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

Rec'd 10/5/95 SH

Date September 29, 1995
Project 20805-129.002

To:

Ms. Susan Hugo
Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harborbay Parkway, Suite 250
Alameda, California 94502-6577

We are enclosing:

Copies	Description
1	Second quarter 1995 groundwater monitoring and remediation system performance evaluation report, interim soil-vapor extraction and air-sparge systems, ARCO Service Station 2169, Oakland, California

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

Comments:
The enclosed groundwater monitoring and performance evaluation report is being sent to you per the request of ARCO Products Company. Please call if you have questions or comments.

David Larsen
Project Coordinator

cc: Kevin Graves, RWQCB - SFBR
Michael Whelan - ARCO Products Company
David Larsen, EMCON
File

ARCO Products Company
Environmental Engineering
2155 South Bascom Avenue, Suite 202
Campbell, California 95008

Date: September 29, 1995

Re: ARCO Station # 2169 • 889 West Grand Avenue • Oakland, CA
Second Quarter 1995 Groundwater Monitoring and
Remediation System Performance Evaluation Report

" I declare, that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached proposal or report are true and correct."

Submitted by:

Michael R. Whelan

Michael R. Whelan
Environmental Engineer

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

September 6, 1995
Project 20805-129.002

Mr. Michael Whelan
ARCO Products Company
2155 South Bascom Avenue, Suite 202
Campbell, California 95008

Re: Second quarter 1995 groundwater monitoring results and remediation system performance evaluation report, interim SVE and AS remediation systems, ARCO service station 2169, 889 West Grand Avenue, Oakland, California

Dear Mr. Whelan:

This letter presents the results of the second quarter 1995 groundwater monitoring program at ARCO Products Company (ARCO) service station 2169, 889 West Grand Avenue, Oakland, California (Figure 1). Operation and performance data for the interim soil-vapor extraction (SVE) and air-sparge (AS) remediation systems at the site are also presented. The quarterly monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations. Pertinent site features, including existing on-site monitoring and vapor extraction wells, are shown in Figure 2.

BACKGROUND

Four on-site groundwater monitoring wells (A-1 through A-4), two off-site groundwater monitoring wells (A-5 and A-6), two on-site groundwater extraction wells (AR-1 and AR-2), seven on-site vapor extraction wells (AV-1 through AV-7), two dual groundwater/vapor extraction wells (ADR-1 and ADR-2), and three AS wells (AS-1, AS-2, and AS-3) were installed as part of a comprehensive site assessment conducted at this site from May 1991 through January 1994 (Figure 2). Please refer to *Fourth Quarter 1994 Groundwater Monitoring Results and Remediation System Performance Evaluation Report, Interim SVE and AS Remediation Systems, ARCO Service Station 2169, Oakland, California* (EMCON, March 1995) for more details.

MONITORING PROGRAM FIELD PROCEDURES

A program of quarterly groundwater monitoring was initiated during the second quarter of 1992 to provide information concerning water quality, flow direction, and gradient, and to meet ACHCSA and Regional Water Quality Control Board (RWQCB) requirements regarding underground fuel tank investigations. Water levels are measured quarterly in

wells A-1 through A-6, AR-1, AR-2, ADR-1, and ADR-2. Wells A-3 and A-4 are sampled annually during the first quarter of the year. Wells A-1, A-2, A-5, A-6, AR-1, AR-2, ADR-1, and ADR-2 are sampled quarterly.

The second quarter 1995 groundwater monitoring event was performed by EMCON on June 5, 1995. Field work this quarter included (1) measuring depths to groundwater and subjectively analyzing groundwater for the presence of floating product in wells A-1 through A-6, AR-1, AR-2, ADR-1, and ADR-2; (2) purging and subsequently sampling groundwater monitoring wells A-1, A-2, A-5, A-6, AR-1, AR-2, and ADR-1 for laboratory analysis; and (3) directing a state-certified laboratory to analyze the groundwater samples. Floating product was observed in well ADR-2 on June 5, 1995; therefore, this well was not sampled during second quarter 1995. Copies of all field data sheets from the second quarter 1995 groundwater monitoring event are included in Appendix A.

ANALYTICAL PROCEDURES

Groundwater samples collected during second quarter 1995 monitoring were analyzed for total petroleum hydrocarbons as gasoline (TPHG) and benzene, toluene, ethylbenzene, and total xylenes (BTEX). The samples were prepared for analysis by U.S. Environmental Protection Agency (USEPA) method 5030 (purge and trap). The samples were analyzed for TPHG by the methods accepted by the Department of Toxic Substances Control, California Environmental Protection Agency (Cal-EPA), and referenced in the *Leaking Underground Fuel Tank* (LUFT) *Field Manual* (State Water Resources Control Board, October 1989). Samples were analyzed for BTEX by USEPA method 8020 as described in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA SW-846, November 1986, third edition). Additional groundwater samples collected from wells A-1, AR-1, AR-2, and ADR-1 were analyzed for total petroleum hydrocarbons as diesel (TPHD) by USEPA method 3510 and the LUFT method. These methods are recommended in the *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites* (August 10, 1990) for analysis of samples from petroleum-hydrocarbon-impacted sites.

MONITORING PROGRAM RESULTS

Results of the second quarter 1995 groundwater monitoring event are summarized in Table 1 and illustrated in Figure 3. Historical groundwater elevation data, including top-of-casing elevations, depth-to-water measurements, calculated groundwater elevations, floating-product thickness measurements, and groundwater flow direction and gradient data, are summarized in Table 2. Table 3 summarizes historical laboratory analytical data for TPHG, BTEX, and TPHD analyses. Copies of the analytical results and chain-of-custody documentation for second quarter 1995 are included in Appendix B.

Groundwater elevation data collected on June 5, 1995, indicate that groundwater beneath the site flows northwest with an approximate hydraulic gradient of 0.002 foot per foot (calculated using data from wells A-2, A-4, and A-5). Figure 3 illustrates groundwater contours and analytical data for second quarter 1995.

Groundwater samples collected from wells A-2 and AR-2 did not contain detectable concentrations of TPHG or BTEX. Groundwater samples from well A-6 contained 160 micrograms per liter (µg/L) of TPHG, but did not contain detectable concentrations of BTEX (<0.5 µg/L). Groundwater samples collected from wells A-1, A-5, AR-1, and ADR-1 contained concentrations of TPHG ranging from 190 to 57,000 µg/L, and concentrations of benzene ranging from 10 to 2,700 µg/L. Groundwater samples collected from wells A-1, AR-1, and ADR-1 contained 710, 580, and 13,000 µg/L of TPHD, respectively. The laboratory noted that the chromatograms for TPHD analysis on these samples did not match the typical diesel fingerprint. Groundwater samples collected from well AR-2 did not contain detectable concentrations of TPHD (<50 µg/L). Floating product was observed in wells ADR-2. Therefore, this well was not sampled during second quarter 1995.

FLOATING PRODUCT RECOVERY

EMCON began recovering floating product on January 13, 1995. Floating product is measured and manually bailed biweekly from wells ADR-1 and ADR-2. Approximately 4.8 gallons of product were recovered during first quarter 1995. Table 4 summarizes floating product recovery data. No floating product was recovered during second quarter 1995.

REMEDIATION SYSTEM PERFORMANCE EVALUATION

Soil-Vapor Extraction System

System Description. GeoStrategies, Inc. (GSI), completed construction of the SVE system in January 1994 and initiated system operation on June 2, 1994. The system was operated by GSI until September 13, 1994. The on-site SVE system uses a blower to apply vacuum to vapor extraction wells A-1 through A-4, AV-1 through AV-7, AR-2, ADR-1, and ADR-2, which extracts hydrocarbon vapor from subsurface soils. Extracted hydrocarbon vapor from the wells is directed via subgrade remediation piping to an off-gas abatement unit in the treatment compound (Figure 2). The trailer-mounted off-gas abatement unit used to treat the influent extracted vapor is a Thermtech, Inc., VAC 25 model thermal/catalytic oxidizer with a nominal operating capacity of 250 standard cubic feet per minute (scfm). Treated off-gas from the unit is discharged to the atmosphere via a 10-inch by 10-inch square stack. The off-gas abatement unit was operated in the thermal

mode from system startup on June 2, 1994, to July 15, 1994. As a result of decreases in total volatile hydrocarbons as gasoline (TVHG) and BTEX concentrations in extracted vapor, the off-gas abatement unit operation was changed to catalytic mode on July 15, 1994. ARCO transferred the site from GSI to EMCON in October 1994. EMCON began operating the SVE system on December 15, 1994.

System Monitoring. Consistent with site-specific air permit requirements, the operating temperature of the oxidation unit is measured and recorded continuously during system operation. Once a month, air samples are collected at three sample ports: (1) effluent from the well field and before air dilution (sample port I-1), (2) influent to the oxidizer, after fresh air dilution (sample port I-2), and (3) effluent from the unit (sample port E-1). Air samples collected from sample ports I-1, I-2, and E-1 are submitted to a state-certified laboratory for chemical analysis. The samples are analyzed for TVHG and BTEX by USEPA methods 8015 and 8020, respectively.

In addition to the parameters described above, the SVE system is generally monitored once a month for (1) TVHG concentrations in extracted vapor from each extraction well, using a flame-ionization detector (FID); (2) applied and induced vacuum on vapor extraction wells; (3) depths to water in extraction wells; and (4) measured vapor flow rate from individual wells and the combined well field. Site visits are also conducted once a month for routine operation and maintenance of the treatment system.

System Operation. Rising water levels resulting from heavy precipitation during January 1995 caused partial or complete submergence of the screen in the SVE wells, and reduced air flow from the SVE wells. The reduced air flow warranted adding ambient air to the extracted vapor to provide sufficient flow for operating the abatement unit. In addition, hydrocarbon concentrations in extracted vapor decreased significantly (to less than 60 milligrams per cubic meter [mg/m^3] on January 26, 1995). This decrease reduced the economy of the system, because it became necessary to add a substantial supply of support fuel to the abatement unit to oxidize the lean influent vapor stream. Therefore, the unit was manually shut down on January 26, 1995. The SVE system remained down during second quarter 1995. The system was restarted during the third quarter of 1995 (on July 17, 1995) after water levels had receded. Table 5 summarizes SVE system operation and performance data from startup, June 2, 1994, to the end of this reporting period, June 28, 1995.

Operational Status of SVE Wells. Table 6 summarizes the operating status of individual vapor extraction wells since startup on June 2, 1994, to the end of this reporting period, June 28, 1995. To maximize hydrocarbon removal rates, each vapor extraction well was brought on-line or closed depending on the TVHG concentrations in extracted vapor from the well. As described above, the SVE system was shut down during second quarter 1995.

Air Sample Results. Figure 4 depicts changes in TVHG and benzene concentrations with time from initial startup of the SVE system on June 2, 1994, to the end of the second quarter 1995 reporting period.

Hydrocarbon Removal Rates. Table 5 summarizes hydrocarbon removal rates, pounds of hydrocarbons removed this period, and cumulative pounds of hydrocarbons removed from system startup on June 2, 1994, to the end of the reporting period June 28, 1995. Figure 5 depicts historical hydrocarbon removal rates since system startup. The calculations and assumptions made for estimating hydrocarbon removal rates for the SVE system are explained in the footnotes for Table 5.

A total of approximately 5,564 pounds (or 928 gallons) of hydrocarbons was recovered from the site from system startup on June 2, 1994, to June 28, 1995.

Air-Sparge System

System Description. In January 1994, GSI completed construction of the SVE and AS systems. Initially, only the SVE system was brought on-line to remediate petroleum hydrocarbons in vadose-zone and capillary-fringe soils. With ongoing SVE system operation, a decline in TVHG concentrations was observed in extracted vapor from the combined well field. Accordingly, the AS system was brought on-line on July 15, 1994.

The AS system consists of subgrade remediation piping that directs compressed air from a 3-horsepower (hp) rotary-vane blower at the remediation compound into AS wells AS-1 through AS-5.

AS involves injecting compressed air into groundwater through AS wells, which contain a 1- to 2-foot section of slotted screen installed near the bottom of the water-bearing zone. The injected air forms bubbles and transient air pockets, which rise up through the saturated soils to enhance the volatilization of dissolved-phase gasoline hydrocarbons (in groundwater) and adsorbed-phase gasoline hydrocarbons (in saturated soils) within the radius of influence (ROI) of each AS well.

The gasoline-hydrocarbon-bearing vapors exit the groundwater surface and rise into the vadose-zone or capillary-fringe soils, where they are captured by an operating SVE system. Hence, any observed changes in petroleum-hydrocarbon concentrations in vapor extracted from vadose-zone soils (i.e., from vapor extraction wells) may be a result of operating the AS system. AS also helps introduce dissolved oxygen (DO) into groundwater and saturated-zone soils, which may promote biodegradation of petroleum hydrocarbons.

System Monitoring. The AS system is generally monitored once every two weeks in conjunction with monitoring of the SVE system. Parameters monitored during each visit

include (1) applied total air pressure and total air flow to the AS wells; (2) applied AS pressure to each AS well; (3) changes in TVHG concentrations in extracted vapor from the combined well field, influent to the SVE system, as a result of sparging; and (4) changes in DO in AS and monitoring wells.

System Operation. During the second quarter of 1995, EMCON replaced the 3-hp AS blower with an air compressor to meet the higher AS pressure required for effective sparging into the saturated zone at the site. This was necessary because of rising water levels at the site. The AS system did not operate during the second quarter of 1995 because the SVE system was shut down as a result of high water levels at the site. Operation and performance data for the AS system, from startup on July 15, 1994, to June 28, 1995, are summarized in Table 7.

LIMITATIONS

No monitoring event is thorough enough to describe all geologic and hydrogeologic conditions of interest at a given site. If conditions have not been identified during the monitoring event, such a finding should not be construed as a guarantee of the absence of such conditions at the site, but rather as the result of the scope, limitations, and cost of the work performed during the monitoring event.

SITE STATUS UPDATE

This update reports site activities performed during the second quarter of 1995 and the anticipated site activities for the third quarter of 1995.

Second Quarter 1995 Activities

- Performed quarterly groundwater monitoring for second quarter 1995.
- Prepared and submitted the quarterly groundwater monitoring and performance evaluation report for the SVE and AS systems for first quarter 1995.
- Installed a new AS air compressor and associated instrumentation at the site.

Work Anticipated for Third Quarter 1995

- Prepare the quarterly groundwater monitoring and performance evaluation report for the SVE and AS systems for second quarter 1995.
- Perform quarterly groundwater monitoring for third quarter 1995.

- Perform floating product recovery from wells ADR-1 and ADR-2 for third quarter 1995.
- Restart the SVE/AS systems.
- Perform operation and maintenance of the SVE/AS systems for third quarter 1995.

Sincerely,

EMCON

David Larsen
Project Coordinator

Valli Voruganti
Project Engineer

for Mark Smolley, R.G. 4650
Senior Project Geologist

REGISTERED GEOLOGIST
LYNN A. GALLAGHER
RG6090
STATE OF CALIFORNIA

cc: Kevin Graves, RWQCB
Susan Hugo, ACHCSA

Attachments:

Table 1 -	Groundwater Monitoring Data, Second Quarter 1995
Table 2 -	Historical Groundwater Elevation Data
Table 3 -	Historical Groundwater Analytical Data
Table 4 -	Approximate Cumulative Floating Product Recovery Data
Table 5 -	Soil-Vapor Extraction System Operation and Performance Data
Table 6 -	Soil-Vapor Extraction Well Data
Table 7 -	Air-Sparge System Operation and Performance Data
Figure 1 -	Site Location
Figure 2 -	Site Plan
Figure 3 -	Groundwater Data, Second Quarter 1995
Figure 4 -	Historical SVE System Influent TPHG and Benzene Concentrations
Figure 5 -	Historical SVE System Hydrocarbon Removal Rates
Appendix A -	Field Data Sheets, Second Quarter 1995 Groundwater Monitoring Event
Appendix B -	Analytical Results and Chain-of-Custody Documentation for Groundwater Monitoring Samples, Second Quarter 1995

Table 1
Groundwater Monitoring Data
Second Quarter 1995

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPHD
		ft-MSL	feet	ft-MSL	feet	MWN	foot/foot		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
A-1	06-05-95	14.16	11.13	3.03	ND	NW	0.002	06-05-95	1500	310	27	36	76	^710
A-2	06-05-95	14.55	11.72	2.83	ND	NW	0.002	06-05-95	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	06-05-95	15.75	12.44	3.31	ND	NW	0.002	06-05-95	Not sampled: not scheduled for chemical analysis					
A-4	06-05-95	15.25	11.70	3.55	ND	NW	0.002	06-05-95	Not sampled: not scheduled for chemical analysis					
A-5	06-05-95	13.51	10.43	3.08	ND	NW	0.002	06-05-95	57000	2700	4600	1500	6800	Not analyzed
A-6	06-05-95	13.51	10.06	3.45	ND	NW	0.002	06-05-95	160	<0.5	<0.6	<0.5	<0.5	Not analyzed
AR-1	06-05-95	15.61	11.37	4.24	ND	NW	0.002	06-05-95	190	10	<0.5	0.8	0.5	^580
AR-2	06-05-95	15.28	12.09	3.19	ND	NW	0.002	06-05-95	<50	<0.5	<0.5	<0.5	<0.5	<50
ADR-1	06-05-95	13.95	11.02	2.93	ND	NW	0.002	06-05-95	23000	310	420	300	1900	^13000
ADR-2	06-05-95	14.64	11.45	NR*	>3.00*	NR*	NR*	06-05-95	Not sampled: well contained floating product					

TOC: top of casing
TPHG: total petroleum hydrocarbons as gasoline
TPHD: total petroleum hydrocarbons as diesel
ft-MSL: elevation in feet, relative to mean sea level
MWN: groundwater flow direction and gradient apply to the entire monitoring well network
µg/L micrograms per liter
ND: none detected
NW: northwest
^: sample contains a lower boiling point hydrocarbon quantitated as diesel; chromatogram does not match the typical diesel fingerprint
NR: not reported; data not available or not measurable
*: well contained more than 3 feet of floating product; exact product thickness and groundwater elevation could not be measured

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Table 2
Historical Groundwater Elevation Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient
		ft-MSL	feet	ft-MSL	feet	MWN	foot/foot
A-1	04-03-92	14.75	10.35	4.40	ND	NR	NR
A-1	05-20-92	14.75	11.66	3.09	ND	NR	NR
A-1	06-16-92	14.75	11.95	2.80	ND	NR	NR
A-1	07-17-92	14.75	12.23	2.52	ND	NR	NR
A-1	08-07-92	14.75	12.16	2.59	ND	NR	NR
A-1	09-22-92	14.75	12.42	2.33	ND	NR	NR
A-1	10-13-92	14.75	12.47	2.28	ND	NR	NR
A-1	11-23-92	14.75	11.83	2.92	ND	NR	NR
A-1	12-16-92	14.75	11.03	3.72	ND	NR	NR
A-1	01-28-93	14.75	9.08	5.67	ND	NR	NR
A-1	02-22-93	14.75	9.46	5.29	ND	NR	NR
A-1	03-25-93	14.75	10.02	4.73	ND	NR	NR
A-1	04-15-93	14.75	10.50	4.25	ND	NR	NR
A-1	05-22-93	14.75	11.33	3.42	ND	NR	NR
A-1	06-16-93	14.75	11.51	3.24	ND	NR	NR
A-1	07-27-93	14.75	11.91	2.84	ND	NR	NR
A-1	08-26-93	14.75	12.11	2.64	ND	NR	NR
A-1	09-27-93	14.75	12.21	2.54	ND	NR	NR
A-1	10-08-93	14.75	12.21	2.54	ND	NR	NR
A-1	02-09-94	14.16	10.09	4.07	ND	NR	NR
A-1	05-04-94	14.16	10.68	3.48	ND	NW	0.004
A-1	08-10-94	14.16	10.28	3.88	ND	WNW	0.007
A-1	11-16-94	14.16	9.75	4.41	ND	NW	0.005
A-1	03-24-95	14.16	8.10	6.06	ND	NW	0.009
A-1	06-05-95	14.16	11.13	3.03	ND	NW	0.002

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient
		ft-MSL	feet	ft-MSL	feet	MWN	foot/foot
A-2	04-03-92	15.16	10.97	4.19	ND	NR	NR
A-2	05-20-92	15.16	12.17	2.99	ND	NR	NR
A-2	06-16-92	15.16	12.43	2.73	ND	NR	NR
A-2	07-17-92	15.16	12.64	2.52	ND	NR	NR
A-2	08-07-92	15.16	12.75	2.41	ND	NR	NR
A-2	09-22-92	15.16	12.88	2.28	ND	NR	NR
A-2	10-13-92	15.16	12.92	2.24	ND	NR	NR
A-2	11-23-92	15.16	12.18	2.98	ND	NR	NR
A-2	12-16-92	15.16	11.52	3.64	ND	NR	NR
A-2	01-28-93	15.16	9.73	5.43	ND	NR	NR
A-2	02-22-93	15.16	9.28	5.88	ND	NR	NR
A-2	03-25-93	15.16	10.57	4.59	ND	NR	NR
A-2	04-15-93	15.16	11.20	3.96	ND	NR	NR
A-2	05-22-93	15.16	11.91	3.25	ND	NR	NR
A-2	06-16-93	15.16	12.04	3.12	ND	NR	NR
A-2	07-27-93	15.16	12.41	2.75	ND	NR	NR
A-2	08-25-93	15.16	12.54	2.62	ND	NR	NR
A-2	09-27-93	15.16	12.66	2.50	ND	NR	NR
A-2	10-08-93	15.16	12.65	2.51	ND	NR	NR
A-2	02-09-94	14.55	10.67	3.88	ND	NR	NR
A-2	05-04-94	14.55	11.25	3.30	ND	NW	0.004
A-2	08-10-94	14.55	11.56	2.99	ND	WNW	0.007
A-2	11-16-94	14.55	10.31	4.24	ND	NW	0.005
A-2	03-24-95	14.55	8.64	5.91	ND	NW	0.009
A-2	06-05-95	14.55	11.72	2.83	ND	NW	0.002

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient foot/foot
A-3	04-03-92	16.38	11.70	4.68	ND	NR	NR
A-3	05-20-92	16.38	13.00	3.38	ND	NR	NR
A-3	06-16-92	16.38	13.46	2.92	ND	NR	NR
A-3	07-17-92	16.38	13.45	2.93	ND	NR	NR
A-3	08-07-92	16.38	12.37	4.01	ND	NR	NR
A-3	09-22-92	16.38	13.71	2.67	ND	NR	NR
A-3	10-13-92	16.38	13.76	2.62	ND	NR	NR
A-3	11-23-92	16.38	13.60	2.78	ND	NR	NR
A-3	12-16-92	16.38	12.31	4.07	ND	NR	NR
A-3	01-28-93	16.38	10.33	6.05	ND	NR	NR
A-3	02-22-93	16.38	10.44	5.94	ND	NR	NR
A-3	03-25-93	16.38	11.27	5.11	ND	NR	NR
A-3	04-15-93	16.38	11.98	4.40	ND	NR	NR
A-3	05-22-93	16.38	12.70	3.68	ND	NR	NR
A-3	06-16-93	16.38	12.84	3.54	ND	NR	NR
A-3	07-27-93	16.38	13.22	3.16	ND	NR	NR
A-3	08-25-93	16.38	13.35	3.03	ND	NR	NR
A-3	09-27-93	16.38	13.50	2.88	ND	NR	NR
A-3	10-08-93	16.38	13.48	2.90	ND	NR	NR
A-3	02-09-94	15.75	11.32	4.43	ND	NR	NR
A-3	05-04-94	15.75	11.99	3.76	ND	NW	0.004
A-3	08-10-94	15.75	11.12	4.63	ND	WNW	0.007
A-3	11-16-94	15.75	11.02	4.73	ND	NW	0.005
A-3	03-24-95	15.75	8.83	6.92	ND	NW	0.009
A-3	06-05-95	15.75	12.44	3.31	ND	NW	0.002

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient
		ft-MSL	feet	ft-MSL	feet	MWN	foot/foot
A-4	04-03-92	15.89	10.84	5.05	ND	NR	NR
A-4	05-20-92	15.89	12.13	3.76	ND	NR	NR
A-4	06-16-92	15.89	12.33	3.56	ND	NR	NR
A-4	07-17-92	15.89	12.60	3.29	ND	NR	NR
A-4	08-07-92	15.89	12.56	3.33	ND	NR	NR
A-4	09-22-92	15.89	12.87	3.02	ND	NR	NR
A-4	10-13-92	15.89	12.87	3.02	ND	NR	NR
A-4	11-23-92	15.89	12.63	3.26	ND	NR	NR
A-4	12-16-92	15.89	11.34	4.55	ND	NR	NR
A-4	01-28-93	15.89	9.40	6.49	ND	NR	NR
A-4	02-22-93	15.89	9.35	6.54	ND	NR	NR
A-4	03-25-93	15.89	10.32	5.57	ND	NR	NR
A-4	04-15-93	15.89	11.15	4.74	ND	NR	NR
A-4	05-22-93	15.89	11.84	4.05	ND	NR	NR
A-4	06-16-93	15.89	12.01	3.88	ND	NR	NR
A-4	07-27-93	15.89	12.33	3.56	ND	NR	NR
A-4	08-25-93	15.89	12.48	3.41	ND	NR	NR
A-4	09-27-93	15.89	12.60	3.29	ND	NR	NR
A-4	10-08-93	15.89	12.57	3.32	ND	NR	NR
A-4	02-09-94	15.25	10.01	5.24	ND	NR	NR
A-4	05-04-94	15.25	11.08	4.17	ND	NW	0.004
A-4	08-10-94	15.25	11.75	3.50	ND	WNW	0.007
A-4	11-16-94	15.25	9.78	5.47	ND	NW	0.005
A-4	03-24-95	15.25	7.20	8.05	ND	NW	0.009
A-4	06-05-95	15.25	11.70	3.55	ND	NW	0.002

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient foot/foot
A-5	02-11-93	14.14	9.15	4.99	ND	NR	NR
A-5	03-25-93	14.14	9.33	4.81	ND	NR	NR
A-5	04-15-93	14.14	10.11	4.03	ND	NR	NR
A-5	05-22-93	14.14	10.71	3.43	ND	NR	NR
A-5	06-16-93	14.14	10.84	3.30	ND	NR	NR
A-5	07-27-93	14.14	11.22	2.92	ND	NR	NR
A-5	08-26-93	14.14	11.44	2.70	ND	NR	NR
A-5	09-27-93	14.14	11.51	2.63	ND	NR	NR
A-5	10-08-93	14.14	11.68	2.46	ND	NR	NR
A-5	02-09-94	13.51	9.44	4.07	ND	NR	NR
A-5	05-04-94	13.51	10.00	3.51	ND	NW	0.004
A-5	08-10-94	13.51	10.76	2.75	ND	WNW	0.007
A-5	11-16-94	13.51	9.09	4.42	ND	NW	0.005
A-5	03-24-95	13.51	7.40	6.11	ND	NW	0.009
A-5	06-05-95	13.51	10.43	3.08	ND	NW	0.002
A-6	02-11-93	14.17	9.35	4.82	ND	NR	NR
A-6	03-25-93	14.17	Not surveyed: well was inaccessible				
A-6	04-16-93	14.17	9.36	4.81	ND	NR	NR
A-6	05-22-93	14.17	10.86	3.31	ND	NR	NR
A-6	06-16-93	14.17	10.98	3.19	ND	NR	NR
A-6	07-27-93	14.17	Not surveyed: well was inaccessible				
A-6	08-25-93	14.17	Not surveyed: well was inaccessible				
A-6	09-27-93	14.17	11.65	2.52	ND	NR	NR
A-6	10-08-93	14.17	11.80	2.37	ND	NR	NR
A-6	02-09-94	13.51	9.48	4.03	ND	NR	NR
A-6	05-04-94	13.51	10.07	3.44	ND	NW	0.004
A-6	08-10-94	13.51	10.77	2.74	ND	WNW	0.007
A-6	11-16-94	13.51	9.14	4.37	ND	NW	0.005
A-6	03-24-95	13.51	7.89	5.62	ND	NW	0.009
A-6	06-05-95	13.51	10.06	3.45	ND	NW	0.002

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient
		ft-MSL	feet	ft-MSL	feet	MWN	foot/foot
AR-1	04-03-92	15.71	11.07	4.64	ND	NR	NR
AR-1	05-20-92	15.71	12.37	3.34	ND	NR	NR
AR-1	06-16-92	15.71	12.47	3.24	ND	NR	NR
AR-1	07-17-92	15.71	13.00	2.71	ND	NR	NR
AR-1	08-07-92	15.71	12.87	2.84	ND	NR	NR
AR-1	09-22-92	15.71	12.99	2.72	ND	NR	NR
AR-1	10-13-92	15.71	13.05	2.66	ND	NR	NR
AR-1	11-23-92	15.71	12.80	2.91	ND	NR	NR
AR-1	12-16-92	15.71	11.49	4.22	ND	NR	NR
AR-1	01-28-93	15.71	9.46	6.25	ND	NR	NR
AR-1	02-22-93	15.71	10.05	5.66	ND	NR	NR
AR-1	03-25-93	15.71	10.75	4.96	ND	NR	NR
AR-1	04-15-93	15.71	11.26	4.45	ND	NR	NR
AR-1	05-22-93	15.71	12.07	3.64	ND	NR	NR
AR-1	06-16-93	15.71	12.21	3.50	ND	NR	NR
AR-1	07-27-93	15.71	12.60	3.11	ND	NR	NR
AR-1	08-25-93	15.71	12.78	2.93	ND	NR	NR
AR-1	09-27-93	15.71	12.89	2.82	ND	NR	NR
AR-1	10-08-93	15.71	12.84	2.87	ND	NR	NR
AR-1	02-09-94	15.61	11.08	4.53	ND	NR	NR
AR-1	05-04-94	15.61	11.83	3.78	ND	NW	0.004
AR-1	08-10-94	15.61	11.09	4.52	ND	WNW	0.007
AR-1	11-16-94	15.61	10.19	5.42	ND	NW	0.005
AR-1	03-24-95	15.61	7.25	8.36	ND	NW	0.009
AR-1	06-05-95	15.61	11.37	4.24	ND	NW	0.002

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient
		ft-MSL	feet	ft-MSL	feet	MWN	foot/foot
AR-2	07-17-92	15.79	13.14	2.65	ND	NR	NR
AR-2	08-07-92	15.79	13.25	2.54	ND	NR	NR
AR-2	09-22-92	15.79	13.58	2.21	ND	NR	NR
AR-2	10-13-92	15.79	13.65	2.14	ND	NR	NR
AR-2	11-23-92	15.79	Not surveyed: could not located well				
AR-2	12-16-92	15.79	12.16	3.63	ND	NR	NR
AR-2	01-28-93	15.79	10.26	5.53	ND	NR	NR
AR-2	02-22-93	15.79	10.52	5.27	ND	NR	NR
AR-2	03-25-93	15.79	11.18	4.61	ND	NR	NR
AR-2	04-15-93	15.79	11.81	3.98	ND	NR	NR
AR-2	05-22-93	15.79	12.46	3.33	ND	NR	NR
AR-2	06-16-93	15.79	12.53	3.26	ND	NR	NR
AR-2	07-27-93	15.79	12.77	3.02	ND	NR	NR
AR-2	08-26-93	15.79	13.23	2.56	ND	NR	NR
AR-2	09-27-93	15.79	13.16	2.63	ND	NR	NR
AR-2	10-08-93	15.79	13.32	2.47	ND	NR	NR
AR-2	02-09-94	15.28	11.33	3.95	ND	NR	NR
AR-2	05-04-94	15.28	11.88	3.40	ND	NW	0.004
AR-2	08-10-94	15.28	12.48	2.80	ND	WNW	0.007
AR-2	11-16-94	15.28	10.95	4.33	ND	NW	0.005
AR-2	03-24-95	15.28	9.13	6.15	ND	NW	0.009
AR-2	06-05-95	15.28	12.09	3.19	ND	NW	0.002

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-23-95
Project Number: 0805-129.02

Well Designation	Water Level Field Date	TOC Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient
		ft-MSL	feet	ft-MSL	feet	MWN	foot/foot
ADR-1	02-09-94	13.95	9.90	4.05	ND	NR	NR
ADR-1	05-04-94	13.95	10.50	3.45	ND	NW	0.004
ADR-1	08-10-94	13.95	10.36	3.59	ND	WNW	0.007
ADR-1	11-16-94	13.95	9.64	4.31	Sheen	NW	0.005
ADR-1	03-24-95	13.95	8.04	** 5.92	0.01	NW	0.009
ADR-1	06-05-95	13.95	11.02	2.93	ND	NW	0.002
ADR-2	02-09-94	14.64	10.73	3.91	ND	NR	NR
ADR-2	05-04-94	14.64	11.31	3.33	ND	NW	0.004
ADR-2	08-10-94	14.64	9.81	** 4.90	0.10	WNW	0.007
ADR-2	11-16-94	14.64	9.84	** 4.87	0.09	NW	0.005
ADR-2	03-24-95	14.64	8.41	NR*	>3.00*	NR*	NR*
ADR-2	06-05-95	14.64	11.45	NR*	>3.00*	NR*	NR*

TOC: top of casing
ft-MSL: elevation in feet, relative to mean sea level
MWN: groundwater flow direction and gradient apply to the entire monitoring well network
ND. none detected
NR: not reported; data not available or not measurable
NW: northwest
WNW: west-northwest
**: [corrected elevation (Z')] = Z + (h * 0.73) where: Z = measured elevation, h = floating product thickness, 0.73 = density ratio of oil to water
*: well contained more than 3 feet of floating product; exact product thickness and groundwater elevation could not be measured

Table 3
Historical Groundwater Analytical Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Well Designation	Water Sample Field Date	TPHG µg/L	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L	TPHD µg/L
A-1	04-03-92	34000	6200	3900	410	3100	6100
A-1	07-17-92	5600	3000	500	<100	<100	Not analyzed
A-1	10-13-92	5600	980	590	85	910	Not analyzed
A-1	01-28-93	3700	780	360	130	460	^620
A-1	04-15-93	210	34	11	7.1	20	^420
A-1	08-26-93	2000	370	35	50	220	^1500
A-1	10-08-93	2600	430	65	64	99	^1200
A-1	02-09-94	3000	560	150	66	190	^650
A-1	05-04-94	1300	250	61	27	110	^2100
A-1	08-10-94	27000	3700	1100	540	3000	^3000
A-1	11-16-94	2100	460	6.4	62	120	^^^^640
A-1	03-24-95	1200	230	39	34	66	^^^^160
A-1	06-05-95	1500	310	27	36	76	^710
A-2	04-03-92	<30	<0.3	<0.3	<0.3	<0.3	<50
A-2	07-17-92	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-2	10-13-92	<50	0.57	<0.5	<0.5	<0.5	Not analyzed
A-2	01-28-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-2	04-15-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-2	08-25-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-2	10-08-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-2	02-09-94	^^260	<0.6	<0.5	<0.5	<0.5	Not analyzed
A-2	05-04-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-2	08-10-94	690	47	25	3.9	86	Not analyzed
A-2	11-16-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-2	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-2	06-05-95	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	04-03-92	200	0.79	0.65	4.4	<0.3	130
A-3	07-17-92	<50	<0.5	<0.5	1.3	2.3	Not analyzed
A-3	10-13-92	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	01-28-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	04-15-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	08-25-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	10-08-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	02-09-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	05-04-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	08-10-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	11-16-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-3	06-05-95	Not sampled: not scheduled for chemical analysis					

Table 3
Historical Groundwater Analytical Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Well Designation	Water Sample Field Date	TPHG µg/L	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L	TPHD µg/L
A-4	04-03-92	35	<0.3	<0.3	<0.3	<0.3	85
A-4	07-17-92	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	10-13-92	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	01-28-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	04-15-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	08-25-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	10-08-93	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	02-09-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	05-04-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	08-10-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	11-16-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	06-05-95	Not sampled: not scheduled for chemical analysis					
A-5	02-11-93	4900	380	640	140	970	Not analyzed
A-5	04-15-93	27000	3100	4000	1100	4600	Not analyzed
A-5	08-26-93	13000	1100	1400	480	1800	Not analyzed
A-5	10-08-93	6800	490	620	280	980	Not analyzed
A-5	02-09-94	2200	190	130	130	310	Not analyzed
A-5	05-09-94	13000	1000	1500	490	2000	Not analyzed
A-5	08-10-94	11000	730	930	310	1300	Not analyzed
A-5	11-16-94	2600	160	220	130	400	Not analyzed
A-5	03-24-95	3300	200	310	130	460	Not analyzed
A-5	06-05-95	57000	2700	4600	1500	6800	Not analyzed
A-6	02-11-93	990	1.8	5.1	17	7.2	Not analyzed
A-6	04-16-93	390	1.3	1.6	1.7	7.7	Not analyzed
A-6	08-25-93	Not sampled: well was inaccessible					
A-6	10-08-93	220	0.73	<0.5	0.82	0.65	Not analyzed
A-6	02-09-94	640	<2.9	<3.7	<2.4	<8.2	Not analyzed
A-6	05-04-94	260	<0.5	<1.5	<1.5	<0.5	Not analyzed
A-6	08-10-94	300	<0.6	<2.5	<0.8	<1	Not analyzed
A-6	11-16-94	250	<0.5	<1.5	<0.6	<1.5	Not analyzed
A-6	03-24-95	120	<0.5	<1	<0.5	<1.5	Not analyzed
A-6	06-05-95	160	<0.5	<0.6	<0.5	<0.5	Not analyzed

Table 3
Historical Groundwater Analytical Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Well Designation	Water Sample Field Date	TPHG µg/L	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L	TPHD µg/L
AR-1	04-03-92	17000	310	1400	320	3000	12000
AR-1	07-17-92	44000	4300	1800	1800	10000	Not analyzed
AR-1	10-13-92	32000	310	730	570	3100	^22000
AR-1	01-28-93	15000	1200	510	510	2600	^5300
AR-1	04-15-93	17000	1800	360	520	1600	^5400
AR-1	08-25-93	2900	260	54	80	160	^2800
AR-1	10-08-93	3500	200	85	120	290	^4100
AR-1	02-09-94	26000	2900	450	920	3000	^4200
AR-1	05-04-94	36000	3400	360	1400	3700	^7200
AR-1	08-10-94	6100	120	66	65	530	^2900
AR-1	11-16-94	1200	66	20	34	210	^^^^560
AR-1	03-24-95	270	14	0.6	2.5	2.1	^^^^130
AR-1	06-05-95	190	10	<0.5	0.8	0.5	^580
AR-2	07-17-92	150	6.6	24	6.6	39	Not analyzed
AR-2	10-13-92	<50	2	0.86	0.51	3.8	^58
AR-2	01-28-93	2000	570	13	<10	380	^290
AR-2	04-15-93	85	15	<0.5	<0.5	2.4	<50
AR-2	08-26-93	<50	<0.5	<0.5	<0.5	<0.5	<50
AR-2	10-08-93	<50	<0.5	<0.5	<0.5	<0.5	<50
AR-2	02-09-94	^^82	<0.5	<0.5	<0.5	<0.5	<50
AR-2	05-04-94	<50	<0.5	<0.5	<0.5	<0.5	<50
AR-2	08-10-94	200	5	1.7	2.7	38	^55
AR-2	11-16-94	<50	0.8	<0.5	<0.5	<0.5	<50
AR-2	03-24-95	<50	6.2	<0.5	<0.5	0.6	<50
AR-2	06-05-95	<50	<0.5	<0.5	<0.5	<0.5	<50

Table 3
Historical Groundwater Analytical Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Well Desig-nation	Water Sample Field Date	TPHG	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPHD
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ADR-1	02-09-94	3000	380	140	59	240	^110
ADR-1	05-04-94	2100	490	93	68	140	^60
ADR-1	08-10-94	150000	5400	15000	3600	24000	^^^4800
ADR-1	11-16-94	Not sampled: well contained floating product					
ADR-1	03-24-95	Not sampled: well contained floating product					
ADR-1	06-05-95	23000	310	420	300	1900	^13000
ADR-2	02-09-94	83000	6300	6100	2000	11000	12000
ADR-2	05-04-94	36000	4600	2600	930	4500	^4200
ADR-2	08-10-94	Not sampled: well contained floating product					
ADR-2	11-16-94	Not sampled: well contained floating product					
ADR-2	03-24-95	Not sampled: well contained floating product					
ADR-2	06-05-95	Not sampled: well contained floating product					

TPHG: total petroleum hydrocarbons as gasoline
TPHD: total petroleum hydrocarbons as diesel
µg/L: micrograms per liter
^: sample contains a lower boiling point hydrocarbon quantitated as diesel; chromatogram does not match the typical diesel fingerprint
^^: sample contains a single non-fuel component eluting in the gasoline range, and quantified as gasoline
^^^: sample contains a mixture of diesel and a lower boiling point hydrocarbon quantitated as diesel; chromatogram does not match the typical diesel fingerprint
^^^^: sample contains components eluting in the diesel range, quantified as diesel; chromatogram does not match the typical diesel fingerprint

Table 4
Approximate Cumulative Floating Product Recovered

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Well Designation	Date	Floating Product Recovered gallons
ADR-1	1994	0.0
ADR-2		0.0
ADR-1	1995	0.0
ADR-2		4.8
	1994 to 1995 Total:	4.8

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169		Vapor Treatment Unit:	ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer
Location: 889 West Grand Avenue Oakland, California			
Consultant: EMCON 1921 Ringwood Avenue San Jose, California		Start-Up Date:	06-02-94
		Reporting Period From:	06-02-94
		To:	06-28-95

Beginning Date:	06-02-94	06-02-94	06-07-94	06-16-94	06-22-94
Ending Date:	06-02-94	06-07-94	06-16-94	06-22-94	06-30-94
Down-time (days):	0.00	0.00	0.93	0.00	3.57
Total Operation (days):	0.07	5.05	8.07	6.05	4.43
Total Operation (hours):	1.7	121.3	193.7	145.2	106.3
Operation Hours to Date:	1.7	123.0	316.7	462.0	568.2
TPH Concentrations					
Average Influent (ppmv):	18,000	16,000	830	1,100	230
Average Effluent (ppmv):	ND	45	ND	4.9	75.0
Benzene Concentrations					
Average Influent (ppmv):	250	420	17	24	3.8
Average Effluent (ppmv):	ND	0.30	ND	0.08	0.78
Flow Rates					
Average Influent (scfm):	61.1	131.5	145.3	194.1	176.7
Average Dilution (scfm):	184.2	97.8	69.9	0.0	0.0
Average Effluent (scfm):	268.6	252.3	289.7	264.4	288.9
TPH-G Recovery Data					
Recovery Rate (lbs/hr):	11.12	21.26	1.22	2.16	0.41
Recovery Rate (lbs/day):	266.80	510.34	29.25	51.77	9.86
Destruction Efficiency (%):	100.00	99.46	100.00	99.39	46.70
Product Recovered (lbs):	18.68	2579.35	236.08	313.27	43.64
Product Recovered to Date (lbs):	18.68	2598.02	2834.10	3147.37	3191.01
Product Recovered to Date (gal):	3.11	433.00	472.35	524.56	531.83
Benzene Recovery Data					
Recovery Rate (lbs/hr):	0.185	0.670	0.030	0.056	0.008
Recovery Rate (lbs/day):	4.447	16.076	0.719	1.355	0.195
Destruction Efficiency (%):	100.00	99.86	100.00	99.56	66.45
Product Recovered (lbs):	0.311	81.249	5.802	8.202	0.865
Product Recovered to Date (lbs):	0.311	81.561	87.363	95.565	96.430
Product Recovered to Date (gal):	0.043	11.250	12.050	13.181	13.301

Page 1 Footnotes
ppmv = parts per million by volume
scfm = standard cubic feet per minute
lbs/hr = pounds per operational hour
lbs/day = pounds per day
lbs = pounds
gal = gallons
ND = None Detected; Recovery data calculated using laboratory detection limits
Notes:
1. Molecular weights used in recovery calculations are 65 for TPH and 78 for benzene.
2. Densities used in recovery calculations are 6.0 lbs/gal for TPH and 7.25 lbs/gal for benzene.
3. All data and calculations on this page were prepared by GeoStrategies, Inc. (GSI), as presented in *Letter Report, Vapor Extraction Start Up and Quarterly Groundwater Monitoring, Second Quarter 1994,* (GSI, September 1994).

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer

Start-Up Date: 06-02-94
Reporting Period From: 06-02-94
To: 06-28-95

Date Begin:		06-30-94	07-15-94	07-20-94	08-01-94	08-15-94
Date End:		07-15-94	07-20-94	08-01-94	08-15-94	09-13-94
Mode of Oxidation:		Thermal	Thermal	Thermal	Catalytic	Catalytic
Days of Operation:		6.9	3.8	0.3	7.2	10.0
Days of Downtime:		7.8	1.5	11.7	6.8	18.7
Vapor Monitoring Concentrations						
Well Field Influent, as gasoline:	mg/m3(1)(2)	NA(11)	NA	NA	NA	NA
	ppmv(3)	NA	NA	NA	NA	NA
System Influent, as gasoline:	mg/m3	5405	2027	1838	1838	1216
	ppmv	2000	750	680	680	450
System Effluent, as gasoline:	mg/m3	30	ND	141	95	11
	ppmv	11.0	ND	52	35	4.1
Well Field Influent, as benzene:	mg/m3(4)	NA	NA	NA	NA	NA
	ppmv	NA	NA	NA	NA	NA
System Influent, as benzene:	mg/m3	101	32	19	30	9.4
	ppmv	31	10	6.0	9.1	2.9
System Effluent, as benzene:	mg/m3	ND(12)	ND	3.6	1.0	0.14
	ppmv	ND	ND	1.1	0.31	0.044
Well Field Flow Rate, scfm(5):		164.4	197.7	183.9	206.4	211.7
System Influent Flow Rate, scfm:		169.5	195.2	186.7	195.6	212.8
Destruction Efficiency, percent(6):		99.5	98.5	92.4	94.9	99.1
Emission Rates (pounds per day)(7)						
Gasoline:		0.45	<1.05	2.36	1.66	0.21
Benzene:		<0.01	<0.01	0.06	0.02	0.00
Operating Hours This Period:		165.1	90.1	8.3	173.3	241.0
Operating Hours To Date:		733.3	823.4	831.7	1005.0	1246.0
Pounds/ Hour Removal Rate, as gasoline(8):		3.43	1.48	1.28	1.35	0.97
Pounds Removed This Period, as gasoline(9):		566	133	11	233	233
Pounds Removed To Date, as gasoline:		3757	3891	3901	4134	4368
Gallons Removed This Period, as gasoline(10):		94	22	2	39	39
Gallons Removed To Date, as gasoline:		626	649	650	689	728

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169	Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer
Location: 889 West Grand Avenue, Oakland, California	
Consultant: EMCON, 1921 Ringwood Avenue, San Jose, California	Start-Up Date: 06-02-94
	Reporting Period From: 06-02-94
	To: 06-28-95

Date Begin:		09-13-94	10-27-94
Date End:		10-27-94	11-29-94
Mode of Oxidation:		Catalytic	Catalytic
Days of Operation:		34.5	0.3
Days of Downtime:		9.6	32.7
Vapor Monitoring Concentrations			
Well Field Influent, as gasoline:	mg/m3(1)(2)	NA	NA(13)
	ppmv(3)	NA	NA
System Influent, as gasoline:	mg/m3	1216	NA
	ppmv	450	NA
System Effluent, as gasoline:	mg/m3	11	NA
	ppmv	4.1	NA
Well Field Influent, as benzene:	mg/m3(4)	NA	NA
	ppmv	NA	NA
System Influent, as benzene:	mg/m3	9.4	NA
	ppmv	2.9	NA
System Effluent, as benzene:	mg/m3	0.14	NA
	ppmv	0.044	NA
Well Field Flow Rate, scfm(5):		213.6	36.6
System Influent Flow Rate, scfm:		213.6	126.9
Destruction Efficiency, percent(6):		99.1	NA
Emission Rates (pounds per day)(7)			
Gasoline:		0.21	NA
Benzene:		0.00	NA
Operating Hours This Period:		828.7	7.1
Operating Hours To Date:		2074.7	2081.8
Pounds/ Hour Removal Rate, as gasoline(8):		0.97	0.00
Pounds Removed This Period, as gasoline(9):		806	0
Pounds Removed To Date, as gasoline:		5174	5174
Gallons Removed This Period, as gasoline(10):		134	0
Gallons Removed To Date, as gasoline:		862	862

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer

Start-Up Date: 06-02-94
Reporting Period From: 06-02-94
To: 06-28-95

Date Begin:		11-29-94	01-03-95	02-01-95	03-03-95
Date End:		01-03-95	02-01-95	03-03-95	03-31-95
Mode of Oxidation:		Catalytic	Catalytic	Catalytic	Catalytic
Days of Operation:		18.5	23.0	0.0	0.0
Days of Downtime:		16.5	6.0	30.0	28.0
Vapor Monitoring Concentrations					
Well Field Influent, as gasoline:	mg/m3(1)(14)	5600	<60	NA	NA
	ppmv(3)	1548	<17	NA	NA
System Influent, as gasoline:	mg/m3	1600	<60	NA	NA
	ppmv	442	<17	NA	NA
System Effluent, as gasoline:	mg/m3	<60	<60	NA	NA
	ppmv	<17	<17	NA	NA
Well Field Influent, as benzene:	mg/m3(4)	22	<0.5	NA	NA
	ppmv	7	<0.1	NA	NA
System Influent, as benzene:	mg/m3	6.0	<0.5	NA	NA
	ppmv	1.9	<0.1	NA	NA
System Effluent, as benzene:	mg/m3	<0.5	<0.5	NA	NA
	ppmv	<0.1	<0.1	NA	NA
Well Field Flow Rate, scfm(5):		24.3	19.5	0.0	0.0
System Influent Flow Rate, scfm:		139.3	163.5	0.0	0.0
Destruction Efficiency, percent(6):		96.3	NA	NA	NA
Emission Rates (pounds per day)(7)					
Gasoline:		<0.75	<0.88	0.00	0.00
Benzene:		<0.01	<0.01	0.00	0.00
Operating Hours This Period:		443.7	552.2	0.0	0.0
Operating Hours To Date:		2525.5	3077.7	3077.7	3077.7
Pounds/ Hour Removal Rate, as gasoline(8):		0.83	0.04	0.00	0.00
Pounds Removed This Period, as gasoline(9):		370	20	0	0
Pounds Removed To Date, as gasoline:		5544	5564	5564	5564
Gallons Removed This Period, as gasoline(10):		62	3	0	0
Gallons Removed To Date, as gasoline:		924	928	928	928

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169	Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer
Location: 889 West Grand Avenue, Oakland, California	
Consultant: EMCON, 1921 Ringwood Avenue, San Jose, California	Start-Up Date: 06-02-94
	Reporting Period From: 06-02-94
	To: 06-28-95

Date Begin:		03-31-95	04-28-95	05-30-95
Date End:		04-28-95	05-30-95	06-28-95
Mode of Oxidation:		Catalytic	Catalytic	Catalytic
Days of Operation:		0.0	0.0	0.0
Days of Downtime:		28.0	32.0	29.0
Vapor Monitoring Concentrations				
Well Field Influent, as gasoline:	mg/m3(1)(14)	NA	NA	NA
	ppmv(3)	NA	NA	NA
System Influent, as gasoline:	mg/m3	NA	NA	NA
	ppmv	NA	NA	NA
System Effluent, as gasoline:	mg/m3	NA	NA	NA
	ppmv	NA	NA	NA
Well Field Influent, as benzene:	mg/m3(4)	NA	NA	NA
	ppmv	NA	NA	NA
System Influent, as benzene:	mg/m3	NA	NA	NA
	ppmv	NA	NA	NA
System Effluent, as benzene:	mg/m3	NA	NA	NA
	ppmv	NA	NA	NA
Well Field Flow Rate, scfm(5):		0.0	0.0	0.0
System Influent Flow Rate, scfm:		0.0	0.0	0.0
Destruction Efficiency, percent(6):		NA	NA	NA
Emission Rates (pounds per day)(7)				
Gasoline:		0.00	0.00	0.00
Benzene:		0.00	0.00	0.00
Operating Hours This Period:		0.0	0.0	0.0
Operating Hours To Date:		3077.7	3077.7	3077.7
Pounds/ Hour Removal Rate, as gasoline(8):		0.00	0.00	0.00
Pounds Removed This Period, as gasoline(9):		0	0	0
Pounds Removed To Date, as gasoline:		5564	5564	5564
Gallons Removed This Period, as gasoline(10):		0	0	0
Gallons Removed To Date, as gasoline:		928	928	928

Table 5
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2169	Vapor Treatment Unit: ThermTech Model
Location: 889 West Grand Avenue	VAC-25, 250cfm Thermal/
Oakland, California	Catalytic Oxidizer
Consultant: EMCON	Start-Up Date: 06-02-94
1921 Ringwood Avenue	Reporting Period From: 06-02-94
San Jose, California	To: 06-28-95

CURRENT REPORTING PERIOD:	03-31-95	to	06-28-95
DAYS / HOURS IN PERIOD:	89.0	2136	
DAYS / HOURS OF OPERATION:	0.0	0	
DAYS / HOURS OF DOWN TIME:	89.0	2136	
PERCENT OPERATIONAL:		0.0 %	
PERIOD POUNDS REMOVED:	0		
PERIOD GALLONS REMOVED:	0		
AVERAGE SYSTEM INFLUENT FLOW RATE (scfm):		0.0	

1. mg/m3: milligrams per cubic meter
2. Concentration (as gasoline in mg/m3) = [concentration (as gasoline in ppmv) x 65 lb/lb-mole / 24.05 (lb/m3/lb-mole of air)/mg]
3. ppmv: parts per million by volume
4. Concentration (as benzene in mg/m3) = [concentration (as benzene in ppmv) x 78 lb/lb-mole / 24.05 (lb/m3/lb-mole of air)/mg]
5. scfm: flow in standard cubic feet per minute at one atmosphere and 70 degrees Farenheit
6. Destruction efficiency, percent = ([system influent concentration (as gasoline in mg/m3) - system effluent concentration (as gasoline in mg/m3)] / system influent concentration (as gasoline in mg/m3)) x 100 percent
7. Emission rates (pounds per day) = system effluent concentration (as gasoline or benzene in mg/m3) x system influent flow rate (scfm) x 0.02832 m3/ft3 x 1440 minutes/day x 1 pound/454,000 mg
8. Pounds/ hour removal rate (as gasoline) = system influent concentration (as gasoline in mg/m3) x system influent flow rate (scfm) x 0.02832 m3/ft3 x 60 minutes/hour x 1 pound/454,000 mg
9. Pounds removed this period (as gasoline) = pounds/ hour removal rate x hours of operation
10. Gallons removed this period (as gasoline) = pounds removed this period (as gasoline) x 0.1667 gallons/pound of gasoline
11. NA = not analyzed
12. ND = Not detected at or above the method reporting limit
13. System was down for this entire period. The system was operated for 7.1 hour on fresh air for check system operation. No samples were collected.
14. Concentration (as gasoline in mg/m3) = [concentration (as gasoline in ppmv) x 87 lb/lb-mole / 24.05 (lb/m3/lb-mole of air)/mg]

Table 6
Soil-Vapor Extraction Well Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Date	Well Identification											
	A-1			A-2			A-3			A-4		
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
06-02-94	open	12,300 FID	12	open	560 FID	10	open	90 FID	14	open	0 FID	9
06-07-94	open	8,200 FID	68	closed	600 FID	NA	closed	10 FID	NA	closed	0 FID	NA
06-16-94	open	3,600 FID	54	closed	70 FID	0	closed	0 FID	0	closed	0 FID	0
06-22-94	open	1,800 FID	81	open	260 FID	6	open	0 FID	12	open	0 FID	2
06-30-94	open	2,800 FID	67	open	450 FID	14	open	10 FID	NA	closed	0 FID	0
07-15-94	open	1,350 FID	64	open	160 FID	62	closed	50 FID	NA	closed	20 FID	NA
07-15-94	open	2,860 FID	72	open	510 FID	71	closed	80 FID	NA	closed	30 FID	NA
07-20-94	open	2,300 FID	76	open	1,200 FID	78	closed	0 FID	NA	closed	20 FID	NA
08-01-94	open	3,000 FID	68 - 73	open	700 FID	68 - 73	closed	20 FID	68 - 73	closed	4,300 FID	68 - 73
08-15-94	open	1,200 FID	73	open	400 FID	71	open	20 FID	4	open	0 FID	2
09-13-94	open	410 FID	57	open	400 FID	62	closed	400 FID	NA	closed	0 FID	NA
11-02-94	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
12-15-94	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
12-30-94	passive	NA	NA	passive	NA	NA	passive	NA	NA	passive	NA	NA
01-13-95	passive	NA	0	passive	NA	0	passive	NA	0	passive	NA	0
01-26-95	passive	NA	0	passive	NA	0	passive	NA	0	passive	NA	0
03-31-95	System was shut down on January 26, 1995											

TVHG: concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O: inches of water
open: open to the system
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
FID: TVHG concentration was measured with a portable flame ionization detector
LAB: TVHG concentration was analyzed in the laboratory
PID: TVHG concentration was measured with a portable photoionization detector

Table 6
Soil-Vapor Extraction Well Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Date	Well Identification											
	AV-1			AV-2			AV-3			AV-4		
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
06-02-94	open	3,000 FID	8	open	13,470 FID	12	open	13,670 FID	12	open	13,680 FID	9
06-07-94	closed	2,800 FID	NA	open	4,100 FID	38	open	12,600 FID	74	open	14,110 FID	74
06-16-94	closed	0 FID	40	open	1,250 FID	55	open	2,400 FID	57	open	9,000 FID	55
06-22-94	open	0 FID	80	open	750 FID	80	open	1,100 FID	82	open	4,400 FID	83
06-30-94	open	0 FID	56	open	1,000 FID	55	open	900 FID	69	open	6,300 FID	68
07-15-94	closed	100 FID	NA	open	750 FID	64	open	570 FID	64	open	7,160 FID	64
07-15-94	closed	130 FID	NA	open	4,500 FID	74	open	1,470 FID	74	open	12,780 FID	73
07-20-94	closed	30 FID	NA	open	1,200 FID	78	open	2,300 FID	79	open	3,200 FID	75
08-01-94	closed	80 FID	68 - 73	open	1,000 FID	68 - 73	open	800 FID	68 - 73	open	4,300 FID	68 - 73
08-15-94	open	80 FID	80	open	1,900 FID	74	open	500 FID	73	open	2,100 FID	73
09-13-94	closed	10 FID	NA	open	300 FID	65	open	230 FID	65	open	440 FID	64
11-02-94	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
12-15-95	open	NA	32	open	2.1 FID	35	closed	NA	NA	open	>1000 FID	34
12-30-94	passive	NA	NA	passive	NA	NA	passive	NA	NA	open	679 PID	16
01-13-95	passive	NA	15	passive	NA	0	passive	NA	0	open	463 PID	16
01-26-95	passive	NA	27	passive	NA	0	passive	NA	0	open	1.8 FID	30
03-31-95	System was shut down on January 26, 1995											

TVHG: concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O: inches of water
open: open to the system
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
FID: TVHG concentration was measured with a portable flame ionization detector
LAB: TVHG concentration was analyzed in the laboratory
PID: TVHG concentration was measured with a portable photoionization detector

Table 6
Soil-Vapor Extraction Well Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Date	Well Identification											
	AV-5			AV-6			AV-7			AR-2		
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
06-02-94	open	13,680 FID	11	open	13,650 FID	12	open	13,690 FID	10	open	10 FID	11
06-07-94	open	13,400 FID	74	closed	40 FID	NA	open	13,800 FID	74	closed	30 FID	NA
06-16-94	open	1,250 FID	56	closed	240 FID	0	open	3,200 FID	56	closed	0 FID	0
06-22-94	open	600 FID	82	open	70 FID	26	open	1,800 FID	82	open	20 FID	22
06-30-94	open	1,180 FID	33	open	10 FID	20	open	2,200 FID	69	open	0 FID	13
07-15-94	open	2,120 FID	64	closed	200 FID	NA	open	2,000 FID	64	closed	15 FID	NA
07-15-94	open	9,150 FID	72	closed	760 FID	NA	open	8,200 FID	74	closed	20 FID	NA
07-20-94	open	1,200 FID	78	closed	20 FID	NA	open	2,100 FID	78	closed	200 FID	NA
08-01-94	open	2,560 FID	68 - 73	closed	160 FID	68 - 73	open	800 FID	68 - 73	closed	30 FID	68 - 73
08-15-94	open	1,100 FID	72	open	160 FID	26	open	80 FID	73	open	130 FID	30
09-13-94	open	40 FID	59	open	10 FID	20	open	20 FID	50	closed	500 FID	66
11-02-94	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
12-15-94	closed	NA	NA	open	310 FID	11	closed	NA	NA	closed	NA	NA
12-30-94	passive	NA	NA	open	42 PID	16	passive	NA	NA	passive	NA	NA
01-13-95	passive	NA	1	open	46 PID	16	passive	NA	0	passive	NA	0
01-26-95	open	2.2 FID	30	open	2.3 FID	30	passive	NA	0	passive	NA	0
03-31-95	System was shut down on January 26, 1995											

TVHG: concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O: inches of water
open: open to the system
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
FID: TVHG concentration was measured with a portable flame ionization detector
LAB: TVHG concentration was analyzed in the laboratory
PID: TVHG concentration was measured with a portable photoionization detector

Table 6
Soil-Vapor Extraction Well Data

ARCO Service Station 2169
889 West Grand Avenue, Oakland, CA

Date: 08-17-95
Project Number: 0805-129.02

Date	Well Identification											
	ADR-1			ADR-2								
	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O	Valve Position	TVHG ppmv	Vacuum Response in-H2O
06-02-94	open	7,000 FID	11	open	460 FID	13						
06-07-94	open	14,160 FID	73	open	11,910 FID	75						
06-16-94	open	5,400 FID	54	open	5,400 FID	57						
06-22-94	open	2,550 FID	80	open	2,700 FID	83						
06-30-94	open	4,000 FID	67	open	4,300 FID	69						
07-15-94	open	4,010 FID	64	open	2,150 FID	64						
07-15-94	open	7,850 FID	72	open	9,530 FID	93						
07-20-94	open	2,800 FID	78	open	3,500 FID	75						
08-01-94	open	5,100 FID	68 - 73	open	4,250 FID	68 - 73						
08-15-94	open	1,500 FID	72	open	1,800 FID	75						
09-13-94	open	250 FID	58	open	440 FID	66						
11-02-94	closed	NA	NA	closed	NA	NA						
12-15-94	open	>1000 FID	35	open	>1000 FID	36						
12-30-94	open	39 PID	16	open	273 PID	16						
01-13-95	open	58 PID	16	open	160 PID	16						
01-26-95	open	2.2 FID	30	open	4.4 FID	30						
03-31-95	System was shut down on January 26, 1995											

TVHG: concentration of total volatile hydrocarbons as gasoline
ppmv: parts per million by volume
in-H2O: inches of water
open: open to the system
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
FID: TVHG concentration was measured with a portable flame ionization detector
LAB: TVHG concentration was analyzed in the laboratory
PID: TVHG concentration was measured with a portable photoionization detector

Table 7
Air-Sparge System
Operation and Performance Data

Facility Number: 2169				Air-Sparge Unit: 3-horse power	
Location: 889 West Grand Avenue					Conde blower
Oakland, California					
Consultant: EMCON				Start-Up Date: 07-15-94	
1921 Ringwood Avenue				Reporting Period From: 07-15-94	
San Jose, California				To: 06-28-95	
Date Begin:	07-15-94	08-01-94	08-01-94	08-01-94	08-15-94
Date End:	08-01-94	08-01-94	08-01-94	08-15-94	09-13-94
Days of Operation:	5.5	0.0	0.1	7.2	10.0
Days of Downtime:	10.5	0.0	0.0	6.8	18.7
Air-Sparge Well Status:					
AS-1	open	open	open	open	open
AS-2	open	open	open	open	open
AS-3	open	open	open	open	open
AS-4	open	open	open	open	open
AS-5	open	open	open	open	open
Air-Sparge Well Pressure (psig) (1):					
AS-1	2.8	2.8	3.0	2.0	2.4
AS-2	3.0	3.0	2.8	2.2	2.4
AS-3	3.6	3.6	3.8	3.1	2.2
AS-4	3.1	3.1	3.4	3.0	2.8
AS-5	2.8	2.8	3.2	2.8	3.2
Total Air-Sparge Flow Rate (scfm) (2):	25.0	29.0	29.0	27.0	29.0
Total Air-Sparge Pressure (psig):	5.0	2.8	2.8	2.6	3.0
Dissolved Oxygen (mg/L) (3):					
Air-Sparge Wells:					
AS-1	NA (4)	NA	NA	NA	NA
AS-2	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA
AS-4	NA	NA	NA	NA	NA
AS-5	NA	NA	NA	NA	NA
Depth to Water (ft-BGS) (5):					
Air-Sparge Wells:					
AS-1	NA	NA	NA	NA	NA
AS-2	NA	NA	NA	NA	NA
AS-3	NA	NA	NA	NA	NA
AS-4	NA	NA	NA	NA	NA
AS-5	NA	NA	NA	NA	NA

Table 7
Air-Sparge System
Operation and Performance Data

Facility Number: 2169
Location: 889 West Grand Avenue
Oakland, California

Air-Sparge Unit: 3-horse power
Conde blower

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Start-Up Date: 07-15-94
Reporting Period From: 07-15-94
To: 06-28-95

Date Begin:	09-13-94	11-28-94	01-03-95	02-03-95	03-31-95
Date End:	11-28-94	01-03-95	02-03-95	03-31-95	06-28-95
Days of Operation:	0.0	0.0	0.0	0.0	0.0
Days of Downtime:	76.0	36.0	31.0	56.0	89.0
Air-Sparge Well Status:					
AS-1	closed	closed	closed	closed	closed
AS-2	closed	closed	closed	closed	closed
AS-3	closed	closed	closed	closed	closed
AS-4	closed	closed	closed	closed	closed
AS-5	closed	closed	closed	closed	closed
Air-Sparge Well Pressure (psig) (1):					
AS-1	0.0	0.0	0.0	0.0	0.0
AS-2	0.0	0.0	0.0	0.0	0.0
AS-3	0.0	0.0	0.0	0.0	0.0
AS-4	0.0	0.0	0.0	0.0	0.0
AS-5	0.0	0.0	0.0	0.0	0.0
Total Air-Sparge Flow Rate (scfm) (2):	0.0	0.0	0.0	0.0	0.0
Total Air-Sparge Pressure (psig):	0.0	0.0	0.0	0.0	0.0
Dissolved Oxygen (mg/L) (3):					
Air-Sparge Wells:					
AS-1	1.4	NA	NA	NA	NA
AS-2	1.2	NA	NA	NA	NA
AS-3	1.2	NA	NA	NA	NA
AS-4	0.8	NA	NA	NA	NA
AS-5	1.4	NA	NA	NA	NA
Depth to Water (ft-BGS) (5):					
Air-Sparge Wells:					
AS-1	10.55	NA	NA	8.79	NA
AS-2	11.29	NA	NA	9.37	NA
AS-3	10.78	NA	NA	8.93	NA
AS-4	10.27	NA	NA	8.43	NA
AS-5	10.65	NA	NA	8.80	NA

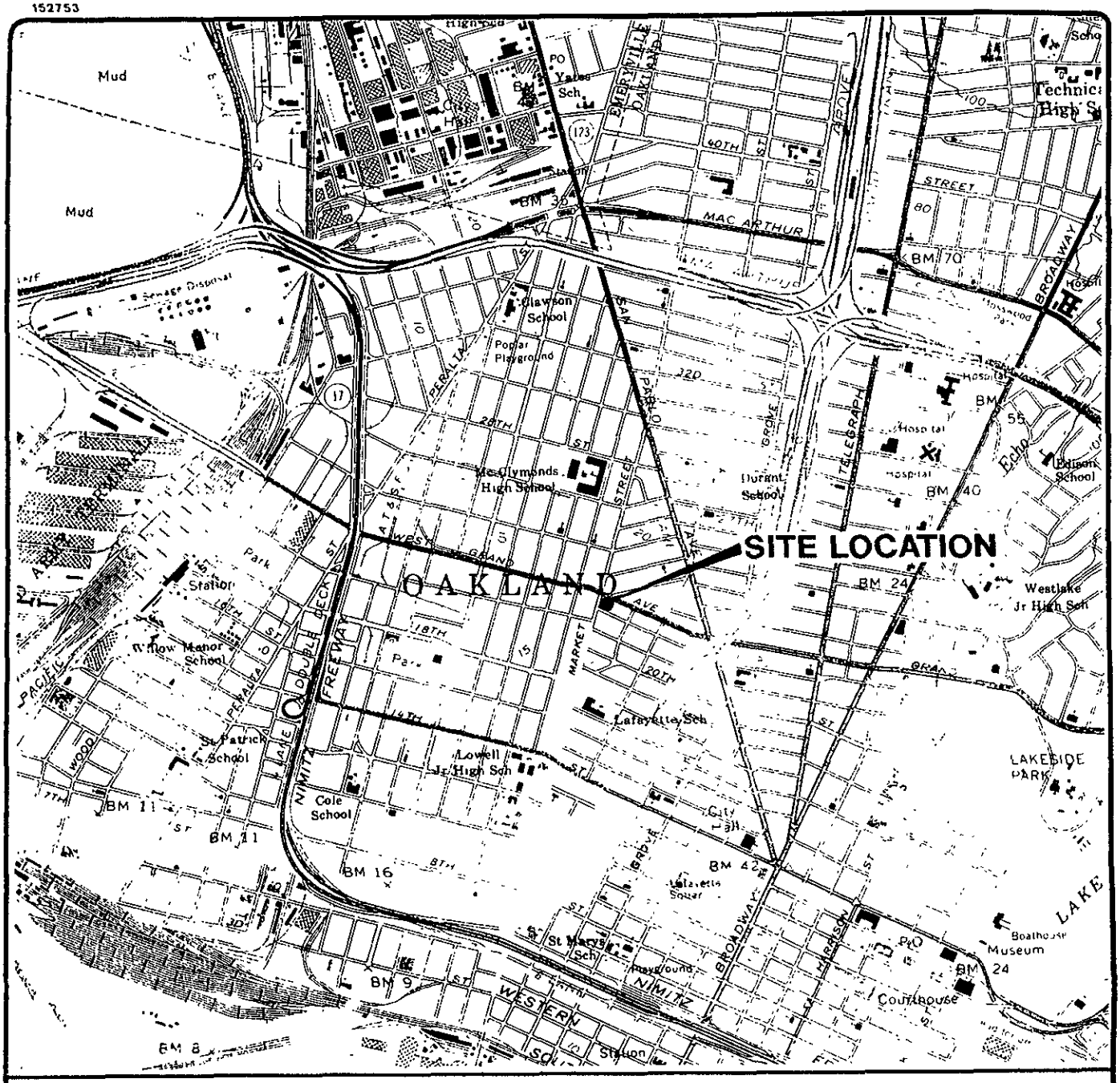
Table 7
Air-Sparge System
Operation and Performance Data

Facility Number:	2169	Air-Sparge Unit:	3-horse power Conde blower
Location:	889 West Grand Avenue Oakland, California		
Consultant:	EMCON 1921 Ringwood Avenue San Jose, California	Start-Up Date: Reporting Period From: To:	07-15-94 07-15-94 06-28-95

CURRENT REPORTING PERIOD:	03-31-95	to	06-28-95
DAYS / HOURS IN PERIOD:	89.0	2136	
DAYS / HOURS OF OPERATION:	0.0	0	
DAYS / HOURS OF DOWN TIME:	89.0	2136	
PERCENT OPERATIONAL:		0.0%	

1. psig: pounds per square inch gauge
2. scfm: standard cubic feet per minute at 14.7 psi and 70° F
3. mg/L: milligrams per liter
4. NA: not available or not analyzed
5. ft-BGS: feet below grade surface

152753

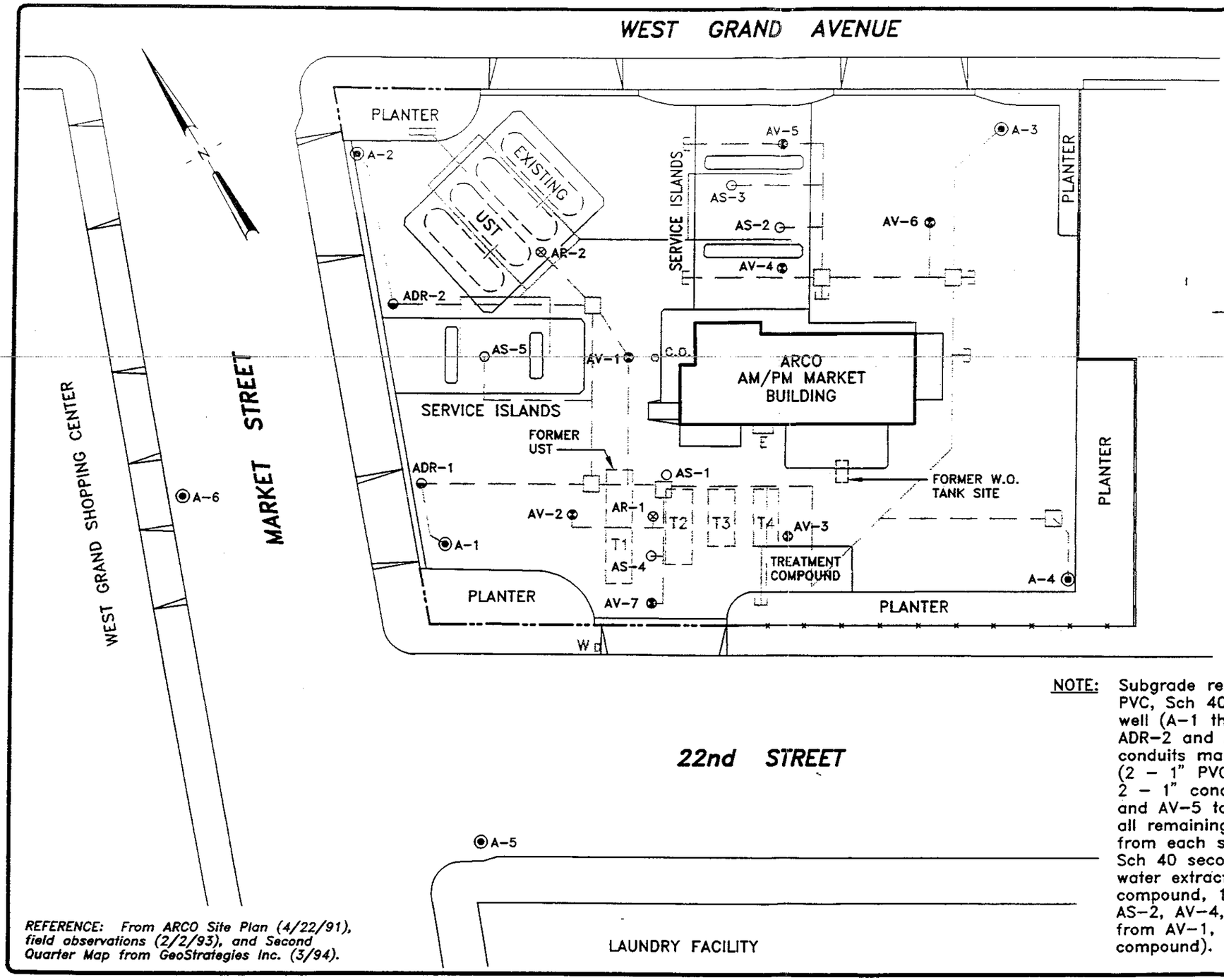


EMCON

ARCO PRODUCTS COMPANY
SERVICE STATION 2169, 889 WEST GRAND AVE.
QUARTERLY GROUNDWATER MONITORING
OAKLAND, CALIFORNIA

SITE LOCATION

FIGURE
1
PROJECT NO.
805-129.02



EXPLANATION

- Groundwater monitoring well
- Groundwater recovery well
- Vapor extraction well
- Groundwater recovery/vapor extraction well
- Air sparging well
- Junction box
- Centerline of trench carrying subgrade remediation piping (See note below)
- Stub-out (pipes capped below grade). A brass monument marker exists above the stub-out location
- C.O. Sewer clean out
- E Existing electrical panel
- W Water meter

Wells A-1, A-2, A-3, A-4, and AR-2 also serve as vapor extraction wells.

NOTE: Subgrade remediation piping consists of individual 2" PVC, Sch 40 vapor lines from each vapor extraction well (A-1 through A-4, AV-1 through AV-7, ADR-1, ADR-2 and AR-2), two 1" PVC Sch 40 electrical conduits manifolded to each well and stubout location (2 - 1" PVC elec. conduits from A-4 to compound, 2 - 1" conduits from A-3, AV-6, AV-4, AS-2, AS-3 and AV-5 to compound, and 2 - 1" conduits connecting all remaining wells), a 2" Sch 80 PVC air sparge pipe from each sparge well to the compound and a 4" PVC Sch 40 secondary containment pipe for future groundwater extraction (1 - 4" pipe from A-4 to manifold compound, 1 - 4" manifold pipe from AV-5, AS-3, AS-2, AV-4, AV-6 and A-3 to compound, 1 - 4" pipe from AV-1, AS-1, AV-3 and one from other wells to compound).

REFERENCE: From ARCO Site Plan (4/22/91), field observations (2/2/93), and Second Quarter Map from GeoStrategies Inc. (3/94).

EMCON

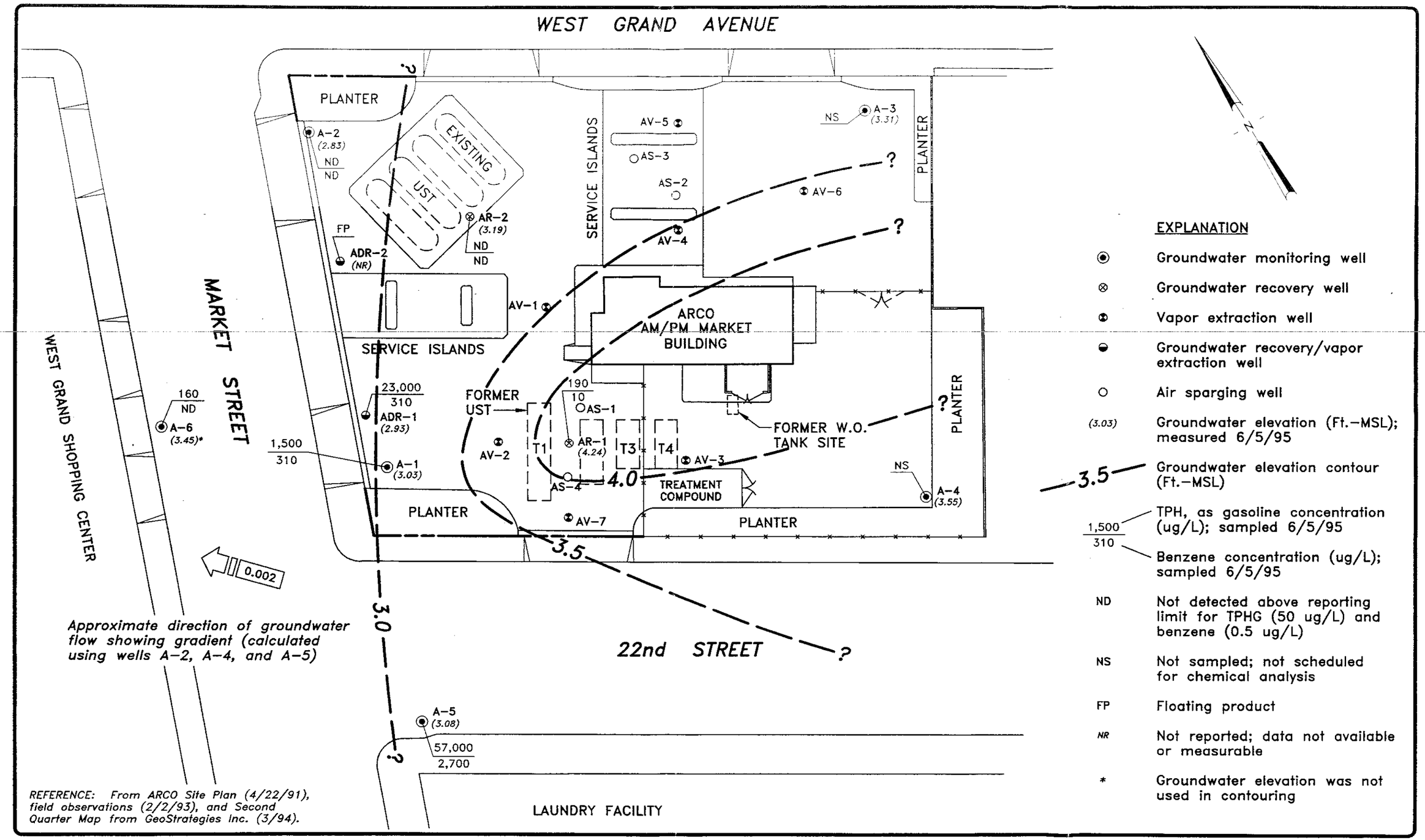
SCALE: 0 40 80 FEET

ARCO PRODUCTS COMPANY
SERVICE STATION 2169, 889 WEST GRAND AVENUE
OAKLAND, CALIFORNIA

SITE PLAN

FIGURE NO. 2

PROJECT NO. 805-129.02



EMCON

SCALE: 0 40 80 FEET

ARCO PRODUCTS COMPANY
SERVICE STATION 2169, 889 WEST GRAND AVENUE
QUARTERLY GROUNDWATER MONITORING
OAKLAND, CALIFORNIA

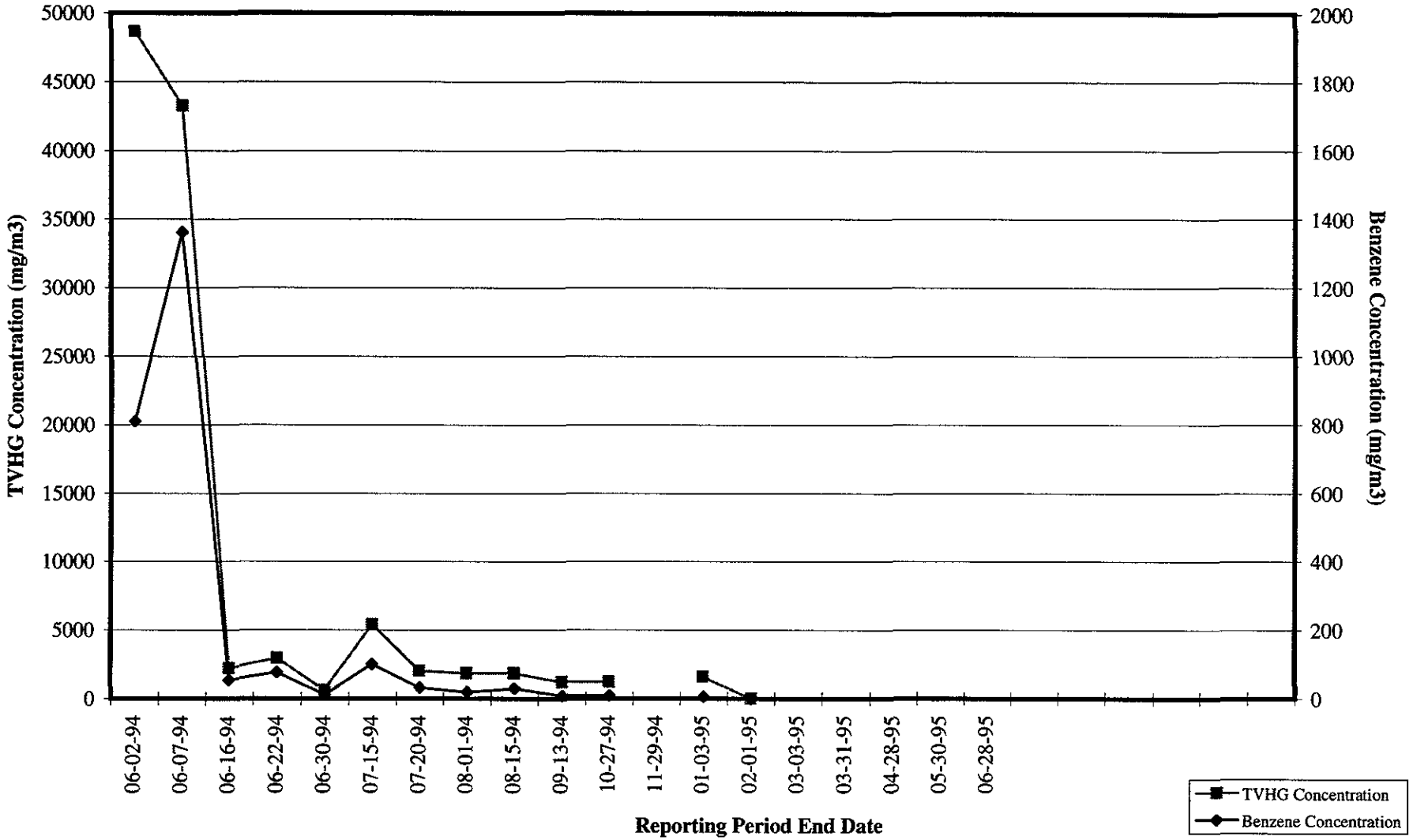
GROUNDWATER DATA
SECOND QUARTER 1995

FIGURE NO.
3

PROJECT NO.
805-129.02

Figure 4

ARCO Service Station 2169
Soil-Vapor Extraction and Treatment System
Historical System Influent TVHG and Benzene Concentrations



mg/m3: milligrams per cubic meter
TVHG: total volatile hydrocarbons as gasoline

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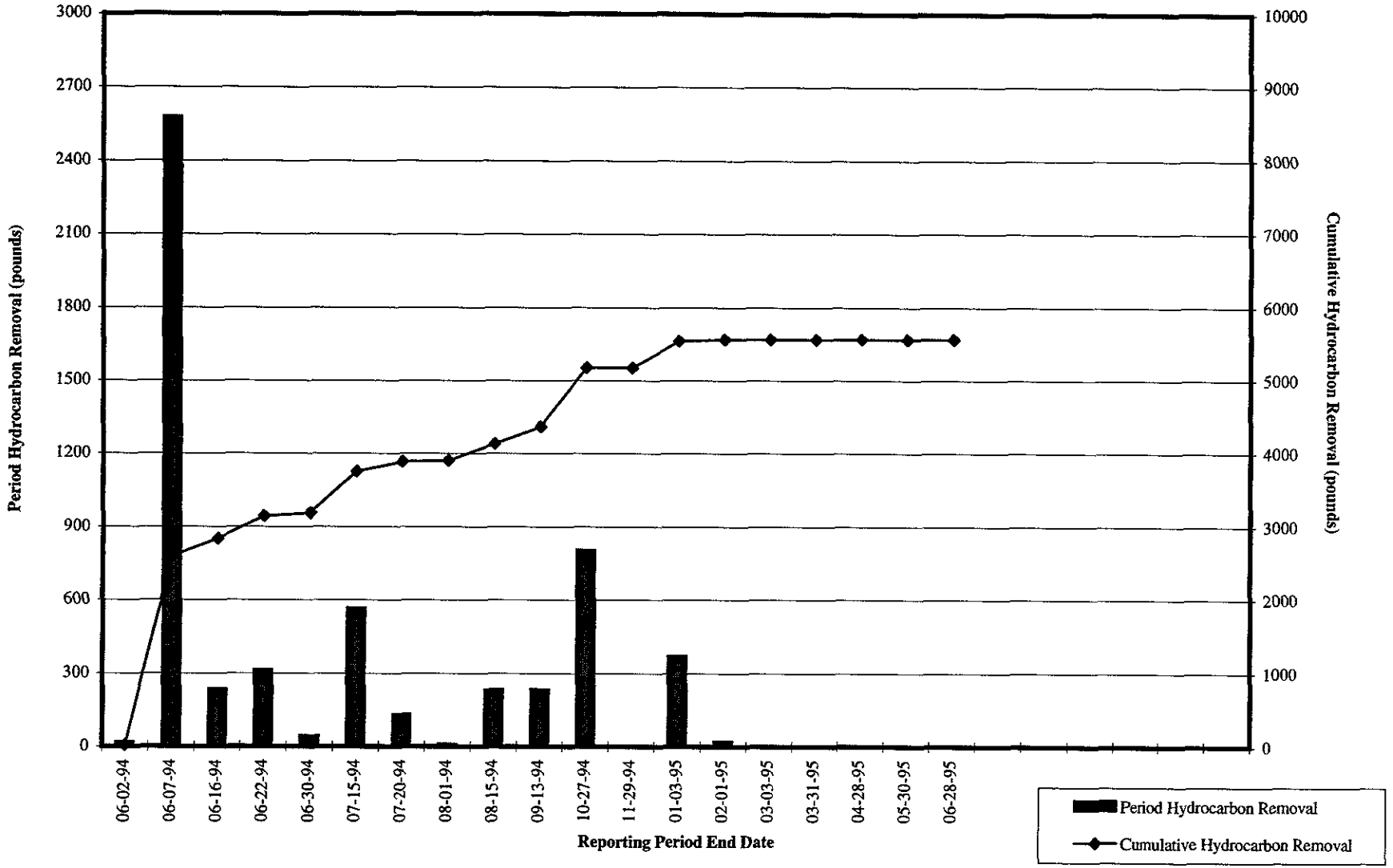
0805-129.02

Figure 5

ARCO Service Station 2169
Soil-Vapor Extraction and Treatment System
Historical Hydrocarbon Removal Rates



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0805-129.02

APPENDIX A

FIELD DATA SHEETS, SECOND QUARTER 1995 GROUNDWATER MONITORING EVENT

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 1775-235.01 STATION ADDRESS : 899 West Grand Avenue DATE : 6/5/95

ARCO STATION # : 2169 FIELD TECHNICIAN : M. ROSS DAY : MONDAY

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	A-2	OK	~~YES~~	Yes	NONE	NO	11.72	11.72	NA	NA	25.2	WATER IN BOX
2	A-3	OK	~~YES~~	~~YES~~ NO	NONE	NO	12.44	12.44	NA	NA	29.0	WATER IN BOX
3	A-4	OK	Yes	NO	NONE	NO	11.70	11.70	NA	NA	28.4	
4	AR-2	OK	Yes	NO	NONE	NO	12.09	12.09	NA	NA	29.1	
5	A-6	~~OK~~	Yes	NO	~~YES~~	Yes	10.06	10.06	NA	NA	27.7	
6	AR-1	OK	Yes	Yes	NONE	NO	11.37	11.37	NA	NA	28.0	WATER IN BOX
7	A-1	OK	Yes	Yes	NO	NO	11.13	11.13	NA	NA	24.4	WATER IN BOX
8	A-5	OK	Yes	NO	~~NO~~	Yes	10.43	10.43	NA	NA	30.8	WATER IN BOX
9	ADR-1	OK	Yes	Yes	NO	NO	11.02	11.02	NA	NA	21.5	
10	ADR-2	OK	Yes	NO	NO	NO	11.45	11.45	11.5	3.0	24.5	

SURVEY POINTS ARE TOP OF WELL CASINGS

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-235.01 SAMPLE ID: A-1

PURGED BY: McROSS CLIENT NAME: AMES 2169

SAMPLED BY: McROSS LOCATION: OAKLAND, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ✓ 4 ___ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL):	NA	VOLUME IN CASING (gal.):	4.86
DEPTH TO WATER (feet):	11.13	CALCULATED PURGE (gal.):	14.59
DEPTH OF WELL (feet):	24.4	ACTUAL PURGE VOL. (gal.):	15.0

DATE PURGED: 6/5/95 Start (2400 Hr) 1446 End (2400 Hr) 1445

DATE SAMPLED: 6/5/95 Start (2400 Hr) 1455 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1447	5.0	7.11	1644	67.5	Light Brn	Mod
1448	10.0	6.95	1670	69.4	"	"
1449	15.0	7.02	1663	69.0	"	"

D. O. (ppm): NA ODOR: Slight

COLOR (visual): NA (COBALT 0 - 500)

TURBIDITY (visual): NA (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
✓ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: NONE

REMARKS: ___

Meter Calibration: Date: 6/5/95 Time: 1215 Meter Serial #: 9210 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: A-2

Signature: Mike Ross Reviewed By: SF Page 1 of 8

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-235.01 SAMPLE ID: A-2

PURGED BY: M. Ross CLIENT NAME: ARCO 2169

SAMPLED BY: M. Ross LOCATION: OAKLAND, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ✓ 4 ___ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): 4.94

DEPTH TO WATER (feet): 11.72 CALCULATED PURGE (gal.): 14.82

DEPTH OF WELL (feet): 25.2 ACTUAL PURGE VOL. (gal.): 15.0

DATE PURGED: 6/5/95 Start (2400 Hr) 1217 End (2400 Hr) 1220

DATE SAMPLED: 6/5/95 Start (2400 Hr) 1230 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1218	5.0	6.11	1107	69.4	Light Brn	Mod
1219	10.0	6.47	10.66	69.8	"	"
1220	15.0	6.52	1099	69.5	"	"

D. O. (ppm): NA ODOR: NONE

COLOR (COBALT 0 - 500): NA

TURBIDITY (NTU 0 - 200 or 0 - 1000): NA

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
✓ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: NONE

REMARKS: ___

Meter Calibration: Date: 6/5/95 Time: 1215 Meter Serial #: 9210 Temperature °F: 76.5

(EC 1000 913 / 1000) (DI —) (pH 7 688 / 752) (pH 10 994 / 1000) (pH 998 / —)

Location of previous calibration: —

Signature: Mitch Ross Reviewed By: SF Page 2 of 8

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-235.01 SAMPLE ID: A-5

PURGED BY: M. ROSS CLIENT NAME: AREO 2169

SAMPLED BY: M. ROSS LOCATION: OAKLAND, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ✓ 3 ___ 4 ___ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): 3.19

DEPTH TO WATER (feet): 10.43 CALCULATED PURGE (gal.): 9.58

DEPTH OF WELL (feet): 30.80 ACTUAL PURGE VOL. (gal.): 10.0

DATE PURGED: 6/5/95 Start (2400 Hr) 1509 End (2400 Hr) 1518

DATE SAMPLED: 6/5/95 Start (2400 Hr) 1525 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1513	3.5	7.30	1129	66.4	Light Brown	Mod
1516	7.0	7.14	1121	66.5	"	Trace
1518	10.0	7.19	1125	66.3	"	"

D. O. (ppm): NA ODOR: Slight

COLOR (visual): NA (COBALT 0 - 500)

TURBIDITY (visual): NM (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
___ Centrifugal Pump	✓ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: GOOD LOCK #: 3283

REMARKS: ___

Meter Calibration: Date: 6/5/95 Time: 1215 Meter Serial #: 9210 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: A-2

Signature: Mike Kopa Reviewed By: SH Page 3 of 8

.49

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-235.01 SAMPLE ID: A-6

PURGED BY: M. Ross CLIENT NAME: ARCO 2169

SAMPLED BY: M. Ross LOCATION: OAKLAND, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ✓ 3 ___ 4 ___ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL):	NA	VOLUME IN CASING (gal.):	2.88
DEPTH TO WATER (feet):	10.06	CALCULATED PURGE (gal.):	8.64
DEPTH OF WELL (feet):	27.7	ACTUAL PURGE VOL. (gal.):	9.0

DATE PURGED: 6/5/95 Start (2400 Hr) 1323 End (2400 Hr) 1557

DATE SAMPLED: 6/5/95 Start (2400 Hr) 1545 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1328	3.0	7.02	1199	69.7	BRN	Heavy
1332	6.0	7.19	1189	68.6	"	"
1337	9.0	7.27	1187	68.7	"	"

D. O. (ppm): NA ODOR: None

COLOR: NA (COBALT 0 - 500)

TURBIDITY: NA (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
___ Centrifugal Pump	✓ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: 3283

REMARKS: ___

Meter Calibration: Date: 6/5/95 Time: 1215 Meter Serial #: 9210 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: A-2

Signature: Mike Ross Reviewed By: SK Page 4 of 8

Rev. 3, 2/94 (7)

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-235.01 SAMPLE ID: MW-1

PURGED BY: M. Ross CLIENT NAME: ARCO 2169

SAMPLED BY: M. Ross LOCATION: OAKLAND, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ___ 4.5 ___ 6 ✓ Other ___

CASING ELEVATION (feet/MSL):	NA	VOLUME IN CASING (gal.):	24.47
DEPTH TO WATER (feet):	11.37	CALCULATED PURGE (gal.):	73.35
DEPTH OF WELL (feet):	28.20	ACTUAL PURGE VOL. (gal.):	48.0

DATE PURGED: 6/5/95 Start (2400 Hr) 1404 End (2400 Hr) 1409

DATE SAMPLED: 6/5/95 Start (2400 Hr) 1415 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1407	24.5	7.72	1301	69.9	Blk	Heavy
1409	—	Dry at 48.0 gallons				
1415	Discharge	7.97	1266	69.4	Light Brn	Mod

D. O. (ppm): NA ODOR: None

(COLOR: COBALT 0 - 500) N/A

(TURBIDITY: NTU 0 - 200 or 0 - 1000) NA

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
✓ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: None

REMARKS: Dry at 48.0 gallons

Meter Calibration: Date: 6/5/95 Time: 1215 Meter Serial #: 9210 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: A-2

Signature: [signature] Reviewed By: SK Page 5 of 8

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-235.01 SAMPLE ID: AR-2

PURGED BY: M. Ross CLIENT NAME: ARCO 2169

SAMPLED BY: M. Ross LOCATION: OAKLAND, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ✓ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL):	NA	VOLUME IN CASING (gal.):	11.11
DEPTH TO WATER (feet):	12.09	CALCULATED PURGE (gal.):	33.33
DEPTH OF WELL (feet):	29.1	ACTUAL PURGE VOL. (gal.):	33.5

DATE PURGED: 6/5/95 Start (2400 Hr) 1245 End (2400 Hr) 1254

DATE SAMPLED: 6/5/95 Start (2400 Hr) 1305 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1246	11.5	7.91	1022	68.4	BRN	MOD
1250	22.5	7.56	913	68.1	LIGHT BRN	TRACE
1254	33.5	7.50	973	68.4	"	"

D. O. (ppm): NA ODOR: NONE

COLOR (COBALT 0 - 500): NA

TURBIDITY (NTU 0 - 200 or 0 - 1000): NA

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
✓ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: NONE

REMARKS: ___

Meter Calibration: Date: 6/5/95 Time: 1215 Meter Serial #: 9210 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: A-2

Signature: Mike Ross Reviewed By: SH Page 6 of 8

1.84

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1175-235.01 SAMPLE ID: ADR-1

PURGED BY: M. ROSS CLIENT NAME: ARCO 2169

SAMPLED BY: M. ROSS LOCATION: OAKLAND, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ✓ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL):	NA	VOLUME IN CASING (gal.):	6.84
DEPTH TO WATER (feet):	11.02	CALCULATED PURGE (gal.):	20.54
DEPTH OF WELL (feet):	21.5	ACTUAL PURGE VOL. (gal.):	21.0

DATE PURGED: 6/5/95 Start (2400 Hr) 1540 End (2400 Hr) 1547

DATE SAMPLED: 6/5/95 Start (2400 Hr) 1555 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1543	7.0	6.94	1639	67.9	GREY	Heavy
1545	14.0	6.98	1678	69.4	Light GREY	Med
1547	21.0	6.91	1692	70.1	"	"

D. O. (ppm): NA ODOR: Slight

COLOR (COBALT 0 - 500): NA

TURBIDITY (NTU 0 - 200 or 0 - 1000): NA

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	✓ Bailer (Teflon®)
✓ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: GOOD LOCK #: 3283

REMARKS: SHEEN NOTICED IN BUCKET WHILE PURGING.

Meter Calibration: Date: 6/5/95 Time: 1215 Meter Serial #: 9210 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: A-7

Signature: Mike Ross Reviewed By: Sit

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 1775-235.01 SAMPLE ID: ADR-2

PURGED BY: M. Ross CLIENT NAME: ARCO 2169

SAMPLED BY: M. Ross LOCATION: OAKLAND, CA

TYPE: Ground Water ✓ Surface Water ___ Treatment Effluent ___ Other ___

CASING DIAMETER (inches): 2 ___ 3 ___ 4 ✓ 4.5 ___ 6 ___ Other ___

CASING ELEVATION (feet/MSL): NA VOLUME IN CASING (gal.): NA

DEPTH TO WATER (feet): 11.45 CALCULATED PURGE (gal.): NA

DEPTH OF WELL (feet): 24.5 ACTUAL PURGE VOL. (gal.): NA

DATE PURGED: NA Start (2400 Hr) NA End (2400 Hr) NA

DATE SAMPLED: NA Start (2400 Hr) NA End (2400 Hr) NA

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
	WELL CONTAINED ≈ 3.0' OF PRODUCT.					
	DID NOT		SAMPLE			

D. O. (ppm): NA ODOR: STRONG

COLOR (visual): NA (COBALT 0 - 500)

TURBIDITY (visual): NA (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NA

Parameters field filtered at this well: NA

PURGING EQUIPMENT

___ 2" Bladder Pump ___ Bailer (Teflon®)
___ Centrifugal Pump ___ Bailer (PVC)
___ Submersible Pump ___ Bailer (Stainless Steel)
___ Well Wizard™ ___ Dedicated
Other: NA

SAMPLING EQUIPMENT

___ 2" Bladder Pump ___ Bailer (Teflon®)
___ DDL Sampler ___ Bailer (Stainless Steel)
___ Dipper ___ Submersible Pump
___ Well Wizard™ ___ Dedicated
Other: NA

WELL INTEGRITY: GOOD LOCK #: NONE

REMARKS: WELL CONTAINED PRODUCT DID NOT SAMPLE.

Meter Calibration: Date: 6/5/95 Time: 1215 Meter Serial #: 7210 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: A-2

Signature: Mike Ross Reviewed By: SH Page 8 of 8

APPENDIX B

ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY DOCUMENTATION FOR GROUNDWATER MONITORING SAMPLES, SECOND QUARTER 1995

Columbia Analytical Services inc.

June 20, 1995 Service Request No. S950705

John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: **ARCO Facility No. 2169 / EMCON Project No. 0805-129.02**

Dear Mr. Young:

Attached are the results of the water sample(s) submitted to our lab on June 6, 1995. For your reference, these analyses have been assigned our service request number S950705.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Steven L. Green
Project Chemist

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

001

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
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
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is 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
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 MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON	**Service Request:**	S950705
Project:	ARCO Facility No. 2169/EMCON Project No.0805-129.02	**Date Collected:**	6/5/95
Sample Matrix:	Water	**Date Received:**	6/6/95
		Date Extracted:	NA
		Date Analyzed:	6/15-16/95

BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Analyte:	**TPH as Gasoline**	**Benzene**	**Toluene**	**Ethyl-benzene**	**Xylenes, Total**
Units:	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)
Method Reporting Limit:	50	0.5	0.5	0.5	0.5
Sample Name	**Lab Code**				
A-2 (25)	S950705-001	ND	ND	ND	ND	ND
AR-2 (29)	S950705-002	ND	ND	ND	ND	ND
A-6 (27)	S950705-003	160	ND	<0.6*	ND	ND
AR-1 (28)	S950705-004	190	10	ND	0.8	0.5
A-1 (24)	S950705-005	1,500	310	27	36	76
A-5 (30)	S950705-006	57,000	2,700	4,600	1,500	6,800
ADR-1 (21)	S950705-007	23,000	310	420	300	1,900
Method Blank	S950615-WB1	ND	ND	ND	ND	ND
Method Blank	S950616-WB1	ND	ND	ND	ND	ND

* Raised MRL due to matrix interference.

Approved By: _____ Date: 6/20/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON	**Service Request:**	S950705
Project:	ARCO Facility No. 2169/EMCON Project No.0805-129.02	**Date Collected:**	6/5/95
Sample Matrix:	Water	**Date Received:**	6/6/95
		Date Extracted:	NA
		Date Analyzed:	6/15/95

Matrix Spike/Duplicate Matrix Spike Summary
BTE
EPA Methods 5030/8020
Units: ug/L (ppb)

Sample Name: A-5 (30)
Lab Code: S950705-006

	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
Analyte	MS	DMS	**Result**	MS	DMS	MS	DMS	Limits	**Difference**
Benzene	5,000	5,000	2,690	7,360	7,470	93	96	75-135	1
Toluene	5,000	5,000	4,600	9,040	9,280	89	94	73-136	3
Ethylbenzene	5,000	5,000	1,480	6,100	6,260	92	96	69-142	3

Approved By: _____ Date: 6/19/95

DMS1S/060194
950705 XLS - wBtems 6/20/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON
Project: ARCO Facility No. 2169/EMCON Project No.0805-129.02
Sample Matrix: Water

Service Request: S950705
Date Collected: 6/5/95
Date Received: 6/6/95
Date Extracted: NA
Date Analyzed: 6/15-16/95

Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Lab Code	Percent Recovery α,α,α-Trifluorotoluene
A-2 (25)	S950705-001	94
AR-2 (29)	S950705-002	93
A-6 (27)	S950705-003	97
AR-1 (28)	S950705-004	102
A-1 (24)	S950705-005	94
A-5 (30)	S950705-006	97
ADR-1 (21)	S950705-007	99
A-5 (30) (MS)	S950705-006MS	98
A-5 (30) (DMS)	S950705-006DMS	96
Method Blank	S950615-WB1	95
Method Blank	S950616-WB1	91

CAS Acceptance Limits: 69-116

Approved By: Steven Green Date: 6/20/95

SUR1/062994
950705 XLS - GBTX SrW 6/20/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON
Project: ARCO Facility No. 2169/EMCON Project No.0805-129.02

Service Request: S950705
Date Analyzed: 6/15/95

Initial Calibration Verification (ICV) Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppb

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	24.5	98	85-115
Toluene	25	23.3	93	85-115
Ethylbenzene	25	23.9	96	85-115
Xylenes, Total	75	68.7	92	85-115
Gasoline	250	247	99	90-110

Approved By: Steven Green Date: 6/20/95

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON
Project: ARCO Products Company #2169/#0805-129.02
Sample Matrix: Water

Service Request: L952522
Date Collected: 6/5/95
Date Received: 6/7/95
Date Extracted: 6/8/95

Total Petroleum Hydrocarbons as Diesel
EPA Methods 3510/8015M/California DHS LUFT Method
Units: µg/L (ppb)

Sample Name	Lab Code	Date Analyzed	MRL	Result
AR-2 (29)	L952522-001	6/8/95	50	ND
AR-1 (28)	L952522-002	6/8/95	50	580*
A-1 (24)	L952522-003	6/8/95	50	710*
ADR-1 (21)	L952522-004	6/8/95	50	13000*
Method Blank	L952522-MB	6/8/95	50	ND

* Chromatogram fingerprint is not characteristic of diesel; however, hydrocarbons in the gasoline range were detected at the reported concentration.

Approved By: Eydie Schwartz Date: 6/12/95

IAMRLB/071594
L952522 XLS - 8015a 6/12/95

6925 CANOGA AVENUE ■ CANOGA PARK, CA 91303 ■ 818 587-5550 ■ FAX 818 587-5555

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON	**Service Request:**	L952522
Project:	ARCO Products Company #2169/#0805-129.02	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
		Date Extracted:	NA
		Date Analyzed:	NA

Surrogate Recovery Summary
Total Petroleum Hydrocarbons as Diesel
EPA Methods 3510/8015M/California DHS LUFT Method

Sample Name	**Lab Code**	**Percent Recovery** *p*-Terphenyl
AR-2 (29)	L952522-001	87
AR-1 (28)	L952522-002	78
A-1 (24)	L952522-003	83
ADR-1 (21)	L952522-004	80
Method Blank	L952522-MB	70

CAS Acceptance Limits: 50-140

Approved By: Eydie Schwartz Date: 6/12/95

SUR1/062994
L952522.XLS - 8015srbds 6/12/95

6925 CANOGA AVENUE ■ CANOGA PARK, CA 91303 ■ 818 587-5550 ■ FAX 818 587-5555

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON	**Service Request:**	L952522
Project:	ARCO Products Company #2169/#0805-129.02	**Date Collected:**	NA
LCS Matrix:	Water	**Date Received:**	NA
		Date Extracted:	6/8/95
		Date Analyzed:	6/9/95

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary*
Total Petroleum Hydrocarbons as Diesel
EPA Methods 3510/8015M/California DHS LUFT Method
Units: µg/L (ppb)

	True Value		Result		Percent Recovery			
Analyte	LCS	DLCS	LCS	DLCS	LCS	DLCS	CAS Acceptance Limits	**Relative Percent Difference**
Diesel	2000	2000	1960	1950	98	98	70-140	<1

* Sample quantity was insufficient to perform matrix spike and matrix spike duplicate. Three separate, replicate one liter samples are required to analyze sample and spikes.

Approved By: Cydie Schwartz Date: 6/12/95

DI.CS/060194
1.952522.XLS - genlcs3 6/12/95

6925 CANOGA AVENUE ■ CANOGA PARK, CA 91303 ■ 818 587-5550 ■ FAX 818 587-5555

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 17075.00

Chain of Custody

ARCO Facility no. 2169	City (Facility) Oakland	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Mike Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 453-7300	Fax no. (Consultant) (408) 453-0452
Consultant name	Address (Consultant)		Contract number

	Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH 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 ☐		GS LAB #
1	A-2(25)		2		X		X	HCL	6/5/95	1230		X	X (GH)										
2	AR-2(24)		4		X		X	HCL		1305		X	X										1
3	A-6(27)		2		X		X	HCL		1345		X											
4	AR-1(28)		4		X		X	HCL		1415		X	X										2
5	A-1(24)		4		X		X	HCL		1455		X	X										3
6	A-5(30)		2		X		X	HCL		1525		X											
7	ADR-1(21)		4		X		X	HCL		1555		X	X										4
	ADR-2( )		4		X		X	HCL	↓			X	X	CONTAINED					PRODUCT				7
														DIN	NOT				SAMPLE				

Method of shipment: Sampler will deliver

Special detection Limit/reporting: lowest possible

TPH-D = 50 ppb

Special QA/QC: As Normal

Remarks: 2 - 40ml HCL VOAs

Add: 2 liter glass NP for AR-2, AR-1, A-1, ADR-1, ADR-2

~~40305-129,02~~

Lab number: 505-0705

Condition of sample: OK		Temperature received: 4.0	
Relinquished by sampler: Mike Whelan	Date: 6/6/95	Time: 0823	Received by: CAS-SJ
Relinquished by	Date	Time	Received by
Relinquished by: Jodie Brown CAS-SJ	Date: 6-6-95	Time: 1600	Received by laboratory: Date: 6-7-95 Time: 1230

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☒

Distribution: White copy — Laboratory, Canary copy — ARCO Environmental Engineering, Pink copy — Consultant

APC 3292 (2-91)

CAS-S: GBTEX CAS-L: TPH-D Due 6/20