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

ENVIRONMENTAL PROTECTION
96 DEC 17 AM 9:58

Date December 13, 1996
Project 20805-123.003

To:

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

3858

We are enclosing:

Copies	Description
1	Third quarter 1996 groundwater monitoring results and
	remediation system performance evaluation report,
	ARCO service station 2035, Albany, California

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

Comments:

The enclosed groundwater monitoring report is being sent to you per the request of ARCO Products Company. Plaese call if you have questions or comments.

John C. Young
Project Manager

cc: Kevin Graves, RWQCB - SFBR
Paul Supple, ARCO Products Company
File

ARCO Products Company

Date:
December 12, 1996

Re: ARCO Station #

2035 • 1001 San Pablo Avenue • Albany, CA
Third Quarter 1996 Groundwater Monitoring Results 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:

Paul Supple
Environmental Engineer

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

December 12, 1996
Project 20805-123.003

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

Re: Third quarter 1996 groundwater monitoring program results and remediation system performance evaluation report, ARCO service station 2035, Albany, California

Dear Mr. Supple:

This letter presents the results of the third quarter 1996 groundwater monitoring program at ARCO Products Company (ARCO) service station 2035, 1001 San Pablo Avenue, Albany, California (Figure 1). Operation and performance data for the site's soil-vapor extraction (SVE) and groundwater extraction remediation systems are also presented. The quarterly monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

LIMITATIONS

No monitoring event is thorough enough to describe all geologic and hydrogeologic conditions of interest at a given site. If conditions have not been identified during the monitoring event, such a finding should not therefore 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 work performed during the monitoring event.

Please call if you have questions.

Sincerely,

EMCON

Krishnaveni M.
Krishnaveni Meka
Staff Engineer

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

REGISTERED GEOLOGIST
JOHN CHARLES YOUNG
7/98
NO. 6407
STATE OF CALIFORNIA

December 12, 1996

ARCO QUARTERLY REPORT

Station No.: 2035	Address: 1001 San Pablo Avenue, San Pablo, California
EMCON Project No.:	20805-123.003
ARCO Environmental Engineer/Phone No.:	Paul Supple /(510) 299-8891
EMCON Project Manager/Phone No.:	John C. Young /(408) 453-7300
Primary Agency/Regulatory ID No.:	ACHCSA /Barney Chan
Reporting Period:	July 1, 1996 to October 1, 1996

WORK PERFORMED THIS QUARTER (Third- 1996):

1. Conducted quarterly groundwater monitoring and sampling for third quarter 1996.
2. Prepared and submitted quarterly report for second quarter 1996.
3. Operated soil-vapor extraction (SVE) and air-bubbling systems.

WORK PROPOSED FOR NEXT QUARTER (Fourth- 1996):

1. Perform quarterly groundwater monitoring and sampling for fourth quarter 1996.
2. Restart SVE system and continue operation if influent hydrocarbon concentrations warrant.
3. Prepare and submit quarterly report for third quarter 1996.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems
Frequency of Sampling:	Quarterly (groundwater), Monthly (SVE)
Frequency of Monitoring:	Quarterly (groundwater), Monthly (SVE)
Is Floating Product (FP) Present On-site:	☐ Yes ☒ No
Cumulative FP Recovered to Date :	27.9 gallons, Wells AS-1V, AS-2V, RW-1, VW-1, VW-2, and VW-7
FP Recovered This Quarter :	None
Bulk Soil Removed to Date :	605 cubic yards of TPH impacted soil
Bulk Soil Removed This Quarter :	None
Water Wells or Surface Waters, within 2000 ft., impacted by site:	None
Current Remediation Techniques:	SVE and Air-Bubbling Systems
Approximate Depth to Groundwater:	10.60 feet
Groundwater Gradient (Average):	0.011 ft/ft toward southwest (consistent with past events)

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory:	Therm Tech Model VAC-10 Thermal/Catalytic Oxidizer SVE system was shut down on 8-12-96.
Operating Mode:	Catalytic Oxidation
BAAQMD Permit #:	10931
TPH Conc. End of Period (lab):	16 ppmv (8-8-96)
Benzene Conc. End of Period (lab):	<0.2 ppmv (8-8-96)
SVE Flowrate End of Period:	52.6 scfm (8-8-96)
Total HC Recovered This Period:	10.2 pounds
Total HC Recovered to Date:	3007.5 pounds

Utility Usage	
Electric (KWH):	2467
Gas (Therms):	410
Operating Hours This Period (SVE):	601.0 hours
Operating Hours to Date (SVE):	6873.2 hours
Percent Operational (SVE):	27.2% (See Discussion)
Operating Hours This Period (GWE):	555.0 hours
Percent Operational (GWE):	25.0% (See Discussion)
Unit Maintenance:	NA
Number of Auto Shut Downs:	1
Destruction Efficiency Permit Requirement:	90%
Percent TPH Conversion:	70.1% Although the destruction efficiency is less than 90 percent, laboratory analytical results collected during this period indicate the effluent TVHG and benzene concentrations in off-gas discharged to the atmosphere were below laboratory detection limits, indicating compliance with BAAQMD discharge requirements.
Stack Temperature:	725°F (8-8-96)
SVE Source Flow:	52.6 scfm (8-8-96)
SVE Process Flow:	95.4 scfm (8-8-96)
Source Vacuum:	35 inches of water (8-8-96)

DISCUSSION:

The groundwater treatment system was manually shut down on August 8, 1996, because of low influent TPHG concentrations. The SVE system was shut down on August 12, 1996, because of low TVHG and benzene concentrations in extracted soil vapor.

ATTACHED:

- Table 1 - Groundwater Monitoring Data, Third Quarter 1996
- Table 2 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Table 3 - Approximate Cumulative Floating Product Recovered, Wells AS-1, AS-2, RW-1, VW-1, VW-2, and VW-7
- Table 4 - Soil-Vapor Extraction System Operation and Performance Data
- Table 5 - Soil-Vapor Extraction Well Data
- Table 6 - Influent and Effluent Groundwater Analyses Summary Report
- Table 7 - Estimated Total Dissolved TPHG and Benzene Removed, Summary Report
- Figure 1 - Site Location
- Figure 2 - Site Plan
- Figure 3 - Groundwater Data, Third Quarter 1996
- Figure 4 - Soil-Vapor Extraction and Treatment System, Historical System Influent TVHG and Benzene Concentrations
- Figure 5 - Soil-Vapor Extraction and Treatment System, Historical Hydrocarbon Removal Rates
- Figure 6 - Groundwater Treatment System, Historical System Influent TPHG and Benzene Concentrations
- Figure 7 - Groundwater Treatment System, Historical Hydrocarbon Removal Rates
- Appendix A - Field Data Sheets, Third Quarter 1996 Groundwater Monitoring Event
- Appendix B - Analytical Results and Chain of Custody Documentation, Third Quarter 1996 Groundwater Monitoring Event
- Appendix C - SVE System Monitoring Data Log Sheets

- Appendix D - Field Data Sheets, Operation and Maintenance Visits, SVE System, Third Quarter 1996
- Appendix E - Analytical Results and Chain-of-Custody Documentation for SVE System, Third Quarter 1996
- Appendix F - Field Data Sheets, Operation and Maintenance Visits, Groundwater Treatment System Third Quarter 1996
- Appendix G - Analytical Results and Chain-of-Custody Documentation, Groundwater Treatment System, Third Quarter 1996

cc: Barney Chan, ACHCSA
Kevin Graves, RWQCB-SFBR

Table 1
Groundwater Monitoring Data
Third Quarter 1996

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-26-96

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**Oil and Grease** SM 5520B&F	**Oil and Grease** SM 5520C	**Oil and Grease** SM 5520F	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	08-15-96	41.41	10.37	31.04	ND	SW	0.011	08-15-96	300	52	<0.5	0.9	<0.5	22	--	--	--	--	--	--
MW-2	08-15-96	40.38	11.10	29.28	ND	SW	0.011	08-15-96	<50	<0.5	<0.5	<0.5	<0.5	4	--	--	--	--	--	--
MW-3	08-15-96	41.44	11.12	30.32	ND	SW	0.011	08-15-96	<50	<0.5	<0.5	<0.5	<0.5	54	--	--	--	--	--	--
MW-4	08-15-96	40.33	10.35	29.98	ND	SW	0.011	08-15-96	Not sampled: not scheduled for chemical analysis											
MW-5	08-15-96	41.84	10.83	31.01	ND	SW	0.011	08-15-96	Not sampled: not scheduled for chemical analysis											
MW-6	08-15-96	40.13	13.18	26.95	ND	SW	0.011	08-15-96	Not sampled: not scheduled for chemical analysis											
RW-1	08-15-96	40.33	10.60	29.73	ND	SW	0.011	08-15-96	1800	31	38	15	150	<30^	--	--	--	--	--	-

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: methyl-tert-butyl ether
SM: standard method
TRPH: total recoverable petroleum hydrocarbons
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
ND: none detected
SW: southwest
^: method reporting limit was raised due to: (1) high analyte concentration requiring sample dilution, or (2) matrix interference
- -: not analyzed or not applicable

esj/h:\2035\2035mdb.xls\Table 1:imi
20805-123.003

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present*

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-25-96

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1	02-01-94	41.41	9.29	32.12	ND	NR	NR	02-01-94	<50	13	<0.5	0.5	0.6	--	--	--	--	--	--	--
MW-1	04-26-94	41.41	9.25	32.16	ND	NR	NR	04-26-94	990	290	3.5	18	14	--	--	--	--	--	--	--
MW-1	07-29-94	41.41	9.87	31.54	ND	WSW	0.016	07-29-94	760	280	<2.5	7.1	<2.5	--	--	--	--	--	--	--
MW-1	11-15-94	41.41	8.76	32.65	ND	WSW	0.019	11-15-94	570	150	7.3	<2.5	30	--	--	--	--	--	--	--
MW-1	03-24-95	41.41	6.21	35.20	ND	NW	0.037	03-24-95	8800	3600	<50	62	99	--	--	--	--	--	--	--
MW-1	05-24-95	41.41	9.37	32.04	ND	WNW	0.013	05-24-95	4800	2000	<20	52	<20	--	--	--	--	--	--	--
MW-1	08-22-95	41.41	10.30	31.11	ND	SW	0.012	08-22-95	780	310	<2.5	12	<2.5	14	--	--	--	--	--	--
MW-1	11-09-95	41.41	12.25	29.16	ND	WSW	0.01	11-09-95	58	14	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-1	02-27-96	41.41	9.08	32.33	ND	SW	0.009	02-27-96	2700	930	12	18	32	51	--	--	--	--	--	--
MW-1	04-22-96	41.41	9.11	32.30	ND	WSW	0.014	04-22-96	2700	1000	<10	22	<10	<60	--	--	--	--	--	--
MW-1	08-15-96	41.41	10.37	31.04	ND	SW	0.011	08-15-96	300	52	<0.5	0.9	<0.5	22	--	--	--	--	--	--
MW-2	02-01-94	40.38	9.66	30.72	ND	NR	NR	02-01-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-2	04-26-94	40.38	9.60	30.78	ND	NR	NR	04-26-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-2	07-29-94	40.38	10.61	29.77	ND	WSW	0.016	07-29-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-2	11-15-94	40.38	9.23	31.15	ND	WSW	0.019	11-15-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-2	03-24-95	40.38	6.96	33.42	ND	NW	0.037	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-2	05-24-95	40.38	10.02	30.36	ND	WNW	0.013	05-24-95	Not sampled: not scheduled for chemical analysis											
MW-2	08-22-95	40.38	10.87	29.51	ND	SW	0.012	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-2	11-09-95	40.38	13.12	27.26	ND	WSW	0.01	11-09-95	Not sampled: not scheduled for chemical analysis											
MW-2	02-27-96	40.38	10.25	30.13	ND	SW	0.009	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-2	04-22-96	40.38	9.98	30.40	ND	WSW	0.014	04-22-96	Not sampled: not scheduled for chemical analysis											
MW-2	08-15-96	40.38	11.10	29.28	ND	SW	0.011	08-15-96	<50	<0.5	<0.5	<0.5	<0.5	4	--	--	--	--	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present*

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-25-96

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-3	02-01-94	41.44	9.71	31.73	ND	NR	NR	02-01-94	<50	1.9	<0.5	2.1	<0.5	--	--	--	<500	<500	--	--
MW-3	04-26-94	41.44	9.56	31.88	ND	NR	NR	04-26-94	<50	1.1	<0.5	2.4	0.9	--	--	--	--	--	<600	--
MW-3	07-29-94	41.44	10.65	30.79	ND	WSW	0.016	07-29-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	600	--
MW-3	11-15-94	41.44	9.25	32.19	ND	WSW	0.019	11-15-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	<500	--
MW-3	03-24-95	41.44	7.29	34.15	ND	NW	0.037	03-24-95	51	0.8	<0.5	2.4	<0.5	--	--	--	--	--	<500	--
MW-3	05-24-95	41.44	9.53	31.91	ND	WNW	0.013	05-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	<500	--
MW-3	08-22-95	41.44	11.19	30.25	ND	SW	0.012	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	79	--	--	--	--	<500	--
MW-3	11-09-95	41.44	12.77	28.67	ND	WSW	0.01	11-09-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	600	--
MW-3	02-27-96	41.44	9.41	32.03	ND	SW	0.009	02-27-96	120	3.6	<0.5	2.2	3.7	90	--	--	--	--	<0.5	--
MW-3	04-22-96	41.44	9.63	31.81	ND	WSW	0.014	04-22-96	<50	<0.5	<0.5	<0.5	<0.5	90	--	--	--	--	--	--
MW-3	08-15-96	41.44	11.12	30.32	ND	SW	0.011	08-15-96	<50	<0.5	<0.5	<0.5	<0.5	54	--	--	--	--	--	--
MW-4	02-01-94	40.33	9.10	31.23	ND	NR	NR	02-01-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-4	04-26-94	40.33	8.94	31.39	ND	NR	NR	04-26-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-4	07-29-94	40.33	10.02	30.31	ND	WSW	0.016	07-29-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-4	11-15-94	40.33	8.47	31.86	ND	WSW	0.019	11-15-94	220	12	19	0.9	39	--	--	--	--	--	--	--
MW-4	03-24-95	40.33	5.92	34.41	ND	NW	0.037	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-4	05-24-95	40.33	9.23	31.10	ND	WNW	0.013	05-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-4	08-22-95	40.33	10.61	29.72	ND	SW	0.012	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	99	--	--	--	--	--	--
MW-4	11-09-95	40.33	11.97	28.36	ND	WSW	0.01	11-09-95	<50	<0.5	<0.5	<0.5	<0.5	--	89	--	--	--	--	--
MW-4	02-27-96	40.33	8.84	31.49	ND	SW	0.009	02-27-96	<50	0.8	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-4	04-22-96	40.33	9.15	31.18	ND	WSW	0.014	04-22-96	Not sampled: not scheduled for chemical analysis											
MW-4	08-15-96	40.33	10.35	29.98	ND	SW	0.011	08-15-96	Not sampled: not scheduled for chemical analysis											

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present*

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-25-96

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-5	02-01-94	41.84	9.74	32.10	ND	NR	NR	02-01-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-5	04-26-94	41.84	9.51	32.33	ND	NR	NR	04-26-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-5	07-29-94	41.84	10.54	31.30	ND	WSW	0.016	07-29-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-5	11-15-94	41.84	9.10	32.74	ND	WSW	0.019	11-15-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-5	03-24-95	41.84	6.23	35.61	ND	NW	0.037	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-5	05-24-95	41.84	9.61	32.23	ND	WNW	0.013	05-24-95	Not sampled: not scheduled for chemical analysis											
MW-5	08-22-95	41.84	11.12	30.72	ND	SW	0.012	08-22-95	Not sampled: not scheduled for chemical analysis											
MW-5	11-09-95	41.84	12.52	29.32	ND	WSW	0.01	11-09-95	Not sampled: not scheduled for chemical analysis											
MW-5	02-27-96	41.84	9.52	32.32	ND	SW	0.009	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-5	04-22-96	41.84	9.44	32.40	ND	WSW	0.014	04-22-96	Not sampled: not scheduled for chemical analysis											
MW-5	08-15-96	41.84	10.83	31.01	ND	SW	0.011	08-15-96	Not sampled: not scheduled for chemical analysis											
MW-6	02-01-94	40.13	11.80	28.33	ND	NR	NR	02-01-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-6	04-26-94	40.13	11.33	28.80	ND	NR	NR	04-26-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-6	07-29-94	40.13	12.16	27.97	ND	WSW	0.016	07-29-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-6	11-15-94	40.13	11.01	29.12	ND	WSW	0.019	11-15-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-6	03-24-95	40.13	9.03	31.10	ND	NW	0.037	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	--
MW-6	05-24-95	40.13	12.45	27.68	ND	WNW	0.013	05-24-95	Not sampled: not scheduled for chemical analysis											
MW-6	08-22-95	40.13	13.32	26.81	ND	SW	0.012	08-22-95	Not sampled: not scheduled for chemical analysis											
MW-6	11-09-95	40.13	14.13	26.00	ND	WSW	0.01	11-09-95	Not sampled: not scheduled for chemical analysis											
MW-6	02-27-96	40.13	11.86	28.27	ND	SW	0.009	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	--
MW-6	04-22-96	40.13	12.35	27.78	ND	WSW	0.014	04-22-96	Not sampled: not scheduled for chemical analysis											
MW-6	08-15-96	40.13	13.18	26.95	ND	SW	0.011	08-15-96	Not sampled: not scheduled for chemical analysis											

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present*

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-25-96

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	TPHG LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	Oil and Grease SM 5520B&F	Oil and Grease SM 5520C	Oil and Grease SM 5520F	TRPH EPA 418.1	TPHD LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
RW-1	02-01-94	40.33	1.00	39.33	ND	NR	NR	02-01-94	Not sampled: well connected to the remediation system											
RW-1	04-26-94	40.33	9.30	** 31.06	0.04	NR	NR	04-26-94	Not sampled: well contained floating product											
RW-1	07-29-94	40.33	9.91	** 30.43	0.02	WSW	0.016	07-29-94	Not sampled: well contained floating product											
RW-1	11-15-94	40.33	8.89	** 31.51	0.10	WSW	0.019	11-15-94	Not sampled: well contained floating product											
RW-1	03-24-95	40.33	9.32	** 31.02	0.01	NW	0.037	03-24-95	11000	560	660	150	1700	--	--	--	--	--	--	--
RW-1	05-24-95	40.33	9.75	** 30.60	0.03	WNW	0.013	05-24-95	Not sampled: well contained floating product											
RW-1	08-22-95	40.33	10.86	** 29.48	0.02	SW	0.012	08-22-95	Not sampled: well contained floating product											
RW-1	11-09-95	40.33	20.61	19.72	ND	WSW	0.01	11-09-95	1600	79	46	13	240	--	--	--	--	--	--	--
RW-1	02-27-96	40.33	16.56	23.77	ND	SW	0.009	02-27-96	210	44	7.5	2.5	24	29	--	--	--	--	--	--
RW-1	04-22-96	40.33	9.65	30.68	ND	WSW	0.014	04-22-96	36000	7400	3700	580	3400	<300	--	--	--	--	--	--
RW-1	08-15-96	40.33	10.60	29.73	ND	SW	0.011	08-15-96	1800	31	38	15	150	<30^	--	--	-	--	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1994 - Present*

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-25-96

Well Designation	Water Level Field Date	Top of Casing Elevation	Depth to Water	Groundwater Elevation	Floating Product Thickness	Groundwater Flow Direction	Hydraulic Gradient	Water Sample Field Date	**TPHG** LUFT Method	**Benzene** EPA 8020	**Toluene** EPA 8020	**Ethylbenzene** EPA 8020	**Total Xylenes** EPA 8020	**MTBE** EPA 8020	**MTBE** EPA 8240	**Oil and Grease** SM 5520B&F	**Oil and Grease** SM 5520C	**Oil and Grease** SM 5520F	**TRPH** EPA 418.1	**TPHD** LUFT Method
		ft-MSL	feet	ft-MSL	feet	MWN	ft/ft		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

ft-MSL: elevation in feet, relative to mean sea level
MWN: ground-water flow direction and gradient apply to the entire monitoring well network
ft/ft: foot per foot
TPHG: total petroleum hydrocarbons as gasoline, California DHS LUFT Method
µg/L: micrograms per liter
EPA: United States Environmental Protection Agency
MTBE: Methyl-tert-butyl ether
SM: standard method
TRPH: total recoverable petroleum hydrocarbons
TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method
ND: none detected
NR: not reported; data not available
WSW: west-southwest
NW: northwest
WNW: west-northwest
SW: southwest
^: method reporting limit was raised due to: (1) high analyte concentration requiring sample dilution, or (2) matrix interference
- -: not analyzed or not applicable
*: For previous historical groundwater elevation and analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 2035, Albany, California*, (EMCON, March 25, 1996).
**: [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
Approximate Cumulative Floating Product Recovered

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-25-96

Well Designations	Date	Floating Product Recovered gallons
RW-1	1992	22.3
RW-1	1993	1.0
RW-1	1994	0.0
AS-1, AS-2, RW-1, VW-1, VW-2, and VW-7	1995	4.6
VW-7	1996	0.003
	1992 to 1996 Total:	27.9

esj/h:\2035\2035mdb.xls\Table 3:imi
20805-123.002

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2035
Location: 1001 San Pablo Avenue
Albany, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: Therm Tech Model VAC-10 thermal/catalytic oxidizer

Start-Up Date: 12-07-93
Operation and Performance Data From: 12-07-93
To: 10-01-96

Date Begin:	12-07-93	12-08-93	12-09-93	12-10-93	12-15-93
Date End:	12-08-93	12-09-93	12-10-93	12-15-93	12-16-93
Mode of Oxidation:	Therm-Ox (17)	Therm-Ox	Therm-Ox	Therm-Ox	Therm-Ox
Days of Operation:	1	0	1	5	1
Days of Downtime:	0	1	0	0	0
Average Vapor Concentrations (1)					
Well Field Influent: ppmv (2) as gasoline (3)	2800	NA (18)	NA	NA	NA
mg/m3 (4) as gasoline	10000	NA	NA	NA	NA
ppmv as benzene (5)	170	NA	NA	NA	NA
mg/m3 as benzene	540	NA	NA	NA	NA
System Influent: ppmv as gasoline	390	NA	390	410	500
mg/m3 as gasoline	1400	NA	1400	1500	1800
ppmv as benzene	12	NA	19	31	24
mg/m3 as benzene	38	NA	60	100	79
System Effluent: ppmv as gasoline	21	NA	36	6	NA
mg/m3 as gasoline	76	NA	130	21	NA
ppmv as benzene	0.7	NA	1	<0.01	NA
mg/m3 as benzene	2.3	NA	3.1	<0.05	NA
Average Well Field Flow Rate (6), scfm (7):	10.0	0.0	10.0	5.0	45.0
Average System Influent Flow Rate (6), scfm:	100.0	0.0	100.0	87.0	100.0
Average Destruction Efficiency (8), percent (9):	94.6	NA	90.7	98.6	NA
Average Emission Rates (10), pounds per day (11)					
Gasoline:	0.68	0.00	1.17	0.16	NA
Benzene:	0.02	0.00	0.03	<0.00	NA
Operating Hours This Period:	21.00	0.00	23.00	121.00	18.00
Operating Hours To Date:	21.0	21.0	44.0	165.0	183.0
SVE Pounds/ Hour Removal Rate, as gasoline (12):	0.52	0.00	0.52	0.49	0.67
SVE Pounds Removed This Period, as gasoline (13):	11.00	0.00	12.05	59.10	12.13
GWE Pounds Removed This Period, as gasoline (14):	0.00	0.00	0.00	0.00	0.00
Total Pounds Removed This Period, as gasoline (15):	11.00	0.00	12.05	59.10	12.13
Total Pounds Removed To Date, as gasoline:	11.0	11.0	23.1	82.2	94.3
Total Gallons Removed This Period, as gasoline (16):	1.77	0.00	1.94	9.53	1.96
Total Gallons Removed To Date, as gasoline:	1.8	1.8	3.7	13.3	15.2

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2035
Location: 1001 San Pablo Avenue
Albany, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: Therm Tech Model VAC-10 thermal/catalytic oxidizer

Start-Up Date: 12-07-93
Operation and Performance Data From: 12-07-93
To: 10-01-96

Date Begin:		12-16-93	12-21-93	12-25-93	12-29-93	12-31-93
Date End:		12-21-93	12-25-93	12-29-93	12-31-93	01-07-94
Mode of Oxidation:		Therm-Ox	Therm-Ox	Therm-Ox	Therm-Ox	Therm-Ox
Days of Operation:		0	4	0	2	0
Days of Downtime:		5	0	4	0	7
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline (3)	NA	NA	NA	NA	NA
	mg/m3 (4) as gasoline	NA	NA	NA	NA	NA
	ppmv as benzene (5)	NA	NA	NA	NA	NA
	mg/m3 as benzene	NA	NA	NA	NA	NA
System Influent:	ppmv as gasoline	NA	NA	NA	NA	NA
	mg/m3 as gasoline	NA	NA	NA	NA	NA
	ppmv as benzene	NA	NA	NA	NA	NA
	mg/m3 as benzene	NA	NA	NA	NA	NA
System Effluent:	ppmv as gasoline	NA	NA	NA	NA	NA
	mg/m3 as gasoline	NA	NA	NA	NA	NA
	ppmv as benzene	NA	NA	NA	NA	NA
	mg/m3 as benzene	NA	NA	NA	NA	NA
Average Well Field Flow Rate (6), scfm (7):		0.0	20.0	0.0	54.0	0.0
Average System Influent Flow Rate (6), scfm:		0.0	100.0	0.0	78.0	0.0
Average Destruction Efficiency (8), percent (9):		NA	NA	NA	NA	NA
Average Emission Rates (10), pounds per day (11)						
Gasoline:		0.00	0.00	0.00	0.00	0.00
Benzene:		0.00	0.00	0.00	0.00	0.00
Operating Hours This Period:		0.00	104.00	0.00	43.00	0.00
Operating Hours To Date:		183.0	287.0	287.0	330.0	330.0
SVE Pounds/ Hour Removal Rate, as gasoline (12):		0.00	0.00	0.00	0.00	0.00
SVE Pounds Removed This Period, as gasoline (13):		0.00	0.00	0.00	0.00	0.00
GWE Pounds Removed This Period, as gasoline (14):		0.00	0.00	0.00	0.00	0.00
Total Pounds Removed This Period, as gasoline (15):		0.00	0.00	0.00	0.00	0.00
Total Pounds Removed To Date, as gasoline:		94.3	94.3	94.3	94.3	94.3
Total Gallons Removed This Period, as gasoline (16):		0.00	0.00	0.00	0.00	0.00
Total Gallons Removed To Date, as gasoline:		15.2	15.2	15.2	15.2	15.2

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2035
Location: 1001 San Pablo Avenue
Albany, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: Therm Tech Model VAC-10 thermal/catalytic oxidizer

Start-Up Date: 12-07-93
Operation and Performance Data From: 12-07-93
To: 10-01-96

Date Begin:		01-07-94	01-12-94	01-24-94	03-31-94	12-31-94
Date End:		01-12-94	01-24-94	03-31-94	12-31-94	02-06-95
Mode of Oxidation:		Therm-Ox	Therm-Ox	Therm-Ox	Therm-Ox	Therm-Ox
Days of Operation:		5	12	0	0	0
Days of Downtime:		0	0	66	275	37
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline (3)	NA	NA	NA	NA	NA
	mg/m3 (4) as gasoline	NA	NA	NA	NA	NA
	ppmv as benzene (5)	NA	NA	NA	NA	NA
	mg/m3 as benzene	NA	NA	NA	NA	NA
System Influent:	ppmv as gasoline	NA	690	NA	NA	NA
	mg/m3 as gasoline	NA	2500	NA	NA	NA
	ppmv as benzene	NA	11	NA	NA	NA
	mg/m3 as benzene	NA	37	NA	NA	NA
System Effluent:	ppmv as gasoline	NA	14	NA	NA	NA
	mg/m3 as gasoline	NA	52	NA	NA	NA
	ppmv as benzene	NA	0.29	NA	NA	NA
	mg/m3 as benzene	NA	0.93	NA	NA	NA
Average Well Field Flow Rate (6), scfm (7):		37.0	41.0	0.0	0.0	0.0
Average System Influent Flow Rate (6), scfm:		60.0	64.0	0.0	0.0	0.0
Average Destruction Efficiency (8), percent (9):		97.9	97.9	NA	NA	NA
Average Emission Rates (10), pounds per day (11)						
Gasoline:		0.30	0.30	0.00	0.00	0.00
Benzene:		0.01	0.01	0.00	0.00	0.00
Operating Hours This Period:		123.00	285.00	0.00	0.00	8.90
Operating Hours To Date:		453.0	738.0	738.0	738.0	746.9
SVE Pounds/ Hour Removal Rate, as gasoline (12):		0.48	0.60	0.00	0.00	0.00
SVE Pounds Removed This Period, as gasoline (13):		59.40	170.67	0.00	0.00	0.00
GWE Pounds Removed This Period, as gasoline (14):		0.00	0.00	0.00	0.00	0.00
Total Pounds Removed This Period, as gasoline (15):		59.40	170.67	0.00	0.00	0.00
Total Pounds Removed To Date, as gasoline:		153.7	324.3	324.3	324.3	324.3
Total Gallons Removed This Period, as gasoline (16):		9.58	27.53	0.00	0.00	0.00
Total Gallons Removed To Date, as gasoline:		24.8	52.3	52.3	52.3	52.3

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2035
Location: 1001 San Pablo Avenue
Albany, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: Therm Tech Model VAC-10 thermal/catalytic oxidizer

Start-Up Date: 12-07-93
Operation and Performance Data From: 12-07-93
To: 10-01-96

Date Begin:	02-06-95	03-01-95	04-01-95	06-01-95	07-01-95
Date End:	03-01-95	04-01-95	06-01-95	07-01-95	08-01-95
Mode of Oxidation:	Therm-Ox	Therm-Ox	Therm-Ox	Cat-Ox (19)	Cat-Ox
Days of Operation:	21	7	0	5	26
Days of Downtime:	2	24	61	25	5
Average Vapor Concentrations (1)					
Well Field Influent: ppmv (2) as gasoline (3)	1800	2500	NA	3300	130
mg/m3 (4) as gasoline	6650	8900	NA	12000	480
ppmv as benzene (5)	17	31	NA	50	4
mg/m3 as benzene	62	99	NA	170	14
System Influent: ppmv as gasoline	240	<15	NA	600	130
mg/m3 as gasoline	880	<60	NA	2200	480
ppmv as benzene	6	<0.1	NA	10	4
mg/m3 as benzene	21	<0.5	NA	34	14
System Effluent: ppmv as gasoline	<15	<15	NA	<15	<15
mg/m3 as gasoline	<60	<60	NA	<60	<60
ppmv as benzene	<0.1	<0.1	NA	0.5	<0.1
mg/m3 as benzene	<0.5	<0.5	NA	1.5	<0.5
Average Well Field Flow Rate (6), scfm (7):	4.7	4.1	1.2	20.9	25.2
Average System Influent Flow Rate (6), scfm:	35.6	32.7	25.3	33.8	33.6
Average Destruction Efficiency (8), percent (9):	93.2	NA	NA	97.3	87.5
Average Emission Rates (10), pounds per day (11)					
Gasoline:	0.19	0.18	NA	0.18	0.18
Benzene:	0.00	0.00	NA	0.00	0.00
Operating Hours This Period:	501.95	162.83	3.02	112.33	614.38
Operating Hours To Date:	1248.9	1411.7	1414.7	1527.0	2141.4
SVE Pounds/ Hour Removal Rate, as gasoline (12):	0.12	0.14	0.00	0.94	0.05
SVE Pounds Removed This Period, as gasoline (13):	58.72	22.24	0.00	105.44	27.81
GWE Pounds Removed This Period, as gasoline (14):	4.28	0.31	0.00	1.42	0.00
Total Pounds Removed This Period, as gasoline (15):	63.00	22.55	0.00	106.86	27.81
Total Pounds Removed To Date, as gasoline:	387.3	409.9	409.9	516.8	544.6
Total Gallons Removed This Period, as gasoline (16):	10.16	3.64	0.00	17.24	4.49
Total Gallons Removed To Date, as gasoline:	62.5	66.1	66.1	83.4	87.8

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2035
Location: 1001 San Pablo Avenue
Albany, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: Therm Tech Model VAC-10 thermal/catalytic oxidizer

Start-Up Date: 12-07-93
Operation and Performance Data From: 12-07-93
To: 10-01-96

Date Begin:		08-01-95	09-01-95	10-01-95	11-01-95	12-01-95
Date End:		09-01-95	10-01-95	11-01-95	12-01-95	01-01-96
Mode of Oxidation:		Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox
Days of Operation:		23	30	26	30	21
Days of Downtime:		8	0	5	1	10
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline (3)	1850	617	425	850	940
	mg/m3 (4) as gasoline	7800	2233	1535	3100	3385
	ppmv as benzene (5)	17.5	5.9	4.7	11	7.4
	mg/m3 as benzene	56	19	15	36	23
System Influent:	ppmv as gasoline	1950	457	320	570	310
	mg/m3 as gasoline	8300	1667	1165	2100	1300
	ppmv as benzene	20	4.6	3.9	7	4.1
	mg/m3 as benzene	63	15	12	23	13
System Effluent:	ppmv as gasoline	54	<15	<15	<15	17
	mg/m3 as gasoline	155	<60	<60	<60	63
	ppmv as benzene	1	0.2	0.2	0.4	0.3
	mg/m3 as benzene	3.2	0.6	0.5	1.2	0.9
Average Well Field Flow Rate (6), scfm (7):		27.7	139.7	91.2	68.0	39.5
Average System Influent Flow Rate (6), scfm:		76.5	114.7	88.4	73.4	57.8
Average Destruction Efficiency (8), percent (9):		98.1	96.4	94.8	97.1	95.2
Average Emission Rates (10), pounds per day (11)						
Gasoline:		1.07	0.62	0.48	0.40	0.33
Benzene:		0.02	0.01	0.00	0.01	0.00
Operating Hours This Period:		562.61	717.42	624.47	708.09	493.54
Operating Hours To Date:		2704.0	3421.4	4045.9	4754.0	5247.5
SVE Pounds/ Hour Removal Rate, as gasoline (12):		0.81	1.17	0.52	0.79	0.50
SVE Pounds Removed This Period, as gasoline (13):		454.96	837.62	327.19	558.66	246.98
GWE Pounds Removed This Period, as gasoline (14):		0.49	0.24	0.07	11.02	5.51
Total Pounds Removed This Period, as gasoline (15):		455.45	837.86	327.26	569.68	252.49
Total Pounds Removed To Date, as gasoline:		1000.0	1837.9	2165.1	2734.8	2987.3
Total Gallons Removed This Period, as gasoline (16):		73.46	135.15	52.79	91.89	40.73
Total Gallons Removed To Date, as gasoline:		161.3	296.5	349.2	441.1	481.9

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2035
Location: 1001 San Pablo Avenue
Albany, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: Therm Tech Model VAC-10 thermal/catalytic oxidizer

Start-Up Date: 12-07-93
Operation and Performance Data From: 12-07-93
To: 10-01-96

Date Begin:		01-01-96	02-01-96 (20)	03-01-96	04-01-96	05-01-96
Date End:		02-01-96	03-01-96	04-01-96	05-01-96	06-01-96
Mode of Oxidation:		Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox
Days of Operation:		31	29	24	0	5
Days of Downtime:		0	0	7	30	26
Average Vapor Concentrations (1)						
Well Field Influent:	ppmv (2) as gasoline (3)	<15	<15	NA	NA	NA
	mg/m3 (4) as gasoline	<60	<60	NA	NA	NA
	ppmv as benzene (5)	<0.1	<0.1	NA	NA	NA
	mg/m3 as benzene	<0.5	<0.5	NA	NA	NA
System Influent:	ppmv as gasoline	<15	<15	NA	NA	NA
	mg/m3 as gasoline	<60	<60	NA	NA	NA
	ppmv as benzene	0.3	0.3	NA	NA	NA
	mg/m3 as benzene	0.9	0.9	NA	NA	NA
System Effluent:	ppmv as gasoline	<15	<15	NA	NA	NA
	mg/m3 as gasoline	<60	<60	NA	NA	NA
	ppmv as benzene	<0.1	<0.1	NA	NA	NA
	mg/m3 as benzene	<0.5	<0.5	NA	NA	NA
Average Well Field Flow Rate (6), scfm (7):		24.8	28.6	0.0	0.0	32.5
Average System Influent Flow Rate (6), scfm:		51.2	53.1	0.0	0.0	41.3
Average Destruction Efficiency (8), percent (9):		NA	NA	NA	NA	NA
Average Emission Rates (10), pounds per day (11)						
Gasoline:		0.28	0.29	NA	NA	NA
Benzene:		0.00	0.00	NA	NA	NA
Operating Hours This Period:		744.00	158.00	0.00	2.38	120.25
Operating Hours To Date:		5991.5	6149.5	6149.5	6151.9	6272.2
SVE Pounds/ Hour Removal Rate, as gasoline (12):		0.01	0.01	0.00	0.00	0.01
SVE Pounds Removed This Period, as gasoline (13):		4.14	1.01	0.00	0.00	0.88
GWE Pounds Removed This Period, as gasoline (14):		3.99	0.00	0.01	0.00	0.00
Total Pounds Removed This Period, as gasoline (15):		8.13	1.01	0.01	0.00	0.88
Total Pounds Removed To Date, as gasoline:		2995.5	2996.5	2996.5	2996.5	2997.4
Total Gallons Removed This Period, as gasoline (16):		1.31	0.16	0.00	0.00	0.14
Total Gallons Removed To Date, as gasoline:		483.2	483.3	483.3	483.3	483.5

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2035
Location: 1001 San Pablo Avenue
Albany, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: Therm Tech Model VAC-10 thermal/catalytic oxidizer

Start-Up Date: 12-07-93
Operation and Performance Data From: 12-07-93
To: 10-01-96

Date Begin:		06-01-96	07-01-96	08-01-96	09-01-96
Date End:		07-01-96	08-01-96	09-01-96	10-01-96
Mode of Oxidation:		Cat-Ox	Cat-Ox	Cat-Ox	Cat-Ox
Days of Operation:		0	16	10	0
Days of Downtime:		30	15	21	30
Average Vapor Concentrations (1)					
Well Field Influent:	ppmv (2) as gasoline (3)	NA	160	16	NA
	mg/m3 (4) as gasoline	NA	660	67	NA
	ppmv as benzene (5)	NA	0.8	<0.2	NA
	mg/m3 as benzene	NA	2.5	<0.5	NA
System Influent:	ppmv as gasoline	NA	160	16	NA
	mg/m3 as gasoline	NA	660	67	NA
	ppmv as benzene	NA	0.8	<0.2	NA
	mg/m3 as benzene	NA	2.5	<0.5	NA
System Effluent:	ppmv as gasoline	NA	<5	<5	NA
	mg/m3 as gasoline	NA	<20	<20	NA
	ppmv as benzene	NA	<0.2	<0.2	NA
	mg/m3 as benzene	NA	<0.5	<0.5	NA
Average Well Field Flow Rate (6), scfm (7):		0.0	52.4	52.6	0.0
Average System Influent Flow Rate (6), scfm:		0.0	95.1	95.4	0.0
Average Destruction Efficiency (8), percent (9):		NA	97.0	70.1 (22)	NA
Average Emission Rates (10), pounds per day (11)					
Gasoline:		NA	0.17	0.17	NA
Benzene:		NA	0.00	0.00	NA
Operating Hours This Period:		0.00	372.17	228.86	0.00
Operating Hours To Date:		6272.2	6644.3	6873.2	6873.2
SVE Pounds/ Hour Removal Rate, as gasoline (12):		0.00	0.01	0.01	0.00
SVE Pounds Removed This Period, as gasoline (13):		0.00	4.38	2.70	0.00
GWE Pounds Removed This Period, as gasoline (14):		0.00	3.07	0.00	0.00
Total Pounds Removed This Period, as gasoline (15):		0.00	7.45	2.70	0.00
Total Pounds Removed To Date, as gasoline:		2997.4	3004.8	3007.5	3007.5
Total Gallons Removed This Period, as gasoline (16):		0.00	1.20	0.44	0.00
Total Gallons Removed To Date, as gasoline:		483.5	484.7	485.1	485.1

Table 4
Soil-Vapor Extraction System
Operation and Performance Data

Facility Number: 2035
Location: 1001 San Pablo Avenue
Albany, California

Consultant: EMCON
1921 Ringwood Avenue
San Jose, California

Vapor Treatment Unit: Therm Tech Model VAC-10 thermal/catalytic oxidizer

Start-Up Date: 12-07-93
Operation and Performance Data From: 12-07-93
To: 10-01-96

CURRENT REPORTING PERIOD:	07-01-96	to	10-01-96
DAYS / HOURS IN PERIOD:	92	2208.0	
DAYS / HOURS OF OPERATION:	25	601.0	
DAYS / HOURS OF DOWN TIME:	67	1607.0	
PERCENT OPERATIONAL:		27.2	%
PERIOD POUNDS REMOVED:	10.2		
PERIOD GALLONS REMOVED:	1.6		
AVERAGE WELL FIELD FLOW RATE (scfm):		52.5	
AVERAGE SYSTEM INFLUENT FLOW RATE (scfm):		95.2	

1. Average vapor monitoring concentrations were calculated for all periods after February 6, 1995. Average concentrations are based on discrete sample results reported during the month; refer to Appendix C for discrete sample results.
2. ppmv: parts per million by volume
3. Between December 7, 1993, and February 6, 1995:
   Concentration (as gasoline in ppmv) = [concentration (as gasoline in mg/m3) x 24.05 (lb/m3/lb-mole of air)/mg] / 87 lb/lb-mole
4. mg/m3: milligrams per cubic meter
5. Between December 7, 1993, and February 6, 1995:
   Concentration (as benzene in ppmv) = [concentration (as benzene in mg/m3) x 24.05 (lb/m3/lb-mole of air)/mg] / 78 lb/lb-mole
6. Average flow rates (time weighted average) are based on instantaneous flow rates recorded during the month; refer to Appendix C for instantaneous flow data.
7. scfm: flow in standard cubic feet per minute at one atmosphere and 70 degrees Fahrenheit
8. Average destruction efficiencies are calculated using monthly average concentrations; refer to Appendix C for instantaneous destruction efficiency data.
9. 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
10. Average emission rates are calculated using monthly average concentrations and flow rates; refer to Appendix C for instantaneous emission rate data.
11. 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
12. pounds/ hour removal rate (as gasoline) = well field influent concentration (as gasoline in mg/m3) x well field influent flow rate (scfm) x 0.02832 m3/ft3 x 60 minutes/hour x 1 pound/454,000 mg
13. Soil-vapor extraction (SVE) pounds removed this period (as gasoline) = pounds/ hour removal rate (SVE) x hours of operation (SVE)
14. Groundwater extraction (GWE); refer to Table 7 for GWE system performance data
15. Represents the total mass recovered by the SVE and GWE systems, and the total mass abated by the thermal/catalytic oxidizer
16. gallons removed this period (as gasoline) = pounds removed this period (as gasoline) x 0.1613 gallons/pound of gasoline
17. Therm-Ox: thermal oxidation
18. NA: not analyzed, not applicable, or not available
19. Cat-Ox: catalytic oxidation; the SVE system's abatement unit was converted to the Cat-Ox mode of operation on June 20, 1995
20. On February 7, 1996 the SVE wells were taken off-line; however, the therm tech unit remained on for the groundwater extraction system.
21. The utility costs for February and March were $694.00 and $649.00, respectively. The SVE system was shut down on February 7, 1996, therefore cost per pound was not calculated for these periods. The utility costs incurred during February and March are associated with the off gas abatement for the aeration tank.
22. Although the destruction efficiency appeared to be less than 90 percent, laboratory analytical results collected during this period indicate the effluent TVHG and benzene concentrations in off-gas discharged to the atmosphere were below laboratory detection limits, indicating compliance with BAAQMD discharge requirements.

Table 5
Soil-Vapor Extraction Well Data

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-26-96

Date	Well Identification											
	VW-1			VW-2			VW-3			VW-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
For SVE well monitoring data prior to January 1, 1995, please refer to the third quarter 1995 groundwater monitoring report for this site.												
02-08-95	open	<17 LAB	20.0	open	<17 LAB	20.0	open	0.0 PID	20.0	open	0.0 PID	20.0
02-14-95	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
02-15-95	open	NA	11.0	open	NA	NA	open	NA	NA	open	NA	NA
03-08-95	open	NA	28.0	closed	NA	17.0	closed	NA	0.0	closed	NA	26.0
03-08-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
06-20-95	open	NA	9.0	open	NA	10.0	closed	NA	NA	closed	NA	NA
06-26-95	open	59000 LAB	17.0	open	56000 LAB	15.0	closed	NA	0.0	closed	NA	14.0
07-10-95	open	NA	NA	open	NA	NA	closed	NA	NA	closed	NA	NA
08-08-95	open	NA	47.0	open	NA	46.0	open	NA	47.0	open	NA	47.0
09-12-95	open	3390 PID	26.7	open	2332 PID	26.5	open	263 PID	25.0	open	1736 PID	26.3
09-28-95	open	1498 PID	30.0	open	1075 PID	29.0	open	235 PID	26.0	open	911 PID	30.0
09-28-95	open	1800 LAB	NA	open	1500 LAB	NA	open	180 LAB	NA	open	990 LAB	NA
09-28-95	open	NA	NA	open	NA	NA	closed	NA	NA	open	NA	NA
09-29-95	open	NA	NA	open	NA	NA	closed	NA	NA	open	NA	NA
10-26-95	open	NA	25.5	open	NA	25.5	closed	NA	0.0	open	NA	25.3
12-05-95	open	NA	54.0	open	NA	54.0	closed	NA	NA	closed	NA	NA
02-07-96	open	698 PID	NA	open	390 PID	NA	open	501 PID	NA	open	610 PID	NA
03-25-96	System was manually shut down.											
05-17-96	open	1945 PID	30.0	closed	101 PID	18.0	closed	50.1 PID	18.0	open	197 PID	25.0
05-22-96	System was manually shut down.											
07-16-96	open	7600 PID	NA	open	3100 PID	NA	open	1450 PID	NA	open	3310 PID	NA
08-08-96	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	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
open(b): open to the system and bubbling air
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
PID: TVHG concentration was measured with a portable photo-ionization detector
LAB: TVHG concentration was analyzed in the laboratory

Table 5
Soil-Vapor Extraction Well Data

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-26-96

Date	Well Identification											
	VW-5			VW-6			VW-7			VW-8		
	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
For SVE well monitoring data prior to January 1, 1995, please refer to the third quarter 1995 groundwater monitoring report for this site.												
02-08-95	open	0.0 PID	24.0	open	<17 LAB	10.0	open	0.0 PID	24.0	open	<17 LAB	20.0
02-14-95	open	NA	NA	closed	NA	NA	open	NA	NA	open	NA	NA
02-15-95	open	NA	NA	closed	NA	16.0	open	NA	NA	open	NA	NA
03-08-95	closed	NA	1.0	closed	NA	8.0	closed	NA	22.0	closed	NA	0.0
03-08-95	closed	NA	NA	open	NA	NA	closed	NA	NA	closed	NA	NA
06-20-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
06-26-95	closed	NA	7.0	closed	NA	34.0	closed	NA	16.0	closed	NA	2.0
07-10-95	closed	NA	NA	closed	NA	NA	closed	NA	NA	closed	NA	NA
08-08-95	open	NA	46.0	open	NA	36.0	open	NA	47.0	open	NA	43.0
09-12-95	open	243 PID	26.2	open	587 PID	27.7	open	1297 PID	25.5	open	830 PID	26.2
09-28-95	open	301 PID	30.0	open	230 PID	32.0	open	941 PID	30.0	open	956 PID	29.0
09-28-95	open	280 LAB	NA	open	250 LAB	NA	open	1400 LAB	NA	open	2000 LAB	NA
09-28-95	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
09-29-95	open	NA	NA	closed	NA	NA	open	NA	NA	open	NA	NA
10-26-95	open	NA	25.3	closed	NA	0.0	open	NA	19.0	open	NA	21.9
12-05-95	closed	NA	NA	closed	NA	NA	open	NA	54.0	closed	NA	NA
02-07-96	open	47.2 PID	NA	open	840 PID	NA	open	102 PID	NA	open	780 PID	NA
03-25-96	System was manually shut down.											
05-17-96	closed	80.6 PID	20.0	open	195 PID	22.0	open	419 PID	28.0	closed	116 PID	18.0
05-22-96	System was manually shut down.											
07-16-96	open	300 PID	NA	open	NA	NA	open	590 PID	NA	open	1400 PID	NA
08-08-96	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	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
open(b): open to the system and bubbling air
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
PID: TVHG concentration was measured with a portable photo-ionization detector
LAB: TVHG concentration was analyzed in the laboratory

esj/h:\2035\2035tdb.xls\Table 5:imi
20805-123.003

Table 5
Soil-Vapor Extraction Well Data

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-26-96

Date	Well Identification											
	VW-9			RW-1			AS-1V			AS-2V		
	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
For SVE well monitoring data prior to January 1, 1995, please refer to the third quarter 1995 groundwater monitoring report for this site.												
02-08-95	open	0.0 PID	23.0	open	13.7 PID	20.0	open	<17 LAB	24.0	open	<17 LAB	24.0
02-14-95	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
02-15-95	open	NA	NA	open	NA	13.0	passive	NA	5.0	passive	NA	1.0
03-08-95	closed	NA	8.0	open	NA	28.0	passive	NA	0.0	passive	NA	0.0
03-08-95	closed	NA	NA	closed	NA	NA	open	NA	NA	open	NA	NA
06-20-95	closed	NA	NA	open	NA	10.0	open	NA	10.0	open	NA	10.0
06-26-95	closed	NA	8.0	open	4800 LAB	19.0	open	40000 LAB	15.0	open	40000 LAB	15.0
07-10-95	closed	NA	NA	open(b)	NA	NA	open	NA	NA	open	NA	NA
08-08-95	open	NA	44.5	open	NA	49.0	open	NA	44.5	open	NA	44.5
09-12-95	open	566 PID	25.3	open	1072 PID	26.3	open	2522 PID	26.6	open	2522 PID	26.6
09-28-95	open	393 PID	25.0	open	921 PID	31.0	open	1213 PID	26.5	open	1183 PID	26.0
09-28-95	open	500 LAB	NA	open	1100 LAB	NA	open	1400 LAB	NA	open	1500 LAB	NA
09-28-95	open	NA	NA	open	NA	NA	open	NA	NA	closed	NA	NA
09-29-95	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	NA
10-26-95	open	NA	22.4	open	NA	23.9	open	NA	25.7	open	NA	25.7
12-05-95	closed	NA	NA	closed	NA	NA	open	NA	54.0	closed	NA	NA
02-07-96	open	1110 PID	NA	open	57 PID	NA	open	465 PID	NA	open	465 PID	NA
03-25-96	System was manually shut down.											
05-17-96	open	384 PID	28.0	closed	118 PID	25.0	open	146 PID	30.0	open	208 PID	30.0
05-22-96	System was manually shut down.											
07-16-96	open	425 PID	NA	open	1140 PID	NA	open	4600 PID	NA	open	4600 PID	NA
08-08-96	open	NA	NA	open	NA	NA	open	NA	NA	open	NA	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
open(b): open to the system and bubbling air
passive: open to the atmosphere
closed: closed to the system and atmosphere
NA: not analyzed or not measured
PID: TVHG concentration was measured with a portable photo-ionization detector
LAB: TVHG concentration was analyzed in the laboratory

Table 6
Influent and Effluent Groundwater Analyses

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-26-96

Well Designation	Water Sample Field Date	TPHG µg/L	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L
I-1	02-08-95	NA	NA	NA	NA	NA
I-1	02-08-95	49000	4300	4900	1000	5200
I-1	02-14-95	33000	4300	5800	970	5600
I-1	02-21-95	21000	940	1500	360	4000
I-1	02-28-95	15000	430	290	54	2000
I-1	06-20-95	20000	1500	1200	220	2300
I-1	08-08-95	11000	970	1100	210	1800
I-1	09-12-95	2700	200	150	29	290
I-1	10-11-95	1000	97	38	7	69
I-1	11-08-95	2500	38	27	8	240
I-1	11-30-95	29000	190	530	300	3100
I-1	01-30-96	70	4.5	1.8	<0.5	8.3
I-1	07-16-96	4300	530	210	110	550
I-2	02-08-95	NA	NA	NA	NA	NA
I-2	02-08-95	1500	59	70	14	86
I-2	02-14-95	1500	59	70	14	86
I-2	02-21-95	340	7.2	8.8	1.9	37
I-2	02-28-95	390	3.9	2.5	0.9	16
I-2	06-20-95	2200	30	27	11	77
I-2	08-08-95	330	17	18	3.5	36
I-2	09-12-95	78	4.1	3	<0.5	8.9
I-2	10-11-95	<50	0.9	<0.5	<0.5	1
I-2	11-08-95	1800	2.5	2.7	3.8	35
I-2	11-30-95	220	5	7.4	1.7	22
I-2	01-30-96	<50	<0.5	<0.5	<0.5	<0.5
I-2	07-16-96	230	23	7.6	4.5	21

Table 6
Influent and Effluent Groundwater Analyses

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-26-96

Well Designation	Water Sample Field Date	TPHG µg/L	Benzene µg/L	Toluene µg/L	Ethyl-benzene µg/L	Total Xylenes µg/L
I-3	02-08-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	02-14-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	02-21-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	02-28-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	06-20-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	08-08-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	09-12-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	10-11-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	11-08-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	11-30-95	<50	<0.5	<0.5	<0.5	<0.5
I-3	01-30-96	<50	<0.5	<0.5	<0.5	<0.5
I-3	07-16-96	<50	<0.5	<0.5	<0.5	<0.5
E-1	02-08-95	<50	0.7	<0.5	<0.5	<0.5
E-1	02-14-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	02-21-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	02-28-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	06-20-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	08-08-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	09-12-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	10-11-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	11-08-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	11-30-95	<50	<0.5	<0.5	<0.5	<0.5
E-1	01-30-96	<50	<0.5	<0.5	<0.5	<0.5
E-1	07-16-96	<50	<0.5	<0.5	<0.5	<0.5

TPHG: total petroleum hydrocarbons as gasoline
µg/L: micrograms per liter
NA: not analyzed

Table 7
Estimated Total Dissolved TPHG Removed

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-26-96

Sample Designation	Sample Date	Groundwater Extraction: Total Volume Extracted (gallons)	Groundwater Extraction: Period Volume Extracted (gallons)	Groundwater Extraction: Period Flow Rate (gpd)	TPHG Removal Data: Period Influent Concentration (µg/L)	TPHG Removal Data: Period Removal Rate (lbs/day)	TPHG Removal Data: Period Pounds Removed [1] (pounds)	TPHG Removal Data: Total Pounds Removed (pounds)	TPHG Removal Data: Total Gallons Removed [2] (gallons)	Benzene Removal Data: Period Influent Concentration (µg/L)	Benzene Removal Data: Period Removal Rate (lbs/day)	Benzene Removal Data: Period Pounds Removed [3] (pounds)	Benzene Removal Data: Total Pounds Removed (pounds)	Benzene Removal Data: Total Gallons Removed [4] (gallons)
I-1	02-08-95	628	0	0	NA	0.000	0.000	0.000	0.000	NA	0.0000	0.0000	0.0000	0.0000
I-1	02-08-95	880	252	2,520	49,000	1.031	0.103	0.103	0.017	4,300	0.0904	0.0090	0.0090	0.0012
I-1	02-14-95	1,329	449	76	33,000	0.021	0.124	0.227	0.037	4,300	0.0027	0.0161	0.0251	0.0035
I-1	02-21-95	15,499	14,170	2,051	21,000	0.360	2.484	2.710	0.437	940	0.0161	0.1112	0.1363	0.0188
I-1	02-28-95	28,788	13,289	1,894	15,000	0.237	1.664	4.374	0.706	430	0.0068	0.0477	0.1840	0.0254
I-1	03-08-95	31,358	2,570	316	15,000	0.040	0.322	4.696	0.757	430	0.0011	0.0092	0.1932	0.0266
I-1	06-20-95	31,695	337	3	20,000	0.001	0.056	4.752	0.767	1,500	0.0000	0.0042	0.1975	0.0272
I-1	06-30-95	40,933	9,238	924	20,000	0.154	1.542	6.294	1.015	1,500	0.0116	0.1157	0.3131	0.0432
I-1	08-08-95	46,416	5,483	141	11,000	0.013	0.503	6.798	1.097	970	0.0011	0.0444	0.3575	0.0493
I-1	09-12-95	57,434	11,018	315	2,700	0.007	0.248	7.046	1.137	200	0.0005	0.0184	0.3759	0.0518
I-1	10-11-95	66,534	9,100	314	1,000	0.003	0.076	7.122	1.149	97	0.0003	0.0074	0.3833	0.0529
I-1	11-08-95	106,654	40,120	1,433	2,500	0.030	0.837	7.959	1.284	38	0.0005	0.0127	0.3960	0.0546
I-1	11-30-95	151,566	44,912	2,041	29,000	0.494	10.871	18.831	3.037	190	0.0032	0.0712	0.4672	0.0644
I-1 (6)	12-22-95	174,511	22,945	1,043	29,000	0.252	5.554	24.385	3.933	190	0.0017	0.0364	0.5036	0.0695
I-1 (6)	01-01-96	191,063	16,552	1,655	29,000	0.401	4.007	28.391	4.580	190	0.0026	0.0262	0.5299	0.0731
I-1	01-30-96	251,187	60,124	2,073	70	0.001	0.035	28.426	4.585	4.5	0.0001	0.0023	0.5321	0.0734
I-1 (6)	04-01-96	296,826	45,639	736	70	0.000	0.027	28.453	4.589	4.5	0.0000	0.0017	0.5339	0.0736
I-1	07-16-96	331,575	34,749	328	4,300	0.012	1.247	29.700	4.791	530	0.0015	0.1537	0.6876	0.0948
I-1 (6)	08-08-96	382,464	50,889	2,213	4,300	0.079	1.826	31.527	5.085	530	0.0098	0.2251	0.9127	0.1259

Groundwater treatment system was shut down on 8-8-96.

Table 7
Estimated Total Dissolved TPHG Removed

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

Date: 11-26-96

Sample Designation	Sample Date	Groundwater Extraction			TPHG Removal Data					Benzene Removal Data				
		Total Volume Extracted	Period Volume Extracted	Period Flow Rate	Period Influent Concentration	Period Removal Rate	Period Pounds Removed [1]	Total Pounds Removed	Total Gallons Removed [2]	Period Influent Concentration	Period Removal Rate	Period Pounds Removed [3]	Total Pounds Removed	Total Gallons Removed [4]
		gallons	gallons	gpd	µg/L	lbs/day	pounds	pounds	gallons	µg/L	lbs/day	pounds	pounds	gallons
I-2	02-08-95	628	0	0	NA	0.000	0.000	0.000	0.000	NA	0.0000	0.0000	0.0000	0.0000
I-2	02-08-95	880	252	2,520	1,500	0.032	0.003	0.003	0.001	59	0.0012	0.0001	0.0001	0.0000
I-2	02-14-95	1,329	449	85	1,500	0.001	0.006	0.009	0.001	59	0.0000	0.0002	0.0003	0.0000
I-2	02-21-95	15,499	14,170	2,024	340	0.006	0.040	0.049	0.008	7	0.0001	0.0009	0.0012	0.0002
I-2	02-28-95	28,788	13,289	1,898	390	0.006	0.043	0.092	0.015	4	0.0001	0.0004	0.0016	0.0002
I-2	03-08-95	31,358	2,570	321	390	0.001	0.008	0.101	0.016	4	0.0000	0.0001	0.0017	0.0002
I-2	06-20-95	31,695	337	3	2,200	0.000	0.006	0.107	0.017	30	0.0000	0.0001	0.0018	0.0002
I-2	06-30-95	40,933	9,238	924	2,200	0.017	0.170	0.276	0.045	30	0.0002	0.0023	0.0041	0.0006
I-2	08-08-95	46,416	5,483	141	330	0.000	0.015	0.292	0.047	17	0.0000	0.0008	0.0049	0.0007
I-2	09-12-95	57,434	11,018	315	78	0.000	0.007	0.299	0.048	4	0.0000	0.0004	0.0053	0.0007
I-2	10-11-95	66,534	9,100	314	<50	0.000	0.004	0.303	0.049	1	0.0000	0.0001	0.0053	0.0007
I-2	11-08-95	106,654	40,120	1,433	1,800	0.022	0.603	0.905	0.146	3	0.0000	0.0008	0.0062	0.0009
I-2	11-30-95	151,566	44,912	2,041	220	0.004	0.082	0.988	0.159	5	0.0001	0.0019	0.0080	0.0011
I-2 (6)	12-22-95	174,511	22,945	1,043	220	0.002	0.042	1.030	0.166	5	0.0000	0.0010	0.0090	0.0012
I-2 (6)	01-01-96	191,063	16,552	1,655	220	0.003	0.030	1.060	0.171	5	0.0001	0.0007	0.0097	0.0013
I-2	01-30-96	251,187	60,124	2,073	<50	0.001	0.025	1.085	0.175	<0.5	0.0000	0.0003	0.0099	0.0014
I-2 (6)	04-01-96	296,826	45,639	736	<50	0.000	0.019	1.104	0.178	<0.5	0.0000	0.0002	0.0101	0.0014
I-2	07-16-96	331,575	34,749	328	230	0.000	0.015	1.119	0.180	23	0.0000	0.0001	0.0103	0.0014
I-2 (6)	08-08-96	382,464	50,889	2,213	230	0.001	0.021	1.140	0.184	23	0.0000	0.0002	0.0105	0.0014

Groundwater treatment system was shut down on 8-8-96.

Table 7
Estimated Total Dissolved TPHG Removed

ARCO Service Station 2035
1001 San Pablo Avenue, Albany, California

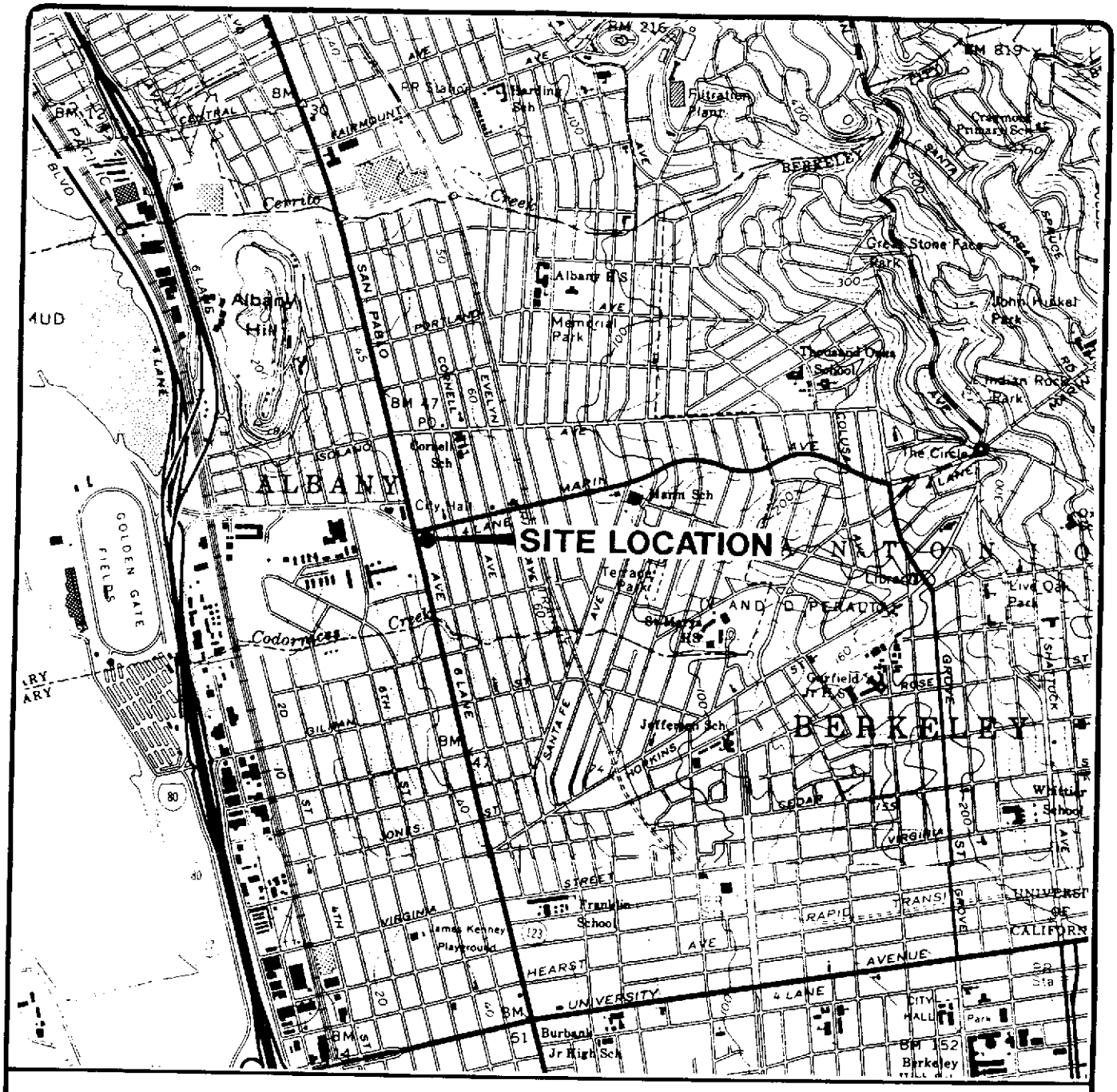
Date: 11-26-96

Sample Designation	Sample Date	Groundwater Extraction: Total Volume Extracted (gallons)	Groundwater Extraction: Period Volume Extracted (gallons)	Groundwater Extraction: Period Flow Rate (gpd)	TPHG Removal Data: Period Influent Concentration (µg/L)	TPHG Removal Data: Period Removal Rate (lbs/day)	TPHG Removal Data: Period Pounds Removed [1] (pounds)	TPHG Removal Data: Total Pounds Removed (pounds)	TPHG Removal Data: Total Gallons Removed [2] (gallons)	Benzene Removal Data: Period Influent Concentration (µg/L)	Benzene Removal Data: Period Removal Rate (lbs/day)	Benzene Removal Data: Period Pounds Removed [3] (pounds)	Benzene Removal Data: Total Pounds Removed (pounds)	Benzene Removal Data: Total Gallons Removed [4] (gallons)
CURRENT REPORTING PERIOD:		07-01-96	to	10-01-96										
DAYS / HOURS IN PERIOD:		92	2,208.0											
DAYS / HOURS OF OPERATION:		23	555.0											
DAYS / HOURS OF DOWN TIME:		69	1,653.0											
PERCENT OPERATIONAL:			25%											
PERIOD GROUNDWATER EXTRACTED (gallons):						85,638								
PERIOD HYDROCARBON REMOVAL (TOTAL):						3.074	pounds	0.496	gallons		0.3788	pounds	0.0522	gallons
HYDROCARBONS REMOVED BY AERATION TANK:						3.038	pounds	0.490	gallons		0.3785	pounds	0.0522	gallons
HYDROCARBONS REMOVED BY CARBON:						0.036	pounds	0.006	gallons		0.0004	pounds	0.0000	gallons
PERCENT PRIMARY CARBON LOADING: [5]						11%								
PERIOD AVERAGE FLOW RATE (gpd):						930.8	(includes down time)							
PERIOD AVERAGE FLOW RATE (gpd):						3703.3	(excludes down time)							
PERIOD AVERAGE FLOW RATE (gpm):						2.6	(excludes down time)							

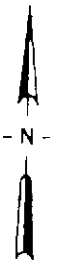
TPHG: total petroleum hydrocarbons as gasoline
gpd: gallons per day
µg/L: micrograms per liter
lbs/day: pounds per day
NA: not analyzed
gpm: gallons per minute
*: The totalizer reading of the groundwater system was estimated from two consecutive monitoring events.
**: The TPHG and benzene concentrations were assumed to be equal to the previous sampling event.

1. Period TPHG removed (pounds) = period influent TPHG concentration (µg/L) x period volume of groundwater extracted (gallons) x 3.7854 (liters/gallon) x 0.000000002205 (pounds/µg)
2. Total TPHG removed (gallons) = total TPHG removed (pounds) x 0.1613 (gallons/pound)
3. Period benzene removed (pounds) = period influent benzene concentration (µg/L) x period volume of groundwater extracted (gallons) x 3.7854 (liters/gallon) x 0.000000002205 (pounds/µg)
4. Total benzene removed (gallons) = total benzene removed (pounds) x 0.1379 (gallons/pound)
5. Percent carbon loading = (total TPHG removed by carbon / 10 pounds of TPH-G) x 100
   The percent carbon loading calculation assumes a 5% by weight carbon adsorption efficiency. The treatment system uses two 200 pound carbon canisters.
   Carbon Loading (10 lbs TPHG) = 1 canister x 200 lbs carbon/canister x 1 lb TPHG/20 lb carbon
6. Assumption that the BTEX and TPHG concentrations in the groundwater treatment system samples are the same as the previous sampling event on 11-30-95. System sampling schedule was reduced from monthly to quarterly by EBMUD during the third quarter 1995, therefore samples were not collected in December 1995

152753



Base map from USGS 7.5' Quad. Maps:
Oakland West and Richmond, California.
Photorevised 1980.



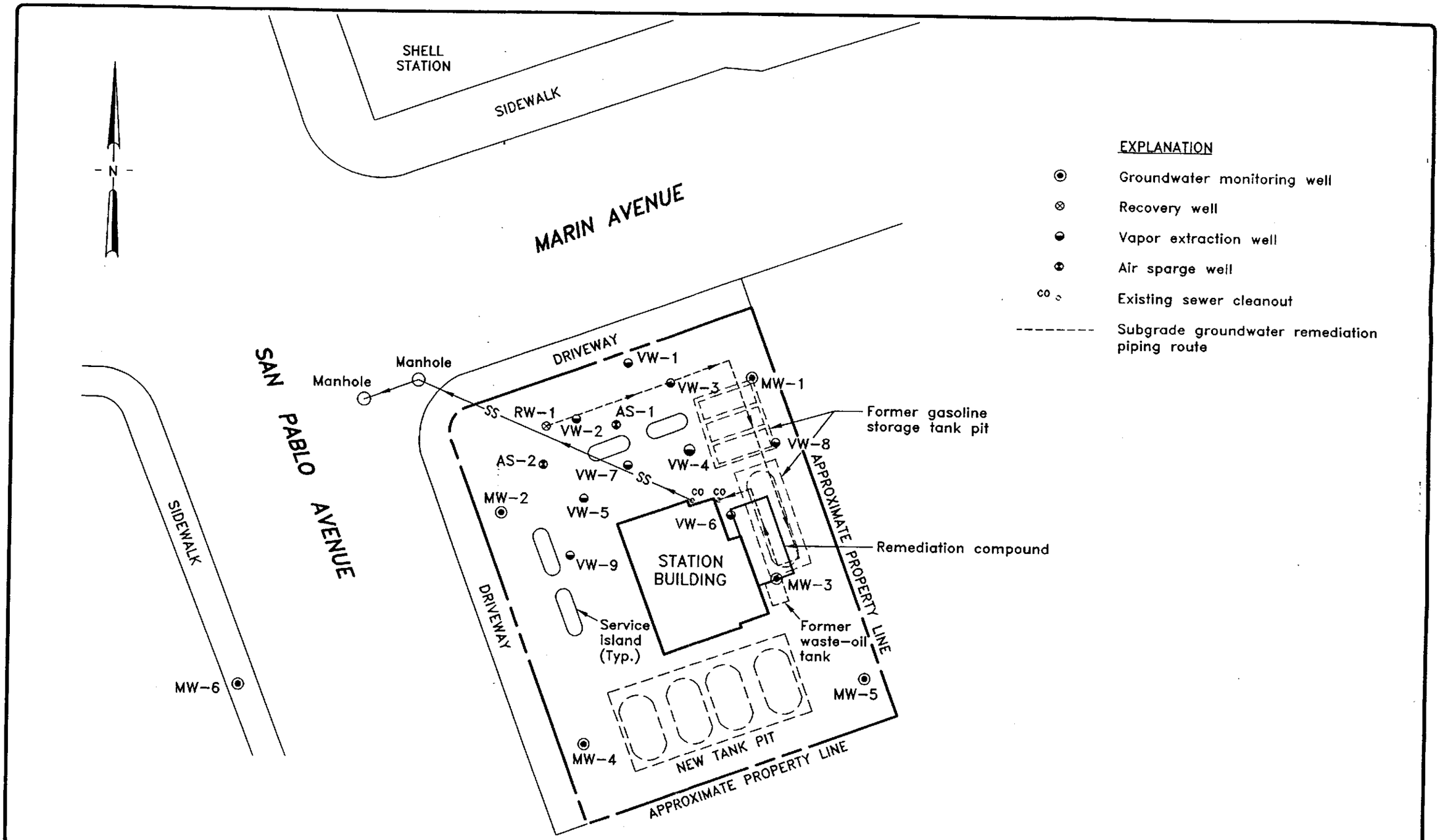
Scale : 0 2000 4000 Feet

EMCON

ARCO PRODUCTS COMPANY
SERVICE STATION 2035, 1001 SAN PABLO AVENUE
QUARTERLY GROUNDWATER MONITORING
ALBANY, CALIFORNIA

SITE LOCATION

FIGURE
1
PROJECT NO.
805-123.03



EMCON

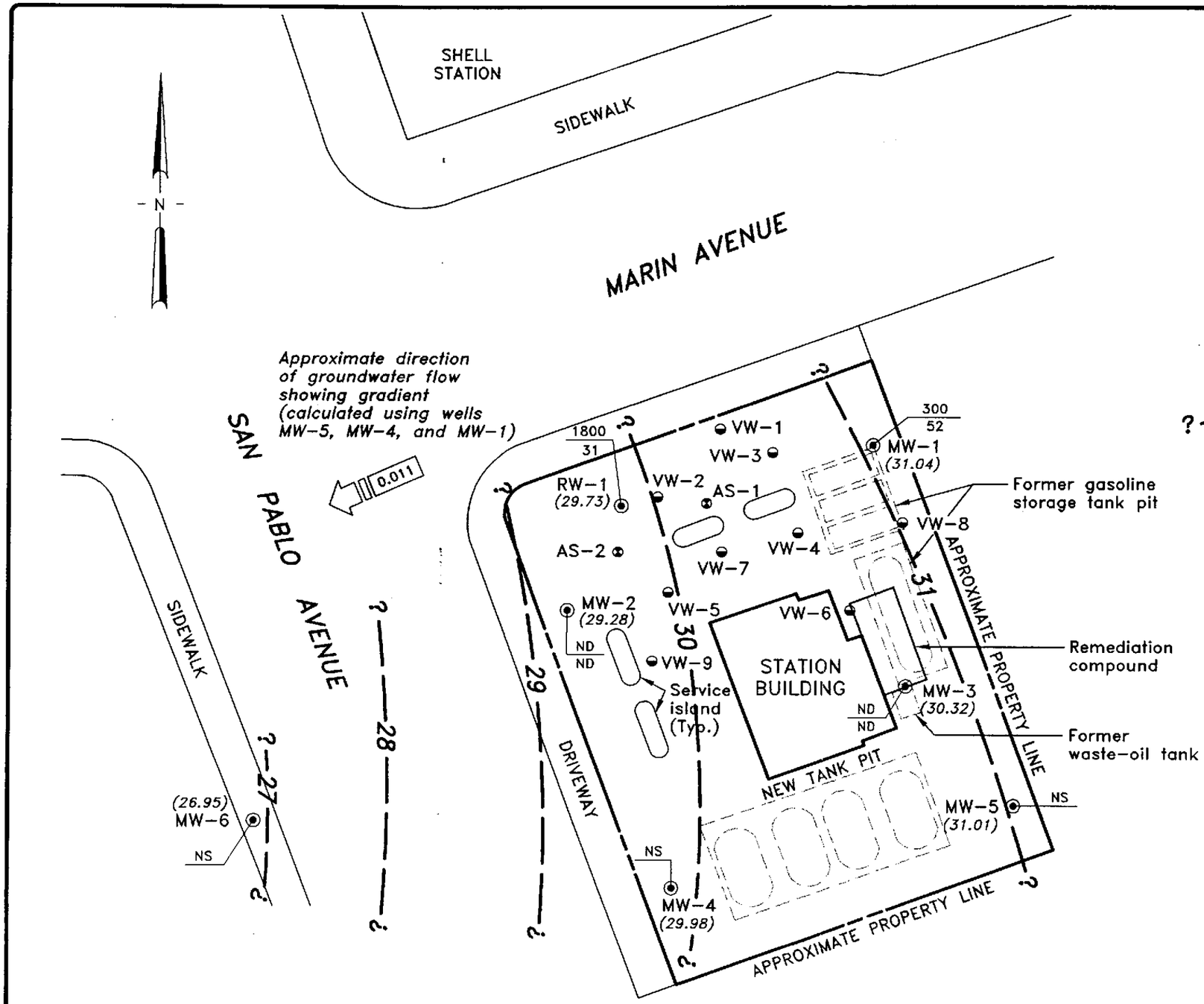
SCALE: 0 30 60 FEET

ARCO PRODUCTS COMPANY
SERVICE STAION 2035, 1001 SAN PABLO AVENUE
QUARTERLY GROUNDWATER MONITORING
ALBANY, CALIFORNIA

SITE PLAN

FIGURE NO.
2

PROJECT NO.
805-123.03



EXPLANATION

- ◉ Groundwater monitoring well
- ◒ Vapor extraction well
- ⊛ Air sparge well
- (31.04) Groundwater elevation (Ft.-MSL); measured 8/15/96
- ? — 28.0 — Groundwater elevation contour (Ft.-MSL)
- 300 / 52 — TPHG concentration in groundwater (ug/L); sampled 8/15/96 / Benzene concentration in groundwater (ug/L); sampled 8/15/96
- ND Not detected at or abdve the method reporting limit for TPHG (50 ug/L) or benzene (0.5 ug/L)
- NS Not sampled; not scheduled for chemical analysis

EMCON

SCALE: 0 30 60 FEET

ARCO PRODUCTS COMPANY
SERVICE STATION 2035, 1001 SAN PABLO AVENUE
QUARTERLY GROUNDWATER MONITORING
ALBANY, CALIFORNIA

GROUNDWATER DATA
THIRD QUARTER 1996

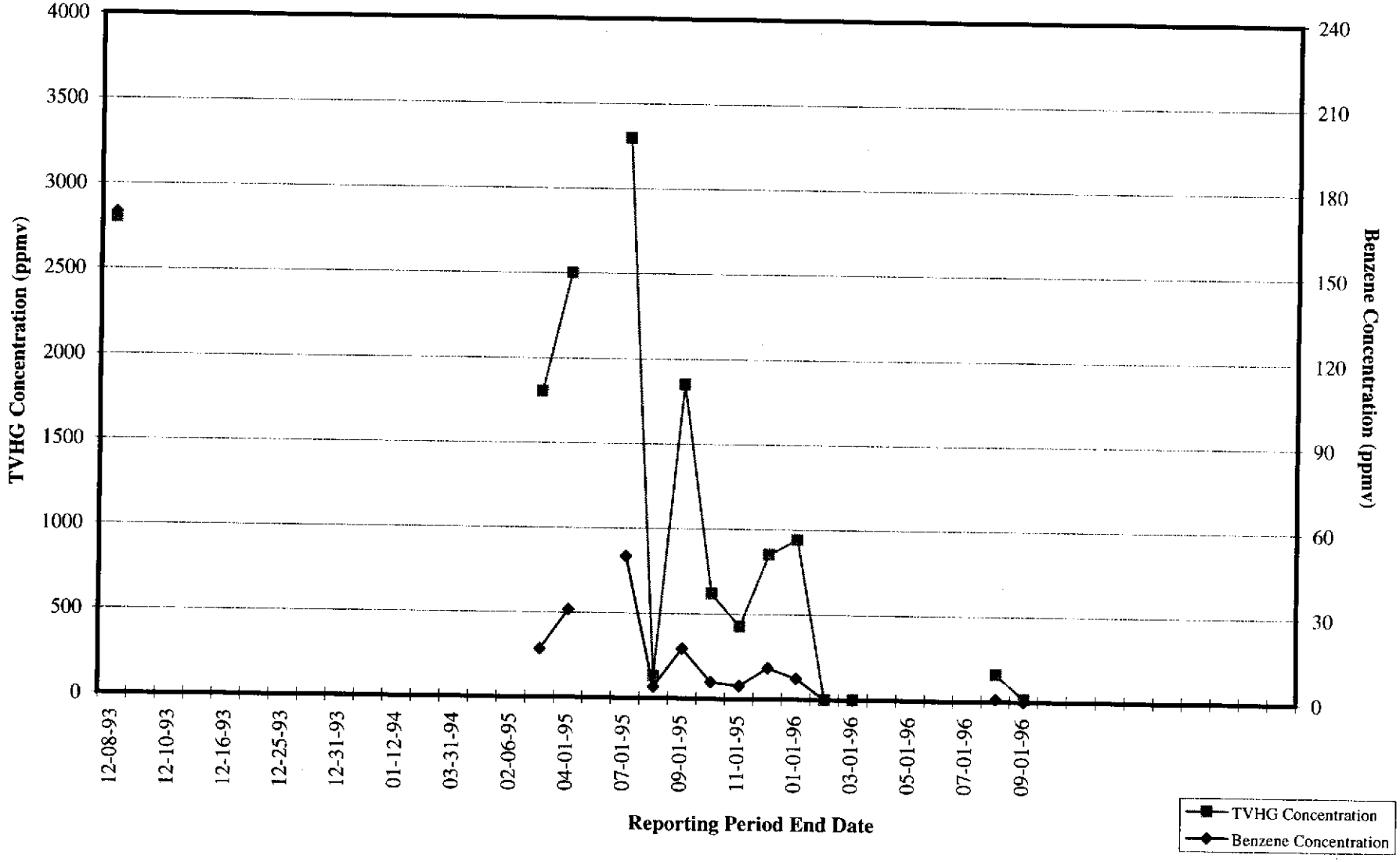
FIGURE NO.
3

PROJECT NO.
805-123.003

G:\805-123\G00 REV 0 11/19/96 12:02:15 DD DJ

Figure 4

ARCO Service Station 2035
Soil-Vapor Extraction and Treatment System
Historical Well Field Influent TVHG and Benzene Concentrations

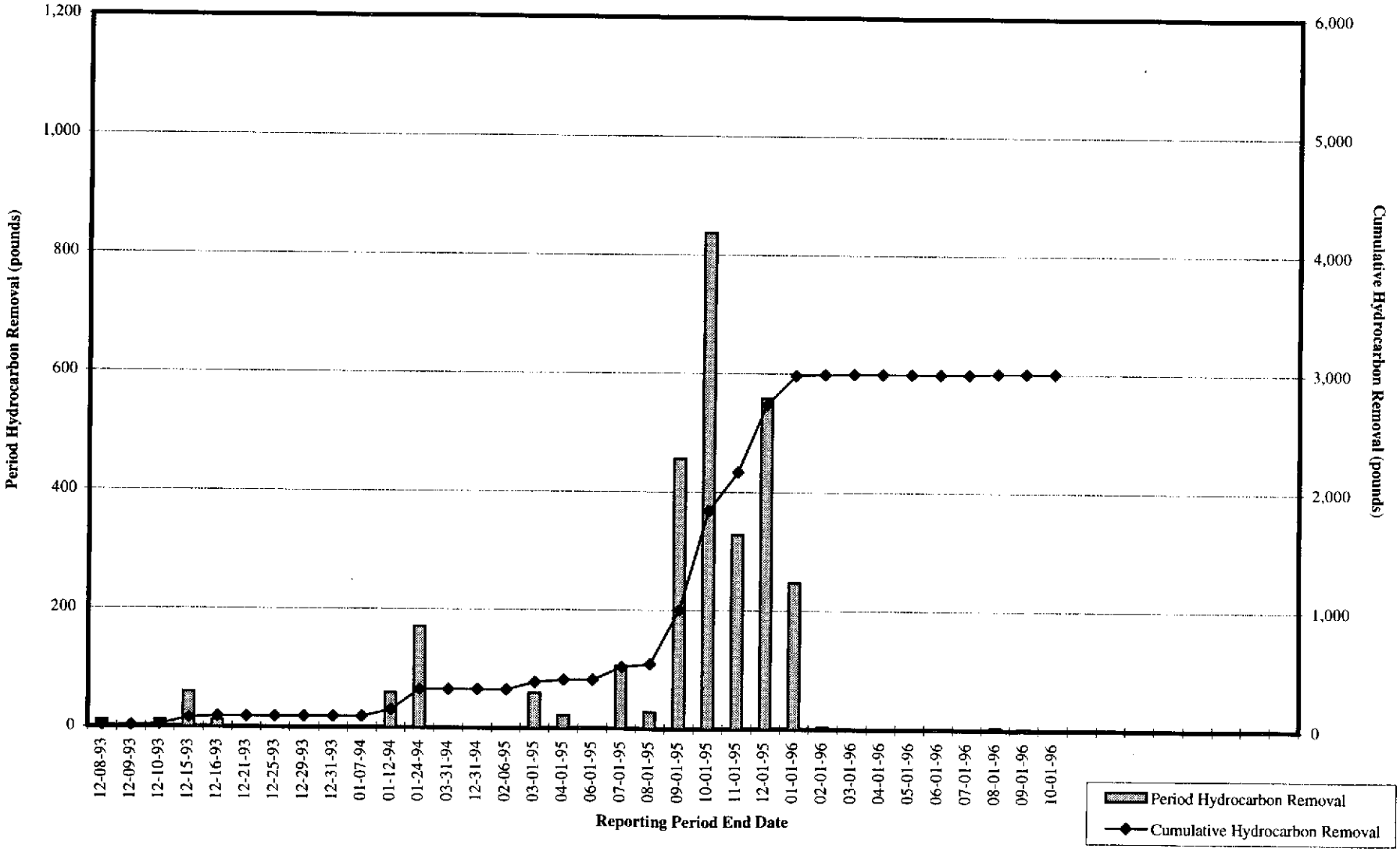


TVHG: total volatile hydrocarbons as gasoline
ppmv: parts per million by volume

esj/h:\2035\2035tdb.xls\SVE Model:imi
20805-123.003

Figure 5

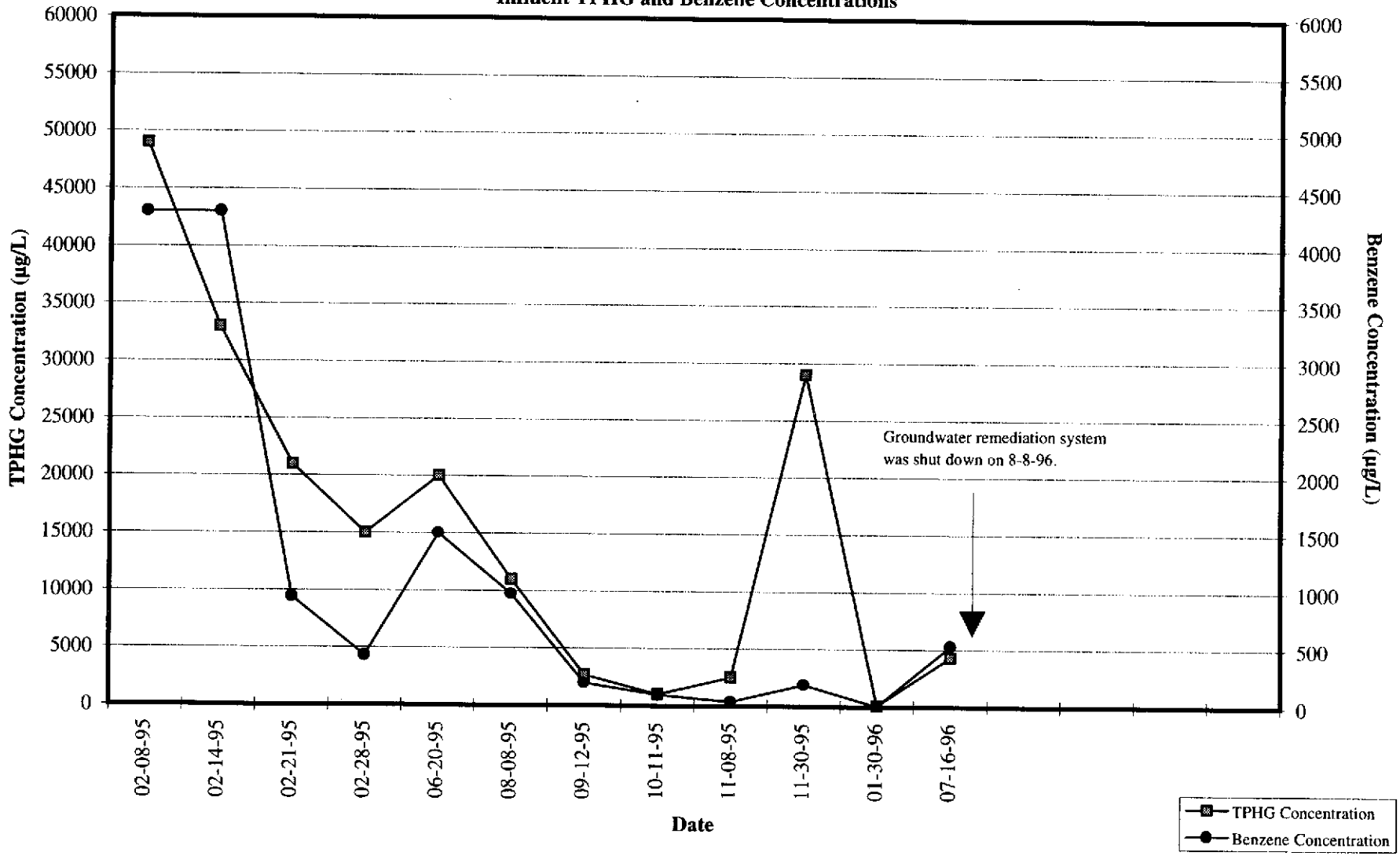
ARCO Service Station 2035
Soil-Vapor Extraction and Treatment System
Historical Hydrocarbon Removal Rates



esj/h:\2035\2035tdb.xls\SVE Model:imi
20805-123.003

Figure 6

ARCO Service Station 2035
Historical Groundwater Treatment System
Influent TPHG and Benzene Concentrations

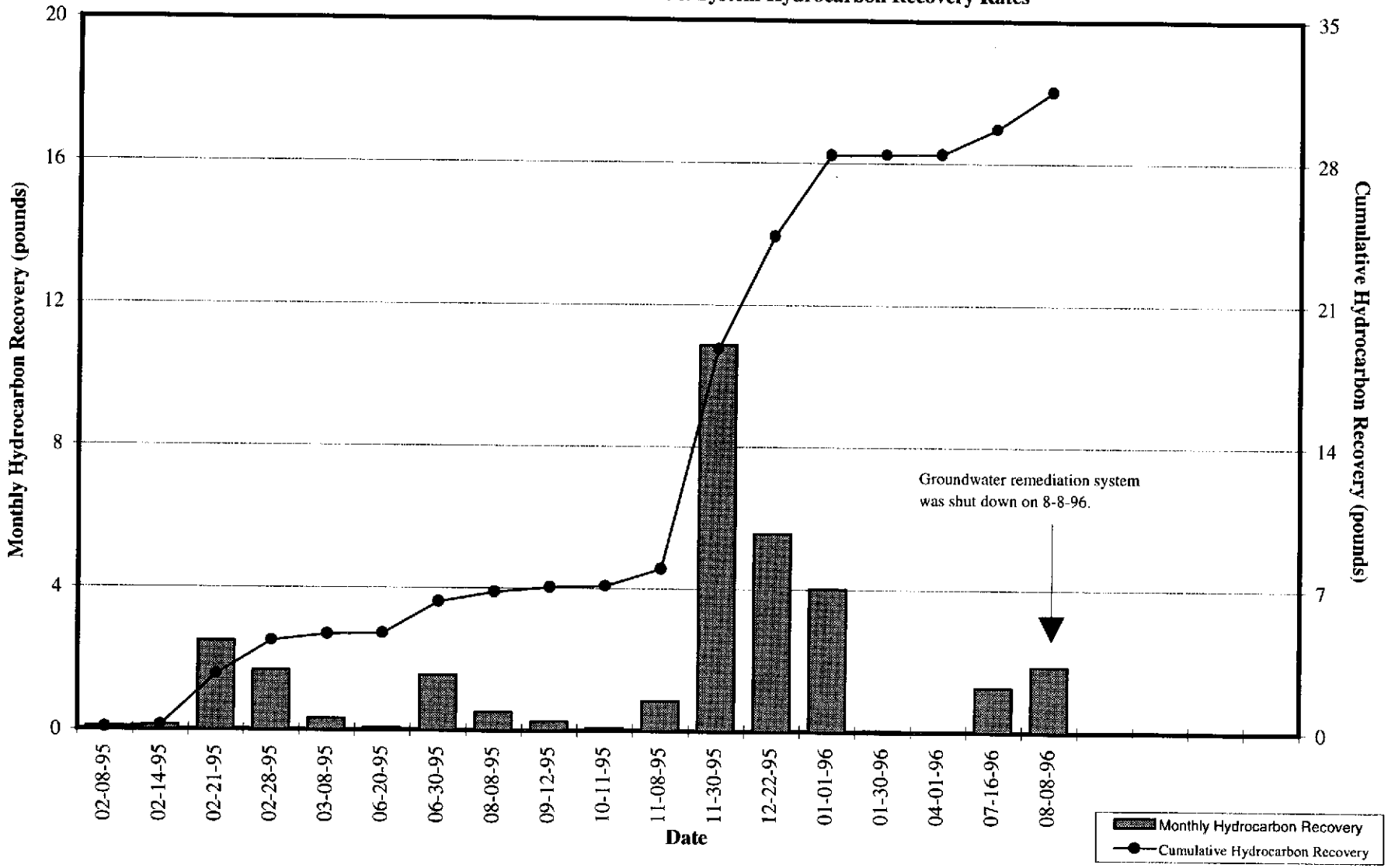


TPHG: total petroleum hydrocarbons as gasoline
µg/L: micrograms per liter

esj/h:\2035\2035tdb xls\Table 8:imi
20805-123.003

Figure 7

ARCO Service Station 2035
Historical Groundwater Treatment System Hydrocarbon Recovery Rates



esj/h:\2035\2035tdb.xls\Table 9:imi
20805-123.003

APPENDIX A

FIELD DATA SHEETS, THIRD QUARTER 1996 GROUNDWATER MONITORING EVENT

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 21775-217.002 STATION ADDRESS : 101 San Pablo Avenue, Albany DATE : 8-15-96

ARCO STATION # : 2035 FIELD TECHNICIAN : M. Gallegos DAY : Thursday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket Present	Lock Number	Type Of Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-2	Good	Good	Yes	Arco	Lwc	11.10	11.10	ND	NA	28.6	
2	MW-4	Good	Good	Yes	Arco	Lwc	10.35	10.35			25.0	
3	MW-5	Good	Good	Yes	Arco	Lwc	10.83	10.83			24.3	
4	MW-6	Good	Good	Yes	Arco	Lwc	13.18	13.18			24.1	
5	MW-3	Good	Good	Yes	Arco	Lwc	11.12	11.12			32.8	
6	RW-1	Good	Good	None	None	Lwc	10.60	10.60			25.3	
7	MW-1	Good	Good	Yes	Arco	Lwc	10.37	10.37			29.6	

SURVEY POINTS ARE TOP OF WELL CASINGS

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 21725-217002 SAMPLE ID: MW-1(29')

PURGED BY: M. GALLEGOS CLIENT NAME: ARCO # 2035

SAMPLED BY: ✓ LOCATION: Albany, CA

TYPE: Ground Water 1 Surface Water ____ Treatment Effluent ____ Other ____

CASING DIAMETER (inches): 2 ____ 3 ____ 4 X 4.5 ____ 6 ____ Other ____

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 12.56

DEPTH TO WATER (feet): 10.37 CALCULATED PURGE (gal.): 37.69

DEPTH OF WELL (feet): 29.6 ACTUAL PURGE VOL. (gal.): 38.0

DATE PURGED: 8-15-96 Start (2400 Hr) 1203 End (2400 Hr) 1212

DATE SAMPLED: ✓ Start (2400 Hr) 1220 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1205	12.5	6.45	635	69.4	clear	clear
1208	25.0	6.45	681	68.4	"	"
1212	38.0	6.48	687	68.2	"	"

D. O. (ppm): NR ODOR: none

COLOR (COBALT 0 - 500): NR

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

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- X Centrifugal Pump
- ____ Submersible Pump
- ____ Well Wizard™
- ____ Bailer (Teflon®)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)
- ____ Dedicated

Other: ____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ DDL Sampler
- ____ Dipper
- ____ Well Wizard™
- X Bailer (Teflon®)
- ____ Bailer (Stainless Steel)
- ____ Submersible Pump
- ____ Dedicated

Other: ____

WELL INTEGRITY: Good LOCK #: ARCO-key

REMARKS: All Samples taken

Meter Calibration: Date: 8-15-96 Time: ____ Meter Serial #: 9204 Temperature °F: ____

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

Location of previous calibration: MW-2

Signature: [signature] Reviewed By: [signature] Page 1 of 4

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 21775-217.002 SAMPLE ID: MW-2 ([redacted] (28'))

PURGED BY: M. GALLEGOS CLIENT NAME: ARCO # 2055

SAMPLED BY: ✓ LOCATION: Albany, CA

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 11.43

DEPTH TO WATER (feet): 11.10 CALCULATED PURGE (gal.): 34.30

DEPTH OF WELL (feet): 28.4 ACTUAL PURGE VOL. (gal.): 34.5

DATE PURGED: 8-15-96 Start (2400 Hr) 1019 End (2400 Hr) 1025

DATE SAMPLED: ✓ Start (2400 Hr) 1035 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1021	11.5	6.15	731	70.4	Cloudy	Light
1023	23.0	6.44	720	68.9	Clear	"
1025	34.5	6.51	725	68.2	Clear	Clear

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

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

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

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT

- ___ 2" Bladder Pump
- X Centrifugal Pump
- ___ Submersible Pump
- ___ Well Wizard™
- ___ Bailer (Teflon®)
- ___ Bailer (PVC)
- ___ Bailer (Stainless Steel)
- ___ Dedicated

Other: ___

SAMPLING EQUIPMENT

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

Other: ___

WELL INTEGRITY: Good LOCK #: ARCO-key

REMARKS: All samples taken

Meter Calibration: Date: 8-15-96 Time: 1015 Meter Serial #: 9204 Temperature °F: 73.0

(EC 1000 1003 / 1000) (DI ___) (pH 7 700 / 700) (pH 10 1000 / 1003) (pH 4 399 / ___)

Location of previous calibration: ___

Signature: [signature] Reviewed By: [signature] Page 2 of 4

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 21775-217.002 SAMPLE ID: MW-3(32')

PURGED BY: M. Gallegos CLIENT NAME: ARCO#2035

SAMPLED BY: ↓ LOCATION: Albany, CA.

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 141.14

DEPTH TO WATER (feet): 11.12 CALCULATED PURGE (gal.): 42.49

DEPTH OF WELL (feet): 32.8 ACTUAL PURGE VOL. (gal.): 42.5

DATE PURGED: 8-15-96 Start (2400 Hr) 1101 End (2400 Hr) 1112

DATE SAMPLED: ↓ Start (2400 Hr) 1125 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1103	14.0	6.43	742	68.3	Cloudy	mod
1107	28.0	6.55	741	68.2	"	"
1112	42.5	6.56	738	67.6	Brn	Heavy

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

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

NR (COBALT 0 - 500)

NR (NTU 0 - 200 or 0 - 1000)

PURGING EQUIPMENT

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

SAMPLING EQUIPMENT

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

WELL INTEGRITY: Good LOCK #: Arco-Key

REMARKS: All Samples Taken

Meter Calibration: Date: 8/15/96 Time: ___ Meter Serial #: 92047 Temperature °F: ___

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

Location of previous calibration: MW-2

Signature: [signature] Reviewed By: [signature] Page 3 of 4

Rev. 3, 2/94

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 21775-217.002 SAMPLE ID: RW-1 (25')

PURGED BY: M. Gallegos CLIENT NAME: ARCO #2035

SAMPLED BY: ↓ LOCATION: Albany, CA

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

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

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

DEPTH TO WATER (feet): 10.60 CALCULATED PURGE (gal.): ↓

DEPTH OF WELL (feet): 25.3 ACTUAL PURGE VOL. (gal.): ___

DATE PURGED: 8-15-96 Start (2400 Hr) 1140 End (2400 Hr) 1142

DATE SAMPLED: ↓ Start (2400 Hr) 1142 End (2400 Hr) ___

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
[illegible]	[illegible]					

D. O. (ppm): NR ODOR: ___ NR (COBALT 0 - 500) NR (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT

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

SAMPLING EQUIPMENT

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

WELL INTEGRITY: Good LOCK #: None

REMARKS: Purged one gallon prior to taking Samples
Not enough water in well to get 2 vols + reading
One VOA taken

Meter Calibration: Date: 8/15/96 Time: ___ Meter Serial #: 9204 Temperature °F: ___

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

Location of previous calibration: MW-2

Signature: [signature] Reviewed By: [signature] Page 4 of 4

DISSOLVED OXYGEN DATA SHEET

EMCON

Project Number: #20805-123.003 Date: 8-15-96

Station Number: ARCO #2035 Day: Thursday

Location: Albany, CA Sampler: Manuel Gallegos

Measuring Method(s): ✓ D.O. Kit _____ D.O. Meter

Well ID	Date	Time	D.O. Reading
MW-2	8/15/96		1-2
MW-4	"		3-4
MW-5	"		2-3
MW-6	"		2-3
MW-3	"		2-3
MW-1	"		2-3
RW-1	✓		2-3

SIGNATURE: [signature]

Page 1 of 1

APPENDIX B

ANALYTICAL RESULTS AND CHAIN OF CUSTODY DOCUMENTATION, THIRD QUARTER 1996 GROUNDWATER MONITORING EVENT

Columbia Analytical Services INC.

August 26, 1996 Service Request No.: S9601345

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

RE: 2035 ALBANY/20805-123.003/TO#19350.00

Dear Mr. Young:

Attached are the results of the samples submitted to our lab on August 15, 1996. For you reference, our service request number for this work is S9601345.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 8, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

If you have questions or further needs, please call me at (408) 428-1283.

Sincerely,

Steven L. Green
Project Chemist

SG/sh

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601345
Project:	2035 ALBANY/20805-123.003/TO#19350.00	**Date Collected:**	8/15/96
Sample Matrix:	Water	**Date Received:**	8/15/96
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

Sample Name:	**MW-2 (28)**	**MW-3 (32)**	**RW-1 (25)**
Lab Code:	S9601345-001	S9601345-002	S9601345-003
Date Analyzed:	8/19/96	8/19/96	8/21/96

Analyte	**MRL**			
TPH as Gasoline	50	ND	ND	1,800
Benzene	0.5	ND	ND	31
Toluene	0.5	ND	ND	38
Ethylbenzene	0.5	ND	ND	15
Total Xylenes	0.5	ND	ND	150
Methyl *tert*-Butyl Ether	3	4	54	<30*

* Raised MRL due to matrix interference.

3S22/060194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601345
Project:	2035 ALBANY/20805-123.003/TO#19350.00	**Date Collected:**	8/15/96
Sample Matrix:	Water	**Date Received:**	8/15/96
		Date Extracted:	NA

BTEX, MTBE and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ug/L (ppb)

	Sample Name:	**MW-1(29)**	**Method Blank**	**Method Blank**
	Lab Code:	S9601345-004	S960819-WB1	S960821-WB1
	Date Analyzed:	8/21/96	8/19/96	8/21/96
Analyte	**MRL**			
TPH as Gasoline	50	300	ND	ND
Benzene	0.5	52	ND	ND
Toluene	0.5	ND	ND	ND
Ethylbenzene	0.5	0.9	ND	ND
Total Xylenes	0.5	ND	ND	ND
Methyl *tert*-Butyl Ether	3	22	ND	ND

3S22/060194

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-123.003/TO#19350.00
Sample Matrix: Water

Service Request: S9601345
Date Collected: 8/15/96
Date Received: 8/15/96
Date Extracted: NA
Date Analyzed: 8/19-21/96

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

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α-Trifluorotoluene
MW-2 (28)	S9601345-001	103	102
MW-3 (32)	S9601345-002	102	99
RW-1 (25)	S9601345-003	109	109
MW-1 (29)	S9601345-004	101	109
Batch QC (MS)	S9601335-001MS	103	101
Batch QC (DMS)	S9601335-001DMS	103	102
Method Blank	S960819-WB1	98	97
Method Blank	S960821-WB1	104	99
CAS Acceptance Limits:		69-116	69-116

SUR2/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601345
Project:	2035 ALBANY/20805-123.003/TO#19350.00	**Date Collected:**	8/15/96
Sample Matrix:	Water	**Date Received:**	8/15/96
		Date Extracted:	NA
		Date Analyzed:	8/19/96

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

Sample Name: Batch QC
Lab Code: S9601335-001

Analyte	Spike Level		Sample	Spike Result		Percent Recovery		CAS Acceptance	Relative Percent
	MS	DMS	Result	MS	DMS	MS	DMS	Limits	Difference
Benzene	25	25	ND	27.3	26.3	109	105	75-135	4
Toluene	25	25	ND	27.5	26.5	110	106	73-136	4
Ethylbenzene	25	25	ND	27.6	26.8	110	107	69-142	3

DMS1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-123.003/TO#19350.00

Service Request: S9601345
Date Analyzed: 8/19/96

Initial Calibration Verification (ICV) Summary
BTEX, MTBE 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	27.0	108	85-115
Toluene	25	27.3	109	85-115
Ethylbenzene	25	27.2	109	85-115
Xylenes, Total	75	84.1	112	85-115
Gasoline	250	237	95	90-110
Methyl *tert*-Butyl Ether	50	51	102	85-115

ICV25AL/060194

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 19350.00

Chain of Custody

ARCO Facility no. 2035	City (Facility) Albany	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Mike Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) (408)453-7300	Fax no. (Consultant) (408)453-0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave. San Jose, CA 95131		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH (acids, HVOC) EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-2(28')		2		X		X	HCL	8/15/96	1035		X											
MW-3(32')		2		X		X	HCL		1125		X											
RW-1(25')		2		X		X	HCL		1142		X											
MW-1(25')		2		X		X	HCL	↓	1220		X											

Method of shipment: Sampler will deliver

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2-40ml HCL VOAs

#20805-123.003

Lab number: 5960345

Turnaround time

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

Condition of sample: ok		Temperature received: Cool	
Relinquished by sampler	Date 8/15/96 Time 2:40	Received by (CAS)	Date 8/15/96 Time 2:40
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date Time

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

R8

APPENDIX C

SVE SYSTEM MONITORING DATA LOG SHEETS

ARCO 2035
SVE SYSTEM
MONITORING DATA

Reporting Period:
07/01/96 00:00
08/01/96 00:00

Hours in Period: 744.00
Days in Period: 31.00

Operation + Down Hours: 744.00
Operation + Down Days: 31.00

	Field Monitoring Data							Laboratory Monitoring Data															
	Flow Rates		FID or PID Results					Well Field Influent				System Influent				System Effluent							
Reading Date & Time	Well Field Flow Rate	System Influent Flow Rate	Well Field	System Influent	System Effluent	Destruction Efficiency	Laboratory Sample Time	Gasoline		Benzene		Gasoline		Benzene		Gasoline		Benzene		Destruction Efficiency	Gasoline Emission Rate	Benzene Emission Rate	Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days
	scfm	scfm	ppm	ppm	ppm	%		ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	%	lb/day	lb/day						
07/01/96 00:00																								10545.47				
07/16/96 11:50	0.0	0.0																					371.83	10545.47	0.00	0.00	371.83	15.49
07/18/96 15:15	28.6	63.6	820	820			15:10	160	660	0.8	2.5	160	660	0.8	2.5	<5	<20	<0.2	<0.5	97.0	0.11	0.00	3.42	10548.89	3.42	0.14	0.00	0.00
08/01/96 00:00	52.8	95.4																					368.75	10917.64	368.75	15.36	0.00	0.00
Period Totals:																							744.00		372.17	15.51	371.83	15.49
Period Averages:	52.4	95.1	820	820				160	660	0.8	2.5	160	660	0.8	2.5	<5	<20	<0.2	<0.5	97.0	0.17	0.00						

ARCO 2035
SVE SYSTEM
MONITORING DATA

Reporting Period:
08/01/96 00:00
09/01/96 00:00

Hours in Period: 744.00
Days in Period: 31.00

Operation + Down Hours: 744.00
Operation + Down Days: 31.00

	Field Monitoring Data							Laboratory Monitoring Data															
	Flow Rates		FID or PID Results					Well Field Influent				System Influent				System Effluent							
Reading Date & Time	Well Field Flow Rate	System Influent Flow Rate	Well Field	System Influent	System Effluent	Destruction Efficiency	Laboratory Sample Time	Gasoline		Benzene		Gasoline		Benzene		Gasoline		Benzene		Destruction Efficiency	Gasoline Emission Rate	Benzene Emission Rate	Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days
	scfm	scfm	ppm	ppm	ppm	%		ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	%	lb/day	lb/day						
08/01/96 00:00																								10917 64				
08/08/96 14:03	52.6	95.4					14:20	16	67	<0.2	<0.5	16	67	<0.2	<0.5	<5	<20	<0.2	<0.5	70.1	0.17	0.00	182.05	11096.10	178.46	7.44	3.59	0.15
08/12/96 15:15	52.6	95.4																					97.20	11146.50	50.40	2.10	46.80	1.95
09/01/96 00:00	0.0	0.0																					464 75	11146.50	0.00	0.00	464.75	19.36
Period Totals:																							744.00		228.86	9.54	515.14	21.46
Period Averages:	52.6	95.4						16	67	<0.2	<0.5	16	67	<0.2	<0.5	<5	<20	<0.2	<0.5	70.1	0.17	0.00						

ARCO 2035
SVE SYSTEM
MONITORING DATA

Reporting Period:
09/01/96 00:00
10/01/96 00:00

Hours in Period: 720.00
Days in Period: 30.00

Operation + Down Hours: 720.00
Operation + Down Days: 30.00

	Field Monitoring Data							Laboratory Monitoring Data														
	Flow Rates		FID or PID Results					Well Field Influent		System Influent		System Effluent										
Reading Date & Time	Well Field Flow Rate	System Influent Flow Rate	Well Field	System Influent	System Effluent	Destruction Efficiency	Laboratory Sample Time	Gasoline	Benzene	Gasoline	Benzene	Gasoline	Benzene	Destruction Efficiency	Gasoline Emission Rate	Benzene Emission Rate	Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days
	scfm	scfm	ppm	ppm	ppm	%		ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	ppmv mg/m3	%	lb/day	lb/day						
09/01/96 00:00																		11146.50				
10/01/96 00:00	0.0	0.0															720.00	11146.50	0.00	0.00	720.00	30.00
Period Totals:																	720.00		0.00	0.00	720.00	30.00
Period Averages:	0.0	0.0																				

APPENDIX D

FIELD DATA SHEETS, OPERATION AND MAINTENANCE VISITS, SVE SYSTEM, THIRD QUARTER 1996

ARCO 2035 . 1001 San Pablo Ave.,Albany,CA. SVE System . EMCON Project # 20805-123.003 . WA # 19289

Remarks: Started System per request.

* Use hours from shut down period.

Unscheduled site visit [] Scheduled site visit [X]

SYSTEM PARAMETERS (Therm Tech Model VAC-10 thermal/catalytic oxidizer)			
Arrival Time (24:00 hour)	1100	Effluent (E-1) (12"x12")	—
System Status (on or off)	ON	Stack Temperature (°F)	730
Shutdown Time (24:00 hour)	—	SYSTEM	—
Restart Time (24:00 hour)	1150	Total Flow (3") (cfm) (before blower-same as Para-Fax)	45
Reading Time (24:00 hour)	1515	Fire Box Temperature (°F)	720
Well Field WF-1 (3")	—	Set Point (°F)	720
Vacuum (in. of H2O)	20	TOTAL HOURS	N/A*
Velocity (ft/min)	—	Electric Meter (kwh)	—
Temperature (°F)	72	Natural Gas (cf)	—
Aeration Tank AT-1 (2")	—		
Vacuum (in. of H2O)	20		
Velocity (ft/min)	—		
Flow (scfm)	25		
After Blower I-2 (4") (AFTER DILUTION)	—		
Total Pressure (in. of H2O)	3		
Total Flow (in. of H2O)	.035		
Influent I-1 (3") (BEFORE DILUTION)	—		
Vacuum (in. of H2O)	20		
Velocity (ft/min) CFM	62		

AIR MONITORING

FID (ppm)	Amb	WF-1	AT-1	I-1	I-2	E-1
Date:						

PID (ppm)		CAL GAS:	150	100 ppm	
Date:	7-16-96	2525	384	660	@ 1220 hrs
Date:	7-16-96	1295	190	820	@ 1440 hrs

Lab samples taken for analysis at: CAS

PARA-FAX on/off: ON

Cleaned K.O. pump pre-filter ? yes/no: Yes

WELL FIELD

SVE WELL ID	Well Diameter	Screen Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Vacuum (in. of H2O)	Velocity (fpm)	Product Recovered (ml)	PID (ppm)	Bubbler (on/off)
VW-1	4"	5'-17'		9.60	100				7600	NA
VW-2	4"	5'-17'							3100	NA
VW-3	4"	4.5'-9.5'							1450	NA
VW-4	4"	5'-17'		9.15					3310	NA
VW-5	4"	4.5'-14.5'							300	NA
VW-6	4"	5'-12.5'					unable to PID=Water			NA
VW-7	4"	5'-15'							590	NA
VW-8	4"	5'-15'		8.15					1400	NA
VW-9	4"	5'-15'							425	NA
RW-1	6"	11'-26'		10.26' @ 1120 hrs, 16.95' @ 1250 hrs.					1140	
AS-1 (vent)	2"	5'-15'							46000	
AS-2 (vent)	2"	5'-15'							46000	

SPARGE WELL ID	Well Diameter	Screen Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Pressure (psi)	Air Flow (scfm)	DO (ppm)	REMARKS
AS-1	2"	28.3'-30.3'							
AS-2	2"	28.8'-30.8'							

Total Sparge Data

Total Air Sparge Pressure(psi)= 0	Total Air Sparge Flow Rate(scfm)= 0	Total Air Sparge Temp(F)= 0

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m^3. Report O_2 and CO_2 in % by volume.

Project# 20805-123.003 **Work Authorization # 19289**

Operator: V. Whitten Date: 7-16-96 **ARCO 2035 Soil Vapor Extraction System**

ARCO 2035 . 1001 San Pablo A..,Albany,CA. SVE System . EMCON Project # 20805-123.003 . WA # 19289

Remarks: System running - checked Vapor of stripped water = 2.0 PPM. Shut water side down per S. Velimanchili @ 1400 hrs. Took Ind & EAt Sample.

Unscheduled site visit [] Scheduled site visit [✓]

SYSTEM PARAMETERS (Therm Tech Model VAC-10 thermal/catalytic oxidizer)

Arrival Time (24:00 hour)	1150	**Effluent (E-1) (12"x12")**	—
System Status (on or off)	ON	Stack Temperature (°F)	725
Shutdown Time (24:00 hour)	—	**SYSTEM**	—
Restart Time (24:00 hour)	—	Total Flow (3") (cfm) (before blower-same as Para-Fax)	80
Reading Time (24:00 hour)	1403	Fire Box Temperature (°F)	714
Well Field WF-1 (3")	—	Set Point (°F)	720
Vacuum (in. of H2O)	30	TOTAL HOURS	11096.10
Velocity (ft/min)	1150	Electric Meter (kwh)	—
Temperature (°F)	74	Natural Gas (cf)	—
Aeration Tank AT-1 (2")	OFF		
Vacuum (in. of H2O)			
Velocity (ft/min)			
Flow (scfm)			
After Blower I-2 (4") (AFTER DILUTION)	—		
Total Pressure (in. of H2O)	1		
Total Flow (in. of H2O)	.08		
Influent I-1 (3") (BEFORE DILUTION)	—		
Vacuum (in. of H2O)	35		
Velocity (ft/min)	1150		

AIR MONITORING

FID (ppm)	Amb	WF-1	AT-1	I-1	I-2	E-1
Date:						
PID (ppm)	CAL GAS:					
Date:						
Date:						

Lab samples taken for analysis at:	CAS
PARA-FAX on/off	ON
Cleaned K.O. pump pre-filter ? yes/no	Yes

WELL FIELD

SVE WELL ID	Well Diameter	Screen Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Vacuum (in. of H2O)	Velocity (fpm)	Product Recovered (ml)	PID (ppm)	Bubbler (on/off)
VW-1	4"	5'-17'			100					
VW-2	4"	5'-17'								NA
VW-3	4"	4.5'-9.5'								NA
VW-4	4"	5'-17'								NA
VW-5	4"	4.5'-14.5'								NA
VW-6	4"	5'-12.5'								NA
VW-7	4"	5'-15'								NA
VW-8	4"	5'-15'								NA
VW-9	4"	5'-15'								NA
RW-1	6"	11'-26'								NA
AS-1 (vent)	2"	5'-15'								
AS-2 (vent)	2"	5'-15'			↓					

SPARGE WELL ID	Well Diameter	Screen Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Pressure (psi)	Air Flow (scfm)	DO (ppm)	REMARKS
AS-1	2"	28.3'-30.3'		OFF					
AS-2	2"	28.8'-30.8'							

Total Sparge Data

Total Air Sparge Pressure(psi)= —	Total Air Sparge Flow Rate(scfm)= —	Total Air Sparge Temp(F)= —

EAt water = 382464 Gls. Compressor hrs = 6004.3 hrs.

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m³. Report O_2 and CO_2 in % by volume.

Project# 20805-123.003 **Work Authorization # 19289**

Operator: V. Whitten Date: 8-8-96 **ARCO 2035 Soil Vapor Extraction System**

Remarks: Checked system after power Outage. System Down on "Control Fault" Shut system electric off - low VOC's Drawn Lab Samples. Per J. Young.

Unscheduled site visit [X] Scheduled site visit []

SYSTEM PARAMETERS (Therm Tech Model VAC-10 thermal/catalytic oxidizer)

Arrival Time (24:00 hour)	1515	**Effluent (E-1) (12"x12")**	
System Status (on or off)	OFF	Stack Temperature (°F)	
Shutdown Time (24:00 hour)	—	**SYSTEM**	
Restart Time (24:00 hour)	—	Total Flow (3") (cfm) (before blower-same as Para-Fax)	
Reading Time (24:00 hour)	1515	Fire Box Temperature (°F)	
Well Field WF-1 (3")	OFF	Set Point (°F)	
Vacuum (in. of H2O)		TOTAL HOURS	11146.50
Velocity (ft/min)		Electric Meter (kwh)	
Temperature (°F)		Natural Gas (cf)	
Aeration Tank AT-1 (2")	OFF		
Vacuum (in. of H2O)			
Velocity (ft/min)			
Flow (scfm)			
After Blower I-2 (4") (AFTER DILUTION)	OFF		
Total Pressure (in. of H2O)			
Total Flow (in. of H2O)			
Influent I-1 (3") (BEFORE DILUTION)			
Vacuum (in. of H2O)			
Velocity (ft/min)			

AIR MONITORING

FID (ppm)	Amb	WF-1	AT-1	I-1	I-2	E-1
Date:						

PID (ppm)	CAL GAS:				
Date:					
Date:					

Lab samples taken for analysis at:

PARA-FAX on/off

Cleaned K.O. pump pre-filter ? yes/no

WELL FIELD

SVE WELL ID	Well Diameter	Screen Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Vacuum (In. of H2O)	Velocity (fpm)	Product Recovered (ml)	PID (ppm)	Bubbler (on/off)
VW-1	4"	5'-17'								NA
VW-2	4"	5'-17'								NA
VW-3	4"	4.5'-9.5'								NA
VW-4	4"	5'-17'								NA
VW-5	4"	4.5'-14.5'								NA
VW-6	4"	5'-12.5'								NA
VW-7	4"	5'-15'								NA
VW-8	4"	5'-15'								NA
VW-9	4"	5'-15'								NA
RW-1	6"	11'-26'								NA
AS-1 (vent)	2"	5'-15'								
AS-2 (vent)	2"	5'-15'								

SPARGE WELL ID	Well Diameter	Screen Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Pressure (psi)	Air Flow (scfm)	DO (ppm)	REMARKS
AS-1	2"	28.3'-30.3'							
AS-2	2"	28.8'-30.8'							

Total Sparge Data

Total Air Sparge Pressure(psi)=	Total Air Sparge Flow Rate(scfm)=	Total Air Sparge Temp(F)=

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m³. Report O_2 and CO_2 in % by volume.

emcon

Project# 20805-123.003 **Work Authorization # 19289**

Operator: V. Whitten Date: 8-2-96 **ARCO 2035 Soil Vapor Extraction System**

APPENDIX E

ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY DOCUMENTATION FOR SVE SYSTEM, THIRD QUARTER 1996

Columbia Analytical Services inc.

July 29, 1996

Service Request No.: S9601137

Sailaja Yelamanchili
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 2035 ALBANY/20805-123.003/TO#19289.00

Dear Sailaja Yelamanchili:

Attached are the results of the samples submitted to our lab on July 16, 1996.
For you reference, our service request number for this work is S9601137.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 13, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

If you have questions or further needs, please call me at (408) 428-1282.

Sincerely,

Steve Green
Project Chemist

SG/sh

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601137
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	7/16/96
Sample Matrix:	Air	**Date Received:**	7/16/96
		Date Extracted:	NA
		Date Analyzed:	7/18/96

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

Sample Name: E-1
Lab Code: S9601137-001

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

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

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601137
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	7/16/96
Sample Matrix:	Air	**Date Received:**	7/16/96
		Date Extracted:	NA
		Date Analyzed:	7/18/96

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

Sample Name: AT-1
Lab Code: S9601137-002

	MRLs		**Results**	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	2.8	0.9
Toluene	0.5	0.1	0.8	0.2
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	1.7	0.4
Total Volatile Hydrocarbons:				
C1 - C5	10	5	ND	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

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

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601137
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	7/16/96
Sample Matrix:	Air	**Date Received:**	7/16/96
		Date Extracted:	NA
		Date Analyzed:	7/18/96

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

Sample Name: WF-1
Lab Code: S9601137-003

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	<1**	<0.4**
Toluene	0.5	0.1	2	0.5
Ethylbenzene	0.5	0.1	2	0.5
Xylenes, Total	1	0.2	23	5.3
Total Volatile Hydrocarbons:				
C1 - C5	10	5	460	110
C6 - C12	20	5	940	230
TPH as Gasoline*	20	5	940	230

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

** Raised MRL due to high analyte concentration requiring sample dilution.

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601137
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	7/16/96
Sample Matrix:	Air	**Date Received:**	7/16/96
		Date Extracted:	NA
		Date Analyzed:	7/18/96

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

Sample Name: I-1
Lab Code: S9601137-004

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	2.5	0.8
Toluene	0.5	0.1	2.8	0.7
Ethylbenzene	0.5	0.1	5.5	1.3
Xylenes, Total	1	0.2	20	4.6
Total Volatile Hydrocarbons:				
C1 - C5	10	5	300	73
C6 - C12	20	5	660	160
TPH as Gasoline*	20	5	660	160

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

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601137
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	7/16/96
Sample Matrix:	Air	**Date Received:**	7/16/96
		Date Extracted:	NA
		Date Analyzed:	7/18/96

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

Sample Name: Method Blank
Lab Code: S960718-VB1

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

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

LCS/102194

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-123.003/TO#19289.00
Sample Matrix: Air

Service Request: S9601137
Date Collected: 7/16/96
Date Received: 7/16/96
Date Extracted: N/A
Date Analyzed: 7/18/96

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name: WF-1
Lab Code: S9601137-003

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.5	<1**	<1**	--	--
Toluene	0.5	2	2	2	<1
Ethylbenzene	0.5	2	3	3	40
Xylenes, Total	1	23	23	23	<1
Total Volatile Hydrocarbons					
C1 - C5	10	460	460	460	<1
C6 - C12	20	940	930	935	1
TPH as Gasoline*	20	940	930	935	1

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

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

** Raised MRL due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-123.003/TO#19289.00
Sample Matrix: Air

Service Request: S9601137
Date Collected: 7/16/96
Date Received: 7/16/96
Date Extracted: N/A
Date Analyzed: 7/18/96

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: uL/L (ppmv)

Sample Name: WF-1
Lab Code: S9601137-003

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.2	<0.4**	<0.4**	--	--
Toluene	0.1	0.5	0.5	1	<1
Ethylbenzene	0.1	0.5	0.7	1	33
Xylenes, Total	0.2	5.3	5.3	5	<1
Total Volatile Hydrocarbons					
C1 - C5	5	110	110	110	<1
C6 - C12	5	230	230	230	<1
TPH as Gasoline*	5	230	230	230	<1

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

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

** Raised MRL due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601137
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	7/16/96
LCS Matrix:	Air	**Date Received:**	7/16/96
		Date Extracted:	NA
		Date Analyzed:	7/18/96

Laboratory Control Sample Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Gasoline	200	220.0	110	60-140

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601137
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	7/16/96
LCS Matrix:	Air	**Date Received:**	7/16/96
		Date Extracted:	NA
		Date Analyzed:	7/18/96

Laboratory Control Sample Summary
BTEX and Total Volatile Hydrocarbons

Units: uL/L (ppmv)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Gasoline	49	54	110	60-140

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-123.003/TO#19289.00

Service Request: S9601137
Date Analyzed: 7/18/96

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

Units: mg/m^3

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	24.9	100	80-120
Toluene	25	24.9	100	80-120
Ethylbenzene	25	24.3	97	80-120
Xylenes, Total	75	73.6	98	80-120
Gasoline	250	226	90	80-120

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 19289.00

Chain of Custody

ARCO Facility no. 2035 | City (Facility) Albany | Project manager (Consultant) S. Yalamanchili

ARCO engineer M. Whelan | Telephone no. (ARCO) 408 453-1640 | Telephone no. (Consultant) 408 453-7300 | Fax no. (Consultant) 408 453-0452

Consultant name EMCON | Address (Consultant) 1921 Ringwood Ave San Jose, CA

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
E-1	①	1			X			7-16-96	1510		X											
AT-1	②	1			X			7-16-96	1515		X											
WF-1	③	1			X			7-16-96	1520		X											
I-1	④	1			X			7-16-96	1530		X											

Laboratory name

Contract number

Method of shipment

Special detection Limit/reporting: Mg/M³ & PPMV

Special QA/QC

Remarks: # ~~2035~~ 20805-123.003

Lab number: S9601137

Turnaround time
- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☑

Condition of sample: Inflated | Temperature received: ambient

Relinquished by	Date	Time	Received by	Date	Time
Relinquished by sampler: Van White	7/16/96	1715	Received by		
Relinquished by			Received by		
Relinquished by			Received by laboratory: Joanne Brown	7-16-96	1715

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

Columbia Analytical Services INC.

August 19, 1996 Service Request No.: S9601294

Valli Voruganti
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 2035 ALBANY/20805-123.003/TO#19289.00

Dear Valli Voruganti:

Attached are the results of the samples submitted to our lab on August 8, 1996. For you reference, our service request number for this work is S9601294.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 11, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

If you have questions or further needs, please call me at (408) 428-1282.

Sincerely,

Steve Green
Project Chemist

SG/sh

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601294
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	8/8/96
Sample Matrix:	Air	**Date Received:**	8/8/96
		Date Extracted:	NA
		Date Analyzed:	8/9/96

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

Sample Name: I-1
Lab Code: S9601294-001

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	4.7	1.1
Total Volatile Hydrocarbons:				
C1 - C5	10	5	33	8
C6 - C12	20	5	67	16
TPH as Gasoline*	20	5	67	16

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

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601294
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	8/8/96
Sample Matrix:	Air	**Date Received:**	8/8/96
		Date Extracted:	NA
		Date Analyzed:	8/9/96

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

Sample Name: E-1
Lab Code: S9601294-002

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

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

LCS/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601294
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	8/8/96
Sample Matrix:	Air	**Date Received:**	8/8/96
		Date Extracted:	NA
		Date Analyzed:	8/9/96

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

Sample Name: Method Blank
Lab Code: S960809-VB1

	MRLs		Results	
	mg/m3	uL/L (ppmv)	mg/m3	uL/L (ppmv)
Benzene	0.5	0.2	ND	ND
Toluene	0.5	0.1	ND	ND
Ethylbenzene	0.5	0.1	ND	ND
Xylenes, Total	1	0.2	ND	ND
Total Volatile Hydrocarbons:				
C1 - C5	10	5	11**	ND
C6 - C12	20	5	ND	ND
TPH as Gasoline*	20	5	ND	ND

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

** Lab contamination. Single discreet peak not detected in associated samples.

LCS/102194

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-123.003/TO#19289.00
Sample Matrix: Air

Service Request: S9601294
Date Collected: 8/8/96
Date Received: 8/8/96
Date Extracted: N/A
Date Analyzed: 8/9/96

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: mg/m^3

Sample Name: I-1
Lab Code: S9601294-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.5	ND	ND	--	--
Toluene	0.5	ND	ND	--	--
Ethylbenzene	0.5	ND	ND	--	--
Xylenes, Total	1	4.7	4.7	4.7	<1
Total Volatile Hydrocarbons					
C1 - C5	10	33	33	33	<1
C6 - C12	20	67	74	71	10
TPH as Gasoline*	20	67	74	71	10

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

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

DUP1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601294
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	8/8/96
Sample Matrix:	Air	**Date Received:**	8/8/96
		Date Extracted:	N/A
		Date Analyzed:	8/9/96

Duplicate Summary
BTEX and Total Volatile Hydrocarbons

Units: uL/L (ppmv)

Sample Name: I-1
Lab Code: S9601294-001

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.2	ND	ND	--	--
Toluene	0.1	ND	ND	--	--
Ethylbenzene	0.1	ND	ND	--	--
Xylenes, Total	0.2	1.1	1.1	1.1	<1
Total Volatile Hydrocarbons					
C1 - C5	5	8	8	8	<1
C6 - C12	5	16	18	17	12
TPH as Gasoline*	5	16	18	17	12

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

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

DUP1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601294
Project:	2035 ALBANY/20805-123.003/TO#19289.00	**Date Collected:**	8/8/96
LCS Matrix:	Vapor	**Date Received:**	8/8/96
		Date Extracted:	NA
		Date Analyzed:	8/9/96

Laboratory Control Sample Summary
BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015
Units: mg/m^3

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	16	16.8	105	60-140
Toluene	16	18.1	113	60-140
Ethylbenzene	16	18.1	113	60-140

LCS/121594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-123.003/TO#19289.00
LCS Matrix: Vapor

Service Request: S9601294
Date Collected: 8/8/96
Date Received: 8/8/96
Date Extracted: NA
Date Analyzed: 8/9/96

Laboratory Control Sample Summary
BTEX and Total Volatile Hydrocarbons
EPA Methods 5030/8020/Modified 8015
Units: uL/L (ppmv)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	5.0	5.3	106	60-140
Toluene	4.3	4.8	112	60-140
Ethylbenzene	3.7	4.2	114	60-140

LCS/121594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-123.003/TO#19289.00

Service Request: S9601294
Date Analyzed: 8/9/96

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

Units: mg/m^3

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	23.4	94	80-120
Toluene	25	23.3	93	80-120
Ethylbenzene	25	23.1	92	80-120
Xylenes, Total	75	68.5	91	80-120
Gasoline	250	208	83	80-120

ICV25AL/060194

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 19289.00

Chain of Custody

ARCO Facility no. 2035	City (Facility) Albany	Project manager (Consultant) V Vorugunti	Laboratory name
ARCO engineer Paul Supple	Telephone no. (ARCO) 408 453-1640	Telephone no. (Consultant) 408 453-7300	Fax no. (Consultant) 408 453 0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave, San Jose, CA		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	
E-1		1			X			8-8-96	1420		X										
E-1		1			X			8-8-96	1430		X										

Special detection Limit/reporting

Special QA/QC

µg/m³ & PPMV

Remarks

20805-123.003

Lab number 9960129A

Turnaround time

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

Condition of sample:		Temperature received:	
Relinquished by sampler Dan Gilbert	Date 8-8-96 Time 1640	Received by	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory Jane Brown	Date 8-8-96 Time 1640

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

APC-3292 (2-91)

APPENDIX F

FIELD DATA SHEETS, OPERATION AND MAINTENANCE VISITS, GROUNDWATER TREATMENT SYSTEM, THIRD QUARTER 1996

ARCO 2035 . 1001 San Pablo Ave.,Albany,Ca. Groundwater Extraction System . EMCON Project # 20805-123.002/3

Remarks:

Startup System per request.

Unscheduled site visit ☐ Scheduled site visit ☐

SYSTEM PARAMETERS	
Arrival Time (24:00 hour)	1100
System Status (on or off)	OFF
Shutdown Time (24:00 hour)	—
Restart Time (24:00 hour)	1140
Reading Time (24:00 hour)	1515
RW-1 Ejection Pressure (psi)	
RW-1 Stroke volume (ml)	
RW-1 Strokes per minute	
RW-1 Stroke counter	
RW-1 DTFP (ft)	0
RW-1 DTW (ft)	16.95
Transfer pump flow rate (gpm)	—
GAC-1 Pressure (psi)	9
GAC-2 Pressure (psi)	7
#1 Filter IN (psi)	17 3-7
#1 Filter OUT (psi)	to 2
#2 Filter IN (psi)	17
#2 Filter OUT (psi)	16
Air compressor run time (hrs)	—
Air compressor discharge (psi)	70
Regulated discharge (psi)	70
RW-1 RUN TIME (hrs)	—
TOTALIZER (gal)	331575

SYSTEM CHECKLIST	Yes	No	Other
Alarm Trip?		✓	
Change Bag Filters ?	✓		
Check Scale Control Unit ?	✓		
Check Aeration Tank Baffles ?	✓		
Clean Pad ?	✓		
Backwash Carbon Drums ?		✓	

Notes:

Took water samples

SAMPLE PARAMETERS			
SAMPLE LOCATION	TEMP (°F)	EC (umhos/cm)	pH (units)
E-1 (E) effluent	65.6	850	6.56
I-3 (D) between carbon drums	66.2	810	6.72
I-2 after aeration tank	67.0	800	7.61
I-1 (A) influent	67.3	790	6.88

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form.

Operator: V. Whitten **Date:** 7-16-96

Project #20805-123.002
ARCO 2035 Groundwater Extraction System

Remarks: System running - checked vapor of stripped water = 2.0 ppm. Shut water side down per S. Kalimanchili @ 1400 hrs. took Inf & Eff Samples.

Unscheduled site visit [] Scheduled site visit [X]

SYSTEM PARAMETERS (Therm Tech Model VAC-10 thermal/catalytic oxidizer)

Arrival Time (24:00 hour)	1150	**Effluent (E-1) (12"x12")**	
System Status (on or off)	ON	Stack Temperature (°F)	725
Shutdown Time (24:00 hour)	—	**SYSTEM**	—
Restart Time (24:00 hour)	—	Total Flow (3") (cfm) (before blower-same as Para-Fax)	80
Reading Time (24:00 hour)	1403	Fire Box Temperature (°F)	714
Well Field WF-1 (3")	—	Set Point (°F)	720
Vacuum (in. of H2O)	30	TOTAL HOURS	11096.10
Velocity (ft/min)	1150	Electric Meter (kwh)	—
Temperature (°F)	74	Natural Gas (cf)	—
Aeration Tank AT-1 (2")	OFF		
Vacuum (in. of H2O)			
Velocity (ft/min)			
Flow (scfm)			
After Blower I-2 (4") (AFTER DILUTION)	—		
Total Pressure (in. of H2O)	1		
Total Flow (in. of H2O)	.06		
Influent I-1 (3") (BEFORE DILUTION)	—		
Vacuum (in. of H2O)	35		
Velocity (ft/min)	1150		

AIR MONITORING

FID (ppm)	Amb	WF-1	AT-1	I-1	I-2	E-1
Date:						

PID (ppm)	CAL GAS:					
Date:						
Date:						

Lab samples taken for analysis at: CAS

PARA-FAX on/off ON

Cleaned K.O. pump pre-filter ? yes/no Yes

WELL FIELD

SVE WELL ID	Well Diameter	Screen Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Vacuum (in. of H2O)	Velocity (fpm)	Product Recovered (ml)	PID (ppm)	Bubbler (on/off)
VW-1	4"	5'-17'			100					
VW-2	4"	5'-17'								NA
VW-3	4"	4.5'-9.5'								NA
VW-4	4"	5'-17'								NA
VW-5	4"	4.5'-14.5'								NA
VW-6	4"	5'-12.5'								NA
VW-7	4"	5'-15'								NA
VW-8	4"	5'-15'								NA
VW-9	4"	5'-15'								NA
RW-1	6"	11'-26'								NA
AS-1 (vent)	2"	5'-15'								
AS-2 (vent)	2"	5'-15'								

SPARGE WELL ID	Well Diameter	Screen Interval	DTFP (feet)	DTW (feet)	Valve Position (% open)	Pressure (psi)	Air Flow (scfm)	DO (ppm)	REMARKS
AS-1	2"	28.3'-30.3'							
AS-2	2"	28.8'-30.8'		OFF					

Total Sparge Data

Total Air Sparge Pressure(psi)= — | Total Air Sparge Flow Rate(scfm)= — | Total Air Sparge Temp(F)= —

EAF Water = 3824.64 Gls. Compressor hrs = 604.3 hrs.

Special Instructions:

Use only ARCO chain-of-custody forms. Please include all analytical method numbers as requested on the chain-of-custody form. Request all TPHG,BTEX, and Benzene results in mg/m³. Report O_2 and CO_2 in % by volume.

Project# 20805-123.003 Work Authorization # 19289

Operator: V. Whitten Date: 8-8-96

ARCO 2035 Soil Vapor Extraction System

APPENDIX G

ANALYTICAL RESULTS AND CHAIN-OF-CUSTODY DOCUMENTATION, GROUNDWATER TREATMENT SYSTEM, THIRD QUARTER 1996

Columbia Analytical Services, Inc.

July 30, 1996

Service Request No: S9601150

Sailaja Yelamanchili
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: 2035 ALBANY/20805-123.003/TO#19289.00

Dear Sailaja Yelamanchili:

The following pages contain analytical results for sample(s) received by the laboratory on July 17, 1996. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. Listed above -- to help expedite our service please refer to this number when contacting the laboratory.

Analytical results were produced by procedures consistent with Columbia Analytical Services' (CAS) Quality Assurance Manual (with any deviations noted). Signature of this CAS Analytical Report below confirms that pages 2 through 7, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

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

Sincerely,

Steven L. Green
Project Chemist

SLG/ld

COLUMBIA ANALYTICAL SERVICES, Inc.
Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9601150
Project:	2035 ALBANY/20805-1213.003/TO#19289.00	**Date Collected:**	7/16/96
Sample Matrix:	Water	**Date Received:**	7/17/96
		Date Extracted:	NA
		Date Analyzed:	7/26, 29/96

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

Analyte:		**TPH as Gasoline**	**Benzene**	**Toluene**	**Ethylbenzene**	**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**					
SP-102(A)	S9601150-001	4,300	530	210	110	550
SP-106(C)	S9601150-002	230	23	7.6	4.5	21
SP-107(D)	S9601150-003	ND	ND	ND	ND	ND
SP-108(E)	S9601150-004	ND	ND	ND	ND	ND
Method Blank	S960726-WB1	ND	ND	ND	ND	ND
Method Blank	S960729-WB1	ND	ND	ND	ND	ND

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-1213.003/TO#19289.00
Sample Matrix: Water

Service Request: S9601150
Date Collected: 7/16/96
Date Received: 7/17/96
Date Extracted: NA
Date Analyzed: 7/26, 29/96

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

Sample Name	Lab Code	PID Detector Percent Recovery 4-Bromofluorobenzene	FID Detector Percent Recovery α,α,α–Trifluorotoluene
SP-102(A)	S9601150-001	101	101
SP-106(C)	S9601150-002	103	101
SP-107(D)	S9601150-001	96	97
SP-108(E)	S9601150-004	102	100
SP-108(E) (MS)	S9601150-004MS	98	103
SP-108(E) (DMS)	S9601150-004DMS	97	109
Method Blank	S960726-WB1	100	99
Method Blank	S960729-WB1	100	98
CAS Acceptance Limits:		69-116	69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	ARCO Products Company	**Service Request:**	S9601150
Project:	2035 ALBANY/20805-1213.003/TO#19289.00	**Date Collected:**	7/16/96
Sample Matrix:	Water	**Date Received:**	7/17/96
		Date Extracted:	NA
		Date Analyzed:	7/26/96

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

Sample Name: SP-108(E)
Lab Code: S9601150-004

Analyte	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference
Gasoline	250	250	ND	240	250	96	100	67-121	4

DMS1S/060194

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 2035 ALBANY/20805-1213.003/TO#19289.00

Service Request: S9601150
Date Analyzed: 7/26/96

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	26.7	107	85-115
Toluene	25	26.5	106	85-115
Ethylbenzene	25	26.2	105	85-115
Xylenes, Total	75	79.1	105	85-115
Methyl tert-Butyl Ether	50	NA	NA	85-115
Gasoline	250	256	102	90-110

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 1928.00

Chain of Custody

ARCO Facility no. 2035	City (Facility) Albany	Project manager (Consultant) S. Kalamanchili	Laboratory name
ARCO engineer M. Whelan	Telephone no. (ARCO) 408 453-1640	Telephone no. (Consultant) 408 453-7300	Fax no. (Consultant) 408 453-0452
Consultant name EMCON	Address (Consultant) 1921 Ringwood Ave. San Jose, CA		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 FTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
SP-102(A)	1	2		X			X	7-16-96	1330		X											
SP-106(C)	2	2		X			X	7-16-96	1340		X											
SP-107(D)	3	2		X			X	7-16-96	1350		X											
SP-108(E)	4	2		X			X	7-16-96	1355		X											

Special detection Limit/reporting

Special QA/QC

Remarks

20805 123.0123

Lab number 59601150

Turnaround time

Priority Rush 1 Business Day ☐

Rush 2 Business Days ☐

Expedited 5 Business Days ☐

Standard 10 Business Days ☒

Condition of sample:		Temperature received:	
Relinquished by sampler Dan Gilbert	Date 7-17-96 Time 11:25	Received by Janet Anderson	
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date 7-17-96 Time 11:25 am

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