



**EMCON**

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

Date February 23, 1995

Project 0805-129.01

To:

Mr. Roel Meregillano  
Alameda County Health Care Services Agency  
Department of Environmental Health  
1131 Harborbay Parkway, Suite 250  
Alameda, California 94502-6577

We are enclosing:

Copies	Description
<u>1</u>	<u>Third quarter 1994 groundwater monitoring and remediation system performance evaluation report, interim soil-vapor extraction and air-sparge systems, ARCO service station 2169, Oakland, California</u>

RECEIVED  
FEB 23 1995  
11 21 AM

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

Comments:

The enclosed groundwater monitoring and performance evaluation report is being sent to you per the request of ARCO Products Company.

*David Larsen*

David Larsen  
Project Coordinator

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



ARCO Products Company  
2000 Alameda de las Pulgas  
Mailing Address: Box 5811  
San Mateo, California 94402  
Telephone 415 571 2400



Date: February 8, 1995

Re: ARCO Station # 2169 • 889 West Grand Avenue • Oakland, CA  
Third Quarter 1994 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:

A handwritten signature in black ink that reads "Michael R. Whelan". The signature is written in a cursive style with a large, prominent 'M' and 'W'.

Michael R. Whelan  
Environmental Engineer

February 23, 1995  
Project 0805-129.02

Mr. Michael Whelan  
ARCO Products Company  
P.O. Box 5811  
San Mateo, California 94402

Re: Third quarter 1994 groundwater monitoring results and remediation system performance evaluation report, interim soil-vapor extraction and air-sparge remediation systems, ARCO service station 2169, 889 West Grand Avenue, Oakland, California

Dear Mr. Whelan:

This letter presents the results of the third quarter 1994 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**

In May 1991, GeoStrategies, Inc. (GSI), conducted a limited site assessment, which included drilling five exploratory soil borings, A-A through A-E, adjacent to the underground storage tank (UST) complex at this site.

Between January and April 1992, four USTs containing gasoline and diesel fuel, and associated product lines were removed and replaced. In March 1992, GSI installed four groundwater monitoring wells, A-1 through A-4, and one recovery well, AR-1. In June 1992, GSI installed three vapor extraction wells, AV-1, AV-2 and AV-3, and an additional groundwater extraction well, AR-2, and conducted an SVE pilot test to evaluate the feasibility of SVE as an alternative for remediating soil at the site. In July 1992, GSI conducted an aquifer pumping and recovery test to evaluate the feasibility of groundwater extraction as an alternative for remediating groundwater at the site.

In February 1993, GSI installed two off-site groundwater monitoring wells, A-5 and A-6. In September 1993, GSI installed three AS wells, AS-1, AS-2 and AS-3, two additional vapor extraction wells, AV-4 and AV-5, and two dual groundwater/vapor extraction wells, ADR-1 and ADR-2. Subsequently, in the same month, GSI conducted SVE and AS pilot tests. Between December 1993 and January 1994, GSI installed two additional vapor extraction wells, AV-6 and AV-7, and completed construction of an interim



remediation system. In June 1994, GSI initiated operation of the interim remediation system. In October 1994, ARCO transferred the site from GSI to EMCON.

## **MONITORING PROGRAM FIELD PROCEDURES AND RESULTS**

The third quarter 1994 groundwater monitoring event was performed by Integrated Wastestream Management, Inc. (IWM), on August 10, 1994. Field work performed by IWM during 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 through A-6, AR-1, AR-2, ADR-1, and ADR-2 for laboratory analysis, and (3) directing a state-certified laboratory to analyze the groundwater samples. Well ADR-2 contained floating product on August 10, 1994, and was not sampled during third quarter 1994. The results of IWM's field work were transmitted to EMCON in a report dated August 31, 1994. These data are presented in Appendix A.

## **ANALYTICAL PROCEDURES**

Groundwater samples collected during third quarter 1994 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* (USEPA, SW-846, November 1986, 3rd 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 for samples from petroleum-hydrocarbon-impacted sites in the *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites* (August 10, 1990).

## **MONITORING PROGRAM RESULTS**

Results of the third quarter 1994 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 data

for TPHG, BTEX, and TPHD analyses. Copies of the analytical results and chain-of-custody documentation for third quarter 1994 are included in Appendix B.

## **MONITORING PROGRAM EVALUATION**

Groundwater elevation data collected on August 10, 1994, indicate that groundwater beneath the site flows west-northwest at an approximate hydraulic gradient of 0.007 foot per foot. Figure 3 illustrates groundwater contours and analytical data for third quarter 1994.

Groundwater samples collected from wells A-3 and A-4 did not contain detectable concentrations of TPHG or BTEX. Groundwater samples from well A-6 contained 300 parts per billion (ppb) TPHG, but did not contain detectable concentrations of BTEX. Groundwater samples collected from wells A-1, A-2, A-5, AR-1, AR-2, and ADR-1 contained concentrations of TPHG ranging from 200 to 150,000 ppb, and concentrations of benzene ranging from 5 to 5,400 ppb. Groundwater samples collected from wells A-1, AR-1, AR-2, and ADR-1 contained concentrations of TPHD ranging from 55 to 4,800 ppb. The laboratory noted that the chromatograms for TPHD analysis on these samples do not match the typical diesel fingerprint, (hydrocarbons with lower boiling points than diesel, possibly weathered gasoline, were observed.) Well ADR-2 contained 0.10 foot of floating product and was not sampled during third quarter 1994. This represents the first event in which floating product was observed in well ADR-2 during quarterly monitoring.

## **REMEDIATION SYSTEM PERFORMANCE EVALUATION**

### **Soil-Vapor Extraction System**

**System Description.** 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 to extract 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.

**System Monitoring.** In accordance 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, located (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 above parameters, 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 air flowrate 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.

Copies of certified analytical reports for all air samples collected during third quarter 1994 are shown in Appendix C. Copies of the field data sheets for all operation and maintenance visits conducted during third quarter 1994 are shown in Appendix D.

**System Operation.** Table 4 summarizes SVE system operation and performance data from startup, June 2, 1994, to the end of this reporting period, September 13, 1994. The SVE system operated for a total of 28.2 days during the 74.7-day reporting period from June 30 to September 13, 1994 (37.8 percent operational). The SVE system was off-line during a portion of the third quarter 1994. In July 1994, worn-out belts on the SVE blower had to be replaced, causing the system to be down for several days. On two routine visits, GSI's field technician found that the breaker box that supplies power to the control panel was open and the breakers were switched off. Subsequently, GSI's field personnel installed a lock on the box to prevent this from recurring.

**Operational Status of SVE Wells.** Table 5 summarizes the operating status of the individual vapor extraction wells during third quarter 1994. To maximize hydrocarbon removal rates, vapor extraction wells were brought on-line or closed based on TVHG concentrations in extracted vapor from each well, as measured by the FID.

**Air Sample Results.** Analytical results for vapor samples collected during the third quarter 1994 were reported by the laboratory in parts per million by volume (ppmv) using a molecular weight of 65 pounds per pound-mole (lb/lb-mole) for TVHG. Copies of the certified analytical reports for all vapor samples collected during third quarter 1994 are provided in Appendix C.

TVHG concentrations in extracted vapor from wells, before fresh-air dilution, during the third quarter 1994 reporting period (June 30 to September 13, 1994) averaged 912 ppmv (2,465 milligrams per cubic meter [ $\text{mg}/\text{m}^3$ ]). TVHG concentrations in extracted vapor from the wells decreased by approximately 97.5 percent, from 18,000 ppmv at system startup on June 2, 1994, to 450 ppmv on September 13, 1994. Benzene concentrations decreased by 96 percent, from 250 ppmv at startup to 9.4 ppmv on September 13, 1994. Figure 4 depicts the changes in TVHG and benzene concentrations with time from startup of the SVE system on June 2, 1994, to September 13, 1994.

**Destruction Efficiency and Emission Rates.** The destruction efficiency of the oxidation unit during the reporting period from June 2 to September 13, 1994, was in compliance with the destruction efficiencies stipulated in the air permit for different ranges of influent TVHG concentrations, with the exception of samples collected between June 22 and June 30, 1994. GSI notified the Bay Area Air Quality Management District (BAAQMD) of this permit violation. This condition was rectified by turning on the AS system to increase the oxygen content in the extracted vapor on July 1, 1994. Emission rates for benzene from the off-gas abatement system during this reporting period were below the limit of 0.093 pound per day stipulated in the BAAQMD permit.

**Hydrocarbon Removal Rates.** Table 4 summarizes hydrocarbon removal rates, pounds of hydrocarbons removed this period, and cumulative pounds of hydrocarbons removed for third quarter 1994. 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 4.

Approximately 1,177 pounds (or 196 gallons) of hydrocarbons were recovered by the SVE system operation during this 74.7-day period. A total of approximately 4,368 pounds (or 728 gallons) of hydrocarbons has been recovered from the site from system startup on June 2, 1994, to September 13, 1994.

### **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. After observing the decline in TVHG concentrations in extracted vapor from the combined well field with ongoing SVE system operation, 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-horse power (hp) rotary vane blower at the remediation compound to 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 of concern. The injected air forms both bubbles and transient air pockets, which rise up through the saturated soils to enhance the volatilization of both 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 in turn promote biodegradation of petroleum hydrocarbons.

**System Monitoring.** The AS system was generally monitored once every two weeks in conjunction with monitoring of the SVE system. Parameters monitored in each visit included (1) applied total air pressure and total air flow to the AS wells, (2) applied AS pressure to each AS well, and (3) changes in TVHG concentrations in extracted vapor from the combined well field, influent to the SVE system, as a result of sparging.

**System Operation.** Table 6 summarizes the AS system operation and performance data from startup of AS system on July 15, 1994, to the end of the third quarter 1994 reporting period.

**Sparge Air Flowrate and Pressures.** Total AS flowrates to the system averaged 27.8 scfm for this reporting period. Compressed air was introduced into AS wells at an average total air pressure of 3.2 pounds per square inch gauge (psig).

### **Field Monitoring Results**

Copies of field data sheets collected on operation and performance of the SVE and AS systems during routine site visits are in Appendix D.

### **PERFORMANCE IMPROVEMENTS**

To improve system performance (maximize hydrocarbon removal rates), during third quarter 1994, different combinations of vapor extraction wells were brought on-line or closed during routine site visits based on observed vacuum at each well and TVHG concentrations in extracted vapor from each well. GSI initiated AS on July 15, 1994, to



enhance volatilization of dissolved-phase hydrocarbons in groundwater and to promote biodegradation in saturated-zone soils via introduction of oxygen.

## **LIMITATIONS**

Field procedures were performed by, and field data were acquired from, IWM and GSI. EMCON does not warrant the accuracy of data supplied by IWM or GSI. EMCON's scope of work was limited to interpreting field data collected by IWM and GSI, which included evaluating trends in the groundwater gradient, groundwater flow direction, dissolved- and adsorbed-phase petroleum-hydrocarbon concentrations beneath the site.

No monitoring event is thorough enough to describe all geologic/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 third quarter 1994 and fourth quarter of 1994.

### **Third Quarter 1994 Activities**

- Quarterly groundwater monitoring and sampling for third quarter 1994 by IWM
- Operation and maintenance of the SVE system for third quarter 1994 by GSI

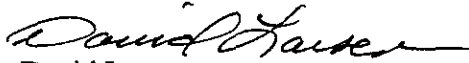
### **Fourth Quarter 1994 Activities**


- Began preparation of quarterly groundwater monitoring and performance evaluation report for the SVE and AS systems for third quarter 1994
- Performed quarterly groundwater monitoring for fourth quarter 1994
- Performed operation and maintenance of the SVE system for fourth quarter 1994

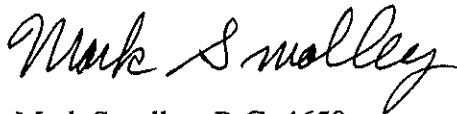
If you have questions, please call.

Sincerely,

EMCON

  
David Larsen  
Sampling Coordinator

  
Valli Voruganti  
Project Engineer

  
Mark Smolley, R.G. 4650  
Senior Project Geologist



cc: Kevin Graves, RWQCB  
Roel Meregillano, ACHCSA

- Attachments:
- Table 1 - Groundwater Monitoring Data, Third Quarter 1994
  - Table 2 - Historical Groundwater Elevation Data
  - Table 3 - Historical Groundwater Analytical Data, TPHG and BTEX
  - Table 4 - Soil-Vapor Extraction System Operation and Performance Data
  - Table 5 - Soil-Vapor Extraction Well Operation and Performance Data
  - Table 6 - Air-Sparge System Operation and Performance Data
  - Figure 1 - Site Location
  - Figure 2 - Site Plan
  - Figure 3 - Groundwater Data, Third Quarter 1994
  - Figure 4 - Historical SVE System Influent TPHG and Benzene Concentrations
  - Figure 5 - Historical SVE System Hydrocarbon Removal Rates
  - Appendix A - Field Data Report, Integrated Wastestream Management, Inc., August 31, 1994
  - Appendix B - Analytical Results and Chain-of-Custody Documentation for Groundwater Monitoring Samples, Third Quarter 1994
  - Appendix C - Analytical and Chain-of-Custody Documentation for Soil-Vapor Extraction System Samples, Third Quarter 1994
  - Appendix D - Field Data Sheets, Operation and Maintenance Visits, Third Quarter 1994

Table 1  
Groundwater Monitoring Data  
Third Quarter 1994  
Summary Report

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

Date: 01-27-95  
Project Number: 0805-129.01

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-water Elevation ft-MSL	Floating Product Thickness feet	Ground-water Flow Direction MWN	Hydraulic Gradient foot/foot	Water Sample Field Date	TPHG ppb	Benzene ppb	Toluene ppb	Ethylbenzene ppb	Total Xylenes ppb	TPHD ppb
A-1	08-10-94	14.16	10.28	3.88	ND	WNW	0.007	08-10-94	27000	3700	1100	540	3000	^3000
A-2	08-10-94	14.55	11.56	2.99	ND	WNW	0.007	08-10-94	690	47	25	3.9	86	Not analyzed
A-3	08-10-94	15.75	11.12	4.63	ND	WNW	0.007	08-10-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-4	08-10-94	15.25	11.75	3.50	ND	WNW	0.007	08-10-94	<50	<0.5	<0.5	<0.5	<0.5	Not analyzed
A-5	08-10-94	13.51	10.76	2.75	ND	WNW	0.007	08-10-94	11000	730	930	310	1300	Not analyzed
A-6	08-10-94	13.51	10.77	2.74	ND	WNW	0.007	08-10-94	300	<0.6	<2.5	<0.8	<1	Not analyzed
AR-1	08-10-94	15.61	11.09	4.52	ND	WNW	0.007	08-10-94	6100	120	66	65	530	^2900
AR-2	08-10-94	15.28	12.48	2.80	ND	WNW	0.007	08-10-94	200	5	1.7	2.7	38	^55
ADR-1	08-10-94	13.95	10.36	3.59	ND	WNW	0.007	08-10-94	150000	5400	15000	3600	24000	^^4800
ADR-2	08-10-94	14.64	9.81	** 4.90	0.10	WNW	0.007	08-10-94 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

ppb = Parts per billion or micrograms per liter (µg/l)

ND = None detected

WNW = West-northwest

^ = Sample contains a lower boiling point hydrocarbon quantitated as diesel; chromatogram does not match the typical diesel fingerprint

^^ = Sample contains a mixture of diesel and a lower boiling point hydrocarbon quantitated as diesel; chromatogram does not match the typical diesel fingerprint

\*\* [Corrected elevation (Z')] = Z + (h \* 0.73) where: Z = measured elevation, h = floating product thickness, 0.73 = density ratio of oil to water

Table 2  
 Historical Groundwater Elevation Data  
 Summary Report

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

Date: 01-27-95  
 Project Number: 0805-129.01

Well Desig- nation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground- water Elevation ft-MSL	Floating Product Thickness feet	Ground- water Flow Direction MWN	Hydraulic Gradient 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

Table 2  
Historical Groundwater Elevation Data  
Summary Report

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

Date: 01-27-95  
Project Number: 0805-129.01

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-water Elevation ft-MSL	Floating Product Thickness feet	Ground-water Flow Direction MWN	Hydraulic Gradient 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

Table 2  
Historical Groundwater Elevation Data  
Summary Report

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

Date: 01-27-95  
Project Number: 0805-129.01

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-water Elevation ft-MSL	Floating Product Thickness feet	Ground-water 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

Table 2  
 Historical Groundwater Elevation Data  
 Summary Report

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

Date: 01-27-95  
 Project Number: 0805-129.01

Well Desig- nation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground- water Elevation ft-MSL	Floating Product Thickness feet	Ground- water Flow Direction MWN	Hydraulic Gradient 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

Table 2  
 Historical Groundwater Elevation Data  
 Summary Report

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

Date: 01-27-95  
 Project Number: 0805-129.01

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-water Elevation ft-MSL	Floating Product Thickness feet	Ground-water 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-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	



Table 2  
Historical Groundwater Elevation Data  
Summary Report

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

Date: 01-27-95  
Project Number: 0805-129.01

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-water Elevation ft-MSL	Floating Product Thickness feet	Ground-water Flow Direction MWN	Hydraulic Gradient 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

Table 2  
Historical Groundwater Elevation Data  
Summary Report

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

Date: 01-27-95  
Project Number: 0805-129.01

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-water Elevation ft-MSL	Floating Product Thickness feet	Ground-water Flow Direction MWN	Hydraulic Gradient 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	

Table 2  
Historical Groundwater Elevation Data  
Summary Report

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

Date: 01-27-95  
Project Number: 0805-129.01

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-water Elevation ft-MSL	Floating Product Thickness feet	Ground-water Flow Direction MWN	Hydraulic Gradient 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-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

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

Table 3  
 Historical Groundwater Analytical Data  
 Summary Report

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

Date: 01-27-95  
 Project Number: 0805-129.01

Well Designation	Water Sample Field Date	TPHG ppb	Benzene ppb	Toluene ppb	Ethylbenzene ppb	Total Xylenes ppb	TPHD ppb
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-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-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

Table 3  
Historical Groundwater Analytical Data  
Summary Report

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

Date: 01-27-95  
Project Number: 0805-129.01

Well Desig- nation	Water Sample Field Date	TPHG  ppb	Benzene  ppb	Toluene  ppb	Ethyl- benzene  ppb	Total Xylenes  ppb	TPHD  ppb	
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-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-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	

Table 3  
Historical Groundwater Analytical Data  
Summary Report

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

Date: 01-27-95  
Project Number: 0805-129.01

Well Designation	Water Sample Field Date	TPHG ppb	Benzene ppb	Toluene ppb	Ethylbenzene ppb	Total Xylenes ppb	TPHD ppb
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-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
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-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					

TPHG = Total petroleum hydrocarbons as gasoline

TPHD = Total petroleum hydrocarbons as diesel

ppb = Parts per billion or micrograms per liter (µg/l)

^ = 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

Table 4  
Soil-Vapor Extraction System  
Operation and Performance Data

Facility Number: 2169 Location: 889 West Grand Avenue Oakland, California	Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer				
Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Start-Up Date: 06-02-94 Reporting Period From: 06-02-94 To: 09-13-94				
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
<b>TPH Concentrations</b>					
Average Influent (ppmv):	18,000	16,000	830	1,100	230
Average Effluent (ppmv):	ND	45	ND	4.9	75.0
<b>Benzene Concentrations</b>					
Average Influent (ppmv):	250	420	17	24	3.8
Average Effluent (ppmv):	ND	0.30	ND	0.08	0.78
<b>Flow Rates</b>					
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
<b>TPH-G Recovery Data</b>					
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
<b>Benzene Recovery Data</b>					
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 4  
Soil-Vapor Extraction System  
Operation and Performance Data

Facility Number: 2169 Location: 889 West Grand Avenue Oakland, California		Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer				
Consultant: EMCON 1921 Ringwood Avenue San Jose, California		Start-Up Date: 06-02-94 Reporting Period From: 06-02-94 To: 09-13-94				
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
<b><u>Vapor Monitoring Concentrations</u></b>						
Well Field Influent, as gasoline:	mg/m3(1)(2) ppmv(3)	NA(11) NA	NA NA	NA NA	NA NA	NA NA
System Influent, as gasoline:	mg/m3 ppmv	5405 2000	2027 750	1838 680	1838 680	1216 450
System Effluent, as gasoline:	mg/m3 ppmv	30 11.0	ND ND	141 52	95 35	11 4.1
Well Field Influent, as benzene:	mg/m3(4) ppmv	NA NA	NA NA	NA NA	NA NA	NA NA
System Influent, as benzene:	mg/m3 ppmv	101 31	32 10	19 6.0	30 9.1	9.4 2.9
System Effluent, as benzene:	mg/m3 ppmv	ND(12) ND	ND ND	3.6 1.1	1.0 0.31	0.14 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
<b><u>Emission Rates (pounds per day)(7)</u></b>						
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):		3.4	1.5	1.3	1.3	1.0
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 4  
Soil-Vapor Extraction System  
Operation and Performance Data

Facility	Number: 2169 Location: 889 West Grand Avenue Oakland, California	Vapor Treatment Unit: ThermTech Model VAC-25, 250cfm Thermal/ Catalytic Oxidizer
	Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Start-Up Date: 06-02-94 Reporting Period From: 06-02-94 To: 09-13-94
<hr/>		
CURRENT REPORTING PERIOD:	06-30-94	to 09-13-94
DAYS / HOURS IN PERIOD:	74.7	1793
DAYS / HOURS OF OPERATION:	28.2	678
DAYS / HOURS OF DOWN TIME:	46.5	1115
PERCENT OPERATIONAL:		37.8 %
PERIOD POUNDS REMOVED:	1177	
PERIOD GALLONS REMOVED:	196	
<hr/>		
AVERAGE SYSTEM INFLUENT FLOW RATE (scfm):		195.2
<hr/>		

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 Fahrenheit
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

Table 5  
Soil-Vapor Extraction Well Data

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

Date: 01-27-95  
Project Number: 0805-129.01

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

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

Table 5  
Soil-Vapor Extraction Well Data

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

Date: 01-27-95  
Project Number: 0805-129.01

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

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

Table 5  
Soil-Vapor Extraction Well Data

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

Date: 01-27-95  
Project Number: 0805-129.01

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

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

Table 5  
Soil-Vapor Extraction Well Data

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

Date: 01-27-95  
Project Number: 0805-129.01

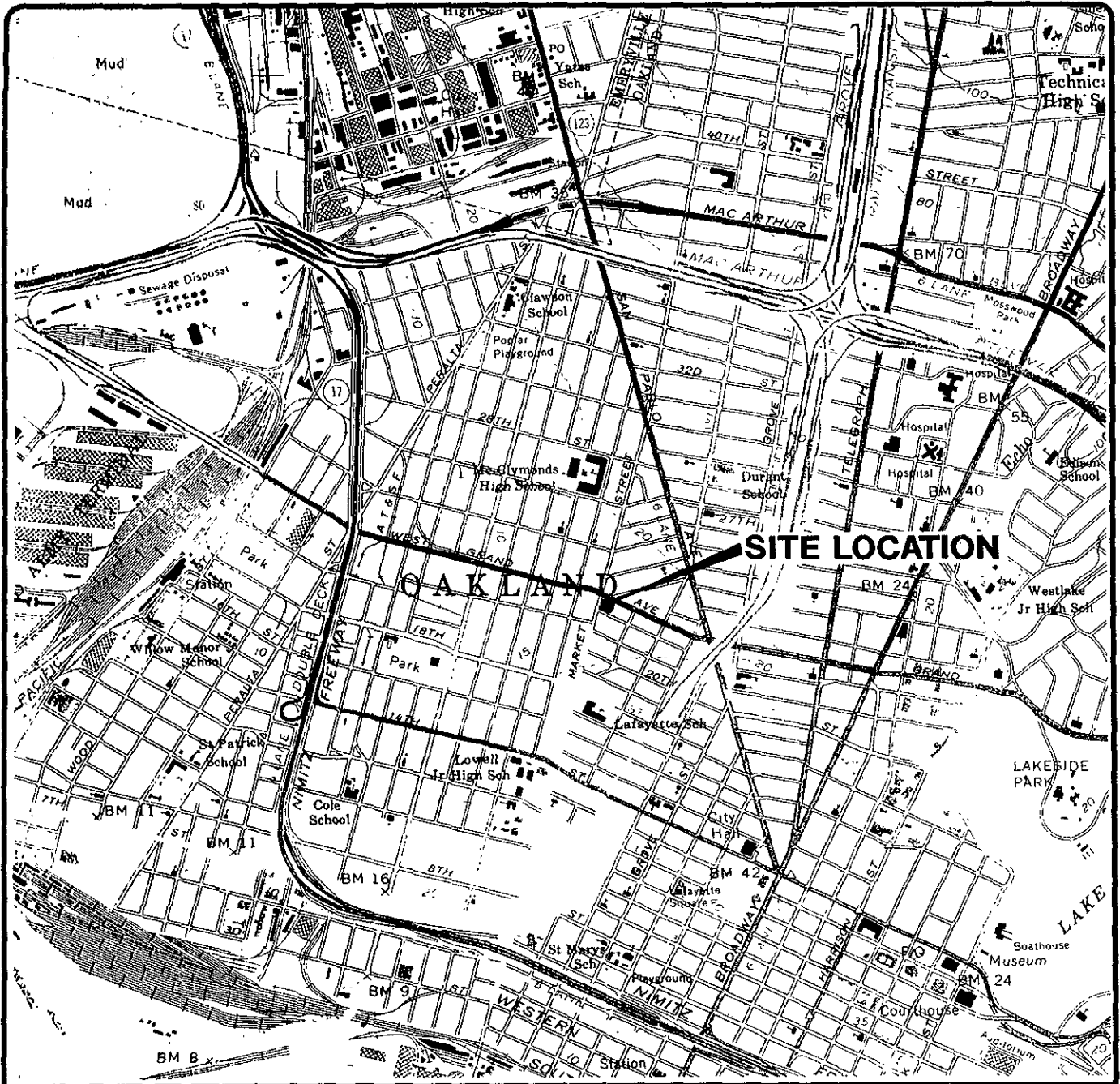
Date	Well Identification											
	ADR-1			ADR-2								
	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response	Valve Position	TVHG	Vacuum Response
		ppmv	in-H2O		ppmv	in-H2O		ppmv	in-H2O		ppmv	in-H2O
06-02-94	open	7,000 FID	11	open	460 FID	13						
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						

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

Table 6  
Air-Sparge System  
Operation and Performance Data

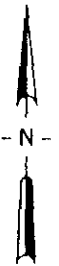
Facility Number: 2169	Air-Sparge Unit: 3-horse power				
Location: 889 West Grand Avenue Oakland, California	Conde blower				
Consultant: EMCON 1921 Ringwood Avenue San Jose, California	Start-Up Date: 08-01-94				
	Reporting Period From: 08-01-94 To: 09-13-94				
Date Begin:	07-15-94	08-01-94	08-01-94	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 (ppm) (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
CURRENT REPORTING PERIOD:	07-15-94	to	09-13-94		
DAYS / HOURS IN PERIOD:	60.0		1440		
DAYS / HOURS OF OPERATION:	22.8		547		
DAYS / HOURS OF DOWN TIME:	37.2		893		
PERCENT OPERATIONAL:			38.0%		

1. psig = pounds per square inch gauge
2. scfm = standard cubic feet per minute at 14.7 psi and 70° F
3. ppm = parts per million
4. NA = Not available or not analyzed
5. ft-BGS = feet below grade surface



Base map from USGS 7.5' Quad. Map:  
Oakland West, California.  
(Photorevised 1980).

Scale : 0 2000 4000 Feet



**EMCON**  
Associates

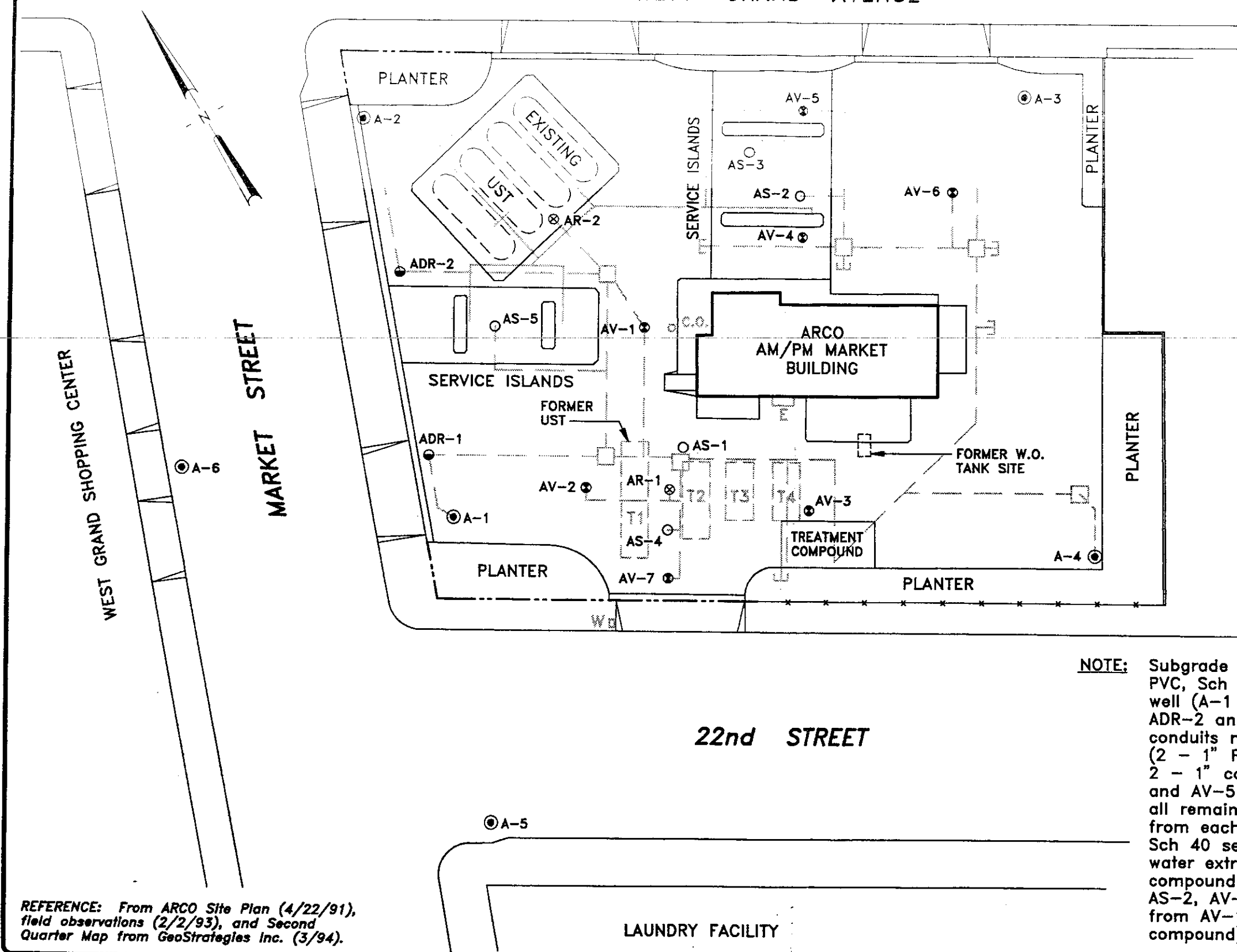
ARCO PRODUCTS COMPANY  
SERVICE STATION 2169, 889 WEST GRAND AVE.  
QUARTERLY GROUNDWATER MONITORING  
OAKLAND, CALIFORNIA

SITE LOCATION

FIGURE

**1**

PROJECT NO.  
805-129.01



- EXPLANATION**
- ⊙ Groundwater well
  - ⊗ Groundwater vapor extraction well
  - ⊕ Vapor extraction well
  - Groundwater extraction well
  - Air sparge well
  - Junction
  - Centerline subgrade (See notes)
  - ┌ Stub-out (above grade)
  - └ marker (below grade)
  - ┌ out location
  - C.O. Sewer cleanout
  - Existing structure
  - Water main
  - Wells A-1 through A-6 and AR-1 through AR-2 vapor extraction wells

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

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

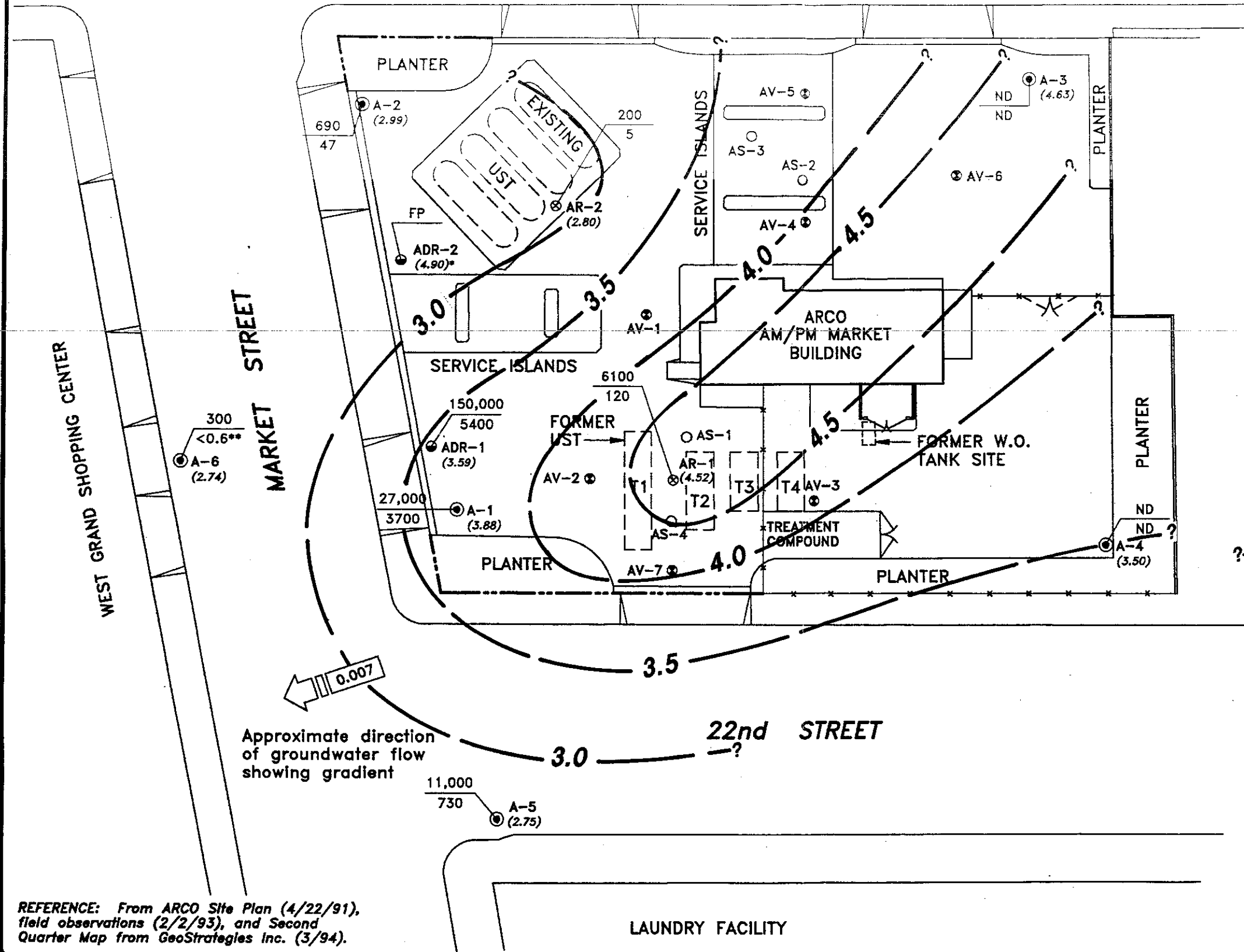


SCALE: 0 40 80 FEET

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

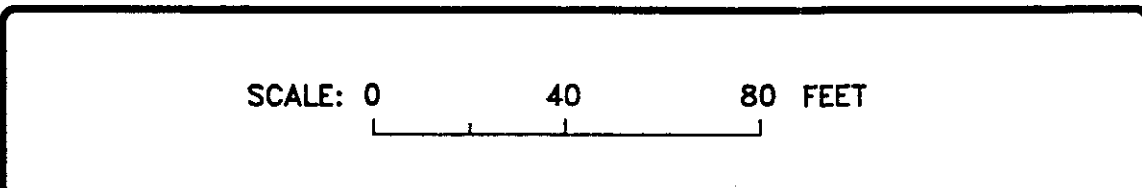
SITE PLAN





- EXPLANATION**
- ⊙ Groundwater
  - ⊗ Groundwater
  - ⊛ Vapor extra
  - Groundwater extraction w
  - Air sparging
  - (4.52) Groundwater measured 8/
  - ND ND ? Groundwater (Ft.-MSL)
  - 6100 TPH, as ga (ppb); sam
  - 120 Benzene co sampled 8/
  - ND Not detected limit for TP benzene (0
  - FP Floating pro
  - \* Groundwater anomalous in contourin
  - \*\* Raised MRL interference

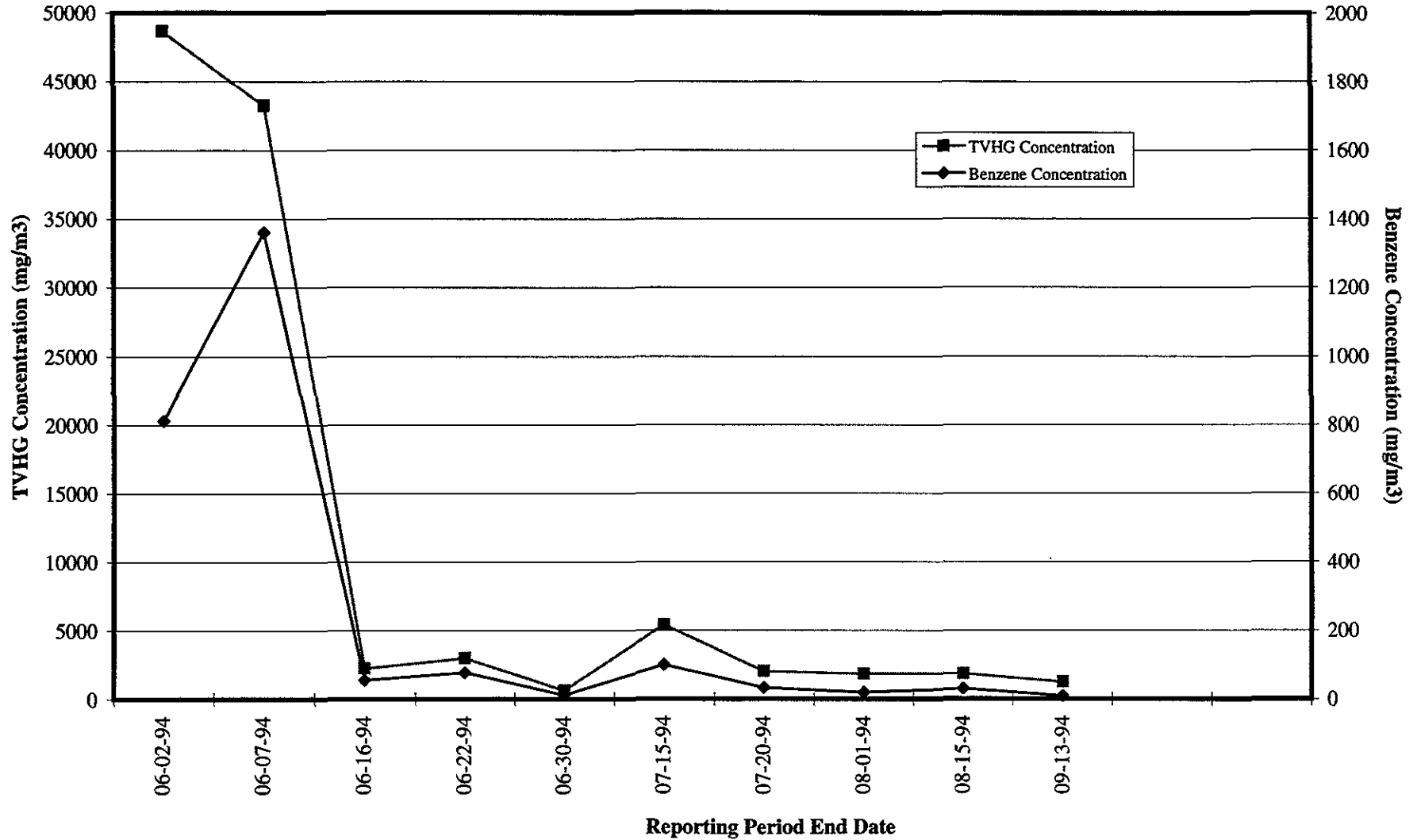
REFERENCE: From ARCO Site Plan (4/22/91), field observations (2/2/93), and Second Quarter Map from GeoStrategies Inc. (3/94).



ARCO PRODUCTS COMPANY  
 SERVICE STATION #2169, 889 WEST GRAND AVENUE  
 QUARTERLY GROUNDWATER MONITORING  
 OAKLAND, CALIFORNIA  
 GROUNDWATER DATA  
 THIRD QUARTER 1994

Figure 4

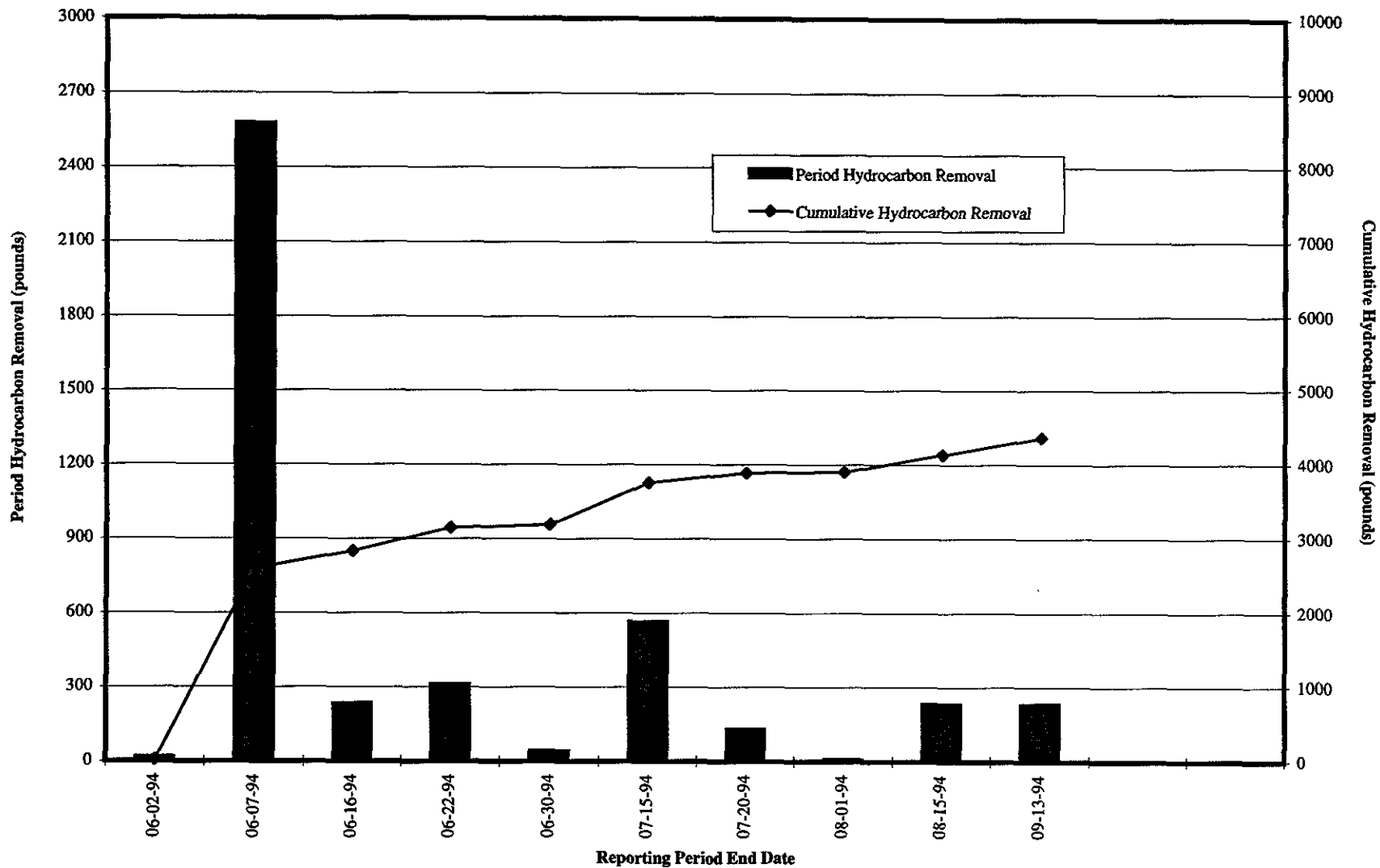
ARCO Service Station 2169  
Soil-Vapor Extraction and Treatment System  
Historical System Influent TVHG and Benzene Concentrations



mg/m<sup>3</sup> = Milligrams per cubic meter  
TVHG = Total volatile hydrocarbons as gasoline

Figure 5

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



**APPENDIX A**

**FIELD DATA REPORT, INTEGRATED WASTESTREAM  
MANAGEMENT, INC., August 31, 1994**

**I** NTEGRATED  
**W** ASTESTREAM  
**M** ANAGEMENT, INC.

August 31, 1994

Ms. Barbara Sieminski  
Geostrategies  
6747 Sierra Court, Suite G  
Dublin, CA 94568


Dear Ms. Sieminski:

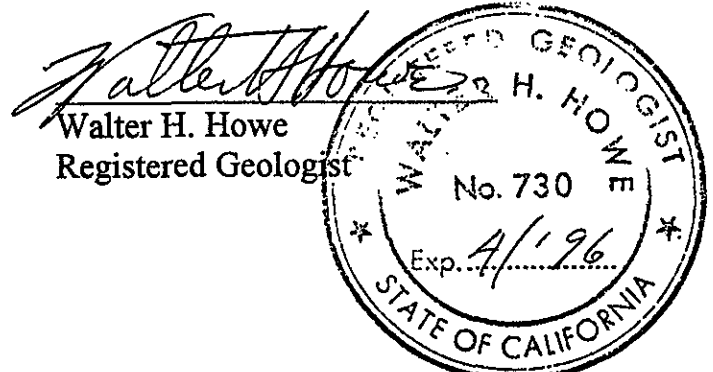
Attached are the field data sheets and analytical results for quarterly ground water sampling at ARCO Facility No. A-2169 in Oakland, California. Integrated Wastestream Management measured the depth to water and collected samples from wells at this site on August 10, 1994.

Sampling was carried out in accordance with the protocols described in the "Request for Bid for Quarterly Sampling at ARCO Facilities in Northern California".

Please call us if you have any questions.

Sincerely,  
Integrated Wastestream Management

  
Tom DeLon  
Project Manager



**Summary of Ground Water Sample Analyses for ARCO Facility A-2169, Oakland, California**

WELL NUMBER	A-1	A-2	A-3	A-4	A-5	A-6	AR-1	AR-2	ADR-1	ADR-2	
DATE SAMPLED	8/10/94	8/10/94	8/10/94	8/10/94	8/10/94	8/10/94	8/10/94	8/10/94	8/10/94	8/10/94	
DEPTH TO WATER	10.28	11.56	11.12	11.75	10.76	10.77	11.09	12.48	10.36	9.81	
SHEEN	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	FP	
PRODUCT THICKNESS	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1	
TPHg	27,000	690	ND	ND	11,000	300	6,100	200	150,000	NA	
<b>BTEX</b>											
BENZENE	3,700	47	ND	ND	730	<0.6#	120	5.0	5,400	NA	
TOLUENE	1,100	25	ND	ND	930	<2.5#	66	1.7	15,000	NA	
ETHYLBENZENE	540	3.9	ND	ND	310	<0.8#	65	2.7	3,600	NA	
XYLENES	3,000	86	ND	ND	1,300	<1#	530	38	24,000	NA	
<b>EPA 3510</b>											
DIESEL	3,000#	NA	NA	NA	NA	NA	2,900#	55#	4,800#	NA	

**FOOTNOTES:**

Concentrations reported in ug/L (ppb)

TPHg = Total Purgeable Petroleum Hydrocarbons (USEPA Method 8015 Modified)

BTEX Distinction (USEPA Method 8020)

PCE = Tetrachloroethene (USEPA Method 8010)

\* = Well inaccessible

\*\* = Not sampled per consultant request

DCE = cis-1, 2-Dichloroethene (USEPA Method 8010)

TCE = Trichloroethene (USEPA Method 8010)

ND = Not Detected

NA = Not applicable

FP = Floating product

# = See laboratory analytical report

# FIELD REPORT

## Depth To Water / Floating Product Survey

 Site Arrival Time: 830

 Site Departure Time: 1418

 Weather Conditions: cloudy  
cool

 DTW: Well Box or Well Casing (circle one)

Project No.: \_\_\_\_\_

 Location: 889 West Grand Av. OAK Date: August 10, 1994

 Client / Station#: Arco 216A

 Field Technician: Vince / Cisco

 Day of Week: Wednesday

DTW ORDER	WELL ID	SURFACE SEAL	LID SECURE	GASKET	LOCK	EXPANDING CAP	TOTAL DEPTH (Feet)	FIRST DEPTH TO WATER (Feet)	SECOND DEPTH TO WATER (Feet)	DEPTH TO FLOATING PRODUCT (Feet)	FLOATING PRODUCT THICKNESS (Feet)	SHEEN (Y= YES, N=NO) FP= FLOATING PRODUCT	COMMENTS	MATERIALS
6	A-1	OK	yes	OK	none	none	24.48	10.28	10.28	N/A	N/A	N	3"	9/16
1	A-2	OK	yes	OK	none	none	25.26	11.56	11.56	N/A	N/A	N	3" <del>surface</del> <u>underneath measurement</u> <u>+1.20 in well box</u>	9/16 + 1/2
2	A-3	OK	yes	OK	none	none	28.88	11.12	11.12	N/A	N/A	N	3"	9/16
3	A-4	OK	yes	OK	none	none	28.41	11.75	11.75	N/A	N/A	N	3"	9/16
8	A-5	OK	yes	none	OK	OK	20.30	10.76	10.76	N/A	N/A	N	2"	crusty
5	A-6	OK	yes	OK	OK	OK	27.70	10.77-	10.77-	N/A	N/A	N	2"	crusty
9	AR-1	OK	yes	OK	none	none	28.0	11.09	11.09	N/A	N/A	N	6"	9/16/7/16
4	AR-2	OK	yes	OK	none	none	29.08	12.48	12.48	N/A	N/A	N	4"	1/2
7	ADR-1	OK	yes	OK	none	none	21.90	10.36	10.36	N/A	N/A	N	4"	1/2
10	ADR-2	OK	yes	OK	none	none	26.3	9.81	9.81	9.71	0.10	Y	4" Floating Product - no sample	1/2

WELL ID: A-4 TD 28.41 DTW 11.75 X 0.38 Gal. X 3 Casing - 18.99 Calculated  
Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1031 END (2400 HR): 1035  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1039 DTW: 14

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1032</u>	<u>2</u>	<u>7.28</u>	<u>0.65</u>	<u>69.4</u>	<u>clear</u>
<u>1033</u>	<u>8</u>	<u>7.24</u>	<u>0.62</u>	<u>68.3</u>	<u>clear</u>
<u>1034</u>	<u>14</u>	<u>7.23</u>	<u>0.60</u>	<u>67.5</u>	<u>clear</u>
<u>1035</u>	<u>19</u>	<u>7.24</u>	<u>0.60</u>	<u>67.0</u>	<u>clear</u>

Total purge: 19

PURGING EQUIP.:  Centrifugal Pump  Bailer Disp. SAMPLING EQUIP.:  Bailer Disp.

REMARKS:

WELL ID: A-3 TD 28.88 DTW 11.12 X 0.38 Gal. X 3 Casing - 20.24 Calculated  
Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1100 END (2400 HR): 1106  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1109 DTW: 14.2

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1102</u>	<u>2</u>	<u>7.54</u>	<u>0.64</u>	<u>69.4</u>	<u>clear</u>
<u>1103</u>	<u>9</u>	<u>7.48</u>	<u>0.73</u>	<u>69.2</u>	<u>clear</u>
<u>1105</u>	<u>15</u>	<u>7.38</u>	<u>0.70</u>	<u>69.0</u>	<u>clear</u>
<u>1106</u>	<u>20</u>	<u>7.37</u>	<u>0.68</u>	<u>68.9</u>	<u>clear</u>

Total purge: 20

PURGING EQUIP.:  Centrifugal Pump  Bailer Disp. SAMPLING EQUIP.:  Bailer Disp.

REMARKS:

WELL ID: AR-2 TD 29.08 DTW 12.48 X 0.66 Gal. X 3 Casing - 32.86 Calculated  
Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1131 END (2400 HR): 1141  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1140 DTW: 12.8

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1133</u>	<u>2</u>	<u>7.34</u>	<u>0.67</u>	<u>70.9</u>	<u>cloudy</u>
<u>1135</u>	<u>11</u>	<u>7.32</u>	<u>0.65</u>	<u>70.7</u>	<u>clear</u>
<u>1138</u>	<u>22</u>	<u>7.29</u>	<u>0.71</u>	<u>70.4</u>	<u>clear</u>
<u>1141</u>	<u>33</u>	<u>7.30</u>	<u>0.72</u>	<u>69.8</u>	<u>clear</u>

Total purge: 33

PURGING EQUIP.:  Centrifugal Pump  Bailer Disp. SAMPLING EQUIP.:  Bailer Disp.

REMARKS:

WELL ID: AR-1 TD 28.0 DTW 11.09 X 1.5 Gal. X 2 Casing - 50.73 Calculated  
Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1201 END (2400 HR): 1214  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1218 DTW: 12.5

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1203</u>	<u>3</u>	<u>7.35</u>	<u>0.69</u>	<u>70.8</u>	<u>clear</u>
<u>1206</u>	<u>25</u>	<u>7.48</u>	<u>0.78</u>	<u>70.1</u>	<u>Black</u>
<u>1210</u>	<u>41</u>	<u>7.42</u>	<u>0.73</u>	<u>69.8</u>	<u>Black</u>
<u>1214</u>	<u>51</u>	<u>7.41</u>	<u>0.71</u>	<u>69.6</u>	<u>Black</u>

Total purge: 51

PURGING EQUIP.:  Centrifugal Pump  Bailer Disp. SAMPLING EQUIP.:  Bailer Disp.

REMARKS:

PRINT NAME: Vince Valdes

SIGNATURE: [Signature]

- CASING DIAMETER (inches): 2 3 4 6 8 12 Other: \_\_\_\_\_
- GALLON/LINEAR FOOT: 0.17 0.38 0.66 1.5 2.6 5.8 Other: \_\_\_\_\_



WELL ID: A-2 TD 25.26 DTW 11.56 x 0.38 Gal. x 3 Casing - 15.61 Calculated  
Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1156 END (2400 HR) 1159  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1205 DTW: 12

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1157</u>	<u>3</u>	<u>7.40</u>	<u>0.82</u>	<u>72.5</u>	<u>CLEAR</u>
<u>1158</u>	<u>9</u>	<u>7.07</u>	<u>0.81</u>	<u>71.9</u>	<u>CLEAR</u>
<u>1159</u>	<u>15</u>	<u>7.05</u>	<u>0.80</u>	<u>71.2</u>	<u>CLEAR</u>

Total purge: 15  
 PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.  
 REMARKS:

WELL ID: A-6 TD 27.70 DTW 10.77 x 0.17 Gal. x 3 Casing - 8.63 Calculated  
Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1227 END (2400 HR) 1232  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1237 DTW: 11.9

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1228</u>	<u>1</u>	<u>7.03</u>	<u>0.81</u>	<u>73.5</u>	<u>CLEAR</u>
<u>1230</u>	<u>5</u>	<u>7.00</u>	<u>0.87</u>	<u>72.9</u>	<u>CLEAR</u>
<u>1232</u>	<u>6</u>	<u>7.00</u>	<u>0.89</u>	<u>72.5</u>	<u>CLEAR</u>

Total purge: 6  
 PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.  
 REMARKS: WELL PUMPED DRY AT  
6 GALLONS.

WELL ID: A-1 TD 24.48 DTW 10.28 x 0.38 Gal. x 3 Casing - 16.18 Calculated  
Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1245 END (2400 HR) 1251  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1256 DTW: 11.40

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1245</u>	<u>3</u>	<u>7.20</u>	<u>1.67</u>	<u>73.9</u>	<u>CLEAR</u>
<u>1248</u>	<u>8</u>	<u>7.00</u>	<u>1.07</u>	<u>72.3</u>	<u>CLEAR</u>
<u>1251</u>	<u>16</u>	<u>7.02</u>	<u>1.06</u>	<u>71.5</u>	<u>CLEAR</u>

Total purge: 16  
 PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.  
 REMARKS:

WELL ID: A-5 TD 30.30 DTW 10.76 x 0.17 Gal. x 3 Casing - 9.96 Calculated  
Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1312 END (2400 HR) 1315  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1320 DTW: 11.1

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1313</u>	<u>1</u>	<u>6.79</u>	<u>0.83</u>	<u>73.3</u>	<u>CLEAR</u>
<u>1313</u>	<u>3</u>	<u>6.81</u>	<u>0.76</u>	<u>73.0</u>	<u>CLEAR</u>
<u>1315</u>	<u>10</u>	<u>6.83</u>	<u>0.72</u>	<u>71.8</u>	<u>CLEAR</u>

Total purge: 10  
 PURGING EQUIP.: Centrifugal Pump Bailer Disp. SAMPLING EQUIP.: Bailer Disp.  
 REMARKS:

PRINT NAME: FRANCISCA ABINGON SIGNATURE: Francisca Abingon

CASING DIAMETER (inches): 2 3 4 6 8 12 Other: \_\_\_\_\_  
 GALLON/LINEAR FOOT: 0.17 0.38 0.66 1.5 2.6 5.8 Other: \_\_\_\_\_

WELL ID: ADR-1 TD 2190 DTW 10.36 X 0.60 Gal. X 2 Casing - 22.84 Calculated  
 Linear Ft. Volume Purge

DATE PURGED: 8-10-94 START (2400 HR): 1330 END (2400 HR): 1333  
 DATE SAMPLED: 8-10-94 TIME (2400 HR): 1340 DTW: 11.3

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
<u>1331</u>	<u>5</u>	<u>6.35</u>	<u>0.98</u>	<u>74.1</u>	<u>CLAR</u>
<u>1332</u>	<u>10</u>	<u>6.37</u>	<u>0.99</u>	<u>73.7</u>	<u>CLAR</u>
<u>1333</u>	<u>15</u>	<u>6.39</u>	<u>0.98</u>	<u>71.9</u>	<u>CLAR</u>
<u>1340</u>	<u>23</u>	<u>6.46</u>	<u>0.96</u>	<u>70.3</u>	<u>CLAR</u>

Total purge: 23

PURGING EQUIP.:  Centrifugal Pump  Bailer Disp. SAMPLING EQUIP.:  Bailer Disp.

REMARKS: K-1338

WELL ID: \_\_\_\_\_ TD \_\_\_\_\_ DTW \_\_\_\_\_ X \_\_\_\_\_ Gal. X \_\_\_\_\_ Casing - \_\_\_\_\_ Calculated  
 Linear Ft. Volume Purge

DATE PURGED: \_\_\_\_\_ START (2400 HR): \_\_\_\_\_ END (2400 HR): \_\_\_\_\_  
 DATE SAMPLED: \_\_\_\_\_ TIME (2400 HR): \_\_\_\_\_ DTW: \_\_\_\_\_

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Total purge: \_\_\_\_\_

PURGING EQUIP.:  Centrifugal Pump  Bailer Disp. SAMPLING EQUIP.:  Bailer Disp.

REMARKS: \_\_\_\_\_

WELL ID: \_\_\_\_\_ TD \_\_\_\_\_ DTW \_\_\_\_\_ X \_\_\_\_\_ Gal. X \_\_\_\_\_ Casing - \_\_\_\_\_ Calculated  
 Linear Ft. Volume Purge

DATE PURGED: \_\_\_\_\_ START (2400 HR): \_\_\_\_\_ END (2400 HR): \_\_\_\_\_  
 DATE SAMPLED: \_\_\_\_\_ TIME (2400 HR): \_\_\_\_\_ DTW: \_\_\_\_\_

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Total purge: \_\_\_\_\_

PURGING EQUIP.:  Centrifugal Pump  Bailer Disp. SAMPLING EQUIP.:  Bailer Disp.

REMARKS: \_\_\_\_\_

WELL ID: \_\_\_\_\_ TD \_\_\_\_\_ DTW \_\_\_\_\_ X \_\_\_\_\_ Gal. X \_\_\_\_\_ Casing - \_\_\_\_\_ Calculated  
 Linear Ft. Volume Purge

DATE PURGED: \_\_\_\_\_ START (2400 HR): \_\_\_\_\_ END (2400 HR): \_\_\_\_\_  
 DATE SAMPLED: \_\_\_\_\_ TIME (2400 HR): \_\_\_\_\_ DTW: \_\_\_\_\_

TIME (2400 HR)	VOLUME (GAL)	pH (UNITS)	(E.C. X 1,000) (UMHOS/CM@25 C)	TEMP. (F)	COLOR (VISUAL)
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Total purge: \_\_\_\_\_

PURGING EQUIP.:  Centrifugal Pump  Bailer Disp. SAMPLING EQUIP.:  Bailer Disp.

REMARKS: \_\_\_\_\_

PRINT NAME: Francisco Abunyan

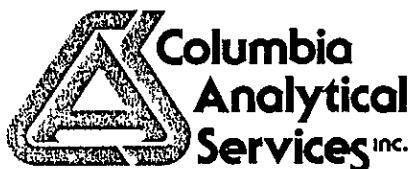
CASING DIAMETER (inches): 2 3 4 6 8 12 Other: \_\_\_\_\_

GALLON/LINEAR FOOT: 0.17 0.38 0.66 1.5 2.6 5.8 Other: \_\_\_\_\_

SIGNATURE: Francisco Abunyan

**APPENDIX B**

**ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY  
DOCUMENTATION FOR GROUNDWATER MONITORING  
SAMPLES, THIRD QUARTER 1994**



August 25, 1994

Service Request No. S940900

Gina Austin  
Tom DeLon  
IWM  
950 Ames Avenue  
Milpitas, CA 95035

Re: **ARCO Facility No. 2169**

Dear Ms. Austin/Mr. DeLon:

Attached are the results of the water samples submitted to our lab on August 11, 1994. For your reference, these analyses have been assigned our service request number S940900.

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.

*Carol J Klein for*  
Keoni A. Murphy  
Laboratory Manager

*Annelise Jade Bazar*  
Annelise J. Bazar  
Regional QA Coordinator

KAM/ajb

# COLUMBIA ANALYTICAL SERVICES, Inc.

## Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
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
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
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
NR	Not Requested
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
VPH	Volatile Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: IWM  
Project: ARCO Facility No. 2169  
Sample Matrix: Water

Service Request: S940900  
Date Collected: 8/10/94  
Date Received: 8/11/94  
Date Extracted: 8/19/94  
Date Analyzed: 8/23,24/94

TPH as Diesel  
EPA Method 3510/California DHS LUFT Method  
Units: ug/L (ppb)

Sample Name	Lab Code	MRL	Result
A-1 (11.4)	S940900-002	50	3,000 *
AR-1 (12.5)	S940900-008	50	2,900 *
AR-2 (12.8)	S940900-009	50	55 *
ADR-1 (11.3)	S940900-010	50	4,800 **
Method Blank	S940819-WB	50	ND

- \* The sample contains a lower boiling point hydrocarbon mixture quantitated as diesel. The chromatogram does not match the typical diesel fingerprint.
- \*\* The sample contains a mixture of diesel and a lower boiling point hydrocarbon mixture quantitated as diesel. The chromatogram does not match the typical diesel fingerprint.

Approved By: Carol Klein Date: 8-25-94

1AMRL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: IWM  
 Project: ARCO Facility No. 2169  
 Sample Matrix: Water

Service Request: S940900  
 Date Collected: 8/10/94  
 Date Received: 8/11/94  
 Date Extracted: NA  
 Date Analyzed: 8/19,22/94

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	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes, Total
A-1 (11.40)	S940900-002	27,000	3,700	1,100	540	3,000
A-2 (12)	S940900-003	690	47	25	3.9	86
A-3 (14.2)	S940900-004	ND	ND	ND	ND	ND
A-4 (14)	S940900-005	ND	ND	ND	ND	ND
A-5 (11.1)	S940900-006	11,000	730	930	310	1,300
A-6 (11.9)	S940900-007	300	<0.6 *	<2.5 *	<0.8 *	<1 *
AR-1 (12.5)	S940900-008	6,100	120	66	65	530
AR-2 (12.8)	S940900-009	200	5.0	1.7	2.7	38
ADR-1 (11.3)	S940900-010	150,000	5,400	15,000	3,600	24,000
Method Blank	S940819-WB	ND	ND	ND	ND	ND
Method Blank	S940822-WB	ND	ND	ND	ND	ND

\* Raised MRL due to matrix interference.

Approved By: Carol Klein Date: 8-25-94

5ABTXGAS/061694

APPENDIX A  
LABORATORY QC RESULTS



COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM  
Project: ARCO Facility No. 2169  
Sample Matrix: Water

Service Request: S940900  
Date Collected: 8/10/94  
Date Received: 8/11/94  
Date Extracted: 8/19/94  
Date Analyzed: 8/23.24/94

Surrogate Recovery Summary  
TPH as Diesel  
EPA Method 3510/California DHS LUFT Method

Sample Name	Lab Code	Percent Recovery p-Terphenyl
A-1 (11.4)	S940900-002	92
AR-1 (12.5)	S940900-008	84
AR-2 (12.8)	S940900-009	99
ADR-1 (11.3)	S940900-010	101
MS	S940899-004MS	98
DMS	S940899-004DMS	92
Method Blank	S9408190WB	93

CAS Acceptance Limits: 66-123

Approved By: Carol Klein Date: 8-25-94

SUR1/061994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM  
Project: ARCO Facility No. 2169

Service Request: S940900  
Date Analyzed: 8/23/94

Initial Calibration Verification (ICV) Summary  
TPH as Diesel  
California DHS LUFT Method  
Units: ppm

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
TPH as Diesel	1,000	913	91	90-110

Approved By: Carol Klein Date: 8-25-94

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM  
 Project: ARCO Facility No. 2169  
 Sample Matrix: Water

Service Request: S940900  
 Date Collected: 8/10/94  
 Date Received: 8/11/94  
 Date Extracted: 8/19/94  
 Date Analyzed: 8/23/94

Matrix Spike/Duplicate Matrix Spike Summary  
 TPH as Diesel  
 EPA Method 3510/California DHS LUFT Method  
 Units: ug/L (ppb)

Sample Name: Batch QC  
 Lab Code: S940899-004

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery			
	MS	DMS		MS	DMS	CAS		Relative Percent Difference	
						MS	DMS		Acceptance Limits
TPH as Diesel	4,000	4,000	83	4,220	3,940	103	96	61-141	7

Approved By: Carol Klein Date: 8-25-94

DMSIS/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM  
Project: ARCO Facility No. 2169  
Sample Matrix: Water

Service Request: S940900  
Date Collected: 8/10/94  
Date Received: 8/11/94  
Date Extracted: NA  
Date Analyzed: 8/19,22/94

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

Sample Name	Lab Code	Percent Recovery $\alpha,\alpha,\alpha$ -Trifluorotoluene
A-1 (11.40)	S940900-002	103
A-2 (12)	S940900-003	112 *
A-3 (14.2)	S940900-004	97
A-4 (14)	S940900-005	95
A-5 (11.1)	S940900-006	104
A-6 (11.9)	S940900-007	111
AR-1 (12.5)	S940900-008	103
AR-2 (12.8)	S940900-009	100
ADR-1 (11.3)	S940900-010	101
A-5 (11.1) MS	S940900-006MS	113
A-5 (11.1) DMS	S940900-006DMS	113
Method Blank	S940819-WB	107
Method Blank	S940822-WB	101

CAS Acceptance Limits: 69-116

\* The surrogate used for this sample was 4-Bromofluorobenzene.

Approved By: Carol Klein Date: 8-25-94

SUR1/062994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM  
Project: ARCO Facility No. 2169

Service Request: S940900  
Date Analyzed: 8/19/94

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	27.3	109	85-115
Toluene	25	25.1	101	85-115
Ethylbenzene	25	25.4	102	85-115
Xylenes, Total	75	72.4	97	85-115
Gasoline	250	270	108	90-110

Approved By: Carol Klein Date: 8-25-94

ICV25AL/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM  
Project: ARCO Facility No. 2169  
Sample Matrix: Water

Service Request: S940900  
Date Collected: 8/10/94  
Date Received: 8/11/94  
Date Extracted: NA  
Date Analyzed: 8/19/94

Matrix Spike/Duplicate Matrix Spike Summary  
TPH as Gasoline  
EPA Methods 5030/California DHS LUFT Method  
Units: ug/L (ppb)

Sample Name: A-5 (11.1)  
Lab Code: S940900-006

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference
	MS	DMS		MS	DMS	MS	DMS		
	Gasoline	10,000		10,000	11,100	21,400	21,700		

Approved By: Carol Klein Date: 8-25-94

DMSIS/060194

APPENDIX B  
CHAIN OF CUSTODY

**ARCO Products Company**  
Division of AtlanticRichfield Company

Task Order No. **IWM-94-5CC**

Chain of Custody

ARCO Facility no. <b>A 2169</b>	City (Facility) <b>OAKLAND</b>	Project manager (Consultant) <b>TOM De Sen / R Campbell</b>	Laboratory name <b>Columbia</b>
ARCO engineer <b>M.W.</b>	Telephone no. (ARCO) <b>415 571 2434</b>	Telephone no. (Consultant) <b>408 / 942 8955</b>	Contract number <b>07077</b>
Consultant name <b>IWM / GSI</b>	Address (Consultant) <b>950 Ames av. Milp CA 95035</b>		Method of shipment <b>sampler deliver</b>

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA 1602/8020/8015	TPH Modified 8015 Gas <input checked="" type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM403E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	Semi Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	CAN Metals EPA 601/7000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org/DHS Lead EPA 7420/7421 7420/7421	<b>7/7/94 Date</b>		
			Soil	Water	Other	Ice	Acid																	
FB-1	1	2		✓		✓	✓	81094	700		✓	✓												
A-1	2	4		✓		✓	✓	}	1256		✓	✓											✓	
A-2	3	2		✓		✓	✓		1205		✓	✓												
A-3	4	2		✓		✓	✓		1109		✓	✓												
A-4	5	2		✓		✓	✓		1039		✓	✓												
A-5	6	2		✓		✓	✓		1320		✓	✓												
A-6	7	2		✓		✓	✓		1237		✓	✓												
AR-1	8	4		✓		✓	✓		1218		✓	✓												✓
AR-2	9	4		✓		✓	✓		1146		✓	✓												✓
ADR-1	10	4		✓		✓	✓	00 1340		✓	✓												✓	
ADR-2	11	4																						

Special detection Limit/reporting

Special QA/QC

Remarks

Condition of sample: <b>okay</b>	Temperature received: <b>cool</b>
Relinquished by sampler <b>John Talbot</b>	Date <b>8-11-94</b> Time <b>1400</b>
Relinquished by	Date Time Received by
Relinquished by	Date Time Received by laboratory <b>Pat Finney 098/88</b> Date <b>8/11/94</b> Time <b>1405</b>

Lab number **5940900**

Turnaround time

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days



**APPENDIX C**

**CERTIFIED ANALYTICAL REPORTS AND CHAIN-OF-CUSTODY  
DOCUMENTATION FOR SOIL-VAPOR EXTRACTION SYSTEM  
SAMPLES, THIRD QUARTER 1994**



# Sequoia Analytical

680 Chesapeake Drive  
1900 Bates Avenue, Suite L  
819 Striker Avenue, Suite 8

Redwood City, CA :  
Concord, CA 94520  
Sacramento, CA 95834

(415) 364-9600  
(510) 686-9600  
(916) 921-9600

FAX (415) 364-9233  
FAX (510) 686-9689  
FAX (916) 921-0100

Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Project: Arco, 2169-94-5

Enclosed are the results from 4 air samples received at Sequoia Analytical on July 15, 1994. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
4G79001	Air, Infl. 1	7/15/94	Calderon Inert Gases EPA 5030/8015 Mod./8020
4G79002	Air, Effl. 1	7/15/94	EPA 5030/8015 Mod./8020
4G79003	Air, Infl. 2	7/15/94	Calderon Inert Gases EPA 5030/8015 Mod./8020
4G79004	Air, Effl. 2	7/15/94	EPA 5030/8015 Mod./8020

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Todd Olive  
Project Manager



Gettler Ryan/Geostrategies	Client Project ID: Arco, 2169-94-5	Sampled: Jul 15, 1994
6747 Sierra Court, Suite J	Sample Matrix: Air	Received: Jul 15, 1994
Dublin, CA 94568	Analysis Method: EPA 5030/8015 Mod./8020	Reported: Jul 19, 1994
Attention: Joel Coffman	First Sample #: 4G79001	

**TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION**

Analyte	Reporting Limit ppmv	Sample I.D. 4G79001 Infl. 1	Sample I.D. 4G79002 Effl. 1	Sample I.D. 4G79003 Infl. 2	Sample I.D. 4G79004 Effl. 2	Sample I.D.	Sample I.D.
Purgeable Hydrocarbons	3.8	2,000	11	3,200	23		
Benzene	0.031	31	N.D.	47	0.15		
Toluene	0.027	66	0.15	96	0.35		
Ethyl Benzene	0.023	11	0.069	19	0.20		
Total Xylenes	0.023	58	0.69	99	1.5		
Chromatogram Pattern:		Gas	Gas	Gas	Gas		

**Quality Control Data**

Report Limit Multiplication Factor:	50	1.0	50	1.0
Date Analyzed:	7/15/94	7/15/94	7/15/94	7/15/94
Instrument Identification:	GCHP-20	GCHP-17	GCHP-20	GCHP-17
Surrogate Recovery, %: (QC Limits = 70-130%) * - Coelution Confirmed	127	105	164 *	100

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.  
Analytes reported as N.D. were not detected above the stated reporting limit.

**SEQUOIA ANALYTICAL**

Todd Olive  
Project Manager

Please Note:

A molecular weight of 65 was used to calculate ppmv for Purgeable Hydrocarbons.



Gettier Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco, 2169-94-5  
Sample Descript: Air  
First Sample #: 4G79001

Sampled: Jul 15, 1994  
Received: Jul 15, 1994  
Reported: Jul 19, 1994

CALDERON INERT GASES

Sample Number	Sample Description	Inert Gases, %			
		O2	N2	CO2	CH4
4G79001	Infl. 1	17	-	-	-
4G79003	Infl. 2	19	-	-	-

Detection Limits:

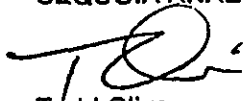
0.10

3.0

0.15

0.020

SEQUOIA ANALYTICAL ELAP #1271

  
Todd Olive  
Project Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco, 2169-94-5  
Matrix: Liquid

QC Sample Group: 4G79001, 03

Reported: Jul 19, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R. Vincent	R. Vincent	R. Vincent	R. Vincent

MS/MSD Batch#:	4G61303	4G61303	4G61303	4G61303
Date Prepared:	N.A.	N.A.	N.A.	N.A.
Date Analyzed:	7/15/94	7/15/94	7/15/94	7/15/94
Instrument I.D.#:	GCHP-20	GCHP-20	GCHP-20	GCHP-20
Conc. Spiked:	10 µg/L	10 µg/L	10 µg/L	30 µg/L
Matrix Spike % Recovery:	91	93	91	90
Matrix Spike Duplicate % Recovery:	96	95	96	97
Relative % Difference:	5.3	2.1	5.3	7.5

LCS Batch#:

Date Prepared:  
Date Analyzed:  
Instrument I.D.#:

LCS %  
Recovery:

% Recovery Control Limits:	71-133	72-128	72-130	71-120
----------------------------	--------	--------	--------	--------

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

Please Note:

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

SEQUOIA ANALYTICAL

Todd Olive  
Project Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco, 2169-94-5  
Matrix: Liquid

QC Sample Group: 4G79002, 04

Reported: Jul 19, 1994

**QUALITY CONTROL DATA REPORT**

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R. Vincent	R. Vincent	R. Vincent	R. Vincent

MS/MSD Batch#:	4G61304	4G61304	4G61304	4G61304
Date Prepared:	N.A.	N.A.	N.A.	N.A.
Date Analyzed:	7/15/94	7/15/94	7/15/94	7/15/94
Instrument I.D.#:	GCHP-17	GCHP-17	GCHP-17	GCHP-17
Conc. Spiked:	10 µg/L	10 µg/L	10 µg/L	30 µg/L
Matrix Spike % Recovery:	96	98	97	97
Matrix Spike Duplicate % Recovery:	99	88	83	93
Relative % Difference:	3.1	11	16	4.2

LCS Batch#:

Date Prepared:  
Date Analyzed:  
Instrument I.D.#:

LCS % Recovery:

% Recovery Control Limits:	71-133	72-128	72-130	71-120
----------------------------	--------	--------	--------	--------

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

**Please Note:**

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

**SEQUOIA ANALYTICAL**

  
Todd Olive  
Project Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco, 2169-94-5  
Matrix: Liquid

QC Sample Group: 4G79001, 03

Reported: Jul 19, 1994

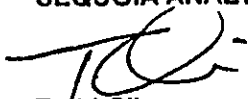
### QUALITY CONTROL DATA REPORT

ANALYTE	Oxygen	Oxygen
Method:	Mod. ASTM-D-3416	Mod. ASTM
Analyst:	M. Nguyen	M. Nguyen

Date Analyzed:	7/18/94	7/18/94
Sample #:	4070833	Ambient Air
Sample Concentration:	19	21
Sample Duplicate Concentration:	18	17
% RPD:	5.4	21
Control Limits:	0-30	0-30

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL ELAP #1271

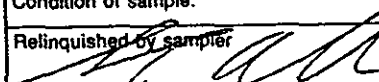
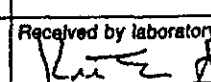
  
Todd Olive  
Project Manager





ARCO Facility no. **2169** City (Facility) **Oakland** Project manager (Consultant) **Joe Callman** Laboratory name **Sygnia**  
 ARCO engineer **Mike Whelan** Telephone no. (ARCO) \_\_\_\_\_ Telephone no. (Consultant) **551-7555** Fax no. (Consultant) **551-7888** Contract number \_\_\_\_\_  
 Consultant name **GSS** Address (Consultant) **6777 Sierra G Suite 6 Dublin CA**

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 802	BTEX/TPH EPA 1632/802/8015	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM/30E	EPA 801/8010	EPA 824/8240	EPA 825/8270	TCLP Metals <input type="checkbox"/> VOC <input type="checkbox"/> VOA <input type="checkbox"/>	SAM Metals EPA 801/807000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org./DHS <input type="checkbox"/> Lead EPA 7420/7421 <input type="checkbox"/>	Method of shipment	
			Soil	Water	Other Air	Ice	Acid															
J.P.1		1			+			2-15-94	8:40													691
J.P.1		1			+			J	8:40													Standard
W.P.2		1			+			7-15-94	12:15													Standard
B.P.2		1			+			1	12:40													Standard
																						Remarks
																						GSS #
																						9927.7C

Condition of sample: \_\_\_\_\_ Temperature received: \_\_\_\_\_  
 Relinquished by sampler  Date **2-15-94** Time **14:10** Received by \_\_\_\_\_  
 Relinquished by \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Received by \_\_\_\_\_  
 Relinquished by \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Received by laboratory  Date **2-15-94** Time **14:10**

Priority Rush 1 Business Day   
 Rush 2 Business Days   
 Expedited 5 Business Days   
 Standard 10 Business Days



Gettler Ryan/Geostrategies  
 6747 Sierra Court, Suite J  
 Dublin, CA 94568  
 Attention: Joel Coffman

Client Project ID: Arco 2169-94-5  
 Sample Matrix: Air  
 Analysis Method: EPA 5030/8015 Mod./8020  
 First Sample #: 4GA4901

Sampled: Jul 20, 1994  
 Received: Jul 20, 1994  
 Reported: Jul 25, 1994

**TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION**

Analyte	Reporting Limit ppmv	Sample I.D.	Sample I.D.
		4GA4901 Infl	4GA4902 Effl
Purgeable Hydrocarbons	3.8	750	N.D.
Benzene	0.031	10	N.D.
Toluene	0.027	14	0.056
Ethyl Benzene	0.023	3.5	N.D.
Total Xylenes	0.023	19	0.042
Chromatogram Pattern:		Gas + Non-gas mix < C8	Gas

**Quality Control Data**

Report Limit Multiplication Factor:	50	1.0
Date Analyzed:	7/21/94	7/21/94
Instrument Identification:	GCHP-17	GCHP-3
Surrogate Recovery, %: (QC Limits = 70-130%)	118	100

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.  
 Analytes reported as N.D. were not detected above the stated reporting limit.

**SEQUOIA ANALYTICAL**

  
 Todd Olive  
 Project Manager

Please Note:

A molecular weight of 65 was used to calculate ppmv for Purgeable Hydrocarbons.



**Sequoia  
Analytical**

Chesapeake Drive  
1900 Bates Avenue, Suite L  
819 Striker Avenue, Suite 8

Redwood City, CA 9  
Concord, CA 94520  
Sacramento, CA 95834

(916) 364-9600  
(510) 686-9600  
(916) 921-9600

FAX (415) 364-9233  
FAX (510) 686-9689  
FAX (916) 921-0100

Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco 2169-94-5  
Sample Descript: Air, Infi  
First Sample #: 4GA4901

Sampled: Jul 20, 1994  
Received: Jul 20, 1994  
Reported: Jul 25, 1994

**CALDERON INERT GASES**

Sample Number	Sample Description	Inert Gases, %			
		O2	N2	CO2	CH4
4GA4901	Infi	20	-	0.64	-

Detection Limits:	0.10	0.0050	0.10	0.0050
-------------------	------	--------	------	--------

SEQUOIA ANALYTICAL

*[Signature]*  
Toad Olive  
Project Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco 2169-94-5

QC Sample Group: 4GA4901

Reported: Jul 25, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J. Minkel	J. Minkel	J. Minkel	J. Minkel
MS/MSD Batch#:	4GA2704	4GA2704	4GA2704	4GA2704
Date Prepared:	N.A.	N.A.	N.A.	N.A.
Date Analyzed:	7/21/94	7/21/94	7/21/94	7/21/94
Instrument I.D.#:	GCHP-17	GCHP-17	GCHP-17	GCHP-17
Conc. Spiked:	10 µg/L	10 µg/L	10 µg/L	30 µg/L
Matrix Spike % Recovery:	95	94	92	93
Matrix Spike Duplicate % Recovery:	97	100	97	97
Relative % Difference:	2.1	6.2	5.3	4.2

LCS Batch#:

Date Prepared:  
Date Analyzed:  
Instrument I.D.#:

LCS % Recovery:

% Recovery Control Limits:	71-133	72-128	72-130	71-120
----------------------------	--------	--------	--------	--------

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

Please Note:

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

SEQUOIA ANALYTICAL

Todd Olive  
Project Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco 2169-94-5

QC Sample Group: 4GA4902

Reported: Jul 25, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J. Minkel	J. Minkel	J. Minkel	J. Minkel
MS/MSD Batch#:	4GA2704	4GA2704	4GA2704	4GA2704
Date Prepared:	N.A.	N.A.	N.A.	N.A.
Date Analyzed:	7/21/94	7/21/94	7/21/94	7/21/94
Instrument I.D.#:	GCHP-3	GCHP-3	GCHP-3	GCHP-3
Conc. Spiked:	10 µg/L	10 µg/L	10 µg/L	30 µg/L
Matrix Spike % Recovery:	110	110	110	107
Matrix Spike Duplicate % Recovery:	100	100	110	107
Relative % Difference:	9.5	9.5	0.0	0.0

LCS Batch#:

Date Prepared:  
Date Analyzed:  
Instrument I.D.#:

LCS %  
Recovery:

% Recovery Control Limits:	71-133	72-128	72-130	71-120
----------------------------	--------	--------	--------	--------

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

Please Note:

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

SEQUOIA ANALYTICAL

Todd Olive  
Project Manager

**ARCO Products Company**

Division of AtlanticRichfieldCompany

Task Order No. **2169-94-5**

**Chain of Custody**

ARCO Facility no. <b>2169</b>	City (Facility) <b>Oakland</b>	Project manager (Consultant) <b>Joel Coffman</b>	Laboratory name <b>SPHQ12</b>
ARCO engineer <b>Mike Whelan</b>	Telephone no. (ARCO)	Telephone no. (Consultant) <b>551-7555</b>	Contract number
Consultant name <b>CSI</b>	Address (Consultant) <b>6747 Sylvia Ct J Dayton, CA</b>	Fax no. (Consultant) <b>551-7888</b>	

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 8020	BTEX/TPH EPA 1602/8020/8015	TPH Modified 8015 Gas Diesel	Oil and Grease 413.1 413.2	TPH EPA 418.1/MS03E	EPA 601/8010	EPA 624/8240	EPA 625/8270	Semi Metals TCLP Metals VOA VOA	CWM Metals EPA 8010/7000 TTLC STLC	Lead Org./DHS Lead EPA 7420/7421	
			Soil	Water	Other	Ice	Acid														
<b>216</b>		<b>2</b>			<b>Air</b>			<b>7-20-94</b>	<b>15:16</b>												
<b>217</b>		<b>1</b>			<b>Air</b>			<b>7-20-94</b>	<b>15:10</b>												

Method of shipment: **CSI**

Special detection Limit/reporting: **Standard**

Special QA/QC: **Standard**

Remarks: **CSI 992770**

Lab number: **9907A49**

Turnaround time:

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample: **GOOD** Temperature received: **COOL**

Relinquished by sampler <b>[Signature]</b>	Date <b>7-20-94</b>	Time <b>18:00</b>	Received by
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory <b>[Signature]</b>
			Date <b>7-20-94</b>
			Time <b>18:00</b>

**ARCO Products Company** 

Division of AtlanticRichfieldCompany

Task Order No. **2169-94-5**

**Chain of Custody**

ARCO Facility no. <b>2169</b>	City (Facility) <b>Oakland</b>	Project manager (Consultant) <b>Joel Cottman</b>
ARCO engineer <b>Mike Whelan</b>	Telephone no. (ARCO)	Telephone no. (Consultant) <b>551-7555</b>
Consultant name <b>GSJ</b>	Address (Consultant) <b>6747 Sierra Ct J Dublin, CA</b>	Fax no. (Consultant) <b>551-7888</b>

Laboratory name **SP9401a**

Contract number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 801	BTEX/TPH EPA 802/803/8015	TPH Modified 8015 Gas Diesel	Oil and Grease 413.1 413.2	TPH EPA 418.1/SM503E	EPA 801/8010	EPA 824/8240	EPA 825/8270	TCLP Metals VOC	Semi VOC VOC	CAR Metals EPA 801/8010 TLC STLC	Lead Org./PbS Lead EPA 7420/7421	CO <sub>2</sub> O <sub>2</sub>	
			Soil	Water	Other	Ice	Acid																
<b>2nd</b>		<b>2</b>			<b>Air</b>			<b>7-20-94 15:16</b>															
<b>1st</b>		<b>1</b>			<b>Air</b>			<b>7-20-94 15:10</b>															

Method of shipment **GSJ**

Special detection Limit/reporting **Standard**

Special QA/QC **Standard**

Remarks **GSJ 992770**

Lab number

Turnaround time

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample: **GOOD**

Temperature received: **COOL**

Relinquished by sampler <b>[Signature]</b>	Date <b>7-20-94</b>	Time <b>18:00</b>	Received by
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory <b>[Signature]</b>
	Date <b>7-20-94</b>	Time <b>18:00</b>	



# Sequoia Analytical

80 Chesapeake Drive  
1900 Bates Avenue, Suite L  
819 Striker Avenue, Suite 8

Redwood City, CA 94063  
Concord, CA 94520  
Sacramento, CA 95834

(415) 364-9600  
(510) 686-9600  
(916) 921-9600

FAX (415) 364-9233  
FAX (510) 686-9689  
FAX (916) 921-0100

Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Project: Arco, 2169-94-5

Enclosed are the results from 2 air samples received at Sequoia Analytical on August 2, 1994. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
4H06701	Air,, Inf-AS	8/1/94	Oxygen Carbon Dioxide EPA 5030/8015 Mod./8020
4H06702	Air, Eff-AS	8/1/94	EPA 5030/8015 Mod./8020

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Todd Olive  
Project Manager





Gettler Ryan/Geostrategies 6747 Sierra Court, Suite J Dublin, CA 94568 Attention: Joel Coffman	Client Project ID: Arco, 2169-94-5 Sample Matrix: Air Analysis Method: EPA 5030/8015 Mod./8020 First Sample #: 4H06701	Sampled: Aug 1, 1994 Received: Aug 2, 1994 Reported: Aug 4, 1994
---	---	--

**TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION**

Analyte	Reporting Limit ppmv	Sample I.D. 4H06701 Inf-AS	Sample I.D. 4H06702 Eff-AS
Purgeable Hydrocarbons	3.8	680	52
Benzene	0.031	6.0	1.1
Toluene	0.027	14	2.1
Ethyl Benzene	0.023	3.9	0.44
Total Xylenes	0.023	25	2.5
Chromatogram Pattern:		Gas + Non Gas Mix < C8	Gas + Non Gas Mix < C8

**Quality Control Data**

Report Limit Multiplication Factor:	50	1.0
Date Analyzed:	8/2/94	8/2/94
Instrument Identification:	GCHP 17	GCHP 17
Surrogate Recovery, %: (QC Limits = 70-130%)	116	152*

\* Coelution Confirmed

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.  
 Analytes reported as N.D. were not detected above the stated reporting limit.

**SEQUOIA ANALYTICAL**

*T.O.*  
 Todd Olive  
 Project Manager

Please Note:

A molecular weight of 65 was used to calculate ppmv for Purgeable Hydrocarbons.



Gettler Ryan/Geostrategies 6747 Sierra Court, Suite J Dublin, CA 94568 Attention: Joel Coffman	Client Project ID: Arco, 2169-94-5 Sample Descript: Air, First Sample #: 4H06701	Sampled: Aug 1, 1994 Received: Aug 2, 1994 Reported: Aug 4, 1994
---	--	--

**CALDERON INERT GASES**

Sample Number	Sample Description	Inert Gases, %			
		O2	N2	CO2	CH4
4H06701	Inf-AS	14	-	0.58	-

<b>Detection Limits:</b>	<b>0.10</b>	<b>0.0050</b>	<b>0.15</b>	<b>0.0050</b>
--------------------------	-------------	---------------	-------------	---------------

SEQUOIA ANALYTICAL

  
Todd Olive  
Project Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court, Suite J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco, 2169-94-5

QC Sample Group: 4H06701

Reported: Aug 4, 1994

**QUALITY CONTROL DATA REPORT**

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
<b>Method:</b>	EPA 8020	EPA 8020	EPA 8020	EPA 8020
<b>Analyst:</b>	R. Vincent	R. Vincent	R. Vincent	R. Vincent

**MS/MSD**

**Batch#:** 9407G0901      9407G0901      9407G0901      9407G0901

**Date Prepared:** N.A.      N.A.      N.A.      N.A.  
**Date Analyzed:** 8/2/94      8/2/94      8/2/94      8/2/94  
**Instrument I.D.#:** GCHP-17      GCHP-17      GCHP-17      GCHP-17  
**Conc. Spiked:** 10 µg/L      10 µg/L      10 µg/L      30 µg/L

**Matrix Spike % Recovery:** 93      91      92      93

**Matrix Spike Duplicate % Recovery:** 97      100      92      97

**Relative % Difference:** 4.2      9.4      0.0      4.2

**LCS Batch#:**

**Date Prepared:**  
**Date Analyzed:**  
**Instrument I.D.#:**

**LCS % Recovery:**

% Recovery Control Limits:	71-133	72-128	72-130	71-120
----------------------------	--------	--------	--------	--------

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

**Please Note:**

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

**SEQUOIA-ANALYTICAL**

Todd Olive  
Project Manager





# Sequoia Analytical

Chesapeake Drive  
1900 Bates Avenue, Suite L  
819 Striker Avenue, Suite 8

Redwood City, CA 94063  
Concord, CA 94520  
Sacramento, CA 95834

(916) 364-9600  
(510) 686-9600  
(916) 921-9600

FAX (415) 364-9233  
FAX (510) 686-9689  
FAX (916) 921-0100

*Handwritten notes:*  
Copy to be given to [unclear]

Gettler Ryan/Geostrategies  
6747 Sierra Court Suite G  
Dublin, CA 94568  
Attention: Joel Coffman

Enclosed are the results from samples received at Sequoia Analytical on August 15, 1994.  
The requested analyses are listed below:

<u>SAMPLE #</u>	<u>SAMPLE DESCRIPTION</u>	<u>DATE OF COLLECTION</u>	<u>TEST METHOD</u>
9408844-01	Infl	08/15/94	TPHGB Purgeable TPH / BTEX
9408844-01	Infl	08/15/94	Carbon Dioxide
9408844-01	Infl	08/15/94	Oxygen
9408844-02	Effl	08/15/94	TPHGB Purgeable TPH / BTEX

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

**SEQUOIA ANALYTICAL**

*T. Olive*

Todd Olive  
Project Manager



**Sequoia  
Analytical**

Chesapeake Drive  
1900 Bates Avenue, Suite L  
819 Striker Avenue, Suite 8

Redwood City, CA 94063  
Concord, CA 94520  
Sacramento, CA 95834

) 364-9600  
(510) 686-9600  
(916) 921-9600

FAX (415) 364-9233  
FAX (510) 686-9689  
FAX (916) 921-0100

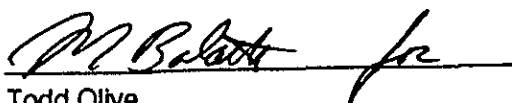
Gettler Ryan/Geostrategies 6747 Sierra Court Suite G Dublin, CA 94568	Client Proj. ID: Arco 2169-94-5  Lab Proj. ID: 9408844	Sampled: 08/15/94 Received: 08/15/94 Analyzed: see below  Reported: 08/18/94
Attention: Joel Coffman		

**LABORATORY ANALYSIS**

Analyte	Units	Date Analyzed	Detection Limit	Sample Results
Lab No: 9408844-01 Sample Desc : AIR,Infl				
#1271 Carbon Dioxide	%	08/17/94	0.15	0.53
#1271 Oxygen	%	08/17/94	0.10	20

Analytes reported as N.D. were not present above the stated limit of detection.

# ELAP Number  
**SEQUOIA ANALYTICAL - ELAP #1210**

  
Todd Olive  
Project Manager



Gettler Ryan/Geostrategies 6747 Sierra Court Suite G Dublin, CA 94568  Attention: Joel Coffman	Client Proj. ID: Arco 2169-94-5 Sample Descript: Infl Matrix: AIR Analysis Method: 8015Mod/8020 Lab Number: 9408844-01	Sampled: 08/15/94 Received: 08/15/94  Analyzed: 08/16/94 Reported: 08/18/94
--	--	---

**Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX**

Analyte	Detection Limit ppmv	Sample Results ppmv
TPPH as Gas	95	680
Benzene	0.78	9.1
Toluene	0.68	24
Ethyl Benzene	0.58	5.5
Xylenes (Total)	0.58	37
Chromatogram Pattern: Gas & Non Gas Mix		<C8
 Surrogates	<b>Control Limits %</b>	<b>% Recovery</b>
Trifluorotoluene	70                      130	127

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL - ELAP #1210**

*T. Olive*  
\_\_\_\_\_  
Todd Olive  
Project Manager



Gettler Ryan/Geostrategies 6747 Sierra Court Suite G Dublin, CA 94568	Client Proj. ID: Arco 2169-94-5 Sample Descript: Effl Matrix: AIR Analysis Method: 8015Mod/8020 Lab Number: 9408844-02	Sampled: 08/15/94 Received: 08/15/94  Analyzed: 08/16/94 Reported: 08/18/94
Attention: Joel Coffman		

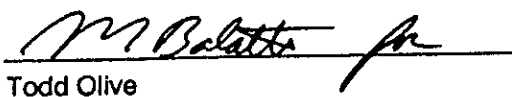
Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX

Analyte	Detection Limit ppmv	Sample Results ppmv
TPPH as Gas	3.8	35
Benzene	0.031	0.31
Toluene	0.027	0.56
Ethyl Benzene	0.023	0.11
Xylenes (Total)	0.023	0.76
Chromatogram Pattern: Gas & Non Gas Mix		<C8

Surrogates	Control Limits %	% Recovery
Trifluorotoluene	70 130	156 Q

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210



Todd Olive  
Project Manager





Gettler Ryan/Geostrategies  
6747 Sierra Court, Ste J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco 2169-94-5  
Matrix: Liquid

QC Sample Group: 9408844 -01

Reported: Aug 18, 1994

**QUALITY CONTROL DATA REPORT**

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J. Minkel	J. Minkel	J. Minkel	J. Minkel

MS/MSD Batch#:	940829702	940829702	940829702	940829702
Date Prepared:	N.A.	N.A.	N.A.	N.A.
Date Analyzed:	8/16/94	8/16/94	8/16/94	8/16/94
Instrument I.D.#:	GCHP-17	GCHP-17	GCHP-17	GCHP-17
Conc. Spiked:	10 µg/L	10 µg/L	10 µg/L	30 µg/L
Matrix Spike % Recovery:	100	100	100	103
Matrix Spike Duplicate % Recovery:	100	100	100	103
Relative % Difference:	0.0	0.0	0.0	0.0

LCS Batch#:

Date Prepared:  
Date Analyzed:  
Instrument I.D.#:

LCS % Recovery:

% Recovery Control Limits:	71-133	72-128	72-130	71-120
----------------------------	--------	--------	--------	--------

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

*T. Olive*  
Todd Olive  
Project Manager

Please Note:

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.



Gettler Ryan/Geostrategies  
6747 Sierra Court, Ste J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco 2169-94-5  
Matrix: Liquid

QC Sample Group: 9408844 -02

Reported: Aug 18, 1994

**QUALITY CONTROL DATA REPORT**

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J. Minkel	J. Minkel	J. Minkel	J. Minkel

MS/MSD Batch#:	940879702	940879702	940879702	940879702
Date Prepared:	N.A.	N.A.	N.A.	N.A.
Date Analyzed:	8/16/94	8/16/94	8/16/94	8/16/94
Instrument I.D.#:	GCHP-2	GCHP-2	GCHP-2	GCHP-2
Conc. Spiked:	10 µg/L	10 µg/L	10 µg/L	30 µg/L
Matrix Spike % Recovery:	93	94	96	93
Matrix Spike Duplicate % Recovery:	94	94	96	93
Relative % Difference:	1.1	0.0	0.0	0.0

LCS Batch#:

Date Prepared:  
Date Analyzed:  
Instrument I.D.#:

LCS % Recovery:

% Recovery Control Limits:	71-133	72-128	72-130	71-120
----------------------------	--------	--------	--------	--------

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

**Please Note:**

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

SEQUOIA ANALYTICAL

*T. Olive*  
Todd Olive  
Project Manager



**Sequoia  
Analytical**

Chesapeake Drive Redwood City, CA 94063  
1000 Bates Avenue, Suite L Concord, CA 94520  
819 Striker Avenue, Suite 8 Sacramento, CA 95834

) 364-9600  
(510) 686-9600  
(916) 921-9600

FAX (415) 364-9233  
FAX (510) 686-9689  
FAX (916) 921-0100

Gettler Ryan/Geostrategies  
6747 Sierra Court, Ste J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco 2169-94-5  
Matrix: Air

QC Sample Group: 9408844 -01

Reported: Aug 18, 1994

### QUALITY CONTROL DATA REPORT

ANALYTE	CO2	O2	N2	CH2
<b>Method:</b>	Inert Gas	Inert Gas	Inert Gas	Inert Gas
<b>Analyst:</b>	M. Nguyen	M. Nguyen	M. Nguyen	M. Nguyen

<b>Date Analyzed:</b>	8/17/94	8/17/94	8/17/94	8/17/94
<b>Sample #:</b>	4080933	4080933	4080933	4080933
<b>Sample Concentration:</b>	0.53	20	81	N.D.
<b>Sample Duplicate Concentration:</b>	0.53	20	82	N.D.
<b>% RPD:</b>	0.0	0.0	1.2	N.D.
<b>Control Limits:</b>	0-30	0-30	0-30	0-30

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

  
Todd Olive  
Project Manager



**ARCO Products Company**  
Division of AtlanticRichfieldCompany

Task Order No. **2169-94.5**

**Chain of Custody**

ARCO Facility no. **2169** City (Facility) **Catland** Project manager (Consultant) **Joel Coffman**  
 ARCO engineer **Mike Whelan** Telephone no. (ARCO) Telephone no. (Consultant) **510-551-7555** Fax no. (Consultant) **510-551-7888**  
 Consultant name **CSI** Address (Consultant) **6747 Sierra Ct Suite 6 DuVal CA**

Laboratory name **SQUICCI**  
 Contract number **07.073**

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA 1662/8020/8015	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM503E	EPA 601/801D	EPA 624/824D	EPA 625/827D	TCLP Metals <input type="checkbox"/> VOA <input type="checkbox"/>	Semi Metals <input type="checkbox"/> VOA <input type="checkbox"/>	CAM Metals EPA 8010/7000 TTLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org./DHS Lead EPA 7420/7421 <input type="checkbox"/>	X	
			Soil	Water	Other	Ice	Acid																
<b>2nd</b>		<b>2</b>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<b>8-15-94</b>	<b>15:36</b>		<input checked="" type="checkbox"/>													
<b>BTC</b>		<b>1</b>			<input checked="" type="checkbox"/>				<b>15:28</b>	<input checked="" type="checkbox"/>													

Method of shipment **CS**  
 Special detection Limit/reporting  
 Special QA/QC  
 Remarks **95**  
 Lab number  
 Turnaround time  
 Priority Rush 1 Business Day   
 Rush 2 Business Days   
 Expedited 5 Business Days   
 Standard 10 Business Days

Condition of sample: **Good** Temperature received: **cool**  
 Relinquished by sampler **[Signature]** Date **8-15-94** Time **17:20** Received by **[Signature]**  
 Relinquished by \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Received by \_\_\_\_\_  
 Relinquished by \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Received by laboratory **[Signature]** Date **8-15-94** Time **19:20**



# Sequoia Analytical

680 Chesapeake Drive  
1900 Bates Avenue, Suite L  
819 Striker Avenue, Suite 8

Redwood City, CA 94063  
Concord, CA 94520  
Sacramento, CA 95834

(415) 364-9600  
(510) 686-9600  
(916) 921-9600

FAX (415) 364-9233  
FAX (510) 686-9689  
FAX (916) 921-0100

Gettler Ryan/Geostrategies  
6747 Sierra Court, Ste J  
Dublin, CA 94568  
Attention: Joel Coffman

Project: Arco 2169-94-5

Enclosed are the results from 2 air samples received at Sequoia Analytical on September 13, 1994. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
9409589-01	Air, Inf.-A	9/13/94	TPHGB Purgeable TPH/ BTEX Carbon Dioxide Oxygen
9409589-02	Alr, Eff.-A	9/13/94	TPHGB Purgeable TPH/ BTEX

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Todd Olive  
Project Manager

SEQUOIA ANALYTICAL

Quality Assurance Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court Suite G  
Dublin, CA 94568

Attention: Joel Coffman

Client Proj. ID: Arco, 2169-94-5  
Sample Descript: Inf-A  
Matrix: AIR  
Analysis Method: 8015Mod/8020  
Lab Number: 9409589-01

Sampled: 09/13/94  
Received: 09/13/94

Analyzed: 09/14/94  
Reported: 09/15/94

### Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX

Analyte	Detection Limit ppmv	Sample Results ppmv
TPPH as Gas	38	450
Benzene	0.31	2.9
Toluene	0.27	11
Ethyl Benzene	0.23	2.1
Xylenes (Total)	0.23	15
Chromatogram Pattern:		gas
<b>Surrogates</b>	<b>Control Limits %</b>	<b>% Recovery</b>
Trifluorotoluene	70 130	167 Q

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL - ELAP #1210

Todd Olive  
Project Manager



Gettler Ryan/Geostrategies 6747 Sierra Court Suite G Dublin, CA 94568	Client Proj. ID: Arco, 2169-94-5 Sample Descript: Eff-A Matrix: AIR Analysis Method: 8015Mod/8020 Lab Number: 9409589-02	Sampled: 09/13/94 Received: 09/13/94 Analyzed: 09/14/94 Reported: 09/15/94
Attention: Joel Coffman		

**Total Purgeable Petroleum Hydrocarbons (TPPH) with BTEX**

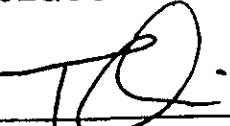
Analyte	Detection Limit ppmv	Sample Results ppmv
TPPH as Gas	3.8	4.1
Benzene	0.031	0.044
Toluene	0.027	0.11
Ethyl Benzene	0.023	N.D.
Xylenes (Total)	0.023	0.13
Chromatogram Pattern:		gas

Surrogates	Control Limits %	% Recovery
Trifluorotoluene	70 130	107

Analytes reported as N.D. were not present above the stated limit of detection.

**SEQUOIA ANALYTICAL - ELAP #1210**

  
 \_\_\_\_\_  
 Todd Olive  
 Project Manager





Gettler Ryan/Geostrategies  
6747 Sierra Court Suite G  
Dublin, CA 94568

Client Proj. ID: Arco, 2169-94-5

Lab Proj. ID: 9409589

Sampled: 09/13/94  
Received: 09/13/94  
Analyzed: see below

Attention: Joel Coffman

Reported: 09/15/94

**LABORATORY ANALYSIS**

Analyte	Units	Date Analyzed	Detection Limit	Sample Results
Lab No: 9409589-01				
Sample Desc : AIR,Inf-A				
#1271	Carbon Dioxide	%	09/15/94	0.15
#1271	Oxygen	%	09/15/94	0.10
				0.38
				17

Analytes reported as N.D. were not present above the stated limit of detection.

# ELAP Number  
**SEQUOIA ANALYTICAL - ELAP #1210**

Todd Olive  
Project Manager



Sequoia  
Analytical

680 Chesapeake Drive  
1900 Bates Avenue, Suite L  
819 Striker Avenue, Suite 8

Redwood City, CA 94063  
Concord, CA 94520  
Sacramento, CA 95834

(415) 364-9600  
(510) 686-9600  
(916) 921-9600

FAX (415) 364-9233  
FAX (510) 686-9689  
FAX (916) 921-0100

Gettler Ryan/Geostrategies  
6747 Sierra Court Suite G  
Dublin, CA 94568  
Attention: Joel Coffman

Client Proj. ID: Arco, 2169-94-5

Received: 09/13/94

Lab Proj. ID: 9409589

Reported: 09/15/94

## LABORATORY NARRATIVE

A molecular weight of 65 was used to calculate the TPH Gas value.  
Q- Surrogate co-elution was confirmed.

SEQUOIA ANALYTICAL

Todd Olive  
Project Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court, Ste J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco 2169-94-5  
Matrix: Liquid

QC Sample Group: 9409589 -01, 02

Reported: Sep 15, 1994

**QUALITY CONTROL DATA REPORT**

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R. Vincent	R. Vincent	R. Vincent	R. Vincent

MS/MSD Batch#:	940955101	940955101	940955101	940955101
Date Prepared:	N.A.	N.A.	N.A.	N.A.
Date Analyzed:	9/14/94	9/14/94	9/14/94	9/14/94
Instrument I.D.#:	GCHP-2	GCHP-2	GCHP-2	GCHP-2
Conc. Spiked:	10 µg/L	10 µg/L	10 µg/L	30 µg/L
Matrix Spike % Recovery:	93	93	93	93
Matrix Spike Duplicate % Recovery:	96	98	97	97
Relative % Difference:	3.2	5.2	4.2	4.2

LCS Batch#:

Date Prepared:  
Date Analyzed:  
Instrument I.D.#:

LCS % Recovery:


% Recovery Control Limits:	71-133	72-128	72-130	71-120
----------------------------	--------	--------	--------	--------

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

**Please Note:**

The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

**SEQUOIA ANALYTICAL**

  
Todd Olive  
Project Manager



Gettler Ryan/Geostrategies  
6747 Sierra Court, Ste J  
Dublin, CA 94568  
Attention: Joel Coffman

Client Project ID: Arco 2169-94-5  
Matrix: Liquid

QC Sample Group: 9409589 -01

Reported: Sep 15, 1994

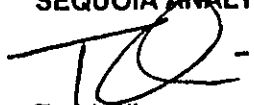
### QUALITY CONTROL DATA REPORT

ANALYTE	C02	02
<b>Method:</b>	Inert Gases	Inert Gases
<b>Analyst:</b>	M. Nguyen	M. Nguyen

<b>Date Analyzed:</b>	9/14/94	9/14/94
<b>Sample #:</b>	4090623	4090623
<b>Sample Concentration:</b>	0.38	17
<b>Sample Duplicate Concentration:</b>	0.37	18
<b>% RPD:</b>	2.7	5.7
<b>Control Limits:</b>	0-30	0-30

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

  
Todd Olive  
Project Manager



**APPENDIX D**

**FIELD DATA SHEETS, OPERATION AND MAINTENANCE VISITS,  
THIRD QUARTER**



THERM-TECH SYSTEM MONITORING DATA SHEET

Client: ARCO #2169
Site: 889 West Grand Ave.
Oakland, CA

Job#: 7927
Field Technician: F. Chir B. Herron
Date: 7-15-94

Table with columns for Inflow and Outflow data. Rows include Inflow, Dilution Air, Total Intake, and Effluent. Data points include Time (8:42am, 12:42pm), Pipe ID (3), Differential Pressure (1.55, 1.5), Vacuum (71, 70), Temperature (66.2, 70.2, 70.4, 77.0), HC Concentration (2130, 4430), and various pressure and meter readings.

STATUS

Active on Arrival (circle one): Y N
Active on Departure (circle one): Y N

Monitoring Device (circle one): FID PID IR
Mode (circle one): Therm Cat

Restart Date

Comments: Dilution Air from Well Field Ambient

Supplies Used:



# VAPOR EXTRACTION WELL MONITORING DATA SHEET

Client: ARCO #2169  
 Site: 889 West Grand Ave.  
Oakland, CA

Job#: 7927  
 Field Technician: I. Cline Bob Hervey  
 Date: 9-15-94

EXTRACTION WELL #	A-4	AR-2	A-3	AV-1	AV-6	A-2	AV-5	ADR-2	AV-4	ADR-1	AV-7	A-1	AV-3	AV-2
Time						902 <del>1224</del>	855 <del>1243</del>	859 <del>1244</del>	855 <del>1245</del>	851 <del>1246</del>	859 <del>1247</del>	901 <del>1248</del>	902 <del>1249</del>	903 <del>1250</del>
Active on Arrival (Y/N)	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Active on Departure (Y/N)	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pipe ID @ Influent (in)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Differential Pressure (in WC)						.14 <del>.21</del>	.20 <del>.21</del>	.18 <del>.21</del>	.22 <del>.22</del>	.16 <del>.23</del>	.14 <del>.16</del>	.20 <del>.21</del>	.11 <del>.23</del>	1.80 <del>1.85</del>
Initial Vacuum (in WC)						62	64	65	64	64	64	64	64	64
Final Vacuum (in WC)						71	72	73	73	72	74	72	74	74
Temperature (F)														
Initial HC Concentration (ppm)	20	15	50	100	200	160	2120	2150	7160	4010	2000	1350	570	750
Final HC Concentration (ppm)	30	20	80	130	700	510	9150	9530	<del>2250</del>	7850	8200	2860	1470	4500
Sampled (Y/N) / ID#	N								12780	N				

All initial data (dP, vacuum, temperature, and HC concentration) should correspond to sampling event.

Notes:

Water Levels: No action  
 Initial Final  
 ADR-1 10:47 6.5'FP 9.56 4'FP Final  
 ADR-2 11:51 4.3'FP 9.78 3.5'FP  
 AR-2 12:38 11.21  
 A-1 11:25 9.67'  
 Top of casing

Initial Temp wet	55.1	58.4	65.8	61.0	63.3	67.8	60.2	56.5	59.8
Temp Dry	57.3	61.4	71.2	64.8	65.0	65.7	60.9	88.7	71.2
Temp Wet	57.8	58.8	58.2	61.3	59.4	57.5	57.5	61.0	70.4
Temp Dry	65.0	69.2	64.4	61.9	76.3	67.3	69.0	69.5	78.3



DAILY REPORT

COMPANY

Arco # 2169

JOB NO.

4927.97C

LOCATION

889 W. Covand  
Oakland CA

DATE

7-15-94

JOB INSTRUCTIONS:

To size to restart system and bring  
spurge Blower online

WORK PERFORMED (CONT. ON REVERSE SIDE):

Perform start up per  
protocol provide by Engineering Department. Water levels.  
therm tech online & Balance. Well field monitored  
Bag samples collected Influent & Effluent.  
Spurge Blower brought online System rebalanced.

Spurge Blower running @ 25 cfm pressure only built up  
to 2 cpsi adjust relief valve still only 1 cpsi

Found sampling port in well AS-1 open. checked  
c14v spurge wells all tight.

MATERIALS:

Measured water levels in A-1 AR-2, AR-1 & 2  
Monitoring caused temp to drop had to bring system  
back up then monitor well field again

SUBCONTRACTOR:

(over)

EQUIPMENT

AIR COMPRESSOR

PAVING ROLLER

VR3

SPECIALTY TRUCK

30-05(6)

PAVING WACKER

OVA

PIPE TRUCK & TOOLS

20-15(6)

CONCRETE MIXER

OVM

DUMP TRUCK

CONCRETE SAWING

GASTECH

LOADER

SIGNS

SAMPLE PUMP

STEAM CLEANER

CONES

HORIBA

WATER/TRANSFER PUMP

ARROW BOARD

PETROTITE-TESTER

GENERATOR

TRENCH PLATES

FLOW TESTER

FOREMAN

Fi Cliné / Bob Herron

Collected influent & Effluent bag samples.  
aer system stabilized

Sparg Sparge Blower giving 25cfm float pressure.  
only built up to 5psi  
Samples to Sequoia

Returned Sunday 7-17-94 to check system.

Found ~~star~~ sparge Blower piping broken.

@ outlet Pitou housing Removed for repair

Sparge Blower off. Therm tech still on

to be repaired 7-18-94.



THERM-TECH SYSTEM MONITORING DATA SHEET

Client: ARCO #2169  
 Site: 889 West Grand Ave.  
Oakland, CA

Job#: 7927  
 Field Technician: E. Cline  
 Date: 7-20-94

<b>INFLUENT</b>		
Time	1438	
Pipe ID @ Influent (in)	3	3
Differential Pressure (in WC)	1.33	
Vacuum (in WC)	82	
Temperature (F)	75.6 70.4 / 73.5	75.8
HC Concentration (ppm)	2500	2610
Sampled (Y/N) / ID#	15116 Yes In f Gas B/P/N/E	CO, O <sub>2</sub> No
<b>DILUTION AIR</b> Oxygen		
Pipe ID @ Dilution Intake (in)	3	3
Differential Pressure (in WC)	0"	0"
Temperature (F)	86°F	86°F
<b>TOTAL INTAKE</b> Total Vacuum		
Differential Pressure (in WC)	0.32"	0.32"
Total Pressure (in WC)	3.1"	3.1"
<b>EFFLUENT</b>		
Stack Dimensions (inXin)	10 x 10	10 x 10
Differential Pressure (in WC)	0.015 @ top of stack	0.016
Temperature (F)	1260°F	1260
HC Concentration (ppm)	0	0
Sampled (Y/N) / ID#	15116 Yes B/P Gas B/P/N/E	No
<b>SYSTEM</b>		
Hour Meter	702.14	704.36
Electric Meter	12218	12219
Gas/Propane Meter	0176	0178
Set Point (F)	1420 / 1500	1420 / 1500
Operating Temperature (F)	1413 - 1421	1420
High Temperature Shutoff (F)	1408 1418	1422
Filter Pressure (in WC)		

STATUS

Active on Arrival (circle one):  Y  N  
 Active on Departure (circle one):  Y  N

Monitoring Device (circle one):  FID  PID  IR  
 Mode (circle one):  Therm  Cat

Restart Date \_\_\_\_\_

Comments: Spare weld Pressure Total pressure 2.8 psi  
 AS-3 3.6 Total Flow 295.4 m

Supplies Used:

AS-1	2.3
AS-5	2.3
AS-4	3.1



# VAPOR EXTRACTION WELL MONITORING DATA SHEET

Client: ARCO #2169  
 Site: 889 West Grand Ave.  
Oakland, CA

Job#: 7927  
 Field Technician: F. Chino  
 Date: 7-20-94

EXTRACTION WELL #	A-4	AR-2	A-3	AV-1	AV-6	A-2	AV-5	ADR-2	AV-4	ADR-1	AV-7	A-1	AV-3	AV-2
Time	14:30													
Active on Arrival (Y/N)	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Active on Departure (Y/N)	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pipe ID @ Influent (in)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Differential Pressure (in WC)	0	0	0	0	0	0.25	1.10	0.16	1.50	0.18	1.15	0.20	0.58	1.20
Initial Vacuum (in WC)	0	0	0	0	0	76	76	78	78	76	78	76	78	77
Final Vacuum (in WC)	0	0	0	0	0	78	78	80	79	78	79	78	79	78
Temperature (F)	NT					69.2	65.6	74.6	72.4	72.8	74.0	70.6	72.2	75.4
Initial HC Concentration (ppm)	25	200	0	30	20	1150	1200	3500	2500	2800	1800	2800	1300	800
Final HC Concentration (ppm)	NT	N	NT	N	NT	1200	1200	3450	3200	2800	2100	2300	800	1000
Sampled (Y/N) / ID#	N													
All initial data (dP, vacuum, temperature, and HC concentration) should correspond to sampling event.														
	NT					60.2	66.0	61.8	66.3	67.2	72.2	61.5	66.2	73.8
	NT					64.5	63.5	63.0	70.0	70.4	68.8	65.0	64.0	76.5

Temp: Wet Bulb  
 Notes: Dry Bulb

Repaired sponge Blower & turned on @  
 12:00 noon.

Valve are  
 what the meter gave.

DAILY REPORT

COMPANY Arco # 2169  
LOCATION 889 W. Grand  
Oakland CA

JOB NO. 9927 / 4927.920  
DATE 7-20-94

JOB INSTRUCTIONS: System O & M & Sampling

WORK PERFORMED (CONT. ON REVERSE SIDE): Travel to site Repair  
Sparg Blower by putting pipe in place of Filter  
housing which broke. 1" x 6" pipe @ outlet of  
Blower in to line. Resealed Blower @ 12:00. Dropped  
Filter housing @ Baystad Rev Repair. Returned to site  
@ 4:00 hrs. Started by sampling Influent &  
B/Eluent. Doing various monitoring of Thermocel  
and well field. Rebalanced system. Samples  
to Sequoia in Redwood City CA

MATERIALS:

Pilot tubes Large & Small  
Wet/Dry Bulb Thermometer

SUBCONTRACTOR:

EQUIPMENT			
AIR COMPRESSOR		PAVING ROLLER	VR3
SPECIALTY TRUCK	<u>3005(4)</u>	PAVING WACKER	OVA <input checked="" type="checkbox"/>
PIPE TRUCK & TOOLS		CONCRETE MIXER	OVM
DUMP TRUCK		CONCRETE SAWING	GASTECH <input checked="" type="checkbox"/>
LOADER		SIGNS	SAMPLE PUMP <input checked="" type="checkbox"/>
STEAM CLEANER		CONES	HORIBA <input checked="" type="checkbox"/>
WATER/TRANSFER PUMP		ARROW BOARD	PETROTITE-TESTER
GENERATOR		TRENCH PLATES	FLOW TESTER
FOREMAN	<u>[Signature]</u>		

\_\_\_\_\_

DAILY REPORT

\_\_\_\_\_

COMPANY ARCO

SS # 2169

JOB NO. 4927.950

LOCATION 889 W. Grand / Market  
Oakland

DATE 7-26-94

JOB INSTRUCTIONS: Check Thermtex

WORK PERFORMED (CONT. ON REVERSE SIDE): Checked unit, found blower  
drive belt broken and chewed up. Removed sound  
enclosure to access blower belt guard. Removed  
all debris. Unable to identify belt due to  
size of remaining belt pieces. Will call  
Thermtex or J.D. to get belt number.

MATERIALS: —

SUBCONTRACTOR: —

EQUIPMENT

AIR COMPRESSOR \_\_\_\_\_  
SPECIALTY TRUCK 30-08  
PIPE TRUCK & TOOLS \_\_\_\_\_  
DUMP TRUCK \_\_\_\_\_  
LOADER \_\_\_\_\_  
STEAM CLEANER \_\_\_\_\_  
WATER/TRANSFER PUMP \_\_\_\_\_  
GENERATOR \_\_\_\_\_

PAVING ROLLER \_\_\_\_\_  
PAVING WACKER \_\_\_\_\_  
CONCRETE MIXER \_\_\_\_\_  
CONCRETE SAWING \_\_\_\_\_  
SIGNS \_\_\_\_\_  
CONES \_\_\_\_\_  
ARROW BOARD \_\_\_\_\_  
TRENCH PLATES \_\_\_\_\_

VR3 \_\_\_\_\_  
OVA \_\_\_\_\_  
OVM \_\_\_\_\_  
GASTECH \_\_\_\_\_  
SAMPLE PUMP \_\_\_\_\_  
HORIBA \_\_\_\_\_  
PETROTITE-TESTER \_\_\_\_\_  
FLOW TESTER \_\_\_\_\_

FOREMAN Bob [Signature]



THERM-TECH SYSTEM MONITORING DATA SHEET

Client: ARCO #2169  
 Site: 889 West Grand Ave.  
Oakland, CA

Job#: 7927  
 Field Technician: F. Cline  
 Date: 8-1-94

*Before Spurge*

*After Spurge*

INFLUENT	Time	15:30	17:25
Pipe ID @ Influent (in)		3	3
Differential Pressure (in WC)		1.36	1.65
Vacuum (in WC)		82"	78"
Temperature (F)		71.6°F	76°F
HC Concentration (ppm)		2020	2510
Sampled (Y/N) / ID#		Yes InP BS	Yes InP AS
DILUTION AIR <i>Oxygen</i>		2090	1890
Pipe ID @ Dilution Intake (in)		3	3
Differential Pressure (in WC)		0"	0"
Temperature (F)		85°F	75°F
TOTAL INTAKE			
Differential Pressure (in WC)		0.31"	0.32
Total Pressure (in WC)		4.0"	4.0
EFFLUENT			
Stack Dimensions (inXin)		10 x 10	10 x 10
Differential Pressure (in WC)		1010	1011
Temperature (F)		910°F	1000°
HC Concentration (ppm)		0ppm	40ppm
Sampled (Y/N) / ID#		Yes EPP BS	Yes EPP AS
SYSTEM			
Hour Meter		710.40	712.50
Electric Meter		13110	—
Gas/Propane Meter		0306.	—
Set Point (F)		600-1250	600-1250
Operating Temperature (F)		595-610	595-610
High Temperature <del>Shut</del> (F)		1038	1028
Filter Pressure (in WC)		1	0

STATUS *Oxygen*

Active on Arrival (circle one): Y  N   
 Active on Departure (circle one):  Y  N

Monitoring Device (circle one):  FID  PID  IR  
 Mode (circle one): Therm  Cat

Restart Date \_\_\_\_\_

Comments: \_\_\_\_\_

Supplies Used: *Tygon tubing 10'*



# VAPOR EXTRACTION WELL MONITORING DATA SHEET

Client: ARCO #2169  
 Site: 889 West Grand Ave.  
Oakland, CA

Job#: 7927  
 Field Technician: F. Cline  
 Date: 8-1-94

Before Sparge  
 After Sparge  
 Before sparge  
 After sparge  
 After sparge  
 After sparge

EXTRACTION WELL #	A-4	AR-2	A-3	AV-1	AV-6	A-2	AV-5	ADR-2	AV-4	ADR-1	AV-7	A-1	AV-3	AV-2
Time	15:20													
Active on Arrival (Y/N)	Y													
Active on Departure (Y/N)	Y													
Pipe ID @ Influent (in)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Differential Pressure (in WC)	0.45	0.38	0.19	0.05	0.20	0.23	0.076	0.16	0.16	0.18	0.14	0.14	1.80	1.04
Initial Vacuum (in WC)	73	73	74	71	68	71	72	74	73	70	74	71	73	72
Final Vacuum (in WC)	68	69	69	65	65	66	68	70	68	67	68	68	69	68
Temperature (F)	64.7	74.2	62.4	67.2	76.6	67.6	70.8	70.3	70.0	68.2	74.0	68.6	67.6	76.0
Initial HC Concentration (ppm)	20	30	20	80	160	700	2500	4250	4300	5100	1800	3000	800	1000
Final HC Concentration (ppm)	0	20	210	6300	210	380	6300	5870	9300	5900	2920	3200	1200	1000
Sampled (Y/N) / ID#	N													

All initial data (dP, vacuum, temperature, and HC concentration) should correspond to sampling event.

Notes: System off upon arrival Replaced Belts on Blower (Bob Herron)  
 Restarted system - Monitored, all wells sampled started sparge Blower Ran  
 1/2 hr re-monitored & sampled.

Sparging Data:

Total	2.8 psi	AS-3	AS-2	AS-1	AS-5	AS-4
	28 scfm	pressure 3.8	2.8	3.0	3.2	3.4



DAILY REPORT

COMPANY ARCO SS # 2169

JOB NO. 4927.950

LOCATION 889 W. Grand / market  
Oakland

DATE 8-1-94

JOB INSTRUCTIONS: Install blower belt and cut blocks on  
the unit.

WORK PERFORMED (CONT. ON REVERSE SIDE): Installed blower belt on  
the unit. Tensioned belt per instructions in  
Hanson manual. 20" x .040"-.060". Installed  
catalytic blocks (2), setup controllers for  
proper catalytic settings. Started unit, warmed  
up to temperature. Reassembled blower sound enclosure  
(except top outside section).

MATERIALS: 1 - Belt Banded, 3 strand 50x63, - Hanson Corp.

SUBCONTRACTOR: JB

EQUIPMENT

AIR COMPRESSOR	PAVING ROLLER	VR3
SPECIALTY TRUCK <u>30-08</u>	PAVING WACKER	OVA
PIPE TRUCK & TOOLS	CONCRETE MIXER	OVM
DUMP TRUCK	CONCRETE SAWING	GASTECH
LOADER	SIGNS	SAMPLE PUMP
STEAM CLEANER	CONES	HORIBA
WATER/TRANSFER PUMP	ARROW BOARD	PETROTITE-TESTER
GENERATOR	TRENCH PLATES	FLOW TESTER

FOREMAN Bob

\_\_\_\_\_

DAILY REPORT

\_\_\_\_\_

COMPANY Arco # 2169

JOB NO. 4927.970

LOCATION 889 W. Grand  
Oakland CA

DATE 8-1-94

JOB INSTRUCTIONS: To site to collect samples & restart of Thermzoch in catalytic mode and Belt Repair (Bob Herven)

WORK PERFORMED (CONT. ON REVERSE SIDE): Travel to site Balance influent & BPPluent. No sparging. Monitored all wells. Started sparging & rebalanced. ~~Sample~~ Ran 1/2 hr. Sampled influent BPPluent and removed wells.

MATERIALS: used FID-OVA - Horiba OVM - GASTECH for Oxygen sample pump 10' of tygon tubing

SUBCONTRACTOR: \_\_\_\_\_

EQUIPMENT

AIR COMPRESSOR	_____	PAVING ROLLER	_____	VR3	_____
SPECIALTY TRUCK	<u>30-0.5(4)</u>	PAVING WACKER	_____	OVA	<u>+</u>
PIPE TRUCK & TOOLS	_____	CONCRETE MIXER	_____	OVM	_____
DUMP TRUCK	_____	CONCRETE SAWING	_____	GASTECH	<u>+</u>
LOADER	_____	SIGNS	_____	SAMPLE PUMP	<u>+</u>
STEAM CLEANER	_____	CONES	_____	HORIBA	<u>+</u>
WATER/TRANSFER PUMP	_____	ARROW BOARD	_____	PETROTITE-TESTER	_____
GENERATOR	_____	TRENCH PLATES	_____	FLOW TESTER	_____

FOREMAN [Signature]

DAILY REPORT

COMPANY ARCO

SS# 2169

JOB NO. 4927,970

LOCATION 889 W. Grand / Market  
Oakland

DATE 8-3-94

JOB INSTRUCTIONS: Check Thermtac operation.

WORK PERFORMED (CONT. ON REVERSE SIDE): Checked site, found Thermtac to be operating properly. Problem appears to be with AT I comm unit.

MATERIALS: —

SUBCONTRACTOR: —

EQUIPMENT

AIR COMPRESSOR	_____	PAVING ROLLER	_____	VR3	_____
SPECIALTY TRUCK	<u>320-08</u>	PAVING WACKER	_____	OVA	_____
PIPE TRUCK & TOOLS	_____	CONCRETE MIXER	_____	OVM	_____
DUMP TRUCK	_____	CONCRETE SAWING	_____	GASTECH	_____
LOADER	_____	SIGNS	_____	SAMPLE PUMP	_____
STEAM CLEANER	_____	CONES	_____	HORIBA	_____
WATER/TRANSFER PUMP	_____	ARROW BOARD	_____	PETROTITE-TESTER	_____
GENERATOR	_____	TRENCH PLATES	_____	FLOW TESTER	_____

FOREMAN

Bob [Signature]



**THERM-TECH SYSTEM MONITORING DATA SHEET**

Client: ARCO #2169  
 Site: 889 West Grand Ave.  
Oakland, CA

Job#: 7927  
 Field Technician: P. C. Lim  
 Date: 8-15-94

<b>INFLUENT</b>			
Time		15:38	10:30
Pipe ID @ Influent (in)		3	3
Differential Pressure (in WC)		1.66	1.65
Vacuum (in WC)		28"	28"
Temperature (F)		<del>78.6</del> 78.6	79.8
HC Concentration (ppm)		<del>940</del> 910 ppm	1000 ppm
Sampled (Y/N) / ID#		Yes Int	No
<b>DILUTION AIR</b>			
Pipe ID @ Dilution Intake (in)		3	3
Differential Pressure (in WC)		0"	0"
Temperature (F)		93°F	94°F
<b>TOTAL INTAKE (4") Oxygen</b>		18.25% with Gas Tech.	
Differential Pressure (in WC)		0.37	0.36
Total Pressure (in WC)		4.4	4.2"
<b>EFFLUENT</b>			
Stack Dimensions (inXin)		10 x 10	10 x 10
Differential Pressure (in WC)		0.12"	0.12
Temperature (F)		810°F	820°F
HC Concentration (ppm)		20 ppm	30 ppm
Sampled (Y/N) / ID#		Yes R/P	No
<b>SYSTEM</b>			
Hour Meter		882.86	883.71
Electric Meter		17916	-
Gas/Propane Meter		0.598	-
Set Point (F)		600 - 1250	600 - 1250
Operating Temperature (F)		595 - 610	611 - 584
High Temperature Shutoff (F)		750 - 768	784 - 782
Filter Pressure (in WC)		0	

**STATUS**

Active on Arrival (circle one):  Y  N  
 Active on Departure (circle one):  Y  N  
 Restart Date: \_\_\_\_\_

Monitoring Device (circle one):  FID  PID  IR  
 Mode (circle one):  Therm  Cat

Comments: Off again Arrival unknown reason Found Electrical  
Box open suspect someone playing with Blower  
put lock on Box needed replace with compensation  
 Supplies Used: type:  
Tightened Replacement Belt on Blower  
resisted system

Blower 240°F



VAPOR EXTRACTION/AIR SPARGING WELL MONITORING DATA SHEET

Client: ARCO #2169  
 Site: 889 West Grand Ave.  
Oakland, CA

Job#: 7927  
 Field Technician: \_\_\_\_\_  
 Date: \_\_\_\_\_

EXTRACTION WELL #	A-4	AR-2	A-3	AV-1	AV-6	A-2	AV-5	ADR-2	AV-4	ADR-1	AV-7	A-1	AV-3	AV-2
Time	15:40	15:41	15:42	15:43	44	45	46	47	48	49	50	51	52	53
Active on Arrival (Y/N)	M	→												
Active on Departure (Y/N)	N	CRACKED	M	CRACKED	CRACKED	Y15	Y15	Y15	Y15	→				
Pipe ID @ Influent (in)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Differential Pressure (in WC)	0	0	1.001	0.001	1.001	1.003	1.04	1.001	1.04	1.05	0.90	3.00	1.05	2.5
Initial Vacuum (in WC)	2"	36"	4"	46"	26"	70"	71"	74"	72"	70"	74"	70"	72"	72"
Final Vacuum (in WC)	0	0	0	46"	26"	71	72	75	73	72	73	73	74	74
Temperature (F)	84.5	83.4	82.8	80.8	81.8	81.2	76.2	81.0	80.0	81.2	80.5	74.5	73.2	82.0
Initial HC Concentration (ppm)	0	130	20	80	150	360	1100	1800	2700	1860	80	1200	500	1500
Final HC Concentration (ppm)	0	120	10	0	160	400	1150	1850	2150	1470		1190	400	1900
Sampled (Y/N) / ID#				W92R							89.			

All initial data (dP, vacuum, temperature, and HC concentration) should correspond to sampling event.

AIR SPARGING WELL	AS-3	AS-2	AS-1	AS-5	AS-4
Pressure (psf)	3.1	2.2	2.0	2.8	3.0
Total Pressure (psf)	2.6 psf				
Total Air Flow (scfm)	27				

*valve leaks*

Notes:

[ ]

DAILY REPORT

[ ]

COMPANY Arco # 2109

JOB NO. 4927.970

LOCATION 889 W. Grand Ave  
Oakland CA

DATE 8-15-74

JOB INSTRUCTIONS:

System O&M & Sampling

WORK PERFORMED (CONT. ON REVERSE SIDE):

Travel to site Found ~~Unit~~ Unit off

Suspect someone in ~~control~~ Breaker Box Found open. Reset all breakers (Power interruption light & Control Fault on)

Reset ~~the~~ unit. checked replaced Blower drive Belt & tightened. Restarted unit. allow to come up to temp. ~~Reestablished~~ Reestablished flow & Balance from wells. Restarted sparse Blower.

Monitor wells and unit. Sampled Inflow  
E B/Went put lock on Breaker Panel right now 2126  
lock to be replaced with site specific combo lock.

Samples re Sequoia

MATERIALS: FID, Horiba, sample pump, sample chamber ladder

SUBCONTRACTOR:

EQUIPMENT

AIR COMPRESSOR	_____	PAVING ROLLER	_____	VR3	_____
SPECIALTY TRUCK	<u>3005</u>	PAVING WACKER	_____	OVA	<u>9370</u>
PIPE TRUCK & TOOLS	_____	CONCRETE MIXER	_____	OVM	_____
DUMP TRUCK	_____	CONCRETE SAWING	_____	GASTECH	<u>9270 #5</u>
LOADER	_____	SIGNS	_____	SAMPLE PUMP	<u>5</u>
STEAM CLEANER	_____	CONES	_____	HORIBA	<u>9400</u>
WATER/TRANSFER PUMP	_____	ARROW BOARD	_____	PETROTITE-TESTER	_____
GENERATOR	_____	TRENCH PLATES	_____	FLOW TESTER	_____

FOREMAN

[Signature]

[ ]

DAILY REPORT

[ ]

COMPANY

Arco # 2169

JOB NO.

4927.970

LOCATION

887 W. Grand

DATE

8-24-94

Oakland CA

JOB INSTRUCTIONS:

By site to check system prior to inspection

WORK PERFORMED (CONT. ON REVERSE SIDE):

Travel to site, check unit

For proper operation unit running @ 593°R & 725°R

Oxygen @ 20.3% Sparge Blower running

MATERIALS:

SUBCONTRACTOR:

EQUIPMENT

- AIR COMPRESSOR \_\_\_\_\_
- SPECIALTY TRUCK \_\_\_\_\_
- PIPE TRUCK & TOOLS \_\_\_\_\_
- DUMP TRUCK \_\_\_\_\_
- LOADER \_\_\_\_\_
- STEAM CLEANER \_\_\_\_\_
- WATER/TRANSFER PUMP \_\_\_\_\_
- GENERATOR \_\_\_\_\_

- PAVING ROLLER \_\_\_\_\_
- PAVING WACKER \_\_\_\_\_
- CONCRETE MIXER \_\_\_\_\_
- CONCRETE SAWING \_\_\_\_\_
- SIGNS \_\_\_\_\_
- CONES \_\_\_\_\_
- ARROW BOARD \_\_\_\_\_
- TRENCH PLATES \_\_\_\_\_

- VR3 \_\_\_\_\_
- OVA \_\_\_\_\_
- OVM \_\_\_\_\_
- GASTECH
- SAMPLE PUMP \_\_\_\_\_
- HORIBA \_\_\_\_\_
- PETROTITE-TESTER \_\_\_\_\_
- FLOW TESTER \_\_\_\_\_

FOREMAN

*[Signature]*



Therm-Tech System Monitoring Data Sheet

Client: ARCO #2169
Site: 889 West Grand Ave.
Oakland, CA

Job#: 7927
Field Technician: P. Ume
Date: 9-13-91

Table with columns for Influent, Dilution Air, Total Intake, Effluent, and System. Rows include measurements like Time, Pipe ID, Differential Pressure, Vacuum, Temperature, HC Concentration, and various meter readings.

STATUS

Active on Arrival (circle one): Y N
Active on Departure (circle one): Y N

Monitoring Device (circle one): FID PID IR
Mode (circle one): Therm Cat

Restart Date

Comments:

Supplies Used:





# VAPOR EXTRACTION/AIR SPARGING WELL MONITORING DATA SHEET

Client: ARCO #2169  
 Site: 889 West Grand Ave.  
Oakland, CA

Job#: 7927  
 Field Technician: R. C. W.  
 Date: 9-13-94

EXTRACTION WELL #	A-4	AR-2	A-3	AV-1	AV-6	A-2	AV-5	ADR-2	AV-4	ADR-1	AV-7	A-1	AV-3	AV-2
Time	10:30													
Active on Arrival (Y/N)	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Active on Departure (Y/N)	N	Y	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y	Y
Pipe ID @ Influent (in)	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Differential Pressure (in WC)	0	.007	.008	0	.010	.02	.025	.018	.007	.018	.118	0.15	.175	.025
Initial Vacuum (in WC)	0	0	0	0	20	56	59	60	57	58	58	57	59	59
Final Vacuum (in WC)	0	66	67	68	0	62	0	66	64	63	50	64	65	65
Temperature (F)	68.3	72.4	72.4	68.14	67.3	75.8	73.2	74.5	75	74.3	72.1	73.0	72.1	73.4
Initial HC Concentration (ppm)	0	500	400	10	70	400	40	440	140	250	20	410	230	300
Final HC Concentration (ppm)	0	500	400	0	10	400	30	400	140	250	20	410	230	300
Sampled (Y/N) / ID#	N													

All initial data (dP, vacuum, temperature, and HC concentration) should correspond to sampling event.

AIR SPARGING WELL	AS-3	AS-2	AS-1	AS-5	AS-4
Pressure (psi)	2.2	2.4	2.4	3.2	2.8
Total Pressure (psi)	3.051				
Total Air Flow (scfm)	29				

Notes: