	11-16-95	<1	<1	<1	<1	<5
WGR-3	02-28-96	<1	<1	<1	<1	<5
WGR-3	05-28-96	<1	<1	<1	<1	<5

µg/L: micrograms per liter
- - : not analyzed or not reported
*: For previous historical groundwater elevation and petroleum hydrocarbon analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Results and Remediation System Performance Evaluation Report, Retail Service Station 10600 and 10700 MacArthur Boulevard, Oakland, California, (EMCON, March 22, 1996).*

APPENDIX B

ASTM RBCA WORKSHEETS

Site Name: Retail Service Station | Date Completed: 10-21-96

Site Location: 10600 MacArthur Blvd., Oakland, CA | Completed By: EMCON

TIER 1 EXECUTIVE SUMMARY CHECKLIST

VISUAL/HISTORICAL ASSESSMENT	(■ TO SELECT)		
Site size (acres)	■ <1	☐ <10	☐ >10
Site setting	☐ undeveloped	■ industrial	☐ residential
Site access	■ *capped*	☐ *fenced-in*	☐ *open*
Visual evidence of environmental impact	■ none	☐ limited	☐ extensive
Current site land use	☐ undeveloped	■ indust./comm.	☐ residential
Contaminant sources	■ tanks/spills	☐ trench/drums	☐ ponds/pits
Affected environmental media	■ soil (>3 ft BGS)	■ groundwater	☐ surficial soil (≤3 ft BGS)
Types of compounds likely to be present	■ petroleum hydrocarbons	☐ metals	
	☐ inorganic (nitrates)	☐ other:(pesticides)	

BASELINE RECEPTOR IDENTIFICATION			
Reasonable potential receptors (greatest concern)	☐ none	☐ ecological	■ human
Distance from fenceline to nearest off-site receptor (ft)	☐ >500	☐ 100 - 500	■ <100
Travel time to closest groundwater receptor (yr)	■ >10	☐ 2 - 10	☐ <2
Depth to first encountered groundwater (ft)	☐ >150	☐ 50 - 150	■ <50
Complete exposure pathways	☐ none	☐ ingestion	■ inhalation
	☐ ecological	☐ dermal	☐ absorption

TIER 1 TASKS COMPLETED

- ■ Visual / historical assessment
- ■ Initial (screening) site assessment
- ■ Site prioritization / classification
- ■ Detailed site characterization
- ■ RBSL comparison
- ☐ Initial ecological assessment
- ■ Corrective action planned or implemented

TIER 1 CLASSIFICATION EVALUATION

Classification No.	Scenario Description	Prescribed Interim Action	Date Implemented
4	No long-term threat to human health or safety or sensitive environmental receptors.	Continue monitoring.	

TIER 1 CORRECTIVE ACTION CRITERIA

Affected Medium	Screening Level Criteria Exceeded? (■ if yes)						
	Risk-Based	Other (MCL)	Others: (specify)	_____	_____	_____	None Exceeded
• Surface Soil (< 3ft BGS)	☐	☐	☐	☐	☐	☐	■
• Subsurface Soil (> 3ft BGS)	☐	☐	☐	☐	☐	☐	■
• Groundwater (potable/nonpotable)	☐	☐	☐	☐	☐	☐	■
• Surface waters	☐	☐	☐	☐	☐	☐	■

NOTES: (List and discuss chemicals for which a Tier 1 exceedance is found.)

PROPOSED TIER 1 ACTION

- ■ ***No Action:*** Site does not exceed Tier 1 criteria. - Apply for closure.
- ☐ ***Interim Corrective Action:*** Site exceeds some Tier 1 criteria. - Propose interim corrective action and reprioritize site.
- ☐ ***Final Corrective Action:*** Site exceeds some Tier 1 criteria. - Propose corrective action to achieve Tier 1 criteria.
- ☐ ***Tier 2 Evaluation:*** Site exceeds some Tier 1 criteria. - Re-evaluate corrective action goals per Tier 2 risk assessment.

NOTE:
Rationale for proposed action documented on Worksheets 1.3 and 10.1-10.3.

ALL WORKSHEETS ENCLOSED IN THIS REPORT ARE IDENTIFIED ON THE TABLE OF CONTENTS FORM.

Site Name: Retail Service Station
Site Location: 10600 MacArthur Blvd., Oakland, CA
Date Completed: 10-21-96
Completed By: EMCON

EXPOSURE CONTROL FLOWCHART

Instructions: *Identify remedial measures to be implemented to prevent exposure, as follows:* • Step 1 – *Baseline Exposure: Identify applicable sources, transport mechanisms, and receptors as shown on Worksheet 4.2 (■ = applicable to site).* • Step 2 – *Remedial Measures: Fill in shut-off valves (⋈) to indicate removal / treatment action, containment measure, or institutional controls to be used to "shut off" exposure pathway.* • Step 3 – *Remedial Technology Options: For each complete pathway, identify category of corrective measure to be applied and list possible technology options in space provided (see options list in RBCA Guidance Manual).*

PRIMARY SOURCES	SECONDARY SOURCES	TRANSPORT MECHANISMS	EXPOSURE PATHWAY	POTENTIAL RECEPTORS	REMEDIAL ACTION TECHNOLOGY OPTIONS
■ Product Storage ■ Piping / Distribution □ Operations □ Waste Management Unit □ Other:	□ Affected Surface Soils (≤3 ft depth)	□ Wind Erosion And Atmospheric Dispersion	□ Soil Dermal Contact/ Ingestion	**Exposed Receptors** On-Site: □ Residential □ Non-Resid. ■ N/A □ Sensitive Habitat □ Recreation Off-Site: □ Residential □ Non-Resid. ■ N/A □ Sensitive Habitat □ Recreation	□ Complete Pathway: ○ Current ○ Potential ⋈ Action Required: □Yes ■ No If yes, list technology options for ⋈:
	■ Affected Subsurface Soils (> 3 ft depth)	■ Volatilization and Atmospheric Dispersion	■ Air Inhalation of Vapor or Dust	**Exposed Persons** On-Site: □Residential ■ Non-Resid. □ N/A Off-Site: □Residential ■ Non-Resid. □ N/A	■ Complete Pathway: ● Current ○ Potential ⋈ Action Required: □Yes ■ No If yes, list technology options for ⋈:
	■ Dissolved Groundwater Plume	■ Volatilization and Enclosed-Space Accumulation			
		■ Leaching and Groundwater Transport	□ Groundwater Potable Water Use	**Groundwater Users** On-Site: □Residential □ Non-Resid. ■ N/A Off-Site: □Residential □ Non-Resid. ■ N/A	□ Complete Pathway: ○ Current ○ Potential ⋈ Action Required: □Yes ■ No If yes, list technology options for ⋈:
	□ Free-Phase Liquid Plume	□ Mobile Free-Liquid Migration			
	□ Affected Surface Soils, Sediments, or Surface	□ Stormwater Surface Water Transport	□ Surface Water Recreational Use / Sensitive Habitat	**Surface Water Users** On-Site: □ Residential □ Non-Resid. ■ N/A □ Sensitive Habitat □ Recreation Off-Site: □ Residential □ Non-Resid. ■ N/A □ Sensitive Habitat □ Recreation	□ Complete Pathway: ○ Current ○ Potential ⋈ Action Required: □Yes ■ No If yes, list technology options for ⋈:
	REMOVAL / TREATMENT ACTIONS	CONTAINMENT MEASURES	INSTITUTIONAL CONTROLS		(■ OR ● OR ⋈ TO SELECT)

Site Name: Retail Service Station | Date Completed: 10-21-96

Site Location: 10600 MacArthur Blvd., Oakland, CA | Completed By: EMCON

SITE DESCRIPTION

Location Description (see Figure 1)

Address: 10600 MacArthur Blvd.
Cross-Street: 106th Ave.
City: Oakland
County: Alameda
State: CA

Notes:

Regulatory Agencies

Identify regulatory authorities and regulatory / legal status of site.

1) Agency: Alameda County Health Care Services Agency
Contact: Barney Chan
Agency: Regional Water Quality Control Board, San Francisco Bay Region
Contact: Kevin Graves
3) Other Involved Parties:
(■ *TO SELECT*) ☐ Consent order ☐ Lawsuit

Discussion:

Local Land Use (See Figure 2)

(■ *TO SELECT*)

On-Site Use	Current	Potential	Prior
Commercial	■	☐	☐
Residential	☐	☐	☐
Industrial	☐	☐	☐
Sensitive Habitat	☐	☐	☐
Other: (below)	☐	☐	☐

Other Comments:

Discuss options for listed items (including anticipated future use)

Topography (See Figures 1 and 3)

Terrain ■ Flat ☐ Steep ☐ Variable
Site Elevation Interval (ft-MSL)
High Pt. 39.87 Low Pt. 30.92
Average Ground Surface Slope
Direction N/A Grade (ft/ft) Flat

Other Comments:

Local Climate

Average Annual Rainfall (in): 20
Annual Average Evapotranspiration (in):
Within 100 Year Floodplain?: ☐ yes / ■ no
Summer Temperature Range (°F): 71-74
Winter Temperature Range (°F): 56-64

Other Comments:

Site Name: Retail Service Station | Date Completed: 10-21-96

Site Location: 10600 MacArthur Blvd., Oakland, CA | Completed by: EMCON

BASELINE EXPOSURE FLOWCHART

Instructions: *To characterize baseline exposure conditions, check boxes to identify applicable primary sources, secondary sources (affected media), potential transport mechanisms, and current or potential exposure pathways and receptors (■ = applicable to site). Identify types(s) of both on-site and off-site receptors, if applicable. Provide detailed information on complete pathways, exposure factors, and risk goals on Worksheets 4.3 - 4.5.*

PRIMARY SOURCES	SECONDARY SOURCES	TRANSPORT MECHANISMS	EXPOSURE PATHWAY	POTENTIAL RECEPTORS	COMPLETE PATHWAY?
■ Product Storage ■ Piping / Distribution ☐ Operations ☐ Waste Management Unit ☐ Other:	☐ Affected Surface Soils (≤3 ft depth)	☐ Wind Erosion and Atmospheric Dispersion	☐ Soil Dermal Contact/ Ingestion	**Exposed Receptors** On-Site: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation Off-Site: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation	■ No ☐ Yes ○ Current ○ Potential ■ No ☐ Yes ○ Current ○ Potential
	■ Affected Subsurface Soils (> 3 ft depth)	■ Volatilization and Atmospheric Dispersion	■ Air Inhalation of Vapor or Dust	**Exposed Persons** On-Site: ☐ Residential ■ Non-Resid. ☐ N/A Off-Site: ☐ Residential ■ Non-Resid. ☐ N/A	☐ No ■ Yes ● Current ○ Potential ☐ No ■ Yes ● Current ○ Potential
	■ Dissolved Groundwater Plume	■ Volatilization and Enclosed-Space Accumulation			
		■ Leaching and Groundwater Transport	☐ Groundwater Potable Water Use	**Groundwater Users** On-Site: ☐ Residential ☐ Non-Resid. ■ N/A Off-Site: ☐ Residential ☐ Non-Resid. ■ N/A	■ No ☐ Yes ○ Current ○ Potential ■ No ☐ Yes ○ Current ○ Potential
	■ Free-Phase Liquid Plume	☐ Mobile Free-Liquid Migration			
	☐ Affected Surface Soils, Sediments, or Surface Water	☐ Stormwater/ Surface Water Transport	☐ Surface Water Recreational Use / Sensitive Habitat	**Surface Water Users** On-Site: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation Off-Site: ☐ Residential ☐ Non-Resid. ■ N/A ☐ Sensitive Habitat ☐ Recreation	■ No ☐ Yes ○ Current ○ Potential ■ No ☐ Yes ○ Current ○ Potential

(■ OR ● TO SELECT)

Site Name: Retail Service Station | Date Completed: 10-21-96

Site Location: 10600 MacArthur Blvd., Oakland, CA | Completed By: EMCON

SUMMARY OF MEDIA INVESTIGATION & CHEMICAL ANALYSES

		Site Media Analyzed (■ *TO SELECT*)					
		Ground-water	Surface Soil	Subsurf. Soil	Soil Vapor	Ambient Vapor	Surface Water
	Applicable?	■	☐	■	☐	☐	☐
	Sampled?	■	☐	■	☐	☐	☐
Chemical Analysis	**EPA Analysis Method**	**•ana. = chemical analyzed; •det. = chemical detected**					
Organic Chemicals		ana./det.	ana./det.	ana /det.	ana./det.	ana./det.	ana./det.
Volatile Organics (BTEX)	*8240 / 624*	■ ■	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Semi-Volatile Organics	*8270 / 625*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Polynuclear Aromatic Hydrocarbons	*8310 / 8270*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Purgeable Aromatics	*8020 / 602*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Total Petroleum Hydrocarbons (GC)	*5030/8020*	☐ ☐	☐ ☐	■ ■	☐ ☐	☐ ☐	☐ ☐
Halogenated Organic Chemicals		ana./det.	ana./det.	ana./det.	ana./det.	ana./det.	ana /det.
Halogenated Volatile Organics	*8240 / 624*	■ ■	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Organochlorine & PCBs	*8080*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Inorganic Chemicals		ana./det.	ana./det.	ana /det.	ana./det.	ana./det.	ana./det.
Metals	*6010 / 7xxx series*	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Others		ana./det.	ana./det.	ana./det.	ana./det.	ana./det.	ana./det.
• _____		☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
• _____		☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
• _____		☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
• _____		☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐

DISCUSSION OF MEDIA INVESTIGATION & CHEMICAL ANALYSES

Items for discussion include: •Selection of sampled media •Selected analysis methods •Planned additional sampling

Items	

Site Name: Retail Service Station | Date Completed: 10-21-96

Site Location: 10600 MacArthur Blvd., Oakland, CA | Completed By: EMCON

SUMMARY OF SOURCE ZONE CHARACTERISTICS

Instructions: ***Provide information regarding presence and dimensions of affected soil and groundwater zones. For each affected medium, list constituents of concern (COCs) and representative concentration data on Worksheets 5.4 - 5.6. Describe source area histories on Worksheets 2.2 and 2.3 and show locations on Figures 3 through 7. (Under RBCA, the affected soil or groundwater zone is defined as the area or volume containing COC concentrations in excess of Tier 1 screening levels.)***

AFFECTED SURFACE SOILS (≤ 3 ft BGS) (■ TO SELECT)

- ☐ Present
- ■ Not Present
- ☐ Not Measured

If present, complete the following:

- Maximum areal extent (ft^2): _____
- Width of affected zone (ft): _____
- Length of affected zone (ft) : _____
- Depth interval (ft,BGS): _____

(Provide COC data on Worksheet 5.4)

AFFECTED SUBSURFACE SOILS (> 3 ft BGS)

- ■ Present
- ☐ Not Present
- ☐ Not Measured

If present, complete the following:

- Depth to top of affected soil (ft) (min. 3 ft, BGS): 15 ft
- Depth to base of affected soil (ft, BGS): 20 ft
- Maximum areal extent (ft^2): _____

(Provide COC data on Worksheet 5.5)

AFFECTED GROUNDWATER

- ■ Present
- ☐ Not Present
- ☐ Not Measured

If present, complete the following:

- Maximum areal extent (ft^2): 3400 ft^2 (BTEX)
- Length of plume (ft): 100 ft (BTEX)
- Width of plume (ft): 30 ft (BTEX)
- Depth to top of affected water-bearing unit (ft, BGS): 20 ft, BGS (BTEX)
- Depth to base of plume (ft, BGS): _____

(Provide COC data on Worksheet 5.6)

OTHER SOURCE MEDIUM

- ☐ Present
- ■ Not Present

If present, describe nature of material and dimensions:

_____

_____

_____

_____

(Provide COC data on separate table)

Site Name: Retail Service Station | Date Completed: 10-21-96

Site Location: 10600 MacArthur Blvd., Oakland, CA | Completed By: EMCON

SUBSURFACE SOIL CONCENTRATION DATA SUMMARY (>3 FT BGS)

Instructions: ***Indicate type and concentrations of hazardous constituents detected in subsurface soil. Provide statistical data (maximum value, mean value, upper 90% confidence limit on mean) on detectable concentrations only. Do not include non-detects from outside of source zone. Select "representative concentration" value for comparison to cleanup standard (SSTL or RBSL) and calculation of baseline risk. Provide detailed lab data table(s) as Appendix A to this report.***

CONSTITUENTS DETECTED		ANALYTICAL METHOD		SAMPLE POPULATION		DETECTED CONCENTRATIONS			SELECTED REPRESENTATIVE CONC. (mg/kg)
CAS No.	Name	Method No.	Typical Detection Limit (mg/kg	No. of Samples	No. of Detects	Max Conc. (mg/kg)	Mean Conc. (mg/kg)	Upper 90%CL Conc. (mg/kg)	
	Volatilization from Soil to Ambient Air								
	Benzene	5030/8020	0.05	13	9			0.95	0.95
	Toluene	5030/8020	0.05	13	9			0.73	0.73
	Ethylbenzene	5030/8020	0.05	13	10			0.73	0.73
	Xylenes	5030/8020	0.05	13	9			2.7	2.7

Site Name: Retail Service Station | Date Completed: 10-21-96

Site Location: 10600 MacArthur Blvd., Oakland, CA | Completed By: EMCON

GROUNDWATER CONCENTRATION DATA SUMMARY

Instructions: ***Indicate type and concentrations of hazardous constituents detected in groundwater. Provide statistical data (maximum value, mean value, upper 90% confidence limit on mean) on detectable concentrations only. Do not include non-detects from outside of source zone. Select "representative concentration" value for comparison to cleanup standard (SSTL or RBSL) and calculation of baseline risk. Provide detailed lab data table(s) as Appendix A to this report.***

CONSTITUENTS DETECTED		ANALYTICAL METHOD		SAMPLE POPULATION		DETECTED CONCENTRATIONS			SELECTED REPRESENTATIVE CONC. (mg/L)
CAS No.	Name	Method No.	Typical Detection Limit (mg/l	No. of Samples	No. of Detects	Max Conc. (mg/L)	Mean Conc. (mg/L)	Upper 90%CL Conc. (mg/L)	
	Volatilization from Groundwater to Ambient Air								
	Tetrachloroethene (PCE)	8240	0.001	165	125			3.1	3.1
	Benzene	8240	0.001	165	19			0.074	0.074
	Toluene	8240	0.001	165	16			0.036	0.036
	Ethylbenzene	8240	0.001	165	19			0.34	0.34
	Xylenes	8240	0.005	165	19			1.6	1.6
	Volatilization from Groundwater to Indoor Air								
	Tetrachloroethene (PCE)	8240	0.001	165	125			3.1	3.1
	Benzene	8240	0.001	165	19			0.074	0.074
	Toluene	8240	0.001	165	16			0.036	0.036
	Ethylbenzene	8240	0.001	165	19			0.34	0.34
	Xylenes	8240	0.005	165	19			1.6	1.6

EMCON
1921 Ringwood Avenue • San Jose, California 95131 • **(408)453-7300** • Fax (408)437-9526

TRANSMITTAL

Project/Task No.: 20805-120.007

TO: Mr. Barney Chan
Alameda County Health Care Services Agency
1131 Harborbay Parkway
Alameda, California 94502-6577

DATE: March 13, 1997

RE: RBCA Report for ARCO Service Station 276, 10600 MacArthur Boulevard, Oakland, California

WE ARE SENDING: # 3756

Quantity	Description
1	RBCA Report, ARCO Station 276, Oakland, CA

I asked Ray Kamrowski to send me soil core info used to calculate as TOC

For Your:
X USE
APPROVAL
REVIEW/COMMENTS
INFORMATION
OTHER

Sent By:
X REGULAR MAIL
FEDERAL EXPRESS
UPS
COURIER
OTHER

COMMENTS:

1/10/

cc: Mr. Kyle Christie, ARCO
Ms. Beth Dorris, ARCO Legal
Mr. Kevin Graves, RWQCB, San Francisco Bay Region

BY: John C. Young

EMCON
1921 Ringwood Avenue • San Jose, California 95131-1721 • (408) 453-7300 • Fax (408) 437-9526

97 MAY 22 AM 9:48

May 20, 1997
Project 20805-127.003

Ms. Medula Logan
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway
Alameda, California 94502

Re: Response to comments on Tier 1 Risk-Based Corrective Action Evaluation for ARCO Service Station No. 276

Dear Ms. Logan:

This letter documents EMCON's response to comments you raised during our May 14, phone call regarding the Tier 1 Risk-Based Corrective Action Evaluation for ARCO Service Station No. 276 dated March 12, 1997.

The first comment was whether chlorinated volatile organic compounds (VOCs) were tested in soil from the excavation of the former waste oil tank near the service station building. The details of the excavation of these tanks are presented in a letter from Pacific Environmental Group to ARCO (April 25, 1989). The tanks were removed in September, 1988 and two soil samples (SP-1 and SP-2) were collected from the bottom of the excavation. These samples, and two additional samples (WO-A2 and WO-B2) collected in November after the excavation was deepened to remove visually stained soil, were tested for chlorinated VOCs using EPA Method 8240. The results showed that no chlorinated VOCs were detected in any of the samples.

The second comment deals with evaluating the possibility that a service station building could be relocated elsewhere on the site in the future. The groundwater-to-indoor air pathway is already covered in the Tier 1 report because the highest groundwater concentrations were used in this evaluation. To evaluate the potential soil-to-indoor air pathway, the average soil BTEX concentrations from an approximate depth of 20-feet below the ground surface (the depth at which the maximum petroleum concentrations were detected) were determined across the site. These concentrations are compared to the Tier 1 RBSLs in the accompanying table. The results of this evaluation show that site BTEX levels do not exceed the Tier 1 RBSLs, and thus do not pose a significant risk to the possible future relocation of the service station building.

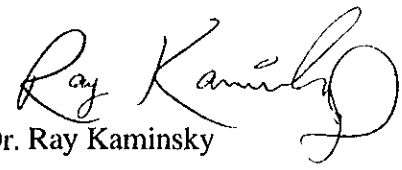
Compound	Representative Concentration (mg/kg)	RBSL (mg/kg)	Note
Benzene	0.15	0.37	RBSL not exceeded
Toluene	0.11	20.6	RBSL not exceeded
Ethylbenzene	0.13	420	RBSL not exceeded
Xylenes	0.26	RES	RBSL not exceeded

Note : RES indicates that the RBSL is greater than the holding capacity of the soil

Hopefully the information presented above addresses your concerns regarding our March 12 evaluation. If you have any additional questions or concerns, please do not hesitate to call.

Sincerely,

EMCON



Dr. Ray Kaminsky

Environmental Chemist

cc: Kyle Christie, ARCO Products, Co.