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

Date June 9, 1997
Project 20805-121.004

To:

Mr. Scott Seery
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

We are enclosing:

Copies	Description
1	Tier 1, Tier 2 Risk-Based Corrective Action Evaluation for ARCO Service Station 601, San Leandro, California

For your:		Sent by:	
	X Use		X Regular Mail
	Approval		Standard Air
	Review		Courier
	Information		Other

Valli Voruganti
Project Manager

97 JUN 11 PM 2:44

cc: Mr. Kevin Graves, RWQCB
Mr. Paul Supple, ARCO Products Company
File

RBCA 7/2 Leesville, S. C.

June 9, 1997

EMCON

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

June 9, 1997
Project 20805-121.004

Mr. Paul Supple
ARCO Products Company
P.O. Box 6549
Moraga, California 94570

Re: Tier 1, Tier 2 Risk-Based Corrective Action Evaluation for ARCO Service Station 601, 712 Lewelling Boulevard, San Leandro, California

Dear Mr. Supple:

This report presents the results of the Tier 1, Tier 2 risk-based corrective action (RBCA) evaluation prepared for ARCO Products Company (ARCO) Service Station 601, 712 Lewelling Boulevard, San Leandro, California (Figures 1 and 2). [redacted] addresses potential on-site and off-site exposures to current and future workers. The RBCA evaluation results indicate that no acceptable levels of risk are exceeded at this site.

off-site residential?

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, figures, and appendixes. Historical analytical groundwater and soil data are summarized in Appendix A. Tier 2 RBCA Tool Kit worksheets are contained 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. This refers, for example, to sites where an unconfined release to the surface has taken place in which direct contact with product is a possibility. Chemical impact to soil and groundwater at this site has been characterized in several investigations and summarized in the *Subsurface Environmental*

Assessment and Vapor Extraction Test at ARCO Station 601, San Leandro, California (RESNA, October 1991) and Worksheet 4.2. 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 releases do not present a potential risk of direct contact. **EMCON recently completed a survey of subgrade utility line trenches in the site vicinity that may be acting as pathways for the migration of petroleum hydrocarbons in groundwater and vapor.** EMCON is currently evaluating alternatives for an additional investigation to determine whether or not some of these trenches contain petroleum hydrocarbon impacted groundwater or vapor.

Step 3 in the RBCA process is a comparison of site-measured soil and groundwater data to conservative, nonsite-specific, health-based screening levels, in accordance with the ASTM RBCA guidelines. This is referred to in the ASTM guidelines as a Tier 1 evaluation.

RWQCB Site Classification

The presence of petroleum hydrocarbons in soil and groundwater beneath the site have been investigated and characterized in several reports. Based on the results of investigations performed to date for the property, the site qualifies as a low risk site as defined in the Regional Water Quality Control Board's (RWQCB) January 1996 Supplemental Instructions. The RWQCB's requirements are bulleted as follows:

? not yet determined

- **Source must be removed**

Source removal was performed in January 1990; underground storage tanks (USTs), piping, and impacted soil were excavated and removed from the site. Even though the source of petroleum to groundwater and soil was removed, high dissolved concentrations of gasoline and its constituents (i.e., benzene, toluene, ethylbenzene, and xylenes [BTEX]) continue to be detected in some groundwater monitoring wells. As discussed in the following RBCA evaluation, these concentrations do not pose a risk to current or future potential receptors for the complete pathways evaluated at the site. The potential pathway for the migration of petroleum hydrocarbons in utility line trenches off-site is being investigated. Soil samples from previous investigations including the UST removal are summarized in Appendix A.

not yet - preferential pathways/ conduits not yet assessed

- **Site is adequately characterized**

Soil and groundwater investigations have been performed at the site and have investigated the lateral and vertical extent of gasoline hydrocarbons in soil and groundwater (RESNA,

October 1991). Further characterization is being performed at the site to investigate potential pathways for the groundwater migration of petroleum hydrocarbons in utility line trenches off-site.

- **Plume is stable or receding**

Concentrations of gasoline and its constituents (BTEX) dissolved in groundwater have been generally decreasing in groundwater monitoring wells, since groundwater monitoring was initiated in the third quarter of 1990. During the past two years the concentrations in groundwater have been relatively static. Historical groundwater elevation and analytical data are summarized in Appendix A.

- **No threat to surface water or deep aquifers**

Groundwater investigations have defined the vertical extent of the dissolved gasoline plume to be contained within the shallow water bearing zone. Based on previous investigations and soil borings, no deep aquifers or surface waters are impacted or threatened.

- **No threat to human health**

Based on the results of this evaluation, no threat to human health exists. Further investigation is necessary to determine whether or not suspect utility line trenches contain petroleum hydrocarbon impacted groundwater or vapor that may impact off-site receptors.

- **No threat to the environment**

The site is located in an urban area developed for commercial use, therefore no ecological receptors have been evaluated.

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 site impact has been established, and is documented in previous reports (RESNA, October 1991), and is summarized in Worksheet 1.1. Additional analytical information is summarized in Worksheets 5.2, 5.5, and 5.6.

Exposure Pathways

The next step in a Tier 1 evaluation is to identify complete exposure pathways by identifying potentially significant environmental transport pathways by which receptors may be exposed to site-related chemicals. 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 an exposure pathway to be considered complete)

First-encountered groundwater at this site is not considered potable, and for this reason potential [illegible] pathways involving groundwater (e.g., infiltration from subsurface soil to groundwater [illegible]) are incomplete. In addition, routine direct exposure to surface and subsurface soil at this site is not considered a complete exposure pathway because soil at this site is covered by asphalt or concrete.

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

- exposure through volatilization of chemicals in groundwater to ambient air and indoor air (i.e., the on-site commercial building and the off-site residences)
- exposure through volatilization of chemicals in subsurface soil to ambient air and indoor air (i.e., the on-site commercial building and the off-site residences)

ok

Site Concentrations

Groundwater

Quarterly groundwater monitoring events have shown a generally decreasing trend in BTEX levels, reaching static BTEX levels in groundwater for the past two years. In recognition of this trend and of the fact that the USTs and piping were removed and the associated soil over-excavated in January 1990, the average groundwater concentrations for the past two years, measured downgradient of the former source, were used to

represent the source of BTEX to which hypothetical on-site indoor and ambient air receptors may be exposed.

The average BTEX concentrations, from March 1995 to November 1996 were used to represent the source of groundwater to BTEX in ambient and indoor air on-site. Groundwater monitoring wells MW-1 through MW-8 were used in the Tier 1 evaluation of the on-site groundwater-to-ambient air pathway. This is a conservative approach because groundwater monitoring wells MW-1 through MW-8 represent the only wells with detected concentrations of BTEX over the entire site for the past two years. No BTEX has been detected from on-site wells MW-11 and MW-12 during this time period. The average BTEX concentrations, from March 1995 to November 1996, for groundwater monitoring wells nearest the on-site commercial building (i.e., MW-1 and MW-6) were used in the Tier 1 evaluation of groundwater-to-indoor air pathway on-site.

BTEX concentrations from the groundwater monitoring wells nearest the off-site residences (i.e., MW-3 and MW-8) were used to represent the source of BTEX to which off-site indoor and ambient air receptors may be exposed. This is a conservative approach because these concentrations of BTEX are assumed to be directly beneath the receptor. However, groundwater monitoring wells MW-3 and MW-8 are approximately 15 feet upgradient (i.e., closer to the higher concentrations of BTEX on the site) from the off-site residences. In addition, the chemical results from groundwater monitoring wells MW-9, MW-10, and MW-15, located approximately 5 to 40 feet from the off-site residences, but about 140 feet downgradient of well MW-3 and MW-8, were not used in this evaluation. This is a conservative approach because BTEX concentrations have not been detected in these groundwater monitoring wells, since groundwater monitoring was initiated. The representative BTEX concentrations for the off-site groundwater to indoor and ambient air scenario does not take into account the dilution attenuation factor underneath the residence between groundwater monitoring wells MW-3 and MW-8 on-site and MW-9, MW-10, and MW-15 off-site. Therefore, the BTEX concentrations underneath the residences off-site have been overestimated.

OK

Subsurface Soil

Residual petroleum hydrocarbons were detected in samples from the side walls of the UST excavation area and from the groundwater monitoring well borings. The subsurface soil results are summarized in Table 1. For exposure through volatilization of chemicals in subsurface soil to ambient air (on-site), the maximum subsurface soil concentrations detected in each of the side wall and monitoring well boring samples were averaged and used in this evaluation. For exposure through volatilization of chemicals in subsurface soil to indoor air (on-site), the maximum subsurface soil concentrations detected in the samples

from monitoring well borings closest to the on-site commercial building (B-6/MW-1 and B-11/MW-6) were averaged and used for this evaluation. For exposure through volatilization of chemicals in subsurface soil to ambient and indoor air (off-site), the maximum subsurface soil concentrations detected in samples from monitoring well borings closest to the off-site residences (B-8/MW-3 and B-13/MW-8) were averaged and used in this evaluation. This is a conservative approach for two reasons. First, the BTEX concentrations used for both the on-site and off-site evaluations have likely decreased from the levels detected in January 1990, due to biodegradation and volatilization. Second, some of the maximum concentrations used in this estimation were detected in subsurface soil samples located at a depth which is currently below the water table. Previous historical water levels have been at approximately 10 feet below ground surface (BGS). Therefore, the estimation of representative BTEX concentrations for the site is likely to be an overestimation of actual BTEX concentrations currently in the vadose zone (i.e., subsurface soil).

Risk Target Levels

The site is currently commercial and is expected to remain commercial property, therefore only commercial receptors are evaluated for potential on-site exposures. On-site acceptable risk-based subsurface soil and groundwater levels were calculated based on a 1×10^{-5} (i.e., 1 in 100,000) target level (consistent with guidance in the Safe Drinking Water and Toxic Enforcement Act of 1986), and a hazard quotient of 1 for noncancer-causing substances.

Commercial
$1E-05$

The off-site apartment complex is considered residential property, therefore only residential receptors are evaluated for potential off-site exposures. Off-site acceptable risk-based subsurface soil and groundwater levels were calculated based on a 1×10^{-6} (i.e., 1 in 1,000,000) target level (consistent with guidance in the Safe Drinking Water and Toxic Enforcement Act of 1986), and a hazard quotient of 1 for noncancer-causing substances.

residential
$1E-06$

Conservative Assumptions

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., subsurface soil and groundwater) and potential exposure routes (i.e., inhalation of ambient and indoor 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 subsurface soil during volatilization from the groundwater and biodegradation from the unsaturated zone are not accounted for by the models.

- Volatilization of BTEX to ambient 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 accounted for by the vapor emission model.

- The RBSLs for volatilization from subsurface soil and groundwater to ambient air are based on the assumption that volatilization takes place through a sandy material. In fact, the soils at this site are clays and silty clays. The RBSLs, therefore, are based on significantly higher rates of volatilization than are expected at this site.

The assumptions used to develop RBSLs for the pertinent potential exposure pathways are judged to be appropriately conservative for the purposes 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, San Francisco Bay Region, memorandum, January 5, 1996).

Tier 1 Results

Table 2 compares the subsurface soil and groundwater representative concentrations of benzene, toluene, ethylbenzene, and xylenes to their appropriate RBSLs. As the table shows, the RBSLs for the groundwater-to-ambient air scenario on-site and off-site were not exceeded by the representative concentrations of BTEX detected. In accordance with ASTM guidelines, no further evaluation is necessary for the on-site and off-site groundwater-to-ambient air pathway. Representative concentrations of toluene, ethylbenzene, and total xylenes did not exceed the RBSLs for all of the pathways evaluated, therefore no further evaluation is necessary for toluene, ethylbenzene, or total xylenes.

OK

6 pathways exceeded:

The results in Table 2 show that the Tier 1 RBSLs for benzene in six of the eight complete pathways evaluated for benzene were exceeded in the Tier 1 evaluation. These six pathways were the groundwater-to-indoor air scenario for the commercial building (on-site) and residences (off-site), the subsurface soil-to-ambient and indoor air scenario (on-site), and the subsurface soil-to-ambient and indoor air scenario (off-site). Although these results do not necessarily indicate a risk to public health (because of the very conservative nature of the evaluation), they indicate that further evaluation is needed to determine if a risk to public health is present at this site. The next step in the RBCA procedure (Step 5) is a Tier 2 evaluation of benzene for the groundwater-to-indoor air pathway and subsurface soil-to-ambient and indoor air pathways.

TIER 2 EVALUATION

In accordance with the ASTM guidelines, the same conservative volatilization models used in the Tier 1 evaluation were used to evaluate the presence of benzene in the groundwater-to-indoor air scenario for the commercial building (on-site) and residences (off-site), the subsurface soil-to-ambient and indoor air scenario (on-site), and the subsurface soil-to-ambient and indoor air scenario (off-site). The Tier 2 evaluation, however, incorporates greater site-specificity by using values for the model parameters that more accurately represent site conditions than the default values used in the Tier 1 evaluation.

Tier 2 Site-Specific Parameters

On February 20, 1997, two soil samples S-4 and S-7 were collected at a depth of 2.0 and 1.5 feet below ground surface (BGS), respectively (Figure 2). The soil samples were analyzed to determine site specific values for water content (θ_w), air content (θ_a), and bulk density (ρ_b). The results for each soil parameter value were averaged to determine representative values for the site. The average water and air content of the soil were determined to be 0.1225 and 0.1546, respectively. Water and air content of the soil combined to give the average total soil porosity (η_{tot}) of 0.2771. The [redacted] density was measured as [redacted] pounds per cubic feet or 2.19 grams per cubic centimeter. The default for total organic carbon (1 percent) was used for this evaluation.

The parameters described above were used to calculate risk-based, site-specific threshold levels (SSTLs) for the groundwater-to-indoor air pathway and subsurface soil-to-ambient and indoor air pathways. The results of this evaluation are summarized in Table 3.

Tier 2 Results

The results in Table 3 show that the SSTLs for the subsurface soil-to-ambient air scenario on-site and off-site were not exceeded by benzene concentrations detected at the site. No further evaluation is necessary for these scenarios. The SSTLs for benzene in the groundwater- and subsurface soil-to-indoor air scenarios for the commercial building on-site and residences off-site were exceeded.

Although more representative of actual site conditions than the Tier 1 results, the Tier 2 results are still conservative for several reasons, the most important of which is the fact that, the models used to estimate emission rates of BTEX from subsurface soil and groundwater into ambient and indoor air assume a constant source of chemicals, and no losses due to biodegradation, therefore the resulting cleanup levels (i.e. SSTLs) will be significantly over-estimated. In addition, the initial source of the petroleum to the groundwater and impacted soil has been removed therefore, the on-site evaluation assumes higher soil benzene concentrations than are probably present.

Further evaluation is necessary to determine if a risk to public health is present, in the on-site and off-site groundwater- and subsurface soil-to-indoor air scenarios. The next step is to further evaluate benzene for the indoor pathways from groundwater and soil, using soil vapor concentrations that more accurately represent benzene levels emanating from soil and groundwater for the on-site commercial and off-site residential potential exposure scenarios.

Further Evaluation Using Soil Vapor

On February 20, 1997, soil vapor samples were collected from the locations presented in Figure 2 to obtain representative concentrations of BTEX at the Site. Samples were collected from each location at depths of 1-1.5 feet BGS to represent vapor concentrations near potential receptor locations. It was important to collect samples at these depths in order to account for the natural attenuation of vapor concentrations from the source to the potential receptors at the surface. It is reasonable to assume that the influence from ambient air was minimized in the vadose-zone because of the low permeability clayey soils and the presence of an asphalt cap at the site and immediate vicinity. In order to represent background soil vapor concentrations an ambient air sample was collected. The sampling procedures are presented in Appendix C and the soil vapor analytical results are presented in Table 4 and Appendix D. No concentrations of BTEX were detected above the method reporting limit in the soil vapor samples collected from 1 to 1.5 feet BGS. Benzene was detected at the method reporting limit (0.5 milligrams per cubic meter [mg/m^3]) in soil

vapor sample S-4B, collected at a depth of 4 feet BGS. This result is not as representative of levels that may lead to exposure as the samples collected closer to the soil surface and was therefore not used in the evaluation described below.

The benzene concentrations measured in near surface soil vapor, the site specific soil parameters previously discussed (e.g., θ_w, θ_a, ρ_b, and η_{tot}), and the conservative equation for calculating indoor air concentrations recommended in the *Air Force/National Technical Guidance Study Series: Assessing Potential Indoor Air Impacts for Superfund Sites* (USEPA 1992) were used to calculate the representative soil vapor concentrations associated with the on-site and off-site exposure from groundwater and soil via inhalation of indoor air. The SSTLs were calculated in accordance with the ASTM guidelines. The calculations used to derive indoor air concentrations and SSTLs are summarized in Appendix E. The results of the modified Tier 2 evaluation using soil vapor results are presented in Table 5. It should be noted that these SSTLs, while they pertain to the groundwater- and soil-to-indoor air pathways, are not directly comparable to the SSTLs presented for these pathways in the previous section. This is because these SSTLs are based on soil vapor measurements, and not on separate groundwater or soil measurements.

Soil Vapor Evaluation Results

The results in Table 5 show that the SSTLs for the groundwater- and subsurface soil-to-indoor air scenarios for the commercial building on-site and the residences off-site were not exceeded by representative indoor air concentrations of benzene. These results indicate that no further evaluation of these potential exposure pathways is necessary.

The Tier 2 soil vapor evaluation is still conservative, in addition the soil vapor concentrations are more representative of actual indoor air concentrations than the initial Tier 2 evaluation. The Tier 2 soil vapor evaluation assumes an indoor air space exposed to an unrestricted soil surface, however the indoor air space on-site and off-site have concrete foundations which limits the vapor diffusion to a much greater degree than accounted for by the calculations.

SUMMARY AND CONCLUSION

At the ARCO Service Station 601, ARCO has undertaken interim cleanup by removing the underground storage tanks and piping, and has conducted further source removal by over-excavating much of the impacted soil. The impact of residual BTEX in the soil and groundwater was evaluated to determine what risk, if any, they might present to current

and future on-site and off-site receptors. This evaluation was conducted using the ASTM RBCA guidelines. The results show that concentrations of BTEX detected in the soil and groundwater at this site do not exceed concentrations that correspond to acceptable levels of risk. These results indicate that no additional remedial measures are necessary to protect the health of current or future on-site commercial and off-site residential receptors that were evaluated in this RBCA. Potential pathways and receptors for the migration of petroleum hydrocarbons in utility line trenches off-site are currently being investigated, and if necessary, an additional RBCA evaluation will be performed at a future date.

Sincerely,

EMCON

Ivy Inouye
Staff Toxicologist

Dr. Ray Kaminsky
Environmental Chemist

Valli Voruganti, P.E.
Project Manager

Attachments: Table 1 - Analytical Soil Results
Table 2 - Tier 1 Results
Table 3 - Tier 2 Results
Table 4 - Analytical Soil Vapor Results
Table 5 - Tier 2 Soil Vapor Results
Figure 1 - Site Location
Figure 2 - Site Plan
Figure 3 - Risk-Based Corrective Action Process Flowchart
Appendix A - Historical Groundwater Elevation Data and Historical Groundwater and Soil Analytical Data
Appendix B - ASTM RBCA Worksheets
Appendix C - Soil Vapor Sampling Procedures
Appendix D - Analytical Results and Chain-of-Custody Documentation for Soil Vapor Samples
Appendix E - Soil Vapor to Indoor Air Calculations

cc: Mr. Scott Seery, ACHCSA
Mr. Kevin Graves, RWQCB

Table 1

Summary of Analytical Soil Results
ARCO Service Station 601

Sample Designation	Depth (feet BGS)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)
ASW-1	10	36	111	50	210
ASW-2	10	175	509	220	980
ASW-3	10	3.1	3.1	3.8	15
ASW-4	10	12	46	26	129
S-7.5-B6/MW-1	7.5	6	27	8.8	52
S-10-B7/MW-2	10	0.99	0.71	0.5	1.3
S-6-B8/MW-3	6	11	30	16	82
S-7-B9/MW-4	7	5.9	24	8.4	48
S-7.5-B10/MW-5	7.5	27	150	65	370
S-8.5-B11/MW-6	8.5	3	9.3	2.7	1.5
S-10.5-B12/MW-7	10.5	<0.0050	0.24	0.5	2.2
S-5.5-B13/MW-8	5.5	0.022	0.017	0.2	0.059

BGS: below ground surface
mg/kg: milligrams per kilogram
ASW: sidewall soil samples from the underground storage tank excavation in January of 1990
<: Concentrations were detected below the method reporting limit (MRL), therefore half of the MRL was used in RBCA calculations.

Table 2

Tier 1 Results
ARCO Service Station 601

Compounds	**On-site** - Groundwater to Ambient Air		**On-site** - Groundwater to Indoor Air		**On-site** - Subsurface Soil to Ambient Air		**On-site** - Subsurface Soil to Indoor Air	
	Representative Concentrations in Groundwater [1] (mg/L)	RBSL Groundwater to Ambient Air (mg/L)	Representative Concentrations in Groundwater [2] (mg/L)	RBSL Groundwater to Indoor Air (mg/L)	Representative Concentrations in Soil [3] (mg/kg)	RBSL Soil to Ambient Air (mg/kg)	Representative Concentrations in Soil [4] (mg/kg)	RBSL Soil to Indoor Air (mg/kg)
Benzene	0.38	53.4	5.7	0.214	3.6	1.33	4.5	0.032
Toluene	0.087	>S	0.12	85	9.6	RES	18	54.5
Ethylbenzene	0.24	>S	2.3	>S	6.9	RES	5.8	1100
Xylenes	0.44	>S	4.5	>S	21	RES	8.8	RES

Compounds	**Off-site** - Groundwater to Ambient Air		**Off-site** - Groundwater to Indoor Air		**Off-site** - Subsurface Soil to Ambient Air		**Off-site** - Subsurface Soil to Indoor Air	
	Representative Concentrations in Groundwater [5] (mg/L)	RBSL Groundwater to Ambient Air (mg/L)	Representative Concentrations in Groundwater [5] (mg/L)	RBSL Groundwater to Indoor Air (mg/L)	Representative Concentrations in Soil [6] (mg/kg)	RBSL Soil to Ambient Air (mg/kg)	Representative Concentrations in Soil [6] (mg/kg)	RBSL Soil to Indoor Air (mg/kg)
Benzene	0.084	3.19	0.084	0.0069	0.49	0.079	0.49	0.0016
Toluene	0.11	>S	0.11	32.8	0.71	RES	0.71	20.6
Ethylbenzene	0.27	>S	0.27	77.5	1.8	RES	1.8	427
Xylenes	0.20	>S	0.20	>S	2.2	RES	2.2	RES

1. The average groundwater concentrations detected above the method reporting limit (MRL) in wells MW-1 through MW-8 from the previous 2 years were used.
2. The average groundwater concentrations detected above MRL in wells MW-1 and MW-6 from the previous 2 years were used.
3. The average of the maximum subsurface soil concentrations detected above the MRL were used (Table 1).
4. The average of the maximum subsurface soil concentrations detected above the MRL in soil samples B-6/MW-1 and B-11/MW-6 were used (Table 1).
5. The average groundwater concentrations detected above MRL in wells MW-3 and MW-8 from the previous 2 years were used.
6. The average of the maximum subsurface soil concentrations detected above the MRL in soil samples B-8/MW-3 and B-13/MW-8 were used (Table 1).

mg/L: milligrams per liter
mg/kg: milligrams per kilogram
RBSL: Risk-Based Screening Level
RBSLs for benzene have been multiplied by 0.29 to account for California's slope factor for benzene.
RBSLs for on-site exposure pathways are for a commercial target risk level of $1x10^{-5}$.
RBSLs for off-site exposure pathways are for a residential target risk level of $1x10^{-6}$.
>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.
RES: The RBSL is greater than the holding capacity of the soil, and thus the soil can be saturated and not exceed the RBSL.
Highlighted values indicate representative concentration exceeds respective RBSL.

Table 3

Tier 2 Results
ARCO Service Station 601

Compounds	**On-site** - Groundwater to Indoor Air		**On-site** - Subsurface Soil to Ambient Air		**On-site** - Subsurface Soil to Indoor Air	
	Representative Concentrations in Groundwater [1] (mg/L)	SSTL Groundwater to Indoor Air (mg/L)	Representative Concentrations in Soil [2] (mg/kg)	SSTL Soil to Ambient Air (mg/kg)	Representative Concentrations in Soil [3] (mg/kg)	SSTL Soil to Indoor Air (mg/kg)
Benzene	5.7	1.5	3.6	102	4.5	0.28

Compounds	**Off-site** - Groundwater to Indoor Air		**Off-site** - Subsurface Soil to Ambient Air		**Off-site** - Subsurface Soil to Indoor Air	
	Representative Concentrations in Groundwater [4] (mg/L)	SSTL Groundwater to Indoor Air (mg/L)	Representative Concentrations in Soil [5] (mg/kg)	SSTL Soil to Ambient Air (mg/kg)	Representative Concentrations in Soil [5] (mg/kg)	SSTL Soil to Indoor Air (mg/kg)
Benzene	0.084	0.046	0.49	7.3	0.49	0.009

1. The average groundwater concentrations detected above MRL in wells MW-1 and MW-6 from the previous 2 years were used.
2. The average of the maximum subsurface soil concentrations detected above the MRL were used (Table 1).
3. The average of the maximum subsurface soil concentrations detected above the MRL in soil samples B-6/MW-1 and B-11/MW-6 were used (Table 1).
4. The average groundwater concentrations detected above MRL in wells MW-3 and MW-8 from the previous 2 years were used.
5. The average of the maximum subsurface soil concentrations detected above the MRL in soil samples B-8/MW-3 and B-13/MW-8 were used (Table 1).

mg/L: milligrams per liter
mg/kg: milligrams per kilogram
SSTL: Site-Specific Threshold Level
SSTLs for benzene have been multiplied by 0.29 to account for California's slope factor for benzene.
SSTLs for on-site exposure pathways are for a commercial target risk level of $1x10^{-5}$.
SSTLs for off-site exposure pathways are for a residential target risk level of $1x10^{-6}$.
RES: The SSTL is greater than the holding capacity of the soil, and thus the soil can be saturated and not exceed the SSTL.
Highlighted values indicate representative concentration exceeds respective SSTL.

Table 4

Summary of Analytical Soil-Vapor Results
ARCO Service Station 601

Sample	Depth (feet BGS)	Benzene (mg/m^3)	Toluene (mg/m^3)	Ethylbenzene (mg/m^3)	Total Xylenes (mg/m^3)
S-B*	ambient air	<0.5	<0.5	<0.5	<1
S-1	1 - 1.5	<0.5	<0.5	<0.5	<1
S-2	1 - 1.5	<0.5	<0.5	<0.5	<1
S-4A	1 - 1.5	<0.5	<0.5	<0.5	<1
S-4B	4	[redacted]	<0.5	<0.5	<1
S-5	1 - 1.5	<0.5	<0.5	<0.5	<1
S-6	1 - 1.5	<0.5	<0.5	<0.5	<1
S-7	1 - 1.5	<0.5	<0.5	<0.5	<1
S-8	1 - 1.5	<0.5	<0.5	<0.5	<1

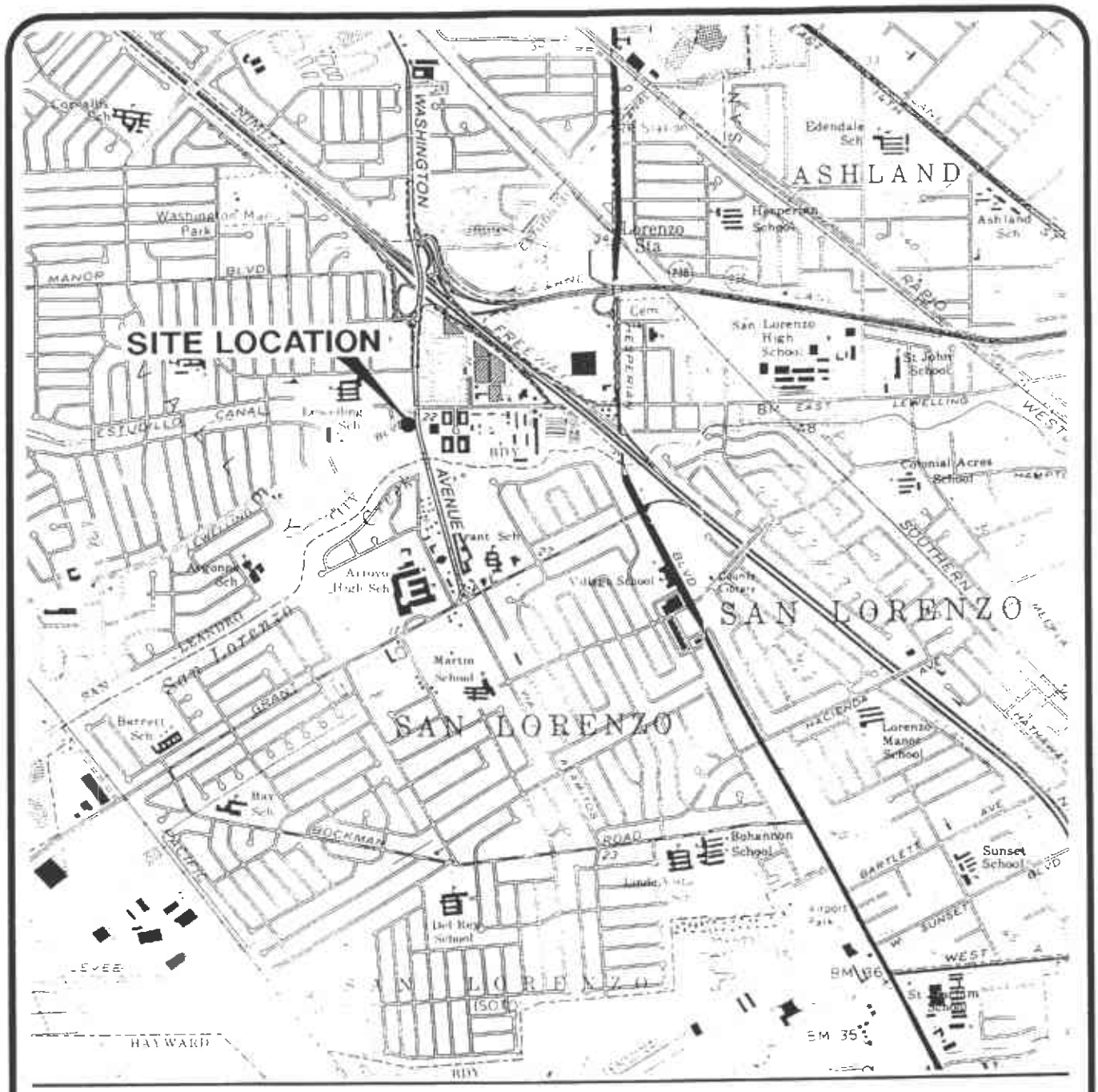
BGS: below ground surface
mg/m^3: milligrams per cubic meter of air
* background ambient air sample
<: Concentrations were detected below the method reporting limit (MRL), therefore half of the MRL was used in RBCA calculations.

Table 5

Tier 2 Soil-Vapor Results
ARCO Service Station 601

	On-site		Off-site	
Compounds	Soil/Groundwater Representative Concentrations [1] (mg/m^3)	SSTL (mg/m^3)	Soil/Groundwater Representative Concentrations [1] (mg/m^3)	SSTL (mg/m^3)
Benzene	9.02E-06	1.43E-03	9.02E-06	1.14E-04

1. The soil-vapor concentrations at 1-1.5 feet below ground surface were used (Table 3).
mg/m3: milligrams per cubic meter of air
SSTL: Site-Specific Threshold Level
SSTLs for on-site exposure pathways are for a commercial target risk level of $1x10^{-5}$.
SSTLs for off-site exposure pathways are for a residential target risk level of $1x10^{-6}$.



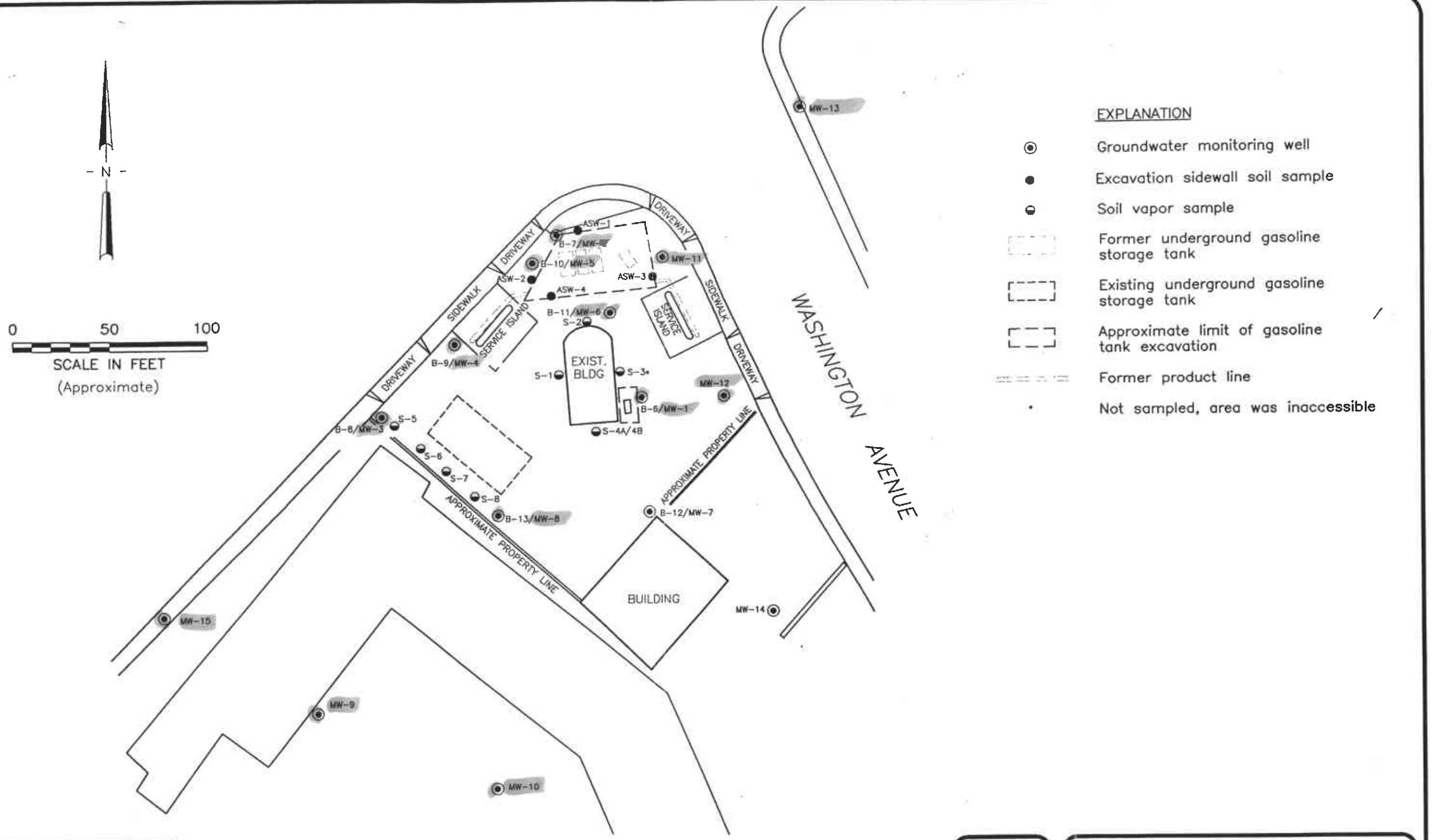
Base map from USGS 7.5' Quad. Maps:
Hayward and San Leandro, California
Photorevised 1980

Scale : 0 2000 4000 Feet

EMCON

DATE APR. 1997
DWN KLT
APP
REV
PROJECT NO.
805-121.004

FIGURE 1
ARCO PRODUCTS COMPANY
SERVICE STATION 601, 712 LEWELLING BLVD
SAN LEANDRO, CALIFORNIA
SITE LOCATION

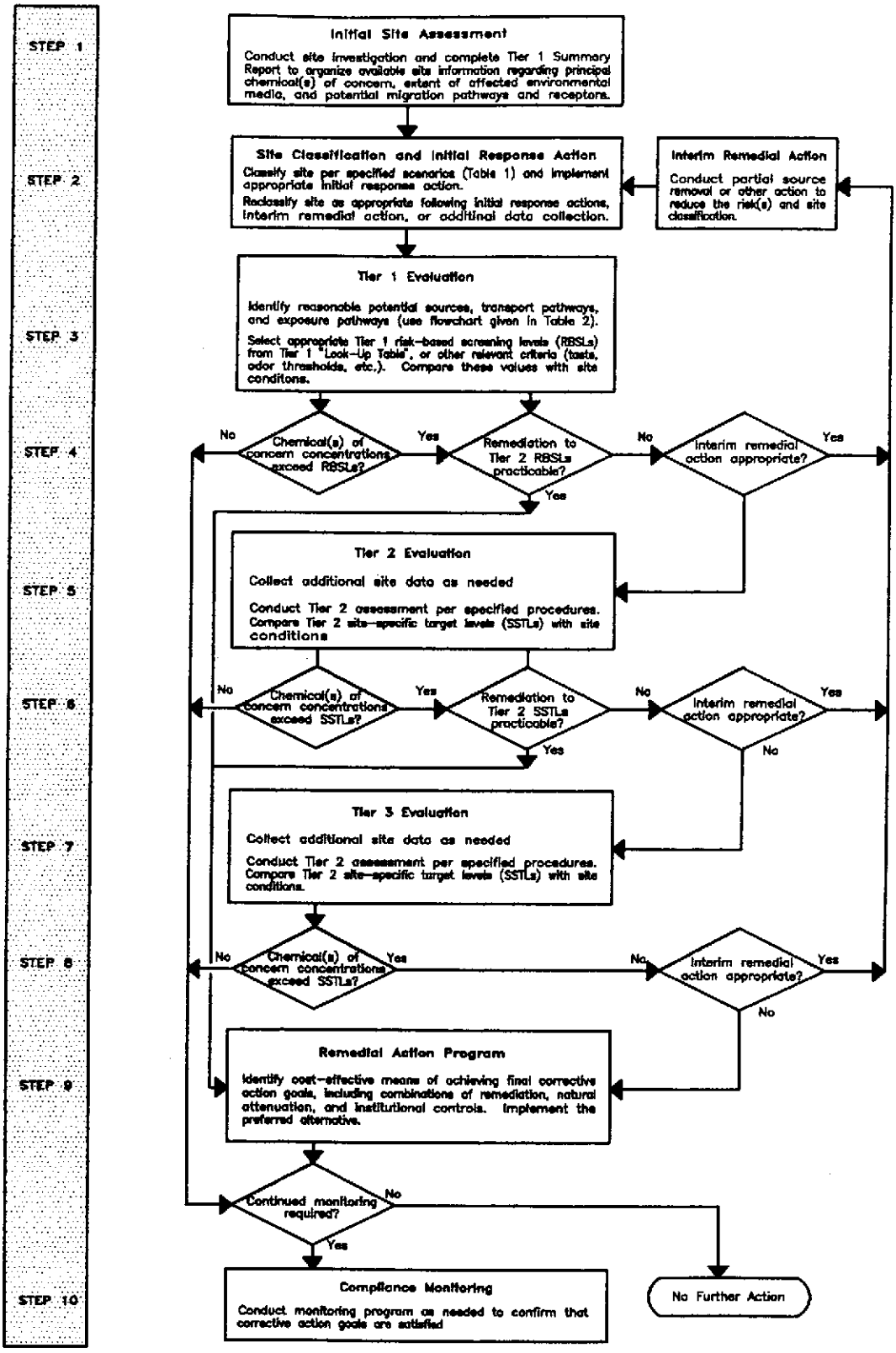


EMCON

DATE	APR. 1997
DWN	KLT
APP	
REV	
PROJECT NO.	805-121.004

FIGURE 2
ARCO PRODUCTS COMPANY
SERVICE STATION 601, 712 LEWELLING BLVD.
SAN LEANDRO, CALIFORNIA
SITE PLAN

EA-SANJOSE-CAD/DRAWINGS: G:\805-121\SITEPLAN.dwg Xrefs: <NONE>
Scale: 1 = 50.00 DimScale: 1 = 50.00 Date: 4/16/97 Time: 1:39 PM Operator: KLT



EMCON

DATE APR. 1997
DWN KLT
APP
REV
PROJECT NO.
805-121.004

FIGURE 3
ARCO PRODUCTS COMPANY
SERVICE STATION 601, 712 LEWELLING BLVD
SAN LEANDRO, CALIFORNIA
RISK-BASED CORRECTIVE ACTION PLAN
PROCESS FLOWCHART

EA-SANJOSE-CAD/DRAWINGS: G:\805-121\RBCA.dwg Xrefs: <NONE>
Scale: 1 = 1.00 DimScale: 1 = 1.00 Date: 4/14/97 Time: 2:20 PM Operator: KLT

APPENDIX A

HISTORICAL GROUNDWATER ELEVATION DATA AND HISTORICAL GROUNDWATER AND SOIL ANALYTICAL DATA

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-1	07-17-90	22.98	9.03	13.95	Emulsion	NR	NR	07-18-90	Not sampled: well contained floating product								
MW-1	08-07-90	22.98	9.19	13.79	ND	NR	NR										
MW-1	10-15-90	22.98	^9.85	^13.13	0.25	NR	NR	10-15-90	Not sampled: well contained floating product								
MW-1	11-20-90	22.98	^9.79	^13.19	0.46	NR	NR										
MW-1	12-21-90	22.98	9.18	13.80	Sheen	NR	NR										
MW-1	01-09-91	22.98	^9.47	^13.51	0.02	NR	NR	01-09-91	Not sampled: well contained floating product								
MW-1	02-27-91	22.98	^9.31	^13.67	0.03	NR	NR										
MW-1	03-20-91	22.98	^^7.81	^^15.17	Sheen	NR	NR										
MW-1	04-16-91	22.98	6.12	16.86	Sheen	NR	NR	04-16-91	Not sampled: well contained floating product								
MW-1	05-16-91	22.98	^8.60	^13.66	0.01	NR	NR										
MW-1	06-10-91	22.26	9.00	13.26	Sheen	NR	NR	06-10-91	Not sampled: well contained floating product								
MW-1	07-18-91	22.26	^9.33	^12.93	0.01	NR	NR										
MW-1	08-22-91	22.26	^9.49	^12.77	0.04	NR	NR										
MW-1	09-18-91	22.26	^9.63	^12.63	0.04	NR	NR										
MW-1	10-10-91	22.26	^9.73	^12.53	0.04	NR	NR	10-10-91	Not sampled: well contained floating product								
MW-1	11-21-91	22.26	^8.40	^13.86	0.01	NR	NR										
MW-1	12-24-91	22.26	^9.68	^13.30	0.13	NR	NR										
MW-1	01-19-92	22.26	8.84	13.42	ND	NR	NR										
MW-1	02-20-92	22.26	7.22	15.04	ND	NR	NR										
MW-1	03-23-92	22.26	7.40	14.86	Sheen	NR	NR	03-23-92	Not sampled: well contained floating product								
MW-1	04-21-92	22.26	8.30	13.96	ND	NR	NR										
MW-1	05-15-92	22.26	^8.77	^13.49	0.01	NR	NR										
MW-1	06-08-92	22.26	^9.08	^13.18	0.02	NR	NR	06-08-92	Not sampled: well contained floating product								
MW-1	07-15-92	22.26	9.40	12.86	ND	NR	NR										
MW-1	08-25-92	22.26	8.21	14.05	ND	NR	NR										
MW-1	09-15-92	22.26	^8.18	^14.08	0.02	NR	NR	09-15-92	Not sampled: well contained floating product								
MW-1	10-28-92	22.26	8.62	13.64	ND	NR	NR										
MW-1	11-16-92	22.26	^9.09	^13.17	0.02	NR	NR	11-16-92	Not sampled: well contained floating product								
MW-1	12-16-92	22.26	^8.10	^14.16	0.02	NR	NR										
MW-1	01-15-93	22.26	6.53	15.73	ND	NR	NR										
MW-1	02-16-93	22.26	^7.03	^15.23	0.01	NR	NR	02-16-93	Not sampled: well contained floating product								
MW-1	03-30-93	22.26	6.86	15.40	ND	NR	NR										

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	04-28-93	22.26	^6.77	^15.49	0.01	NR	NR										
MW-1	05-13-93	22.26	^8.08	^14.18	0.01	NR	NR	05-13-93	Not sampled: well contained floating product								
MW-1	06-17-93	22.26	^8.48	^13.78	0.01	NR	NR										
MW-1	07-28-93	22.26	^8.80	^13.46	0.01	NR	NR										
MW-1	08-17-93	22.26	^8.81	^13.45	0.01	NR	NR	08-17-93	Not sampled: well contained floating product								
MW-1	11-08-93	22.26	^9.22	^13.04	0.01	NR	NR	11-08-93	Not sampled: well contained floating product								
MW-1	02-14-94	22.26	7.72	14.54	Sheen	NR	NR	02-14-94	Not sampled: well contained floating product								
MW-1	05-05-94	22.26	8.47	13.79	Sheen	NR	NR	05-05-94	Not sampled: well contained floating product								
MW-1	08-04-94	22.26	8.72	13.54	Sheen	SW	0.004	08-04-94	Not sampled: well contained floating product								
MW-1	11-20-94	22.26	7.81	14.45	Sheen	SW	0.002	11-20-94	Not sampled: well contained floating product								
MW-1	03-17-95	22.26	6.57	15.69	ND	WSW	0.006	03-17-95	120000	5300	370	1500	13000	--	--	48000	6200^
MW-1	06-01-95	22.26	7.87	14.39	ND	SW	0.003	06-01-95	250000	7100	950	3500	21000	--	--	38000	190000^
MW-1	08-31-95	22.26	8.12	** 14.15	0.01	SSW	0.005	08-31-95	Not sampled: well contained floating product								
MW-1	11-27-95	22.26	8.42	13.84	Sheen	SSW	0.004	11-27-95	310000	4600	770	5700	21000	--	--	--	--
MW-1	02-22-96	22.26	6.01	** 16.26	0.01	NW	0.007	03-14-96	100000	6200	320	2500	12000	<1000*	--	--	--
MW-1	05-20-96	22.26	7.03	15.23	ND	SW	0.007	05-21-96	340000	6600	240	4500	22000	<1000*	--	150	<2500^
MW-1	08-26-96	22.26	8.16	14.10	ND	SSW	0.004	08-26-96	210000	7900	320	3400	15000	<1000*	--	--	--
MW-1	11-20-96	22.26	7.84	14.42	ND	SSE	0.004	11-20-96	62000	5900	77	2000	7700	<300*	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-2	07-17-90	22.06	7.86	14.20	ND	NR	NR	07-18-90	35000	3800	2900	690	3600	--	--	<5000	850^
MW-2	08-07-90	22.06	8.03	14.03	ND	NR	NR										
MW-2	10-15-90	22.06	8.61	13.45	ND	NR	NR	10-15-90	6400	650	290	110	560	--	--	--	--
MW-2	11-20-90	22.06	8.76	13.30	ND	NR	NR										
MW-2	12-21-90	22.06	8.28	13.78	ND	NR	NR										
MW-2	01-09-91	22.06	8.43	13.63	ND	NR	NR	01-09-91	13000	1500	970	390	1500	--	--	--	--
MW-2	02-27-91	22.06	8.28	13.78	ND	NR	NR										
MW-2	03-20-91	22.06	^^7.26	^^14.80	ND	NR	NR										
MW-2	04-16-91	22.06	6.97	15.09	ND	NR	NR	04-16-91	54000	5200	9000	1500	7700	--	--	--	--
MW-2	05-16-91	22.06	7.52	14.54	ND	NR	NR										
MW-2	06-10-91	21.33	7.91	13.42	ND	NR	NR	06-10-91	26000	3000	2500	880	4200	--	--	--	--
MW-2	07-18-91	21.33	8.30	13.03	ND	NR	NR										
MW-2	08-22-91	21.33	8.50	12.83	ND	NR	NR										
MW-2	09-18-91	21.33	8.63	12.70	ND	NR	NR										
MW-2	10-10-91	21.33	8.82	12.51	ND	NR	NR	10-10-91	10000	1600	910	280	1400	--	--	<5000	--
MW-2	11-21-91	21.33	8.46	12.87	ND	NR	NR										
MW-2	12-24-91	21.33	8.72	12.61	ND	NR	NR										
MW-2	01-19-92	21.33	7.96	13.37	ND	NR	NR										
MW-2	02-20-92	21.33	6.55	14.78	ND	NR	NR										
MW-2	03-23-92	21.33	6.86	14.47	ND	NR	NR	03-23-92	33000	4100	5000	1100	5300	--	--	--	--
MW-2	04-21-92	21.33	7.15	14.18	ND	NR	NR										
MW-2	05-15-92	21.33	7.61	13.72	ND	NR	NR										
MW-2	06-08-92	21.33	7.95	13.38	ND	NR	NR	06-08-92	18000	1200	980	330	1800	--	--	--	--
MW-2	07-15-92	21.33	8.45	12.88	ND	NR	NR										
MW-2	08-25-92	21.33	8.53	12.80	ND	NR	NR										
MW-2	09-15-92	21.33	8.71	12.62	ND	NR	NR	09-15-92	13000	430	500	340	1800	--	--	--	--
MW-2	10-28-92	21.33	8.89	12.44	ND	NR	NR										
MW-2	11-16-92	21.33	7.93	13.40	ND	NR	NR	11-16-92	13000	900	940	300	1400	--	--	--	--
MW-2	12-16-92	21.33	7.44	13.89	ND	NR	NR										
MW-2	01-15-93	21.33	6.13	15.20	ND	NR	NR										
MW-2	02-16-93	21.33	6.02	15.31	ND	NR	NR	02-16-93	20000	1800	1200	530	2700	--	--	--	--
MW-2	03-30-93	21.33	5.98	15.35	ND	NR	NR										

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-2	04-28-93	21.33	6.58	14.75	ND	NR	NR										
MW-2	05-13-93	21.33	6.99	14.34	ND	NR	NR	05-13-93	13000	1000	470	370	1900	--	--	--	--
MW-2	06-17-93	21.33	7.40	13.93	ND	NR	NR										
MW-2	07-28-93	21.33	7.79	13.54	ND	NR	NR										
MW-2	08-17-93	21.33	7.85	13.48	ND	NR	NR	08-17-93	9100	770	160	310	1500	--	--	--	--
MW-2	11-08-93	21.33	8.12	13.21	ND	NR	NR	11-08-93	9200	380	62	130	630	--	--	--	--
MW-2	02-14-94	21.33	6.88	14.45	ND	NR	NR	02-14-94	8700	670	370	50	1400	--	--	--	--
MW-2	05-05-94	21.33	7.51	13.82	ND	NR	NR	05-05-94	5600	390	140	120	480	--	--	--	--
MW-2	08-04-94	21.33	8.00	13.33	ND	SW	0.004	08-04-94	2300	180	<2.5*	<2.5*	230	--	--	--	--
MW-2	11-20-94	21.33	6.86	14.47	ND	SW	0.002	11-20-94	4900	170	150	120	390	--	--	--	--
MW-2	03-17-95	21.33	6.12	15.21	ND	WSW	0.006	03-17-95	10000	460	77	260	550	--	--	--	--
MW-2	06-01-95	21.33	6.56	14.77	ND	SW	0.003	06-01-95	13000	400	78	210	410	--	--	--	--
MW-2	08-31-95	21.33	7.18	14.15	ND	SSW	0.005	08-31-95	5000	280	18	120	140	<50*	--	--	--
MW-2	11-27-95	21.33	7.39	13.94	ND	SSW	0.004	11-27-95	3200	230	12	77	90	--	--	--	--
MW-2	02-22-96	21.33	5.78	15.55	ND	NW	0.007	03-14-96	11000	290	67	190	330	<50*	--	--	--
MW-2	05-20-96	21.33	6.27	15.06	ND	SW	0.007	05-21-96	Not sampled: well sampled annually, during the first quarter								
MW-2	08-26-96	21.33	7.30	14.03	ND	SSW	0.004	08-26-96	Not sampled: well sampled annually, during the first quarter								
MW-2	11-20-96	21.33	7.28	14.05	ND	SSE	0.004	11-20-96	Not sampled: well sampled annually, during the first quarter								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-3	07-17-90	20.84	7.03	13.81	Sheen	NR	NR	07-18-90	--	--	--	--	--	--	--	<5000	--
MW-3	08-07-90	20.84	7.21	13.63	ND	NR	NR										
MW-3	10-15-90	20.84	^8.19	^12.65	0.75	NR	NR	10-15-90	Not sampled: well contained floating product								
MW-3	11-20-90	20.84	^7.98	^12.85	1.08	NR	NR										
MW-3	12-21-90	20.84	^7.22	^13.62	0.01	NR	NR										
MW-3	01-09-91	20.84	^7.46	^13.38	0.30	NR	NR	01-09-91	Not sampled: well contained floating product								
MW-3	02-27-91	20.84	^7.37	^13.47	0.02	NR	NR										
MW-3	03-20-91	20.84	^^5.79	^^15.05	Sheen	NR	NR										
MW-3	04-16-91	20.84	7.95	12.89	Sheen	NR	NR	04-16-91	Not sampled: well contained floating product								
MW-3	05-16-91	20.84	7.50	13.34	ND	NR	NR										
MW-3	06-10-91	20.11	7.14	12.97	Sheen	NR	NR	06-10-91	Not sampled: well contained floating product								
MW-3	07-18-91	20.11	7.55	12.56	ND	NR	NR										
MW-3	08-22-91	20.11	7.64	12.47	Sheen	NR	NR										
MW-3	09-18-91	20.11	^7.89	^12.22	0.12	NR	NR										
MW-3	10-10-91	20.11	^7.82	^12.29	0.26	NR	NR	10-10-91	Not sampled: well contained floating product								
MW-3	11-21-91	20.11	^7.59	^12.52	0.04	NR	NR										
MW-3	12-24-91	20.11	^8.74	^11.37	0.01	NR	NR										
MW-3	01-19-92	20.11	6.98	13.13	0.01	NR	NR										
MW-3	02-20-92	20.11	5.05	15.06	0.01	NR	NR										
MW-3	03-23-92	20.11	5.75	14.36	Sheen	NR	NR	03-23-92	Not sampled: well contained floating product								
MW-3	04-21-92	20.11	6.55	13.56	ND	NR	NR										
MW-3	05-15-92	20.11	^7.11	^13.00	0.03	NR	NR										
MW-3	06-08-92	20.11	^7.52	^12.59	0.02	NR	NR	06-08-92	Not sampled: well contained floating product								
MW-3	07-15-92	20.11	7.92	12.19	ND	NR	NR										
MW-3	08-25-92	20.11	8.00	12.11	ND	NR	NR										
MW-3	09-15-92	20.11	^8.01	^12.10	0.02	NR	NR	09-15-92	Not sampled: well contained floating product								
MW-3	10-28-92	20.11	8.66	11.45	ND	NR	NR										
MW-3	11-16-92	20.11	7.11	13.00	Sheen	NR	NR	11-16-92	Not sampled: well contained floating product								
MW-3	12-16-92	20.11	6.62	13.49	ND	NR	NR										
MW-3	01-15-93	20.11	4.44	15.67	ND	NR	NR										
MW-3	02-16-93	20.11	^5.93	^14.18	0.01	NR	NR	02-16-93	Not sampled: well contained floating product								
MW-3	03-30-93	20.11	5.48	14.63	ND	NR	NR										

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-3	04-28-93	20.11	^6.02	^14.09	0.01	NR	NR										
MW-3	05-13-93	20.11	^6.37	^13.74	0.01	NR	NR	05-13-93	Not sampled: well contained floating product								
MW-3	06-17-93	20.11	^6.52	^13.59	0.01	NR	NR										
MW-3	07-28-93	20.11	6.95	13.16	ND	NR	NR										
MW-3	08-17-93	20.11	^7.00	^13.11	0.01	NR	NR	08-17-93	Not sampled: well contained floating product								
MW-3	11-08-93	20.11	7.31	12.80	ND	NR	NR	11-08-93	430000	4100	14000	6400	37000	--	--	--	--
MW-3	02-14-94	20.11	5.81	14.30	ND	NR	NR	02-14-94	85000	4200	12000	2500	16000	--	--	--	--
MW-3	05-05-94	20.11	6.81	13.30	ND	NR	NR	05-05-94	560000	4600	14000	5300	40000	--	--	--	--
MW-3	08-04-94	20.11	7.31	12.80	ND	SW	0.004	08-04-94	64000	4200	7600	1700	12000	--	--	--	--
MW-3	11-20-94	20.11	5.88	14.23	ND	SW	0.002	11-20-94	80000	4700	9700	2400	15000	--	--	--	--
MW-3	03-17-95	20.11	5.46	14.65	ND	WSW	0.006	03-17-95	370000	4800	12000	5800	34000	--	--	--	--
MW-3	06-01-95	20.11	6.34	13.77	ND	SW	0.003	06-01-95	270000	6000	11000	5200	28000	--	--	--	--
MW-3	08-31-95	20.11	6.60	** 13.52	0.02	SSW	0.005	08-31-95	Not sampled: well contained floating product								
MW-3	11-27-95	20.11	6.76	** 13.36	0.01	SSW	0.004	11-27-95	150000	5100	8800	3900	21000	--	--	--	--
MW-3	02-22-96	20.11	5.14	** 14.98	0.01	NW	0.007	03-14-96	150000	4400	7600	4100	22000	<3000*	--	--	--
MW-3	05-20-96	20.11	5.17	14.94	ND	SW	0.007	05-21-96	410000	4700	8000	6300	36000	<3000*	--	--	--
MW-3	08-26-96	20.11	7.04	13.07	ND	SSW	0.004	08-26-96	260000	4000	6100	4200	24000	<2000*	--	--	--
MW-3	11-20-96	20.11	6.26	13.85	ND	SSE	0.004	11-20-96	190000	3200	5800	3300	20000	<1000*	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-4	06-10-91	20.75	DRY	DRY	ND	DRY	DRY	06-10-91	Not sampled: dry well								
MW-4	07-18-91	20.75	7.86	12.89	ND	NR	NR										
MW-4	08-22-91	20.75	7.85	12.90	ND	NR	NR										
MW-4	09-18-91	20.75	7.84	12.91	ND	NR	NR										
MW-4	10-10-91	20.75	DRY	DRY	ND	DRY	DRY	10-10-91	15000	5300	1500	470	1300	--	--	--	--
MW-4	11-21-91	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	12-24-91	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	01-19-92	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	02-20-92	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	03-23-92	20.75	DRY	DRY	ND	DRY	DRY	03-23-92	24000	5600	4000	580	3100	--	--	--	--
MW-4	04-21-92	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	05-15-92	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	06-08-92	20.75	DRY	DRY	ND	DRY	DRY	06-08-92	5700	2000	170	92	270	--	--	--	--
MW-4	07-15-92	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	08-25-92	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	09-15-92	20.75	DRY	DRY	ND	DRY	DRY	09-15-92	Not sampled: dry well								
MW-4	10-28-92	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	11-16-92	20.75	DRY	DRY	ND	DRY	DRY	11-16-92	Not sampled: dry well								
MW-4	12-16-92	20.75	DRY	DRY	ND	DRY	DRY										
MW-4	01-15-93	20.75	7.48	13.27	ND	NR	NR										
MW-4	02-16-93	20.75	7.10	13.65	ND	NR	NR	02-16-93	12000	920	1100	130	750	--	--	--	--
MW-4	03-30-93	20.75	7.51	13.24	ND	NR	NR										
MW-4	04-28-93	20.75	7.10	13.65	ND	NR	NR										
MW-4	05-13-93	20.75	7.02	13.73	ND	NR	NR	05-13-93	19000	2900	2800	360	1900	--	--	--	--
MW-4	06-17-93	20.75	7.98	12.77	ND	NR	NR										
MW-4	07-28-93	20.75	7.90	12.85	ND	NR	NR										
MW-4	08-17-93	20.75	7.85	12.90	ND	NR	NR	08-17-93	8100	1600	1300	170	730	--	--	--	--
MW-4	11-08-93	20.75	DRY	DRY	ND	DRY	DRY	11-08-93	2000	540	110	10	240	--	--	--	--
MW-4	02-14-94	20.75	DRY	DRY	ND	DRY	DRY	02-14-94	Not sampled: dry well								
MW-4	05-05-94	20.75	7.73	13.02	ND	NR	NR	05-05-94	1900	510	78	31	150	--	--	--	--
MW-4	08-04-94	20.75	7.83	12.92	ND	SW	0.004	08-04-94	1300	360	17	<5*	190	--	--	--	--
MW-4	11-20-94	20.75	7.73	13.02	ND	SW	0.002	11-20-94	<50	2.9	0.5	<0.5	1.4	--	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-4	03-17-95	20.75	6.65	14.10	ND	WSW	0.006	03-17-95	16000	1800	970	310	2500	--	--	--	--
MW-4	06-01-95	20.75	7.25	13.50	ND	SW	0.003	06-01-95	16000	2800	870	380	2700	--	--	--	--
MW-4	08-31-95	20.75	7.75	13.00	ND	SSW	0.005	08-31-95	9000	2000	270	270	1400	<100*	--	--	--
MW-4	11-27-95	20.75	7.87	12.88	ND	SSW	0.004	11-27-95	3800	890	130	130	550	--	--	--	--
MW-4	02-22-96	20.75	7.29	13.46	ND	NW	0.007	03-14-96	940	150	82	19	130	<20*	--	--	--
MW-4	05-20-96	20.75	7.30	13.45	ND	SW	0.007	05-21-96	6700	1100	330	120	1100	<100*	--	--	--
MW-4	08-26-96	20.75	7.57	13.18	ND	SSW	0.004	08-26-96	14000	2400	510	350	2100	<100*	--	--	--
MW-4	11-20-96	20.75	7.89	12.86	ND	SSE	0.004	11-20-96	420	55	17	11	62	<3	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-5	06-10-91	20.90	7.58	13.32	ND	NR	NR	06-10-91	100000	25000	20000	2600	12000	--	--	--	--
MW-5	07-18-91	20.90	7.97	12.93	ND	NR	NR										
MW-5	08-22-91	20.90	8.18	12.72	ND	NR	NR										
MW-5	09-18-91	20.90	8.31	12.59	ND	NR	NR										
MW-5	10-10-91	20.90	8.51	12.39	Sheen	NR	NR	10-10-91	Not sampled: well contained floating product								
MW-5	11-21-91	20.90	8.13	12.77	ND	NR	NR										
MW-5	12-24-91	20.90	8.32	12.58	ND	NR	NR										
MW-5	01-19-92	20.90	7.50	13.40	ND	NR	NR										
MW-5	02-20-92	20.90	5.97	14.93	ND	NR	NR										
MW-5	03-23-92	20.90	6.06	14.84	ND	NR	NR	03-23-92	150000	24000	31000	4400	23000	--	--	--	--
MW-5	04-21-92	20.90	6.90	14.00	ND	NR	NR										
MW-5	05-15-92	20.90	7.32	13.58	ND	NR	NR										
MW-5	06-08-92	20.90	7.66	13.24	ND	NR	NR	06-08-92	120000	17000	13000	2400	11000	--	--	--	--
MW-5	07-15-92	20.90	8.34	12.56	ND	NR	NR										
MW-5	08-25-92	20.90	8.18	12.72	ND	NR	NR										
MW-5	09-15-92	20.90	8.40	12.50	ND	NR	NR	09-15-92	Not sampled: floating product entered the well during purging								
MW-5	10-28-92	20.90	8.83	12.07	ND	NR	NR										
MW-5	11-16-92	20.90	7.70	13.20	ND	NR	NR	11-16-92	110000	16000	16000	3200	18000	--	--	--	--
MW-5	12-16-92	20.90	6.92	13.98	ND	NR	NR										
MW-5	01-15-93	20.90	5.52	15.38	ND	NR	NR										
MW-5	02-16-93	20.90	5.64	15.26	ND	NR	NR	02-16-93	150000	12000	15000	3000	17000	--	--	--	--
MW-5	03-30-93	20.90	5.56	15.34	ND	NR	NR										
MW-5	04-28-93	20.90	6.28	14.62	ND	NR	NR										
MW-5	05-13-93	20.90	6.68	14.22	ND	NR	NR	05-13-93	Not sampled: floating product entered the well during purging								
MW-5	06-17-93	20.90	7.07	13.83	ND	NR	NR										
MW-5	07-28-93	20.90	7.41	13.49	ND	NR	NR										
MW-5	08-17-93	20.90	7.49	13.41	ND	NR	NR	08-17-93	87000	15000	8500	1900	11000	--	--	--	--
MW-5	11-08-93	20.90	7.93	12.97	ND	NR	NR	11-08-93	87000	12000	8300	2000	12000	--	--	--	--
MW-5	02-14-94	20.90	6.49	14.41	ND	NR	NR	02-14-94	46000	7300	5300	940	5200	--	--	--	--
MW-5	05-05-94	20.90	7.18	13.72	ND	NR	NR	05-05-94	54000	9700	4700	1000	6400	--	--	--	--
MW-5	08-04-94	20.90	7.83	13.07	ND	SW	0.004	08-04-94	57000	14000	3200	1200	7200	--	--	--	--
MW-5	11-20-94	20.90	6.34	14.56	ND	SW	0.002	11-20-94	33000	5700	1800	720	4700	--	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-5	03-17-95	20.90	5.51	15.39	ND	WSW	0.006	03-17-95	48000	6400	2000	740	5100	--	--	--	--
MW-5	06-01-95	20.90	6.55	14.35	ND	SW	0.003	06-01-95	76000	11000	5400	1400	7700	--	--	--	--
MW-5	08-31-95	20.90	6.80	14.10	ND	SSW	0.005	08-31-95	53000	12000	1600	1000	6000	<500*	--	--	--
MW-5	11-27-95	20.90	7.13	13.77	ND	SSW	0.004	11-27-95	43000	7900	3300	950	4900	--	--	--	--
MW-5	02-22-96	20.90	5.12	15.78	ND	NW	0.007	03-14-96	52000	9100	3300	940	5000	<500*	--	--	--
MW-5	05-20-96	20.90	5.87	15.03	ND	SW	0.007	05-21-96	55000	9300	3800	1100	5400	<500*	--	--	--
MW-5	08-26-96	20.90	7.15	13.75	ND	SSW	0.004	08-26-96	47000	5300	2100	780	3200	<300*	--	--	--
MW-5	11-20-96	20.90	6.88	14.02	ND	SSE	0.004	11-20-96	53000	8700	5700	920	4400	<500*	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-6	06-10-91	22.08	DRY	DRY	ND	DRY	DRY	06-10-91	Not sampled: dry well								
MW-6	07-18-91	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	08-22-91	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	09-18-91	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	10-10-91	22.08	DRY	DRY	ND	DRY	DRY	10-10-91	Not sampled: dry well								
MW-6	11-21-91	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	12-24-91	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	01-19-92	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	02-20-92	22.08	7.28	14.80	ND	NR	NR										
MW-6	03-23-92	22.08	7.45	14.63	ND	NR	NR	03-23-92	75000	19000	10000	1600	8600	--	--	--	--
MW-6	04-21-92	22.08	7.74	14.34	ND	NR	NR										
MW-6	05-15-92	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	06-08-92	22.08	DRY	DRY	ND	DRY	DRY	06-08-92	Not sampled: dry well								
MW-6	07-15-92	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	08-25-92	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	09-15-92	22.08	DRY	DRY	ND	DRY	DRY	09-15-92	Not sampled: dry well								
MW-6	10-28-92	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	11-16-92	22.08	DRY	DRY	ND	DRY	DRY	11-16-92	Not sampled: dry well								
MW-6	12-16-92	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	01-15-93	22.08	7.22	14.86	ND	NR	NR										
MW-6	02-16-93	22.08	6.79	15.29	ND	NR	NR	02-16-93	65000	14000	3500	1300	6100	--	--	--	--
MW-6	03-30-93	22.08	6.68	15.40	ND	NR	NR										
MW-6	04-28-93	22.08	7.28	14.80	ND	NR	NR										
MW-6	05-13-93	22.08	7.73	14.35	ND	NR	NR	05-13-93	36000	8200	870	1000	5200	--	--	--	--
MW-6	06-17-93	22.08	8.15	13.93	ND	NR	NR										
MW-6	07-28-93	22.08	DRY	DRY	ND	DRY	DRY										
MW-6	08-17-93	22.08	DRY	DRY	ND	DRY	DRY	08-17-93	Not sampled: dry well								
MW-6	11-08-93	22.08	DRY	DRY	ND	DRY	DRY	11-08-93	Not sampled: dry well								
MW-6	02-14-94	22.08	7.78	14.30	ND	NR	NR	02-14-94	47000	14000	390	1000	5100	--	--	--	--
MW-6	05-05-94	22.08	8.24	13.84	ND	NR	NR	05-05-94	45000	14000	<200*	1300	4500	--	--	--	--
MW-6	08-04-94	22.08	DRY	DRY	ND	DRY	DRY	08-04-94	Not sampled: dry well								
MW-6	11-20-94	22.08	7.41	14.67	ND	SW	0.002	11-20-94	30000	11000	<100*	1200	2300	--	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-6	03-17-95	22.08	6.66	15.42	ND	WSW	0.006	03-17-95	45000	9300	<100*	1900	3600	--	--	--	--
MW-6	06-01-95	22.08	7.60	14.48	ND	SW	0.003	06-01-95	23000	5600	<50*	1300	1900	--	--	--	--
MW-6	08-31-95	22.08	7.92	14.16	ND	SSW	0.005	08-31-95	26000	8000	<100*	1900	900	<500*	--	--	--
MW-6	11-27-95	22.08	8.21	13.87	ND	SSW	0.004	11-27-95	6700	1800	<20*	480	230	--	--	--	--
MW-6	02-22-96	22.08	6.21	15.87	ND	NW	0.007	03-14-96	17000	3100	69	810	1500	<300*	--	--	--
MW-6	05-20-96	22.08	7.07	15.01	ND	SW	0.007	05-21-96	16000	3700	<50*	1100	1100	<300*	--	--	--
MW-6	08-26-96	22.08	7.93	14.15	ND	SSW	0.004	08-26-96	23000	5800	<50*	2000	560	<300*	--	--	--
MW-6	11-20-96	22.08	8.02	14.06	ND	SSE	0.004	11-20-96	11000	3300	<50*	480	370	<300*	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-7	06-10-91	22.89	DRY	DRY	ND	DRY	DRY	06-10-91	Not sampled: dry well								
MW-7	07-18-91	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	08-22-91	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	09-18-91	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	10-10-91	22.89	DRY	DRY	ND	DRY	DRY	10-10-91	Not sampled: dry well								
MW-7	11-21-91	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	12-24-91	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	01-19-92	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	02-20-92	22.89	8.74	14.15	ND	NR	NR										
MW-7	03-23-92	22.89	8.20	14.69	ND	NR	NR	03-23-92	270	10	0.5	3	13	--	--	--	--
MW-7	04-21-92	22.89	8.86	14.03	ND	NR	NR										
MW-7	05-15-92	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	06-08-92	22.89	DRY	DRY	ND	DRY	DRY	06-08-92	Not sampled: dry well								
MW-7	07-15-92	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	08-25-92	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	09-15-92	22.89	DRY	DRY	ND	DRY	DRY	09-15-92	Not sampled: dry well								
MW-7	10-28-92	22.89	^^10.38	12.51	ND	NR	NR										
MW-7	11-16-92	22.89	DRY	DRY	ND	DRY	DRY	11-16-92	Not sampled: dry well								
MW-7	12-16-92	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	01-15-93	22.89	8.37	14.52	ND	NR	NR										
MW-7	02-16-93	22.89	7.84	15.05	ND	NR	NR	02-16-93	120	3.6	<0.5	<0.5	1.2	--	--	--	--
MW-7	03-30-93	22.89	8.03	14.86	ND	NR	NR										
MW-7	04-28-93	22.89	8.33	14.56	ND	NR	NR										
MW-7	05-13-93	22.89	8.56	14.33	ND	NR	NR	05-13-93	<50	0.8	<0.5	<0.5	<0.5	--	--	--	--
MW-7	06-17-93	22.89	9.30	13.59	ND	NR	NR										
MW-7	07-28-93	22.89	DRY	DRY	ND	DRY	DRY										
MW-7	08-17-93	22.89	DRY	DRY	ND	DRY	DRY	08-17-93	Not sampled: dry well								
MW-7	11-08-93	22.89	DRY	DRY	ND	DRY	DRY	11-08-93	Not sampled: dry well								
MW-7	02-14-94	22.89	8.80	14.09	ND	NR	NR	02-14-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-7	05-05-94	22.89	9.11	13.78	ND	NR	NR	05-05-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-7	08-04-94	22.89	DRY	DRY	ND	DRY	DRY	08-04-94	Not sampled: dry well								
MW-7	11-20-94	22.89	8.72	14.17	ND	SW	0.002	11-20-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-7	03-17-95	22.89	7.68	15.21	ND	WSW	0.006	03-17-95	<50	<0.5	<0.5	<0.5	<0.5	- -	- -	- -	- -
MW-7	06-01-95	22.89	8.40	14.49	ND	SW	0.003	06-01-95	<50	<0.5	<0.5	<0.5	<0.5	- -	- -	- -	- -
MW-7	08-31-95	22.89	9.09	13.80	ND	SSW	0.005	08-31-95	<50	<0.5	<0.5	0.6	<0.5	<3	- -	- -	- -
MW-7	11-27-95	22.89	9.15	13.74	ND	SSW	0.004	11-27-95	<50	<0.5	<0.5	0.9	<0.5	- -	- -	- -	- -
MW-7	02-22-96	22.89	7.44	15.45	ND	NW	0.007	03-14-96	110	1.4	<0.5	3.8	3	<3	- -	- -	- -
MW-7	05-20-96	22.89	8.47	14.42	ND	SW	0.007	05-21-96	Not sampled: well sampled annually, during the first quarter								
MW-7	08-26-96	22.89	8.81	14.08	ND	SSW	0.004	08-26-96	Not sampled: well sampled annually, during the first quarter								
MW-7	11-20-96	22.89	9.17	13.72	ND	SSE	0.004	11-20-96	Not sampled: well sampled annually, during the first quarter								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-8	06-10-91	20.97	7.80	13.17	ND	NR	NR	06-10-91	5800	73	7.2	150	21	--	--	<5000	--
MW-8	07-18-91	20.97	8.36	12.61	ND	NR	NR										
MW-8	08-22-91	20.97	8.53	12.44	ND	NR	NR										
MW-8	09-18-91	20.97	8.68	12.29	ND	NR	NR										
MW-8	10-10-91	20.97	8.87	12.10	ND	NR	NR	10-10-91	2800	31	6.1	4.5	3.9	--	--	--	--
MW-8	11-21-91	20.97	8.43	12.54	ND	NR	NR										
MW-8	12-24-91	20.97	8.68	12.29	ND	NR	NR										
MW-8	01-19-92	20.97	7.73	13.24	ND	NR	NR										
MW-8	02-20-92	20.97	5.57	15.40	ND	NR	NR										
MW-8	03-23-92	20.97	5.81	15.16	ND	NR	NR	03-23-92	8000	18	<5.0*	320	42	--	--	--	--
MW-8	04-21-92	20.97	7.05	13.92	ND	NR	NR										
MW-8	05-15-92	20.97	7.79	13.18	ND	NR	NR										
MW-8	06-08-92	20.97	8.01	12.96	ND	NR	NR	06-08-92	4000	<10*	<10*	110	<10*	--	--	--	--
MW-8	07-15-92	20.97	8.46	12.51	ND	NR	NR										
MW-8	08-25-92	20.97	8.64	12.33	ND	NR	NR										
MW-8	09-15-92	20.97	8.80	12.17	ND	NR	NR	09-15-92	4200	6.4	<5*	120	<5*	--	--	--	460^
MW-8	10-28-92	20.97	8.80	12.17	ND	NR	NR										
MW-8	11-16-92	20.97	8.19	12.78	ND	NR	NR	11-16-92	2600	4	<2.5*	21	5.2	--	--	1200	1100^
MW-8	12-16-92	20.97	6.66	14.31	ND	NR	NR										
MW-8	01-15-93	20.97	5.18	15.79	ND	NR	NR										
MW-8	02-16-93	20.97	5.84	15.13	ND	NR	NR	02-16-93	8700	<5*	<5*	200	<5*	--	--	150000	5300^
MW-8	03-30-93	20.97	4.98	15.99	ND	NR	NR										
MW-8	04-28-93	20.97	6.17	14.80	ND	NR	NR										
MW-8	05-13-93	20.97	6.93	14.04	ND	NR	NR	05-13-93	2300	<5*	<5*	42	<5*	--	--	2000	2300^
MW-8	06-17-93	20.97	7.36	13.61	ND	NR	NR										
MW-8	07-28-93	20.97	7.80	13.17	ND	NR	NR										
MW-8	08-17-93	20.97	7.87	13.10	ND	NR	NR	08-17-93	1700	1.8	<1.3*	16	1.2	--	--	1200	1000^
MW-8	11-08-93	20.97	8.31	12.66	ND	NR	NR	11-08-93	1200	2.4	<1*	19	2.3	--	--	4200	<1000
MW-8	02-14-94	20.97	7.00	13.97	ND	NR	NR	02-14-94	3600	3	<1*	72	<1*	--	--	2000	3900^
MW-8	05-05-94	20.97	7.46	13.51	ND	NR	NR	05-05-94	2100	<2.5*	<2.5*	8.3	<2.5*	--	--	700	440^
MW-8	08-04-94	20.97	8.17	12.80	ND	SW	0.004	08-04-94	1200	1.5	<1*	6.7	<1*	--	--	700	<50
MW-8	11-20-94	20.97	6.78	14.19	ND	SW	0.002	11-20-94	2300	1.2	1.1	20	2.2	--	--	<500	2100^

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-8	03-17-95	20.97	6.14	14.83	ND	WSW	0.006	03-17-95	5400	<5*	<5*	35	<5*	--	--	--	--
MW-8	06-01-95	20.97	6.50	14.47	ND	SW	0.003	06-01-95	2600	<2.5*	<2.5*	15	<2.5*	--	--	--	--
MW-8	08-31-95	20.97	7.35	13.62	ND	SSW	0.005	08-31-95	1400	<3*	<3*	5	<3*	520	--	900	--
MW-8	11-27-95	20.97	7.60	13.37	ND	SSW	0.004	11-27-95	620	<0.5	<0.5	<0.5	0.5	--	560	900	510^
MW-8	02-22-96	20.97	5.35	15.62	ND	NW	0.007	03-14-96	5800	<5*	<5*	28	<5*	110	--	1900	6800^
MW-8	05-20-96	20.97	5.92	15.05	ND	SW	0.007	05-21-96	6100	<5*	<5*	26	<5*	240	--	--	--
MW-8	08-26-96	20.97	7.08	13.89	ND	SSW	0.004	08-26-96	970	<1*	<1*	3	<1*	710	--	--	--
MW-8	11-20-96	20.97	7.01	13.96	ND	SSE	0.004	11-20-96	3900	<2.5*	<2.5*	12	<2.5*	930	--	--	--

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-9	06-11-93	20.89	8.15	12.74	ND	NR	NR	06-11-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	07-28-93	20.89	8.49	12.40	ND	NR	NR										
MW-9	08-17-93	20.89	8.53	12.36	ND	NR	NR	08-17-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	11-08-93	20.89	8.87	12.02	ND	NR	NR	11-08-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	02-14-94	20.89	7.47	13.42	ND	NR	NR	02-14-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	05-05-94	20.89	8.04	12.85	ND	NR	NR	05-05-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	08-04-94	20.89	8.78	12.11	ND	SW	0.004	08-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	11-20-94	20.89	6.83	14.06	ND	SW	0.002	11-20-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	03-17-95	20.89	6.94	13.95	ND	WSW	0.006	03-17-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	06-01-95	20.89	8.15	12.74	ND	SW	0.003	06-01-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	08-31-95	20.89	8.10	12.79	ND	SSW	0.005	08-31-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-9	11-27-95	20.89	8.38	12.51	ND	SSW	0.004	11-27-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-9	02-22-96	20.89	7.36	13.53	ND	NW	0.007	03-14-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-9	05-20-96	20.89	7.81	13.08	ND	SW	0.007	05-21-96	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-9	08-26-96	20.89	8.00	12.89	ND	SSW	0.004	08-26-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-9	11-20-96	20.89	7.06	13.83	ND	SSE	0.004	11-20-96	Not sampled: well sampled semi-annually, during the first and third quarters								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-10	06-11-93	21.12	8.14	12.98	ND	NR	NR	06-11-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	07-28-93	21.12	8.43	12.69	ND	NR	NR										
MW-10	08-17-93	21.12	8.54	12.58	ND	NR	NR	08-17-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	11-08-93	21.12	8.70	12.42	ND	NR	NR	11-08-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	02-14-94	21.12	7.13	13.99	ND	NR	NR	02-14-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	05-05-94	21.12	8.08	13.04	ND	NR	NR	05-05-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	08-04-94	21.12	8.84	12.28	ND	SW	0.004	08-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	11-20-94	21.12	7.05	14.07	ND	SW	0.002	11-20-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	03-17-95	21.12	6.26	14.86	ND	WSW	0.006	03-17-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	06-01-95	21.12	7.63	13.49	ND	SW	0.003	06-01-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	08-31-95	21.12	8.17	12.95	ND	SSW	0.005	08-31-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-10	11-27-95	21.12	8.38	12.74	ND	SSW	0.004	11-27-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-10	02-22-96	21.12	5.41	15.71	ND	NW	0.007	03-14-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-10	05-20-96	21.12	6.78	14.34	ND	SW	0.007	05-21-96	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-10	08-26-96	21.12	8.00	13.12	ND	SSW	0.004	08-26-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-10	11-20-96	21.12	7.81	13.31	ND	SSE	0.004	11-20-96	Not sampled: well sampled semi-annually, during the first and third quarters								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-11	11-16-92	22.38	9.02	13.36	ND	NR	NR	11-16-92	7000	21	<10*	18	230	--	--	--	--
MW-11	12-16-92	22.38	8.48	13.90	ND	NR	NR										
MW-11	01-15-93	22.38	7.14	15.24	ND	NR	NR										
MW-11	02-16-93	22.38	7.11	15.27	ND	NR	NR	02-16-93	2200	<10*	<10*	11	<10*	--	--	--	--
MW-11	03-30-93	22.38	7.01	15.37	ND	NR	NR										
MW-11	04-28-93	22.38	7.62	14.76	ND	NR	NR										
MW-11	05-13-93	22.38	8.04	14.34	ND	NR	NR	05-13-93	1600	<2.5*	<2.5*	41	6.8	--	--	--	--
MW-11	06-17-93	22.38	8.44	13.94	ND	NR	NR										
MW-11	07-28-93	22.38	8.80	13.58	ND	NR	NR										
MW-11	08-17-93	22.38	8.78	13.60	ND	NR	NR	08-17-93	830	1.4	<1.0*	25	15	--	--	--	--
MW-11	11-08-93	22.38	9.23	13.15	ND	NR	NR	11-08-93	370	<1.0*	<1.0*	2.5	2.1	--	--	--	--
MW-11	02-14-94	22.38	7.94	14.44	ND	NR	NR	02-14-94	650	<1*	<1*	2	4	--	--	--	--
MW-11	05-05-94	22.38	8.55	13.83	ND	NR	NR	05-05-94	210	<0.5	<0.5	2.5	0.6	--	--	--	--
MW-11	08-04-94	22.38	9.13	13.25	ND	SW	0.004	08-04-94	390	<0.5	<0.7*	1.9	2.2	--	--	--	--
MW-11	11-20-94	22.38	7.73	14.65	ND	SW	0.002	11-20-94	1300	1.3	0.5	1.5	21	--	--	--	--
MW-11	03-17-95	22.38	6.94	15.44	ND	WSW	0.006	03-17-95	100	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-11	06-01-95	22.38	7.90	14.48	ND	SW	0.003	06-01-95	210	<0.5	<0.5	0.9	0.7	--	--	--	--
MW-11	08-31-95	22.38	8.18	14.20	ND	SSW	0.005	08-31-95	680	<0.5	<0.5	4	1.8	<3	--	--	--
MW-11	11-27-95	22.38	8.48	13.90	ND	SSW	0.004	11-27-95	340	<0.5	<0.5	2.2	1.6	--	--	--	--
MW-11	02-22-96	22.38	6.63	15.75	ND	NW	0.007	03-14-96	150	<0.5	<0.5	<0.8*	0.8	<3	--	--	--
MW-11	05-20-96	22.38	7.25	15.13	ND	SW	0.007	05-21-96	Not sampled: well sampled annually, during the first quarter								
MW-11	08-26-96	22.38	8.22	14.16	ND	SSW	0.004	08-26-96	Not sampled: well sampled annually, during the first quarter								
MW-11	11-20-96	22.38	8.37	14.01	ND	SSE	0.004	11-20-96	Not sampled: well sampled annually, during the first quarter								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TRPH EPA 418.1 µg/L	TPHD LUFT Method µg/L
MW-12	11-16-92	22.77	9.65	13.12	ND	NR	NR	11-16-92	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	12-16-92	22.77	8.71	14.06	ND	NR	NR										
MW-12	01-15-93	22.77	7.19	15.58	ND	NR	NR										
MW-12	02-16-93	22.77	7.88	14.89	ND	NR	NR	02-16-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	03-30-93	22.77	7.43	15.34	ND	NR	NR										
MW-12	04-28-93	22.77	8.22	14.55	ND	NR	NR										
MW-12	05-13-93	22.77	8.63	14.14	ND	NR	NR	05-13-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	06-17-93	22.77	8.98	13.79	ND	NR	NR										
MW-12	07-28-93	22.77	9.32	13.45	ND	NR	NR										
MW-12	08-17-93	22.77	9.30	13.47	ND	NR	NR	08-17-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	11-08-93	22.77	9.72	13.05	ND	NR	NR	11-08-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	02-14-94	22.77	8.24	14.53	ND	NR	NR	02-14-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	05-05-94	22.77	8.97	13.80	ND	NR	NR	05-05-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	08-04-94	22.77	9.57	13.20	ND	SW	0.004	08-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	11-20-94	22.77	8.06	14.71	ND	SW	0.002	11-20-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	03-17-95	22.77	7.09	15.68	ND	WSW	0.006	03-17-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-12	06-01-95	22.77	8.40	14.37	ND	SW	0.003	06-01-95	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-12	08-31-95	22.77	8.55	14.22	ND	SSW	0.005	08-31-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-12	11-27-95	22.77	8.95	13.82	ND	SSW	0.004	11-27-95	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-12	02-22-96	22.77	6.81	15.96	ND	NW	0.007	03-14-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-12	05-20-96	22.77	7.56	15.21	ND	SW	0.007	05-21-96	Not sampled: well sampled annually, during the first quarter								
MW-12	08-26-96	22.77	8.63	14.14	ND	SSW	0.004	08-26-96	Not sampled: well sampled annually, during the first quarter								
MW-12	11-20-96	22.77	8.38	14.39	ND	SSE	0.004	11-20-96	Not sampled: well sampled annually, during the first quarter								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-13	11-16-92	22.45	9.02	13.43	ND	NR	NR	11-16-92	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	12-16-92	22.45	8.23	14.22	ND	NR	NR										
MW-13	01-15-93	22.45	6.89	15.56	ND	NR	NR										
MW-13	02-16-93	22.45	7.14	15.31	ND	NR	NR	02-16-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	03-30-93	22.45	7.01	15.44	ND	NR	NR										
MW-13	04-28-93	22.45	7.57	14.88	ND	NR	NR										
MW-13	05-13-93	22.45	7.95	14.50	ND	NR	NR	05-13-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	06-17-93	22.45	8.32	14.13	ND	NR	NR										
MW-13	07-28-93	22.45	8.59	13.86	ND	NR	NR										
MW-13	08-17-93	22.45	8.57	13.88	ND	NR	NR	08-17-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	11-08-93	22.45	8.86	13.59	ND	NR	NR	11-08-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	02-14-94	22.45	7.78	14.67	ND	NR	NR	02-14-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	05-05-94	22.45	8.38	14.07	ND	NR	NR	05-05-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	08-04-94	22.45	8.78	13.67	ND	SW	0.004	08-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	11-20-94	22.45	7.68	14.77	ND	SW	0.002	11-20-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	03-17-95	22.45	6.91	15.54	ND	WSW	0.006	03-17-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-13	06-01-95	22.45	7.72	14.73	ND	SW	0.003	06-01-95	Not sampled: well sampled annually, during the first quarter								
MW-13	08-31-95	22.45	7.58	14.87	ND	SSW	0.005	08-31-95	Not sampled: well sampled annually, during the first quarter								
MW-13	11-27-95	22.45	7.98	14.47	ND	SSW	0.004	11-27-95	Not sampled: well sampled annually, during the first quarter								
MW-13	02-22-96	22.45	6.71	15.74	ND	NW	0.007	03-14-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-13	05-20-96	22.45	6.98	15.47	ND	SW	0.007	05-21-96	Not sampled: well sampled annually, during the first quarter								
MW-13	08-26-96	22.45	7.85	14.60	ND	SSW	0.004	08-26-96	Not sampled: well sampled annually, during the first quarter								
MW-13	11-20-96	22.45	7.76	14.69	ND	SSE	0.004	11-20-96	Not sampled: well sampled annually, during the first quarter								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-14	09-15-92	22.99	10.66	12.33	ND	NR	NR	09-15-92	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	10-28-92	22.99	10.91	12.08	ND	NR	NR										
MW-14	11-16-92	22.99	10.33	12.66	ND	NR	NR	11-16-92	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	12-16-92	22.99	9.20	13.79	ND	NR	NR										
MW-14	01-15-93	22.99	7.06	15.93	ND	NR	NR										
MW-14	02-16-93	22.99	8.18	14.81	ND	NR	NR	02-16-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	03-30-93	22.99	7.97	15.02	ND	NR	NR										
MW-14	04-28-93	22.99	8.63	14.36	ND	NR	NR										
MW-14	05-13-93	22.99	9.05	13.94	ND	NR	NR	05-13-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	06-17-93	22.99	9.55	13.44	ND	NR	NR										
MW-14	07-28-93	22.99	9.89	13.10	ND	NR	NR										
MW-14	08-17-93	22.99	9.90	13.09	ND	NR	NR	08-17-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	11-08-93	22.99	10.25	12.74	ND	NR	NR	11-08-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	02-14-94	22.99	8.80	14.19	ND	NR	NR	02-14-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	05-05-94	22.99	9.49	13.50	ND	NR	NR	05-05-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	08-04-94	22.99	10.11	12.88	ND	SW	0.004	08-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	11-20-94	22.99	8.66	14.33	ND	SW	0.002	11-20-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	03-17-95	22.99	8.17	14.82	ND	WSW	0.006	03-17-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-14	06-01-95	22.99	8.57	14.42	ND	SW	0.003	06-01-95	Not sampled: well sampled annually, during the first quarter								
MW-14	08-31-95	22.99	9.05	13.94	ND	SSW	0.005	08-31-95	Not sampled: well sampled annually, during the first quarter								
MW-14	11-27-95	22.99	9.19	13.80	ND	SSW	0.004	11-27-95	Not sampled: well sampled annually, during the first quarter								
MW-14	02-22-96	22.99	6.52	16.47	ND	NW	0.007	03-14-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-14	05-20-96	22.99	7.88	15.11	ND	SW	0.007	05-21-96	Not sampled: well sampled annually, during the first quarter								
MW-14	08-26-96	22.99	8.83	14.16	ND	SSW	0.004	08-26-96	Not sampled: well sampled annually, during the first quarter								
MW-14	11-20-96	22.99	8.95	14.04	ND	SSE	0.004	11-20-96	Not sampled: well sampled annually, during the first quarter								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-15	04-28-93	19.19	5.51	13.68	ND	NR	NR										
MW-15	05-13-93	19.19	5.91	13.28	ND	NR	NR	05-13-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-15	06-17-93	19.19	6.18	13.01	ND	NR	NR										
MW-15	07-28-93	19.19	6.45	12.74	ND	NR	NR										
MW-15	08-17-93	19.19	6.54	12.65	ND	NR	NR	08-17-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-15	11-08-93	19.19	6.98	12.21	ND	NR	NR	11-08-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-15	02-14-94	19.19	5.44	13.75	ND	NR	NR	02-14-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-15	05-05-94	19.19	6.18	13.01	ND	NR	NR	05-05-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-15	08-04-94	19.19	6.84	12.35	ND	SW	0.004	08-04-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	-
MW-15	11-20-94	19.19	5.31	13.88	ND	SW	0.002	11-20-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-15	03-17-95	19.19	5.21	13.98	ND	WSW	0.006	03-17-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--
MW-15	06-01-95	19.19	5.84	13.35	ND	SW	0.003	06-01-95	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-15	08-31-95	19.19	6.18	13.01	ND	SSW	0.005	08-31-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--
MW-15	11-27-95	19.19	6.42	12.77	ND	SSW	0.004	11-27-95	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-15	02-22-96	19.19	4.84	14.35	ND	NW	0.007	03-14-96	<50	<0.5	<0.5	<0.5	<0.5	12	--	--	--
MW-15	05-20-96	19.19	5.31	13.88	ND	SW	0.007	05-21-96	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-15	08-26-96	19.19	6.05	13.14	ND	SSW	0.004	08-26-96	<50	<0.5	<0.5	<0.5	<0.5	8	--	--	--
MW-15	11-20-96	19.19	5.46	13.73	ND	SSE	0.004	11-20-96	Not sampled: well sampled semi-annually, during the first and third quarters								

Historical Groundwater Elevation and Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 04-15-97

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl-tert-butyl ether
TRPH: total recoverable petroleum hydrocarbons
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
NR: not reported; data not available or not measurable
ND: none detected
SW: southwest
WSW: west-southwest
SSW: south-southwest
SSE: south-southeast
NW: northwest
DRY: dry well; groundwater was not detected
- - : not analyzed
^: chromatogram fingerprint is not characteristic of diesel
*: method reporting limit was raised due to: (1) high analyte concentration requiring sample dilution, or (2) matrix interference
**: [corrected elevation (Z')] = Z + (h * 0.73) where: Z = measured elevation, h = floating product thickness, 0.73 = density ratio of oil to water

Historical Soil Analytical Data

ARCO Service Station 601
712 Lewelling Boulevard, San Leandro, California

Date: 05-02-97

Sample Designation	Sample Field Date	TPHG EPA 5030/8015 mg/kg	Benzene EPA 8020 mg/kg	Toluene EPA 8020 mg/kg	Ethylbenzene EPA 8020 mg/kg	Total Xylenes EPA 8020 mg/kg
ASW-1	January 1990	1600	36	111	50	210
ASW-2	January 1990	7100	175	509	220	980
ASW-3	January 1990	140	3.1	3.1	3.8	15
ASW-4	January 1990	1400	12	46	26	129
S-4 1/2-B6	June 1990	9.5	1.4	0.099	0.25	1.3
S-7 1/2-B6	June 1990	420	6	27	8.8	52
S-12-B6	June 1990	6.5	0.062	0.29	0.1	0.6
S-16 1/2-B6	June 1990	<1.0	<0.0050	0.04	0.011	0.069
S-4 1/2-B7	June 1990	9.3	0.71	0.04	0.18	0.68
S-10-B7	June 1990	15	0.99	0.71	0.5	1.3
S-12 1/2-B7	June 1990	<1.0	0.056	0.015	<0.0050	0.011
S-16-B7	June 1990	<1.0	0.0085	0.0071	<0.0050	0.0094
S-6-B8	June 1990	620	11	30	16	82
S-9-B8	June 1990	3.1	0.18	0.25	0.094	0.43
S-12-B8	June 1990	1.7	0.034	0.039	0.0098	0.046
S-15 1/2-B8	June 1990	<1.0	0.082	0.076	<0.0050	0.079
S-5 1/2-B9	May 1991	120	1.6	4.2	1.9	12
S-7-B9	May 1991	420	5.9	24	8.4	48
S-8 1/2-B9	May 1991	170	3.7	14	3.5	20
S-11 1/2-B9	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-14 1/2-B9	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-17 1/2-B9	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-5 1/2-B10	May 1991	500	2.8	8.1	7.4	34
S-7 1/2-B10	May 1991	2700	27	150	65	370
S-10-B10	May 1991	4.9	0.33	0.33	0.10	0.51
S-16-B10	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-5 1/2-B11	May 1991	4.4	0.72	0.019	0.022	0.041
S-8 1/2-B11	May 1991	100	3	9.3	2.7	1.5
S-12-B11	May 1991	<1.0	0.011	0.019	0.0055	0.025
S-15-B11	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-5 1/2-B12	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-7 1/2-B12	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-10 1/2-B12	May 1991	23	<0.050	0.24	0.5	2.2
S-14 1/2-B12	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-5 1/2-B13	May 1991	8.4	0.022	0.017	0.2	0.059
S-11-B13	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-15-B13	May 1991	<1.0	<0.0050	<0.0050	<0.0050	<0.0050

TPHG: total petroleum hydrocarbons as gasoline
ASW: Former underground storage tank excavation sidewall soil sample, *Tank Replacement Report* (Geostratigies, June 1990)
mg/kg: milligrams per kilogram
EPA: United States Environmental Protection Agency

APPENDIX B

ASTM RBCA WORKSHEETS

Site Name: ARCO 601 | Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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
3	Residual BTEX in soil following tank and piping removal. Dissolved BTEX in groundwater. Potential exposure via volatilization to indoor and ambient air.	Evaluate under Tier 2.	

TIER 1 CORRECTIVE ACTION CRITERIA

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

NOTES:

The RBSLs were exceeded for benzene in the groundwater-to-indoor air scenario for the commercial building (on-site) and residences (off-site), the soil-to-ambient and -indoor air scenario (on-site), and the soil-to-ambient and -indoor air scenario (off-site).

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: ARCO 601 | Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, CA | Completed By: EMCON | *Page 1 of 1*

TIER 2 EXECUTIVE SUMMARY CHECKLIST

TIER 2 SSTL CALCULATION METHOD (■ OR ● TO SELECT)

SSTL Calculation Option

- ☐ Option 1: Site-Specific Screening Levels
- ■ Option 2: Individual Constituent SSTL Values
- ☐ Option 3: Cumulative Constituent SSTL Values

NAF Calculation Method

- ☐ Fate and Transport Modeling:
  - ○ RBCA Spreadsheet System
  - ○ Other Model(s)
- ☐ Empirical NAF Calculation

SITE DATA INVENTORY

Source Zone Investigation Complete:

- ☐ Surface Soil (e.g., ≥ 3 ft BGS)
- ■ Subsurface Soil (e.g., > 3 ft BGS)
- ■ Groundwater

Exposure Pathway Information Compiled:

- ■ Air Pathway
- ■ Groundwater Pathway
- ☐ Soil Pathway
- ☐ Surface Water Pathway
- ☐ Land Use Classification (on-site and off-site)

TIER 1 WORKSHEETS 1.3 - 4.2 AND 5.2 - 5.6 HAVE BEEN UPDATED TO INCLUDE NEW TIER 2 INFORMATION.

TASKS COMPLETED

- ■ Tier 1 Evaluation
- ☐ Tier 1 Interim Corrective Action
- ■ Tier 2 Evaluation
- ☐ Tier 2 Interim Corrective Action
- ☐ Tier 2 Final Corrective Action
- ☐ Tier 3 Evaluation

CURRENT SITE CLASSIFICATION

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 2 CORRECTIVE ACTION CRITERIA

Affected Medium	Tier 2 SSTL Exceeded ?		Applicable Excess Risk Limits (specify value)				Other Applicable Exposure Limit
	Yes	No	Indiv. Risk	Total Risk	Hazard Index	Hazard Quotent	*(specify, if any)*
• Surface Soil (≤ 3ft BGS)	☐	☐					
• Subsurface Soil (>3ft BGS	☐	■	see text		1		
• Groundwater	☐	■	see text		1		

PROPOSED ACTION

- ■ ***No Action:*** Tier 2 SSTLs not exceeded.
- ☐ ***Interim Corrective Action:*** Address principal, near-term risks sources.
- ☐ ***Final Corrective Action:*** Remediate/control site to meet Tier 2 criteria.
- ☐ ***Tier 3 Evaluation:*** Improve baseline risk and SSTL estimates.

NOTE:

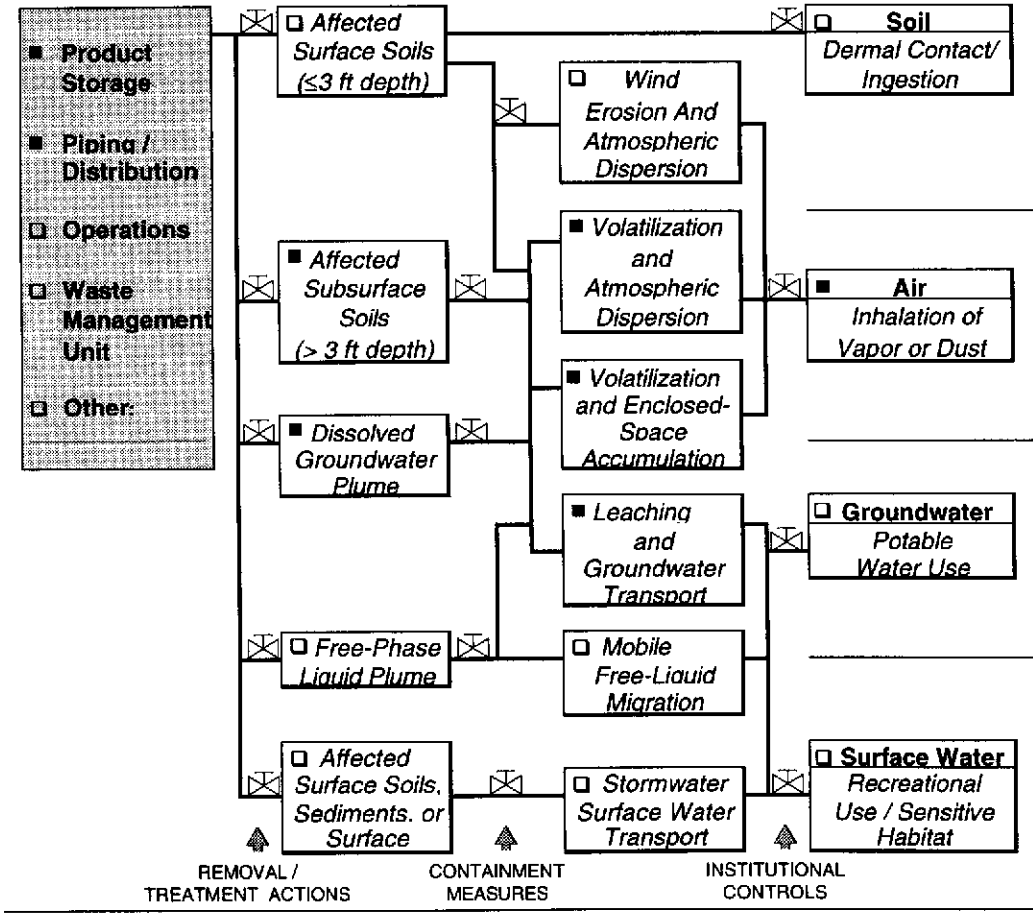
Rationale for proposed action documented on Worksheets 1.3 and 10.1-10.3.

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

Site Name: ARCO 601
Site Location: 712 Lewelling Blvd., San Leandro, CA
Date Completed: 4-4-97
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).*



POTENTIAL RECEPTORS

Exposed Receptors

On-Site: □ Residential □ Non-Resid. ■ N/A; □ Sensitive Habitat □ Recreation

Off-Site: □ Residential □ Non-Resid. ■ N/A; □ Sensitive Habitat □ Recreation

Exposed Persons

On-Site: □Residential ■ Non-Resid. □ N/A

Off-Site: ■ Residential □ Non-Resid. □ N/A

Groundwater Users

On-Site: □Residential □ Non-Resid. ■ N/A

Off-Site: □Residential □ Non-Resid. ■ N/A

Surface Water Users

On-Site: □ Residential □ Non-Resid. ■ N/A; □ Sensitive Habitat □ Recreation

Off-Site: □ Residential □ Non-Resid. ■ N/A; □ Sensitive Habitat □ Recreation

REMEDIAL ACTION TECHNOLOGY OPTIONS

□ Complete Pathway: ○ *Current* ○ *Potential*
⋈ Action Required: □Yes ■ No
If yes, list technology options for ⋈:

■ Complete Pathway: ● *Current* ○ *Potential*
⋈ Action Required: □Yes ■ No
If yes, list technology options for ⋈:

□ Complete Pathway: ○ *Current* ○ *Potential*
⋈ Action Required: □Yes ■ No
If yes, list technology options for ⋈:

□ Complete Pathway: ○ *Current* ○ *Potential*
⋈ Action Required: □Yes ■ No
If yes, list technology options for ⋈:

(■ OR ● OR ⋈ TO SELECT)

Site Name: ARCO 601 | Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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)

MAKE ZAPF NOT ITALICS

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, CA Completed By: EMCON *Page 1 of 1*

EXPOSURE FACTOR CHECKLIST

Instructions: • ***Tier 1 Evaluation:*** *Indicate use of either residential or commercial / industrial Reasonable Maximum Exposure (RME) factors at on-site points of exposure (POEs) for complete exposure pathways.* • ***Tier 2 Evaluation:*** *Indicate use of either a Reasonable Maximum Exposure (RME) factor or a site-specific exposure factor for both residential and commercial / industrial points of exposure (POEs), as appropriate for each exposure pathway. For Tier 2, data is required for Global Factors and for complete pathways only (see Worksheet 4.4).*

		RESIDENTIAL POE		COMMERCIAL/ INDUSTRIAL POE	
		RME	Site-Specific	RME	Site-Specific
GLOBAL FACTORS		**(■ TO SELECT)**			
AT_C	Averaging time for carcinogens	■ 70 yrs	❑	■ 70 yrs	❑
AT_n	Averaging time for non-carcinogens	■ = ED	❑	■ = ED	❑
BW	Body weight -Adult	■ 70 kg	❑	■ 70 kg	❑
	-Child (1-6 yrs)	■ 15 kg	❑	■ NA	❑
ED	Exposure duration	■ 30 yrs	❑	■ 25 yrs	❑
AIR EXPOSURE FACTORS		**■ COMPLETE (provide data)**	**❑ NOT COMPLETE (skip)**		
EF	Exposure frequency (inhalation)	■ 350 dy/yr	❑	■ 250 dy/yr	❑
IR_{ai}	Daily indoor inhalation rate	■ 15 m^3/dy (24-hr/dy)	❑	■ 20 m^3/dy (8-hr/dy)	❑
IR_{ao}	Daily outdoor inhalation rate	■ 20 m^3/dy (24-hr/dy)	❑	■ 20 m^3/dy (8-hr/dy)	❑
POTABLE WATER USE EXPOSURE FACTORS		**❑ COMPLETE (provide data)**	**■ NOT COMPLETE (skip)**		
EF	Exposure frequency (ingestion/showering)	❑ 350 dy/yr	❑	❑ 250 dy/yr	❑
IR_W	Daily water ingestion rate	❑ 2 L/dy (24-hr/dy)	❑	❑ 1 L/dy (8-hr/dy)	❑
EP_{sh}	Exposure period (showering)	❑ 12 min/dy	❑	❑ 12 min/day	❑
SA_W	Skin surface area (showering) -Adult (70 kg)	❑ 0.86 m^2	❑	❑ 0.86 m^2	❑
SOIL EXPOSURE FACTORS		**❑ COMPLETE (provide data)**	**■ NOT COMPLETE (skip)**		
EF	Exposure Frequency -Dermal Contact	❑ 350 dy/yr	❑	❑ 40 dy/yr	❑
	-Soil ingestion	❑ 350 dy/yr	❑	❑ 250 dy/yr	❑
SA_S	Skin surface area (soil contact) -Adult (18 to 31 yrs, 70 kg)	❑ 0.58 m^2	❑	❑ 0.58 m^2	❑
	-Child (1 - 17 yrs, 35 kg)	❑ 0.20 m^2	❑	❑ NA	❑
M	Soil to skin adherance factor	❑ 1.0 mg/cm^2	❑	❑ 1.0 mg/cm^2	❑
IR_S	Soil ingestion rate - Age-adjusted average	❑ 114 mg-yr /kg-dy	❑	o NA	❑
	-Adult (7 to 31 yrs, 70 kg)	❑ 100 mg/dy (24-hr/dy)	❑	❑ 50 mg/dy (8-hr/dy)	❑
	-Child (1 - 6 yrs, 15 kg)	❑ 200 mg/dy (24-hr/dy)	❑	❑ NA	❑
SURFACE WATER EXPOSURE FACTORS		**❑ COMPLETE (provide data)**	**■ NOT COMPLETE (skip)**		
EF	Exposure Frequency -Fish consumption	❑ 350 dy/yr	❑	❑ NA	❑
	-Swimming	❑ 7 dy/yr	❑	❑ NA	❑
IR_f	Daily fish intake rate -Freshwater	❑ 10 g/dy	❑	❑ NA	❑
	-Saltwater	❑ 15 g/dy	❑	❑ NA	❑
SA_W	Skin surface area (swimming) -Adult (70 kg)	❑ 0.86 m^2	❑	❑ NA	❑
EP_{sw}	Exposure period (swimming)	❑ 2.6 hrs/dy	❑	❑ NA	❑

Site Name: ARCO 601 | Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, CA | Completed By: EMCON

TIER 2 EXPOSURE PATHWAY SCREENING

Instructions: *Exposure pathways screening involves the following steps:*

1) ***Source Medium:*** *Compare maximum constituent concentration in relevant source medium to applicable Tier 1 RBSL value for designated pathway.*

2) ***Transport Mechanism:*** *Transport is active at site if: a) relevant source medium is affected, b) exposure medium or receptor exists, and c) constituent transport from source to receptor could occur under current or anticipated future use.*

3) ***Exposure Medium:*** *For pathways under steady-state transport conditions (e.g., air), compare measured COC concentration at POE to applicable Tier 1 exposure limit for air, groundwater, or soil. Surface water concentrations should be compared to applicable state or federal water quality criteria.*

4) ***Complete Pathway:*** *For screening, pathway considered complete if "Yes" reported in Column A and either Column B or C.*

Notes:

RBSL = Risk-Based Screening Level

POE = Point of Exposure

COC = Constituent of Concern

NM = Not Measured

PATHWAY	A) SOURCE MEDIUM: Type	A) SOURCE MEDIUM: Pathway Tier 1 RBSL Exceeded?	B) TRANSPORT MECHANISM: Type	B) TRANSPORT MECHANISM: Active at Site?	C) EXPOSURE MEDIUM: Type	C) EXPOSURE MEDIUM: Exposure Limit Exceeded at POE?	COMPLETE PATHWAY? (Check if yes & specify status)
AIR EXPOSURE PATHWAYS (■ TO SELECT)							
1) ***Surface Soils:*** Vapor Inhalation and Dust Ingestion	Surface Soil	☐ Yes ■ No	Volatilization /Dust Transport	■ No ☐ Yes - Current ☐ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
2) ***Subsurface Soils:*** Volatilization to Ambient Air	Subsurface Soil	■ Yes ☐ No	Volatilization	☐ No ■ Yes - Current ■ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	■ Current ☐ Potential
3) ***Subsurface Soils:*** Volatilization to Enclosed Space	Subsurface Soil	■ Yes ☐ No	Volatilization	☐ No ■ Yes - Current ■ Yes - Future	Indoor Air	■ NM ☐ No ☐ Yes	■ Current ☐ Potential
4) ***Groundwater:*** Volatilization to Ambient Air	Groundwater	☐ Yes ■ No	Volatilization	☐ No ■ Yes - Current ■ Yes - Future	Ambient Air	■ NM ☐ No ☐ Yes	■ Current ☐ Potential
5) ***Groundwater:*** Volatilization to Enclosed Space	Groundwater	■ Yes ☐ No	Volatilization	☐ No ■ Yes - Current ■ Yes - Future	Indoor Air	■ NM ☐ No ☐ Yes	■ Current ☐ Potential
GROUNDWATER EXPOSURE PATHWAYS							
6) ***Soil:*** Leaching to Groundwater: Ingestion	Surface or Subsurface Soils	☐ Yes ■ No	Leaching /Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Groundwater	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
7) ***Dissolved or Free-Phase Groundwater Plume:*** Ingestion	Groundwater	☐ Yes ■ No	Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Groundwater	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
SOIL EXPOSURE PATHWAY							
8) ***Surface Soils:*** Dermal Contact /Ingestion	Surface Soil	☐ Yes ■ No	Direct Contact	■ No ☐ Yes - Current ☐ Yes - Future	Soil	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential

Site Name: ARCO 601 | Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, CA | Completed By: EMCON

TIER 2 EXPOSURE PATHWAY SCREENING *CONTINUED*

PATHWAY	A) SOURCE MEDIUM: Type	Pathway Tier 1 RBSL Exceeded?	B) TRANSPORT MECHANISM: Type	Active at Site?	C) EXPOSURE MEDIUM: Type	Exposure Limit Exceeded at POE?	COMPLETE PATHWAY? (Check if yes & specify status)
SURFACE WATER PATHWAYS							
9) *Soil:* Leaching to Groundwater /Discharge to Surface Water: Recreation or Fish	Surface or Subsurface Soils	☐ Yes ■ No	Leaching /Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
10) *Groundwater Plume:* Discharge to Surface Water: Recreation or Fish	Groundwater	☐ Yes ■ No	Groundwater Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential
11) *Soil :* Leaching to Stormwater / Discharge to Surface Water: Recreation or Fish	Surface Soils	☐ Yes ■ No	Overland Flow	■ No ☐ Yes - Current ☐ Yes - Future	Surface Water	■ NM ☐ No ☐ Yes	☐ Current ☐ Potential

Additional Information:

See Table 2 for Tier 1 results.

Site Name: ARCO 601 | Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, CA | Completed By: EMCON

TIER 2 EXPOSURE SCENARIOS AND RISK GOALS

Instructions: ***For each exposure pathway, indicate i) Point of Exposure (POE) location (on-site, off-site, or both), ii) applicable exposure scenario at each POE (residential or commercial / industrial), and iii) applicable risk goals. Distance from source corresponds to shortest lateral distance to applicable POE from point of maximum COC concentration in source medium along possible migration pathway. Provide exposure limit information if applicable (e.g., OSHA Limits, MCLs, etc.).*** *(■ TO SELECT)*

EXPOSURE PATHWAY	DISTANCE FROM SOURCE	EXPOSURE SCENARIO AT POE	TARGET RKSKS AT POE: Individual Constituent Effects — Indiv. Risk	Indiv. HQ	Cumulative Constituent Effects — Additive Risk	Additive HI	Other Exposure Limit (specify if applicable)
AIR EXPOSURE PATHWAYS ■ COMPLETE (provide data) ❑ NOT COMPLETE (skip to next pathway)							
■ On-Site POE	0 ft	❑ Residential ■ Commercial /Industrial	1E-5	1			❑ PEL/TLV
■ Off-Site POE	0 ft	■ Residential ❑ Commercial /Industrial	1E-6	1			❑ PEL/TLV
GROUNDWATER EXPOSURE PATHWAYS ❑ COMPLETE (provide data) ■ NOT COMPLETE (skip to next pathway)							
❑ On-Site POE	_____ ft	❑ Residential ❑ Commercial /Industrial					❑ MCL
❑ Off-Site POE	_____ ft	❑ Residential ❑ Commercial /Industrial					❑ MCL
SOIL EXPOSURE PATHWAY ❑ COMPLETE (provide data) ■ NOT COMPLETE (skip to next pathway)							
❑ On-Site POE: (at source)		❑ Residential ❑ Commercial /Industrial					❑ _____
❑ Off-Site POE (at source)		❑ Residential ❑ Commercial /Industrial					❑ _____
SURFACE WATER EXPOSURE PATHWAYS ❑ COMPLETE (provide data) ■ NOT COMPLETE (skip to next pathway)							
❑ On-Site POE	_____ ft	❑ Recreational ❑ Ecological *(specify exp. limit only)*					❑ _____
❑ Off-Site POE	_____ ft	❑ Recreational ❑ Ecological *(specify exp. limit only)*					❑ _____

ADDITIONAL INFORMATION:

If exposure limit is specified, provide reference for concentration limits to be applied to each COC (e.g., OSHA limits, water quality criteria, etc.):

Site Name: ARCO 601 | Date Completed: 4-4-97
Site Location: 712 Lewelling Blvd., San Leandro, CA | Completed By: EMCON

SITE PARAMETER CHECKLIST FOR RISK-BASED SCREENING LEVELS

Instructions: ***For Tier 1 evaluation (generic screening levels), review specified default parameters (*) to ensure values are conservative for site. For Tier 2 Option 1 SSTL calculation (site-specific screening levels), provide site-specific values for sensitive parameters (§). Indicate parameter value used in evaluation by completing check box (■).***

Note: *** Confirm conservatism of these values for Tier 1 evaluation.**
§ Provide site-specific measurement or estimate for Tier 2 evaluation.

		Default Value Used		Site-Specific Value Used		
Soil Parameters						
	soil type	❑	sandy soil	■	clay, silty clay	*§
Θ_T	Soil porosity	❑	0.38 (dim)	■	0.27	§
Θ_{ws}	water content - vadose zone	■	0.12 (dim)	❑		§
Θ_{as}	air content - vadose zone (= Θ_T - Θ_{ws})	❑	0.26 (dim)	■	0.15	
Θ_{wcap}	water content - capillary fringe	❑	0.342 (dim)	■	0.24	
Θ_{acap}	air content - capillary fringe (= Θ_T - Θ_{wcap})	❑	0.038 (dim)	■	0.03	
ρ_c	Soil density	❑	1.7 g/cm^3	■	2.19	§
foc	mass fraction of organic carbon in soil	■	0.01 (dim)	❑		§
Ls	Depth to contaminated soil	❑	100 cm	■	150	§
Lgw	Depth to groundwater	❑	300 cm	■	210	§
h_{cap}	capillary zone thickness	❑	5 cm	■	30	
hv	vadose zone thickness (= Lgw - hc)	❑	295 cm	■	180	
pH	Soil/water pH	■	6.5	❑		
Groundwater Parameters						
I	Water infiltration rate	❑	30 cm/yr	❑		§
V_{gw}	groundwater velocity	❑	82.0 ft/yr	❑		*§
δ_{gw}	groundwater mixing zone depth	❑	200 cm	❑		*§
DF	aquifer dilution factor (= 1 + V_{gw} δ_{gw}/ (IW))	❑	12.1	❑		
Surface Parameters						
U_{air}	Amb. air velocity in mixing zone	❑	225 cm/s	❑		*§
δ_{air}	Mixing zone height	❑	200 cm	❑		*§
A	Contaminated Area	❑	2250000 cm^2	❑		
W	Width of Contaminated Area	❑	1500 cm	❑		§
d	Thickness of Surficial Soils	❑	100 cm	❑		§
Pe	Particulate areal emission rate	❑	2.17E-10 g/cm^2-s	❑		§
Building Parameters						
L_{crack}	Foundation crack thickness	■	15 cm	❑		
η	Foundation crack fraction	❑	0.01 (dim)	■	0.005	
Lb_r	Building Volume/Foundation Area Ratio (res.)	■	200 cm	❑		
Lb_c	Building Volume/Foundation Area Ratio (com./ind.)	■	300 cm	❑		
ER_r	Building vapor volume exchange rate (res.)	■	12 dy^{-1}	❑		
ER_c	Building vapor volume exchange rate (com./ind.)	■	20 dy^{-1}	❑		

(continue on next page if needed)

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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	*8240 / 624*	❑ ❑	❑ ❑	❑ ❑	❑ ❑	❑ ❑	❑ ❑
Semi-Volatile Organics	*8270 / 625*	❑ ❑	❑ ❑	❑ ❑	❑ ❑	❑ ❑	❑ ❑
Polynuclear Aromatic Hydrocarbons	*8310 / 8270*	❑ ❑	❑ ❑	❑ ❑	❑ ❑	❑ ❑	❑ ❑
Purgeable Aromatics	*8020*	■ ■	❑ ❑	■ ■	■ ■	■ ❑	❑ ❑
Total Petroleum Hydrocarbons (GC)	*5030 / 8015*	■ ■	❑ ❑	■ ■	■ ■	■ ❑	❑ ❑
Halogenated Organic Chemicals		ana./det.	ana./det.	ana./det.	ana./det.	ana./det.	ana./det.
Halogenated Volatile Organics	*8010 / 601*	❑ ❑	❑ ❑	❑ ❑	❑ ❑	❑ ❑	❑ ❑
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

On February 20, 1997, soil vapor samples were collected from the site. The field sampling procedures are presented in Appendix C. The soil vapor analytical results are in Appendix D and summarized in Table 4. No concentrations of benzene, toluene, ethylbenzene, and total xylenes were detected above the method reporting limit in the soil vapor samples collected from 1 to 1.5 feet below ground surface (BGS). Benzene was detected at the method reporting limit in soil vapor sample S-4B, at a depth of 4 feet BGS. The soil vapor samples collected from 1 to 1.5 feet BGS represent vapor concentrations near potential receptor locations. In order to represent background soil vapor concentrations an ambient air sample was collected.

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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)
	Name	Method No.	Typical Detection Limit (mg/kg)	No. of Samples	No. of Detects		Mean Conc. (mg/kg)		
On-Site	**Volatilization from Soil to Ambient Air**								
	Benzene	5030/8020	0.005	12	11		3.6		3.6
	Toluene	5030/8020	0.005	12	12		9.6		9.6
	Ethylbenzene	5030/8020	0.005	12	12		6.9		6.9
	Xylenes	5030/8020	0.005	12	12		21		21
On-Site	**Volatilization from Soil to Indoor Air**								
	Benzene	5030/8020	0.005	2	2		4.5		4.5
	Toluene	5030/8020	0.005	2	2		18		18
	Ethylbenzene	5030/8020	0.005	2	2		5.8		5.8
	Xylenes	5030/8020	0.005	2	2		8.8		8.8

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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)
	Name	Method No.	Typical Detection Limit (mg/kg)	No. of Samples	No. of Detects		Mean Conc. (mg/kg)		
Off-Site	**Volatilization from Soil to Ambient Air**								
	Benzene	5030/8020	0.005	2	2		0.49		0.49
	Toluene	5030/8020	0.005	2	2		0.71		0.71
	Ethylbenzene	5030/8020	0.005	2	2		1.8		1.8
	Xylenes	5030/8020	0.005	2	2		2.2		2.2
Off-Site	**Volatilization from Soil to Indoor Air**								
	Benzene	5030/8020	0.005	2	2		0.49		0.49
	Toluene	5030/8020	0.005	2	2		0.71		0.71
	Ethylbenzene	5030/8020	0.005	2	2		1.8		1.8
	Xylenes	5030/8020	0.005	2	2		2.2		2.2

Site Name: ARCO 601 | Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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	Name	ANALYTICAL METHOD		SAMPLE POPULATION		DETECTED CONCENTRATIONS			SELECTED REPRESENTATIVE CONC. (mg/L)
		Method No.	Typical Detection Limit (mg/L)	No. of Samples	No. of Detects		Mean Conc. (mg/L)		
On-Site	**Volatilization from Groundwater to Ambient Air**								
	Benzene	5030/8020	0.0005	56	44		0.38		0.38
	Toluene	5030/8020	0.0005	56	36		0.087		0.087
	Ethylbenzene	5030/8020	0.0005	56	53		0.24		0.24
	Xylenes	5030/8020	0.0005	56	45		0.44		0.44
On-Site	**Volatilization from Groundwater to Indoor Air**								
	Benzene	5030/8020	0.0005	15	15		5.7		5.7
	Toluene	5030/8020	0.0005	15	8		0.12		0.12
	Ethylbenzene	5030/8020	0.0005	15	15		2.3		2.3
	Xylenes	5030/8020	0.0005	15	15		4.5		4.5

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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)
	Name	Method No.	Typical Detection Limit (mg/L)	No. of Samples	No. of Detects		Mean Conc. (mg/L)		
Off-Site	**Volatilization from Groundwater to Ambient Air**								
	Benzene	5030/8020	0.0005	15	7		0.084		0.084
	Toluene	5030/8020	0.0005	15	7		0.11		0.11
	Ethylbenzene	5030/8020	0.0005	15	14		0.27		0.27
	Xylenes	5030/8020	0.0005	15	8		0.20		0.20
Off-Site	**Volatilization from Groundwater to Indoor Air**								
	Benzene	5030/8020	0.0005	15	7		0.084		0.084
	Toluene	5030/8020	0.0005	15	7		0.11		0.11
	Ethylbenzene	5030/8020	0.0005	15	14		0.27		0.27
	Xylenes	5030/8020	0.0005	15	8		0.20		0.20

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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)
	Name	Method No.	Typical Detection Limit (mg/L)	No. of Samples	No. of Detects		Mean Conc. (mg/L)		
On-Site	**Volatilization from Groundwater to Ambient Air**								
	Benzene	5030/8020	0.0005	56	44		0.38		0.38
	Toluene	5030/8020	0.0005	56	36		0.087		0.087
	Ethylbenzene	5030/8020	0.0005	56	53		0.24		0.24
	Xylenes	5030/8020	0.0005	56	45		0.44		0.44
On-Site	**Volatilization from Groundwater to Indoor Air**								
	Benzene	5030/8020	0.0005	15	15		5.7		5.7
	Toluene	5030/8020	0.0005	15	8		0.12		0.12
	Ethylbenzene	5030/8020	0.0005	15	15		2.3		2.3
	Xylenes	5030/8020	0.0005	15	15		4.5		4.5

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, 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)
	Name	Method No.	Typical Detection Limit (mg/L)	No. of Samples	No. of Detects		Mean Conc. (mg/L)		
Off-Site	**Volatilization from Groundwater to Ambient Air**								
	Benzene	5030/8020	0.0005	15	7		0.084		0.084
	Toluene	5030/8020	0.0005	15	7		0.11		0.11
	Ethylbenzene	5030/8020	0.0005	15	14		0.27		0.27
	Xylenes	5030/8020	0.0005	15	8		0.20		0.20
Off-Site	**Volatilization from Groundwater to Indoor Air**								
	Benzene	5030/8020	0.0005	15	7		0.084		0.084
	Toluene	5030/8020	0.0005	15	7		0.11		0.11
	Ethylbenzene	5030/8020	0.0005	15	14		0.27		0.27
	Xylenes	5030/8020	0.0005	15	8		0.20		0.20

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, CA Completed By: EMCON

TIER 2 EXPOSURE PATHWAY TRANSPORT PARAMETERS

Instructions: ***For complete exposure pathways, provide site-specific values for transport parameters. In absence of direct measurements, default values may be selected for some parameters, as shown below. If no default value shown, site-specific value must be provided.***

TRANSPORT PARAMETER		SITE-SPECIFIC VALUE (INPUT VALUE BELOW)	DEFAULT VALUE (■ TO SELECT)
AIR PARAMETERS			
δ_{air}	Air mixing zone height (cm)		■ 200
U_{air}	Ambient air velocity in mixing zone (cm/sec)		■ 225
Pe	Soil particulate areal emission rate (g/cm^2-sec)		❑ 2.17E-10
σ_y	Transverse air dispersion coeff. (m)		■ 100
σ_z	Vertical air dispersion coeff. (m)		■ 10
GROUNDWATER PARAMETERS			
δ_{gw}	Groundwater mixing zone depth (cm)		❑ 200
I	Water infiltration rate (cm/yr)		❑ 30
V_{gw}	Groundwater Darcy velocity (ft/yr)		
K	Saturated hydraulic conductivity (cm/sec)		
i_{grad}	Lateral groundwater flow gradient (dim)		
$(BC)_i$	Available biodegradation capacity of electron acceptors for constituent *i*		
x	Distance to POE from point of maximum COC concentration in groundwater (ft)		
α_x	Longitudinal groundwater dispersion coeff. (cm)		❑ 10% of x
α_y	Transverse groundwater dispersion coeff. (cm)		❑ 33% of α_x
α_z	Vertical groundwater dispersion coeff. (cm)		❑ 5% of α_z
SOIL PARAMETERS			
h_{cap}	Capillary zone thickness (cm)	30	❑ 5
h_v	Vadose zone thickness (cm)	180	
ρ_s	Soil bulk density (g/cm^3)	2.19	❑ 1.7
foc_s	Fraction organic carbon in soil leaching zone (dim)		■ 0.01
foc_{gw}	Fraction organic carbon in water-bearing unit (dim)		❑ 0.001
Lgw	Depth to groundwater (cm)	210	
Θ_T	Soil porosity (dim)	0.27	❑ 0.38
	Soil volumetric water content (dim)		
Θ_{wcap}	• Capillary zone	0.24	❑ 0.342
Θ_{ws}	• Vadose zone		■ 0.12
Θ_{wcrack}	• Foundation crack		■ 0.12

Site Name: ARCO 601 Date Completed: 4-4-97

Site Location: 712 Lewelling Blvd., San Leandro, CA Completed By: EMCON

TIER 2 EXPOSURE PATHWAY TRANSPORT PARAMETERS *CONTINUED*

TRANSPORT PARAMETER		SITE-SPECIFIC VALUE *(INPUT VALUE BELOW)*	DEFAULT VALUE (■ *TO SELECT*)	
SOIL PARAMETERS (Continued)				
	Soil volumetric air content (dim)			
Θ_{acap}	•Capillary zone	0.03	❑ 0.038	
Θ_{as}	•Vadose zone	0.15	❑ 0.26	
Θ_{acrack}	•Foundation crack	0.15	❑ 0.26	
d	Thickness of surficial soil zone (cm)		❑ 100 cm	
BUILDING PARAMETERS				
			Resid.	Comm/ Ind.
L_b	Building volume/area ratio (cm)		❑ 200	■ 300
ER	Building air exchange rate (dy-1)		❑ 12	■ 20
L_{crack}	Foundation crack thickness (cm)		❑ 15	■ 15
η	Foundation crack fraction	0.005	❑ 0.01	

Additional Information:

APPENDIX C

SOIL VAPOR SAMPLING PROCEDURES

SOIL VAPOR SAMPLING PROCEDURES

A jack-hammer and hand auger were used to get through the existing asphalt surface and underlying road base material at each sampling location. Soil samples were collected for geotechnical analysis using 3-inch-diameter hand auger drilling and sampling equipment. Once the desired sampling depth was reached at each soil sampling location, a sample shoe fitted with stainless-steel liners and was driven into undisturbed soil at the base of the boring with a slide hammer. The sample liner was then removed from the shoe, sealed on both ends with Teflon tape and plastic end caps, labeled, and stored on ice in a cooler.

At each soil gas sampling location, a 3/4-inch-diameter stainless steel probe and rod were driven to between 1 and 4 feet below ground surface (BGS) ground surface (BGS)at each location using a slide hammer. Because of the fine-grained soil (clays and silts) encountered beneath the road base at each sampling location, the potential for short-circuiting of air between the probe tip and the atmosphere was reduced. The stainless steel probe tip utilizes a 1-inch-long perforated section to allow soil vapors to enter the probe. A vacuum was applied to the top of the stainless steel rod using a portable vacuum pump for approximately 5 minutes until several volumes of air had been evacuated from the probe and rods. The soil gas samples were then collected by connecting empty Tedlar® bags to the probe, placing the bags in a sealed plastic box and applying a vacuum to the box with the vacuum pump. A background sample of ambient air was also collected using the same equipment for comparative purposes. The sealed Tedlar® sample bags were then labeled and placed in a cooler on ice and delivered immediately to Columbia Analytical Services (CAS), a state-certified laboratory.

The soil and soil gas sampling equipment was decontaminated before each sampling event by (1) disassembling the sampler and, (2) washing the sampler with an Alcanox soap and water solution, and (3) rinsing the sampler in deionized water. Once the desired samples were collected at each location the borings were backfilled with bentonite chips and capped with asphalt patch.

APPENDIX D

ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY DOCUMENTATION FOR SOIL VAPOR SAMPLES

MOISTURE - DENSITY TEST

ASTM D2216

EMCON

PROJECT NAME: ARCO #601 **DATE:** 2/24/97

PROJ. NUMBER: 20805-121.004 **TESTED BY:** RMM **CORRECTED BY:** DGC

REFERENCE NUMBER:		1	2					
SAMPLE NUMBER:		S-4	S-7					
SPECIFIC GRAVITY, EST.		2.7	2.7					
DEPTH,	(feet)	2.0'	1.5'					
DIAMETER,	(inches)	1.92	1.92					
LENGHT,	(inches)	3.21	3.98					
VOLUME,	(cu. feet)	0.005378	0.006669					

WATER CONTENT DETERMINATION:

TARE NUMBER:		#82	#88					
WET WT. + TARE,	(gms.)	396.27	505.84					
DRY WT. + TARE,	(gms.)	357.72	464.15					
WT. OF TARE,	(gms.)	76.18	76.61					
WT. OF WATER,	(gms.)	38.55	41.69					
WT. OF DRY SOIL,	(gms.)	281.54	387.54					
WATER CONTENT,	(%)	13.7	10.8					

DENSITY DETERMINATION:

TOTAL WET WT.,	(gms.)	320.18	429.30					
WET DENSITY	(pcf.)	131.2	141.9					
DRY DENSITY,	(pcf.)	115.4	128.1					
VOID RATIO,	(e)	0.4595	0.3148					
POROSITY,	(η)	0.3148	0.2394					

USCS and or Visual Classification:

1	SANDY CLAY, GRAY.
2	CLAYEY SAND, BROWN.

NOTE: Porosity and void ratios were calculated based on estimated specific gravity of 2.7

δγχ93μχδδ

Columbia Analytical Services, Inc.

February 27, 1997

Service Request No.: S9700305

Mr. John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 601 SAN LEANDRO/20805-121.004

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on February 20, 1997. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above. To help expedite our service, please refer to this number when contacting the laboratory.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 19, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

Please feel welcome to contact me should you have questions or further needs.

Sincerely,

Steven L. Green
Project Chemist

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

A2LA	American Association for Laboratory Accreditation
ASTM	American Society for Testing and Materials
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAM	California Assessment Metals
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
COD	Chemical Oxygen Demand
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank sample
ICP	Inductively Coupled Plasma atomic emission spectrometry
ICV	Initial Calibration Verification sample
J	Estimated concentration. The value is less than the MRL, but greater than or equal to the MDL. If the value is equal to the MRL, the result is actually <MRL before rounding.
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified
MBAS	Methylene Blue Active Substances
MCL	Maximum Contaminant Level. The highest permissible concentration of a substance allowed in drinking water as established by the U. S. EPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl tert-Butyl Ether
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the paper industry for Air and Stream Improvement
ND	Not Detected at or above the method reporting/detection limit (MRL/MDL)
NIOSH	National Institute for Occupational Safety and Health
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	Standard Methods for the Examination of Water and Wastewater, 18th Ed., 1992
STLC	Solubility Threshold Limit Concentration
SW	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Ed., 1986 and as amended by Updates I, II, IIA, and IIB.
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
tr	Trace level. The concentration of an analyte that is less than the PQL but greater than or equal to the MDL. If the value is equal to the PQL, the result is actually <PQL before rounding.
TRPH	Total Recoverable Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/20/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: S-1
Lab Code: S9700305-001

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/20/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: S-2
Lab Code: S9700305-002

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/20/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: S-4A
Lab Code: S9700305-003

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/20/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: S-4B
Lab Code: S9700305-004

4' depth

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	**0.5**	**0.2**
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	14	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/21/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: S-5
Lab Code: S9700305-005

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/21/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: S-6
Lab Code: S9700305-006

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/21/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: S-7
Lab Code: S9700305-007

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/21/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: S-8
Lab Code: S9700305-008

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/20/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: Method Blank
Lab Code: S970220-VB1

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
Sample Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/21/97

BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015

Sample Name: Method Blank
Lab Code: S970221-VB1

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 601 SAN LEANDRO/20805-121.004
Sample Matrix: Air

Service Request: S9700305
Date Collected: 2/20/97
Date Received: 2/20/97
Date Extracted: N/A
Date Analyzed: 2/21/97

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name: Batch QC
Lab Code: S9700306-001D

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.5	<2 C1	<2 C1	--	--
Toluene	0.5	13	11	12	17
Ethylbenzene	0.5	22	19	21	15
Xylenes, Total	1	280	260	270	7
Total Volatile Hydrocarbons					
C1 - C5	10	160	150	155	6
C6 - C12	20	1,900	1,700	1,800	11
TPH as Gasoline*	20	1,900	1,700	1,800	11

Note: ppmV = mg/m^3 x [24.45 (gas constant)/ molecular weight (MW)]
MW Benzene = 78, Toluene = 92, Ethylbenzene = 106, Total Xylenes = 106
MW Gasoline = 100

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

C1 The MRL was elevated due to high analyte concentration requiring sample dilution.

DUP1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 601 SAN LEANDRO/20805-121.004
Sample Matrix: Air

Service Request: S9700305
Date Collected: 2/20/97
Date Received: 2/20/97
Date Extracted: N/A
Date Analyzed: 2/21/97

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: uL/L (ppmv)

Sample Name: Batch QC
Lab Code: S9700306-001D

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.2	<0.8 C1	<0.8 C1	--	--
Toluene	0.1	3.2	2.9	3.0	10
Ethylbenzene	0.1	5.1	4.4	4.8	15
Xylenes, Total	0.2	65	60	63	8
Total Volatile Hydrocarbons					
C1 - C5	5	39	37	38	5
C6 - C12	5	440	420	430	5
TPH as Gasoline*	5	440	420	430	5

Note: ppmV = mg/m^3 x [24.45 (gas constant)/ molecular weight (MW)]
MW Benzene = 78, Toluene = 92, Ethylbenzene = 106, Total Xylenes = 106
MW Gasoline = 100

* TPH as gasoline is defined as C6 (benzene) through C12 (dodecane) and uses a molecular weight of 100 to calculate the ppmv.

C1 The MRL was elevated due to high analyte concentration requiring sample dilution.

DUP1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
LCS Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/21/97

Laboratory Control Sample Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Gasoline	200	210	105	60-140

LCSX/121594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9700305
Project:	601 SAN LEANDRO/20805-121.004	**Date Collected:**	2/20/97
LCS Matrix:	Air	**Date Received:**	2/20/97
		Date Extracted:	NA
		Date Analyzed:	2/21/97

Laboratory Control Sample Summary
BTEX and Total Volatile Hydrocarbons

Units: uL/L (ppmv)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Gasoline	49	51	104	60-140

LCSX/121594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 601 SAN LEANDRO/20805-121.004

Service Request: S9700305
Date Analyzed: 2/20/97

Initial Calibration Verification (ICV) Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	24	96	80-120
Toluene	25	23	92	80-120
Ethylbenzene	25	25	100	80-120
Xylenes, Total	75	70	93	80-120
Gasoline	250	240	96	80-120

ICV25AL/060194

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 20649 00

Chain of Custody

ARCO Facility no. 601	City (Facility) San Leandro	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Paul Supple	Telephone no. (ARCO) (510) 299-8891	Telephone no. (Consultant) (408) 453-7300	Fax no. (Consultant) (408) 437-9526
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave. San Jose		Contract number

Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: (Air) Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH-t/MTBE EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
S-1	1	1						2/20														
S-2	2																					
S-4A	3																					
S-4B	4																					
S-5	5																					
S-6	6																					
S-7	7																					
S-8	8																					
S-B	9																					

Special detection Limit/reporting
Report MTBE results separately. MRL 5 ppb

Special QA/QC

Remarks
EMCON Project
20805-121.004

Lab number
59700305

Turnaround time
Priority Rush 1 Business Day ☐
Rush 2 Business Days ☐
Expedited 5 Business Days 2/27 ☒
Standard 10 Business Days ☐

Condition of sample:		Temperature received:	
Relinquished by sampler: Robert McCann	Date 2/20/97 Time	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory: Cristina Vlaycee	Date 2/20/97 Time 19:40

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APC-3292 (2-91)

APPENDIX E

SOIL VAPOR TO INDOOR AIR CALCULATIONS

SOIL VAPOR TO INDOOR AIR CALCULATIONS

A Tier 2 evaluation was needed to determine if benzene in the subsurface soil and groundwater at this site represents a risk to public health. The potential exposure pathways evaluated are groundwater- and subsurface soil-to-indoor air for the commercial building (on-site), and the residences (off-site). In order to better evaluate the site benzene concentrations were measured in near surface soil vapor, site specific soil parameters (e.g., θ_w, θ_a, ρ_b, and η_{tot}) were measured, and representative benzene indoor air concentrations were calculated using a conservative equation recommended in the *Air/Superfund National Technical Guidance Study Series: Assessing Potential Indoor Air Impacts for Superfund Sites* (USEPA 1992). The site specific parameters used to calculate effective dispersion in soil are summarized on Table D-1.

The indoor air concentration can be calculated using the following equation (USEPA 1992).

$$C_{in} = E/Q$$

where,

C_{in} = indoor air concentration (g/m^3)
E = contaminant emission rate (g/sec)
Q = building ventilation rate (m^3/sec)

The emission rate of benzene can be calculated using the Farmer equation discussed in *Land Disposal of Hexachlorobenzene Wastes - Controlling Vapor Movement in Soil* (USEPA 1980). This equation was modified to substitute measured soil vapor concentration (C_{sv}) for calculated saturation vapor concentration.

$$E = D_{eff} \times A \times \eta_{tot}^{4/3} C_{sv} / L$$

where,

D_{eff} = effective diffusivity (cm^2/sec)
A = area (cm^2)
η_{tot} = total soil porosity (unitless)
C_{sv} = soil gas concentration ($\mu g/cm^3$)
L = depth from point of measured soil vapor (cm)

The following equation was used to calculate effective diffusivity in soil in accordance with the *Soil Screening Guidance Users Guide* (USEPA 1996).

$$D_{eff} = [(\theta_a^{10/3} \times D_a \times H') + \theta_w^{10/3} \times D_w)/\eta_{tot}^2] / (\rho \times K_d + \theta_w + \theta_a \times H')$$

where,

θ_a = soil air content (unitless)
D_a = air diffusivity coefficient (cm^2/sec)
H' = Henry's coefficient (dimensionless)
θ_w = soil water content (unitless)
D_w = water diffusivity coefficient (cm^2/sec)
ρ = soil bulk density (g/cm^3)
K_d = soil/water partition coefficient (mL/g)
$K_d = f_{oc} \times K_{oc}$
where,
f_{oc} = total organic carbon (proportion)
K_{oc} = organic carbon adsorption coefficient (mL/g)

The building ventilation rate can be estimated by the following equation (USEPA 1992).

$$Q = (ACH / 3600) \times V$$

where,

ACH = building air changes per hour (hr^{-1})
V = volume of building (m^3)
3600 sec/hour

The concentration in indoor air, calculated using the previous equations, is compared to site specific threshold levels (SSTLs). The SSTLs were calculated as recommended 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). SSTLs can be calculated using the following equation.

$$SSTL = (TR \times BW \times AT \times 365)/(SF \times IR \times EF \times ED)$$

where,

TR = target risk
BW = body weight
AT = averaging time
365 days/year
SF = slope factor
IR = inhalation rate
EF = exposure frequency
ED = exposure duration

The default and measured parameter values used in these equations are summarized in Tables E-1 through E-3.

Table E-1

Summary of Calculations for the Infiltration Rate of Benzene
ARCO Service Station 601

Calculation of effective diffusivity (D_{eff}) of benzene[1]:

	Description	Units	Soil Parameter Values On-Site	Off-Site
θ_a	soil air content	unitless	0.1546	0.1546
D_a	air diffusivity coefficient	cm^2/sec	7.90E-02	7.90E-02
H'	Henry's coefficient	dimensionless	0.228	0.228
θ_w	soil water content	unitless	0.1225	0.1225
D_w	water diffusivity coefficient	cm^2/sec	9.80E-06	9.80E-06
ρ	soil bulk density	g/cm^3	2.19	2.19
K_d	soil/water partition coefficient	mL/g	0.589	0.589
f_{oc}	total organic carbon	proportion	0.01	0.01
K_{oc}	organic carbon adsorption coefficient	mL/g	5.89E+01	5.89E+01
η_{tot}	total soil porosity	unitless	0.2771	0.2771
D_{eff}	effective diffusivity	cm^2/sec	0.000322	0.000322

Calculation of emission rate (E) of benzene[2]:

	Description	Units	On-Site	Off-Site
A	area	cm^2	1.06E+06	3.34E+06
C_{sv}	soil gas concentration	$\mu g/cm^3$	2.50E-04	2.50E-04
L	depth to source	cm	38.1	38.1
E	**benzene emission rate**	**µg/sec**	**0.000403**	**0.001274**

1. Please refer to Appendix E text for effective diffusivity equation.
2. Please refer to Appendix E text for benzene emission rate equation.

Table E-2

Summary of Calculations for the Indoor Air Concentration of Benzene
ARCO Service Station 601

Calculation of building ventilation rate (Q)[1]:

	Description	Units	On-Site	Off-Site
ACH	building air changes per hour	hr^{-1}	0.5	0.5
V	volume of building	m^3	322	814
		sec/hr	3600	3600
Q	building ventilation rate	m^3/sec	0.0447	0.1131

Calculation of indoor air concentration of benzene (C_{in})[2]:

	Description	Units	On-Site	Off-Site
E	benzene emission rate	µg/sec	4.03E-04	4.03E-04
Q	building ventilation rate	m^3/sec	0.0447	0.1131
C_{in}	**indoor air concentration of benzene**	**µg/m^3**	**0.00902**	**0.00357**

1. Please refer to Appendix E text for building ventilation rate equation.
2. Please refer to Appendix E text for indoor air concentration of benzene equation.

Table E-3

Summary of Calculations for Site Specific Threshold Levels (SSTLs)
ARCO Service Station 601

Calculation of SSTL based on a $1x10^{-5}$ commercial target risk level[1]:

	Description	Units	Values On-Site
TR	target risk	unitless	1.00E-05
BW	body weight	kg	70
AT	averaging time	years	70
SF	cancer slope factor	$(mg/kg\ day)^{-1}$	0.1
IR	inhalation rate	m^3/day	20
EF	exposure fequency	days/year	250
ED	exposure duration	years	25
SSTL	**site specific threshold level**	**$\mu g/m^3$**	**1.43**

Calculation of SSTL based on a $1x10^{-6}$ residential target risk level[1]:

	Description	Units	Values Off-Site
TR	target risk	unitless	1.00E-06
BW	body weight	kg	70
AT	averaging time	years	70
SF	cancer slope factor	$(mg/kg\ day)^{-1}$	0.1
IR	inhalation rate	m^3/day	15
EF	exposure fequency	days/year	350
ED	exposure duration	years	30
SSTL	**site specific threshold level**	**$\mu g/m^3$**	**0.114**

1. Please refer to Appendix E text for SSTL equation.