



September 21, 1998
Project 20805-129.005

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

Re: Quarterly Groundwater Monitoring Report, First Quarter 1998, for ARCO Service Station
No. 2169, located at 889 West Grand Avenue, Oakland, California

Dear Mr. Supple:

Pinnacle Environmental Solutions, a division of EMCON (Pinnacle), is submitting the attached report which presents the results of the first quarter 1998 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 2169, located at 889 West Grand Avenue, Oakland, California. The monitoring program complies with the 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, results should not be construed as a guarantee of the absence of such conditions at the site, but rather as the product of the scope and limitations of work performed during the monitoring event.

Please call if you have questions.

Sincerely,

Pinnacle

Glen VanderVeen
Project Manager

Jay R. Johnson, R.G.
Senior Project Supervisor

Attachment: Quarterly Groundwater Monitoring Report, First Quarter 1998

cc: Susan Hugo, ACHCSA

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Date: September 21, 1998**ARCO QUARTERLY GROUNDWATER MONITORING REPORT**

Station No.: 2169 Address: 889 West Grand Avenue, Oakland, California
 Pinnacle Project No. 20805-129.005
 ARCO Environmental Engineer/Phone No.: Paul Supple /(510) 299-8891
 Pinnacle Project Manager/Phone No.: Glen VanderVeen /(925) 977-9020
 Primary Agency/Regulatory ID No.: ACHCSA /Susan Hugo

WORK PERFORMED THIS QUARTER (First- 1998):

1. Prepared and submitted quarterly groundwater monitoring report for fourth quarter 1997.
2. Performed quarterly groundwater monitoring and sampling for first quarter 1998.

WORK PROPOSED FOR NEXT QUARTER (Second- 1998):

1. Prepare and submit quarterly groundwater monitoring report for first quarter 1998.
2. Perform quarterly groundwater monitoring and sampling for second quarter 1998.
3. Repair and restart air-sparge system and restart soil-vapor extraction (SVE) system if influent hydrocarbon concentrations in extracted vapor and groundwater levels warrant.

QUARTERLY MONITORING:

Current Phase of Project:	Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems The SVE system was shut down on January 15, 1997, because of blower failure.
Frequency of Sampling:	Quarterly (groundwater), Monthly (SVE)
Frequency of Monitoring:	Quarterly (groundwater), Monthly (SVE and Air-Sparge)
Is Floating Product (FP) Present On-site:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Cumulative FP Recovered to Date :	4.8 gallons, Wells ADR-1 and ADR-2
FP Recovered This Quarter :	None
Bulk Soil Removed to Date :	2,196 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-Sparge Systems
Average Depth to Groundwater:	7.10 feet
Groundwater Gradient (Average):	0.013 ft/ft toward North

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory:	Therm Tech Model VAC-25, 250 cfm, Thermal/Catalytic Oxidizer
Operating Mode:	Catalytic Oxidation
BAAQMD Permit #:	12119
TPH Conc. End of Period (lab):	NA
Benzene Conc. End of Period (lab):	NA
Flowrate End of Period:	NA
HC Destroyed This Period:	0 pounds
HC Destroyed to Date:	8582.1 pounds
Utility Usage	
Electric (KWH):	0 KWH
Operating Hours This Period:	0 hours
Percent Operational:	0% System was shut down due to low influent concentrations.
Operating Hours to Date:	6909.6 hours
Unit Maintenance:	Routine monthly maintenance.
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	90%
Average Percent TPH Conversion:	NA
Average Stack Temperature:	NA
Average Source Flow:	NA
Average Process Flow:	NA
Average Source Vacuum:	NA

DISCUSSION:

The soil-vapor extraction (SVE) system was restarted on 10-16-97 due to an increase in influent hydrocarbon concentrations, and was operated periodically during fourth quarter 1997. The system was not in operation during the first quarter of 1998 due to low influent hydrocarbon concentrations. The air sparge system, which has been used at low flow rates to stimulate biodegradation, did not operate during the first quarter 1998, due to electrical problems.

ATTACHMENTS:

- Table 1 - Groundwater Monitoring Data, First Quarter 1998
- Table 2 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Figure 1 - Groundwater Analytical Summary Map
- Figure 2 - Groundwater Elevation Contour Map
- Figure 3 - Historical SVE System Influent TVHG and Benzene Concentrations
- Figure 4 - Historical SVE System Hydrocarbon Removal Rates
- Appendix A - Sampling and Analysis Procedures
- Appendix B - Certified Analytical Reports and Chain-of-Custody Documentation
- Appendix C - Field Data Sheets
- Appendix D - SVE System Monitoring Data Log Sheets

**Table 1
Groundwater Monitoring Data
Second Quarter 1998**

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

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TPHD LUFT Method µg/L
A-1	02-20-98	14.16	7.10	7.06	ND	N	0.013	02-23-98	590	160	22	15	28	70	--	--
A-2	02-20-98	14.55	7.68	6.87	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	17	--	--
A-3	02-20-98	15.75	8.06	7.69	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
A-4	02-20-98	15.25	6.25	9.00	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
A-5	02-20-98	13.51	NR	NR	NR	N	0.013	02-20-98	Not sampled: well was inaccessible							
A-6	02-20-98	13.51	6.73	6.78	ND	N	0.013	02-20-98	60	<0.5	0.6	1.3	0.5	4	--	--
AR-1	02-20-98	15.61	6.42	9.19	ND	N	0.013	02-23-98	<200 [^]	<2 [^]	<2 [^]	<2 [^]	<2 [^]	160	--	--
AR-2	02-20-98	15.28	8.00	7.28	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	43	--	--
ADR-1	02-20-98	13.95	NR	NR	NR	N	0.013	02-20-98	Not sampled: well was inaccessible							
ADR-2	02-20-98	14.64	7.67	6.97	ND	N	0.013	02-20-98	4700	320	30	130	360	20	--	--

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

TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method

NR: not reported; data not available or not measurable

ND: none detected

N: North

[^]: method reporting limit was raised due to: (1) high analyte concentration requiring sample dilution, or (2) matrix interference

--: not analyzed or not applicable

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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

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	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
A-1	03-24-95	14.16	8.10	6.06	ND	NW	0.009	03-24-95	1200	230	39	34	66	--	--	160^^
A-1	06-05-95	14.16	11.13	3.03	ND	NW	0.002	06-05-95	1500	310	27	36	76	--	--	710^
A-1	08-17-95	14.16	11.71	2.45	ND	W	0.001	08-18-95	1600	470	35	48	110	120	--	240^
A-1	12-04-95	14.16	12.28	1.88	ND	NNW	0.002	12-04-95	1200	240	17	25	56	--	120	--
A-1	03-01-96	14.16	8.78	5.38	ND	NW	0.003	03-13-96	1300	300	74	29	73	100	--	--
A-1	05-29-96	14.16	9.85	4.31	ND	NW	0.002	05-29-96	Not sampled: well sampled semi-annually, during the first and third quarters							
A-1	08-29-96	14.16	11.08	3.08	ND	W	0.002	08-29-96	1200	320	5.9	25	27	110	--	--
A-1	11-21-96	14.16	10.54	3.62	ND	WNW	0.002	11-21-96	Not sampled: well sampled semi-annually, during the first and third quarters							
A-1	03-26-97	14.16	10.55	3.61	ND	NW	0.002	03-26-97	<50	0.8	<0.5	<0.5	<0.5	64	--	--
A-1	05-21-97	14.16	11.10	3.06	ND	NNW	0.002	05-21-97	Not sampled: well sampled semi-annually, during the first and third quarters							
A-1	08-08-97	14.16	11.32	2.84	ND	NNW	0.002	08-08-97	91	7	<0.5	0.5	3.9	<60^	--	--
A-1	02-20-98	14.16	7.10	7.06	ND	N	0.013	02-23-98	590	160	22	15	28	70	--	--
A-2	03-24-95	14.55	8.64	5.91	ND	NW	0.009	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-2	06-05-95	14.55	11.72	2.83	ND	NW	0.002	06-05-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-2	08-17-95	14.55	12.35	2.20	ND	W	0.001	08-17-95	<50	<0.5	<0.5	<0.5	<0.5	12	--	--
A-2	12-04-95	14.55	12.74	1.81	ND	NNW	0.002	12-04-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-2	03-01-96	14.55	9.34	5.21	ND	NW	0.003	03-13-96	<50	<0.5	0.6	<0.5	1.3	<9	--	--
A-2	05-29-96	14.55	10.40	4.15	ND	NW	0.002	05-29-96	<50	<0.5	<0.5	<0.5	<0.5	<20	--	--
A-2	08-29-96	14.55	11.50	3.05	ND	W	0.002	08-29-96	<50	<0.5	<0.5	<0.5	<0.5	<39^	--	--
A-2	11-21-96	14.55	11.06	3.49	ND	WNW	0.002	11-21-96	<50	<0.5	<0.5	<0.5	<0.5	<30^	--	--
A-2	03-26-97	14.55	11.12	3.43	ND	NW	0.002	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<20^	--	--
A-2	05-21-97	14.55	11.58	2.97	ND	NNW	0.002	05-21-97	Not sampled: well sampled semi-annually, during the first and third quarters							
A-2	08-08-97	14.55	11.82	2.73	ND	NNW	0.002	08-08-97	<50	<0.5	<0.5	<0.5	<0.5	<20^	--	--
A-2	02-20-98	14.55	7.68	6.87	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	17	--	--

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ARCO Service Station 2169
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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	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
A-3	03-24-95	15.75	8.83	6.92	ND	NW	0.009	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-3	06-05-95	15.75	12.44	3.31	ND	NW	0.002	06-05-95	Not sampled: well sampled annually, during the first quarter							
A-3	08-17-95	15.75	13.04	2.71	ND	W	0.001	08-17-95	Not sampled: well sampled annually, during the first quarter							
A-3	12-04-95	15.75	13.57	2.18	ND	NNW	0.002	12-04-95	Not sampled: well sampled annually, during the first quarter							
A-3	03-01-96	15.75	9.90	5.85	ND	NW	0.003	03-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
A-3	05-29-96	15.75	11.08	4.67	ND	NW	0.002	05-29-96	Not sampled: well sampled annually, during the first quarter							
A-3	08-29-96	15.75	12.38	3.37	ND	W	0.002	08-29-96	Not sampled: well sampled annually, during the first quarter							
A-3	11-21-96	15.75	11.86	3.89	ND	WNW	0.002	11-21-96	Not sampled: well sampled annually, during the first quarter							
A-3	03-26-97	15.75	11.81	3.94	ND	NW	0.002	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
A-3	05-21-97	15.75	12.35	3.40	ND	NNW	0.002	05-21-97	Not sampled: well sampled annually, during the first quarter							
A-3	08-08-97	15.75	12.62	3.13	ND	NNW	0.002	08-08-97	Not sampled: well sampled annually, during the first quarter							
A-3	02-20-98	15.75	8.06	7.69	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
A-4	03-24-95	15.25	7.20	8.05	ND	NW	0.009	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
A-4	06-05-95	15.25	11.70	3.55	ND	NW	0.002	06-05-95	Not sampled: well sampled annually, during the first quarter							
A-4	08-17-95	15.25	12.28	2.97	ND	W	0.001	08-17-95	Not sampled: well sampled annually, during the first quarter							
A-4	12-04-95	15.25	12.63	2.62	ND	NNW	0.002	12-04-95	Not sampled: well sampled annually, during the first quarter							
A-4	03-01-96	15.25	8.55	6.70	ND	NW	0.003	03-13-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
A-4	05-29-96	15.25	10.32	4.93	ND	NW	0.002	05-29-96	Not sampled: well sampled annually, during the first quarter							
A-4	08-29-96	15.25	11.55	3.70	ND	W	0.002	08-29-96	Not sampled: well sampled annually, during the first quarter							
A-4	11-21-96	15.25	10.83	4.42	ND	WNW	0.002	11-21-96	Not sampled: well sampled annually, during the first quarter							
A-4	03-26-97	15.25	10.97	4.28	ND	NW	0.002	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
A-4	05-21-97	15.25	11.51	3.74	ND	NNW	0.002	05-21-97	Not sampled: well sampled annually, during the first quarter							
A-4	08-08-97	15.25	11.73	3.52	ND	NNW	0.002	08-08-97	Not sampled: well sampled annually, during the first quarter							
A-4	02-20-98	15.25	6.25	9.00	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--

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		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
A-5	03-24-95	13.51	7.40	6.11	ND	NW	0.009	03-24-95	3300	200	310	130	460	--	--	--
A-5	06-05-95	13.51	10.43	3.08	ND	NW	0.002	06-05-95	57000	2700	4600	1500	6800	--	--	--
A-5	08-17-95	13.51	11.15	2.36	ND	W	0.001	08-18-95	34000	1600	2700	1100	5100	<28	--	--
A-5	12-04-95	13.51	11.42	2.09	ND	NNW	0.002	12-04-95	61	<0.5	<0.5	<0.5	<0.5	--	--	--
A-5	03-01-96	13.51	8.11	5.40	ND	NW	0.003	03-13-96	11000	860	960	380	1600	<100	--	--
A-5	05-29-96	13.51	9.30	4.21	ND	NW	0.002	05-29-96	19000	1600	1900	880	3300	<100	--	--
A-5	08-29-96	13.51	10.60	2.91	ND	W	0.002	08-29-96	7700	490	450	260	990	<30^	--	--
A-5	11-21-96	13.51	10.05	3.46	ND	WNW	0.002	11-21-96	8000	450	550	340	1100	<30^	--	--
A-5	03-26-97	13.51	9.87	3.64	ND	NW	0.002	03-26-97	3100	190	140	130	340	<30^	--	--
A-5	05-21-97	13.51	10.25	3.26	ND	NNW	0.002	05-21-97	16000	1500	900	700	2700	<120^	--	--
A-5	08-08-97	13.51	10.42	3.09	ND	NNW	0.002	08-08-97	9000	690	240	440	1300	<30^	--	--
A-5	02-20-98	13.51	NR	NR	NR	N	0.013	02-20-98	Not sampled: well was inaccessible							
A-6	03-24-95	13.51	7.89	5.62	ND	NW	0.009	03-24-95	120	<0.5	<1	<0.5	<1.5	--	--	--
A-6	06-05-95	13.51	10.06	3.45	ND	NW	0.002	06-05-95	160	<0.5	<0.6	<0.5	<0.5	--	--	--
A-6	08-17-95	13.51	11.10	2.41	ND	W	0.001	08-18-95	530	<0.5	<0.5	<2.4	<4.2	6	--	--
A-6	12-04-95	13.51	11.52	1.99	ND	NNW	0.002	12-04-95	28000	1600	1800	880	3600	--	--	--
A-6	03-01-96	13.51	8.21	5.30	ND	NW	0.003	03-13-96	1400	<3	<15	<7	<10	<20	--	--
A-6	05-29-96	13.51	9.25	4.26	ND	NW	0.002	05-29-96	410	<2	<2	<2	<2	3	--	--
A-6	08-29-96	13.51	10.52	2.99	ND	W	0.002	08-29-96	80	<0.5	<0.5	<0.5	<0.5	6	--	--
A-6	11-21-96	13.51	10.54	2.97	ND	WNW	0.002	11-21-96	62	<0.5	<0.5	<0.5	<0.5	12	--	--
A-6	03-26-97	13.51	9.93	3.58	ND	NW	0.002	03-26-97	110	<0.5	0.8	1	1.4	15	--	--
A-6	05-21-97	13.51	10.54	2.97	ND	NNW	0.002	05-21-97	600	0.6	0.6	<2^	2.7	<3	--	--
A-6	08-08-97	13.51	10.77	2.74	ND	NNW	0.002	08-08-97	850	<0.5	<0.5	6.1	<0.5	<4^	--	--
A-6	02-20-98	13.51	6.73	6.78	ND	N	0.013	02-20-98	60	<0.5	0.6	1.3	0.5	4	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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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	TPHC LUFT Method	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020	MTBE EPA 8020	MTBE EPA 8240	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
AR-1	03-24-95	15.61	7.25	8.36	ND	NW	0.009	03-24-95	270	14	0.6	2.5	2.1	--	--	130^^
AR-1	06-05-95	15.61	11.37	4.24	ND	NW	0.002	06-05-95	190	10	<0.5	0.8	0.5	--	--	580^
AR-1	08-17-95	15.61	12.40	3.21	ND	W	0.001	08-17-95	960	110	12	4.5	150	14	--	△50
AR-1	12-04-95	15.61	12.90	2.71	ND	NNW	0.002	12-04-95	<50	1.5	<0.5	<0.5	0.8	--	--	--
AR-1	03-01-96	15.61	8.19	7.42	ND	NW	0.003	03-13-96	150	3.8	0.5	1.4	1.3	<3	--	--
AR-1	05-29-96	15.61	10.41	5.20	ND	NW	0.002	05-29-96	Not sampled: well sampled semi-annually, during the first and third quarters							
AR-1	08-29-96	15.61	12.12	3.49	ND	W	0.002	08-29-96	<50	<0.5	<0.5	<0.5	0.8	<3	--	--
AR-1	11-21-96	15.61	11.52	4.09	ND	WNW	0.002	11-21-96	Not sampled: well sampled semi-annually, during the first and third quarters							
AR-1	03-26-97	15.61	11.33	4.28	ND	NW	0.002	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
AR-1	05-21-97	15.61	12.02	3.59	ND	NNW	0.002	05-21-97	Not sampled: well sampled semi-annually, during the first and third quarters							
AR-1	08-08-97	15.61	12.31	3.30	ND	NNW	0.002	08-08-97	<50	0.7	<0.5	1	<0.5	<3	--	--
AR-1	02-20-98	15.61	6.42	9.19	ND	N	0.013	02-23-98	<200^	<2^	<2^	<2^	<2^	160	--	--
AR-2	03-24-95	15.28	9.13	6.15	ND	NW	0.009	03-24-95	<50	6.2	<0.5	<0.5	0.6	--	--	△50
AR-2	06-05-95	15.28	12.09	3.19	ND	NW	0.002	06-05-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	△50
AR-2	08-17-95	15.28	12.78	2.50	ND	W	0.001	08-18-95	<50	<0.5	<0.5	<0.5	<0.5	4	--	△50
AR-2	12-04-95	15.28	11.44	3.84	ND	NNW	0.002	12-13-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--
AR-2	03-01-96	15.28	9.83	5.45	ND	NW	0.003	03-13-96	190	26	2.6	3.3	13	200	--	--
AR-2	05-29-96	15.28	10.97	4.31	ND	NW	0.002	05-29-96	Not sampled: well sampled semi-annually, during the first and third quarters							
AR-2	08-29-96	15.28	12.20	3.08	ND	W	0.002	08-29-96	<50	<0.5	<0.5	<0.5	<0.5	95	--	--
AR-2	11-21-96	15.28	11.57	3.71	ND	WNW	0.002	11-21-96	Not sampled: well sampled semi-annually, during the first and third quarters							
AR-2	03-26-97	15.28	11.60	3.68	ND	NW	0.002	03-26-97	<50	<0.5	<0.5	<0.5	<0.5	9	--	--
AR-2	05-21-97	15.28	12.12	3.16	ND	NNW	0.002	05-21-97	Not sampled: well sampled semi-annually, during the first and third quarters							
AR-2	08-08-97	15.28	12.35	2.93	ND	NNW	0.002	08-08-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--
AR-2	02-20-98	15.28	8.00	7.28	ND	N	0.013	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	43	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	TPHID LUFT Method µg/L
ADR-1	03-24-95	13.95	8.04	** 5.92	0.01	NW	0.009	03-24-95	Not sampled: well contained floating product							
ADR-1	06-05-95	13.95	11.02	2.93	ND	NW	0.002	06-05-95	23000	310	420	300	1900	--	--	13000^
ADR-1	08-17-95	13.95	11.86	2.09	ND	W	0.001	08-18-95	4400	150	120	95	620	120	--	4500^
ADR-1	12-04-95	13.95	10.05	3.90	ND	NNW	0.002	12-13-95	8800	100	130	120	990	--	--	--
ADR-1	03-01-96	13.95	8.76	5.19	ND	NW	0.003	03-13-96	89000	370	1000	840	8100	<500	--	--
ADR-1	05-29-96	13.95	9.74	4.21	ND	NW	0.002	05-30-96	27000	230	380	370	2700	<100	--	--
ADR-1	08-29-96	13.95	10.77	3.18	ND	W	0.002	08-29-96	5300	190	58	76	470	85	--	--
ADR-1	11-21-96	13.95	10.49	3.46	ND	WNW	0.002	11-21-96	1900	82	21	32	270	110	--	--
ADR-1	03-26-97	13.95	10.37	3.58	ND	NW	0.002	03-26-97	1300	260	6	39	27	95	--	--
ADR-1	05-21-97	13.95	10.90	3.05	ND	NNW	0.002	05-21-97	2100	300	18	37	200	79	--	--
ADR-1	08-08-97	13.95	11.12	2.83	ND	NNW	0.002	08-08-97	3900	620	49	110	470	<200^	--	--
ADR-1	02-20-98	13.95	NR	NR	NR	N	0.013	02-20-98	Not sampled: well was inaccessible							
ADR-2	03-24-95	14.64	8.41	NR*	>3.00*	NR*	NR*	03-24-95	Not sampled: well contained floating product							
ADR-2	06-05-95	14.64	11.45	NR*	>3.00*	NR*	NR*	06-05-95	Not sampled: well contained floating product							
ADR-2	08-17-95	14.64	12.10	** 2.56	0.03	W	0.001	08-17-95	Not sampled: well contained floating product							
ADR-2	12-04-95	14.64	10.93	** 3.73	0.03	NNW	0.002	12-13-95	Not sampled: well contained floating product							
ADR-2	03-01-96	14.64	8.74	5.90	ND	NW	0.003	03-13-96	29000	1100	1200	710	3800	<500	--	--
ADR-2	05-29-96	14.64	10.43	4.21	ND	NW	0.002	05-29-96	33000	510	500	470	2300	120	--	--
ADR-2	08-29-96	14.64	11.64	3.00	ND	W	0.002	08-29-96	8000	230	180	150	730	53	--	--
ADR-2	11-21-96	14.64	11.23	3.41	ND	WNW	0.002	11-21-96	15000	630	440	390	2100	75	--	--
ADR-2	03-26-97	14.64	11.13	3.51	ND	NW	0.002	03-26-97	6100	320	23	180	400	32	--	--
ADR-2	05-21-97	14.64	11.64	3.00	ND	NNW	0.002	05-21-97	6100	380	22	210	320	<30^	--	--
ADR-2	08-08-97	14.64	11.85	2.79	ND	NNW	0.002	08-08-97	8400	380	35	230	910	<30^	--	--
ADR-2	02-20-98	14.64	7.67	6.97	ND	N	0.013	02-20-98	4700	320	30	130	360	20	--	--

Table 2
Historical Groundwater Elevation and Analytical Data
Petroleum Hydrocarbons and Their Constituents
1995 - Present***

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

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	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

ft-MSL: elevation in feet, relative to mean sea level

MWN: groundwater 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

TPHD: total petroleum hydrocarbons as diesel, California DHS LUFT Method

ND: none detected

NR: not reported; data not available or not measurable

N: North

^: method reporting limit was raised due to: (1) high analyte concentration requiring sample dilution, or (2) matrix interference

^^: sample contains components eluting in the diesel range, quantified as diesel; chromatogram does not match the typical diesel fingerprint

--: not analyzed or not applicable

*: well contained more than 3 feet of floating product; exact product thickness and groundwater elevation could not be measured

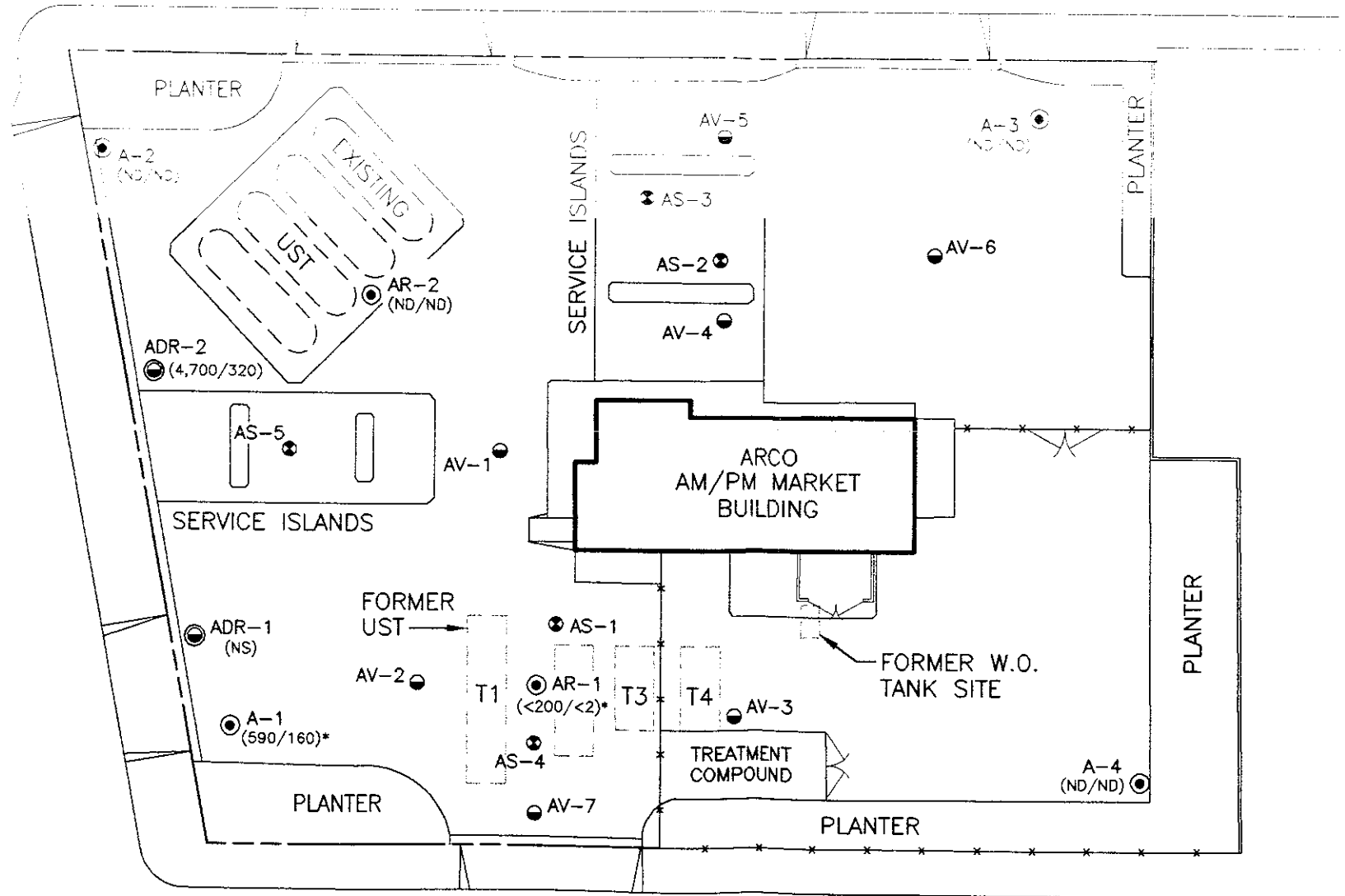
** : [corrected elevation (Z)] = Z + (h * 0.73) where: Z = measured elevation, h = floating product thickness, 0.73 = density ratio of oil to water

***: For previous historical groundwater elevation data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report, ARCO Service Station 2169, 889 West Grand Avenue, Oakland, California*, (EMCON, March 4, 1996).

WEST GRAND AVENUE

MARKET STREET

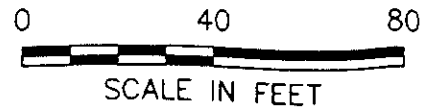
WEST GRAND SHOPPING CENTER



22nd STREET

A-5 (NS)

LAUNDRY FACILITY



EXPLANATION

- ⊙ Groundwater monitoring well
- ⊖ Vapor extraction well
- ⊙⊖ Groundwater monitoring/vapor extraction well
- ⊙ Air sparging well
- (60/ND) Concentration of total petroleum hydrocarbons, as gasoline (TPHG) and benzene in groundwater (ug/L); samples were collected on 2/20/98
- ND Not detected at or above the method reporting limit for TPHG (50 ug/L) or benzene (0.5 ug/L)
- < Method reporting limit raised due to high analyte concentration requiring sample dilution or matrix interference
- NS Not sampled
- * Sampled 2/23/98



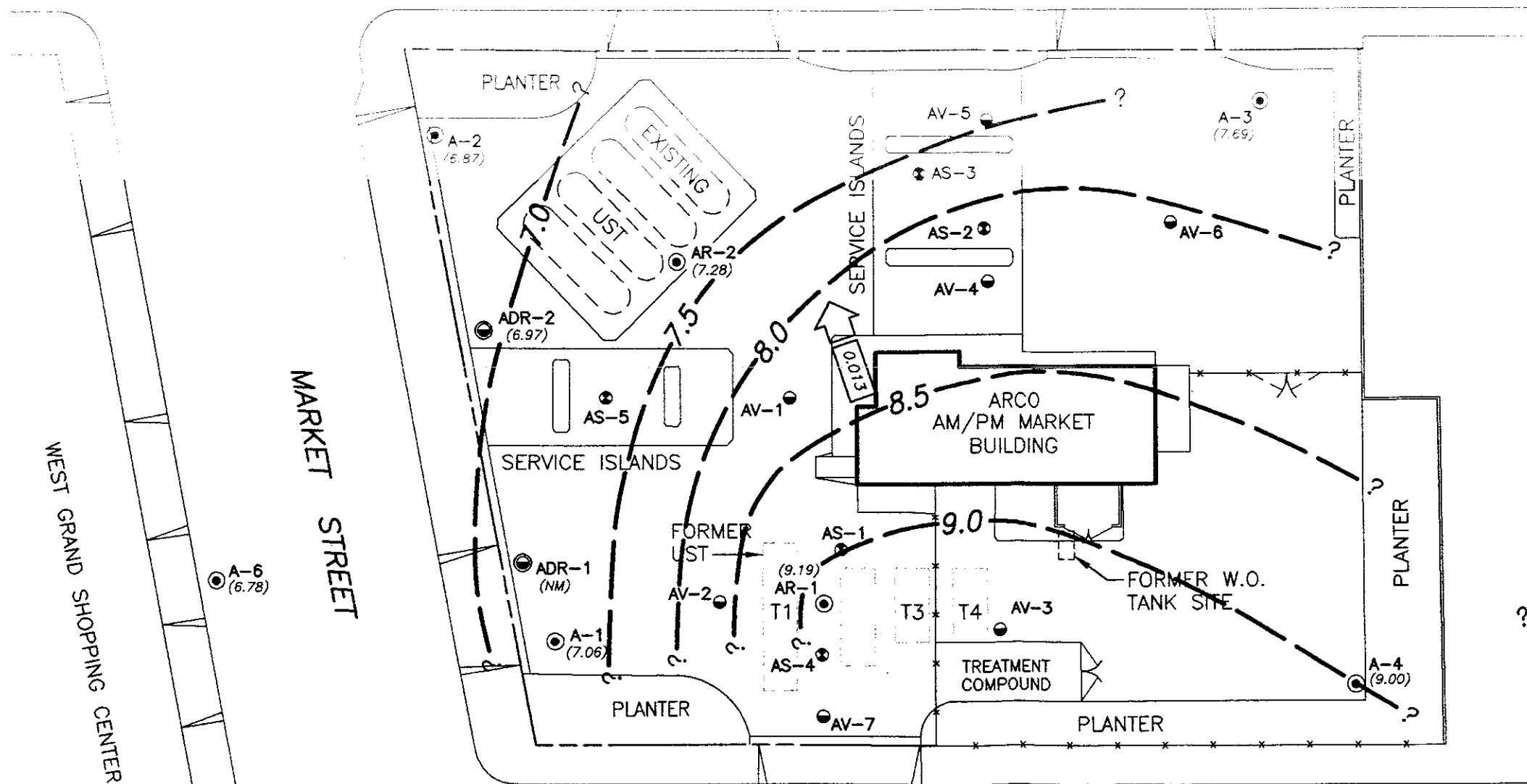
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 Thu, 27/Aug/98 08:44am kblack
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 SANJOSE/CADD: N:\DWG\805129\SJSITE.DWG

Pinnacle
 ENVIRONMENTAL SOLUTIONS
 A DIVISION OF EMCON

DATE JUNE 1998
 DWN KAJ
 APP _____
 REV 0
 PROJECT NO.
 805-129.005

FIGURE 1
 ARCO PRODUCTS COMPANY
 SERVICE STATION 2169, 889 W. GRAND AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ANALYTICAL SUMMARY
 1ST QUARTER 1998

WEST GRAND AVENUE



EXPLANATION

- Groundwater monitoring well
- Vapor extraction well
- Groundwater monitoring/vapor extraction well
- Air sparging well
- (3.46) Groundwater elevation (Ft.-MSL); measured 2/20/98
- ? - - - Groundwater elevation contour (Ft.-MSL)
- ← Approximate direction of groundwater flow showing gradient
- NM Not measured

MARKET STREET

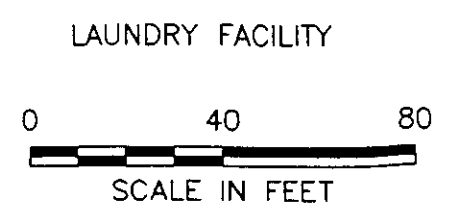
WEST GRAND SHOPPING CENTER

22nd STREET

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

1" 1/2" 0" 1"
 IMAGE Files: <No Images>
 XREF Files: <No Xrefs>
 Dimstyle: 40 Ltscale: 40 Psttscale: 0
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Pinnacle
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 A DIVISION OF EMCON

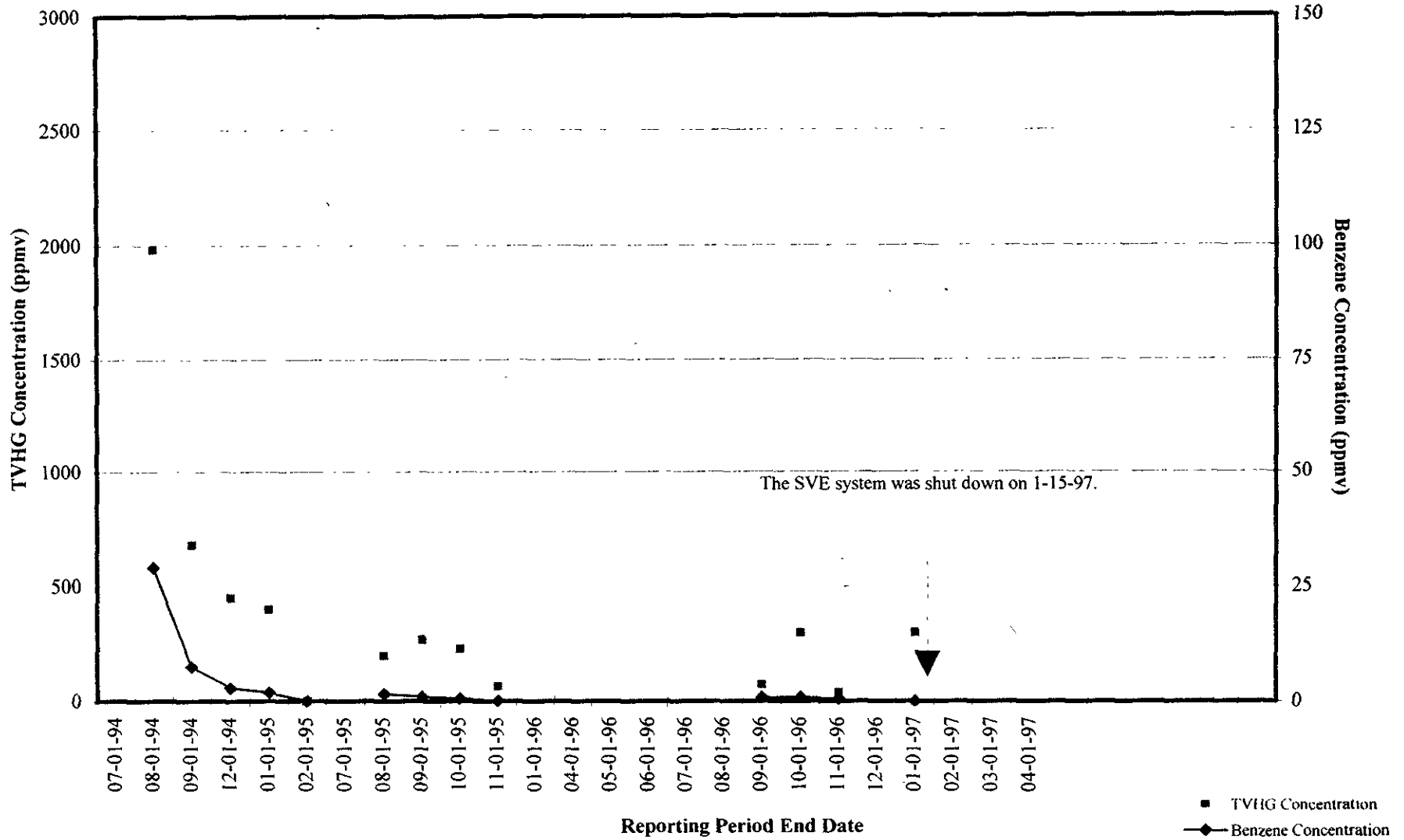


DATE JUNE 1998
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 REV 0
 PROJECT NO. 805-129.005

FIGURE 2
 ARCO PRODUCTS COMPANY
 SERVICE STATION 2169, 889 W. GRAND AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ELEVATION CONTOURS
1ST QUARTER 1998

Figure 3

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



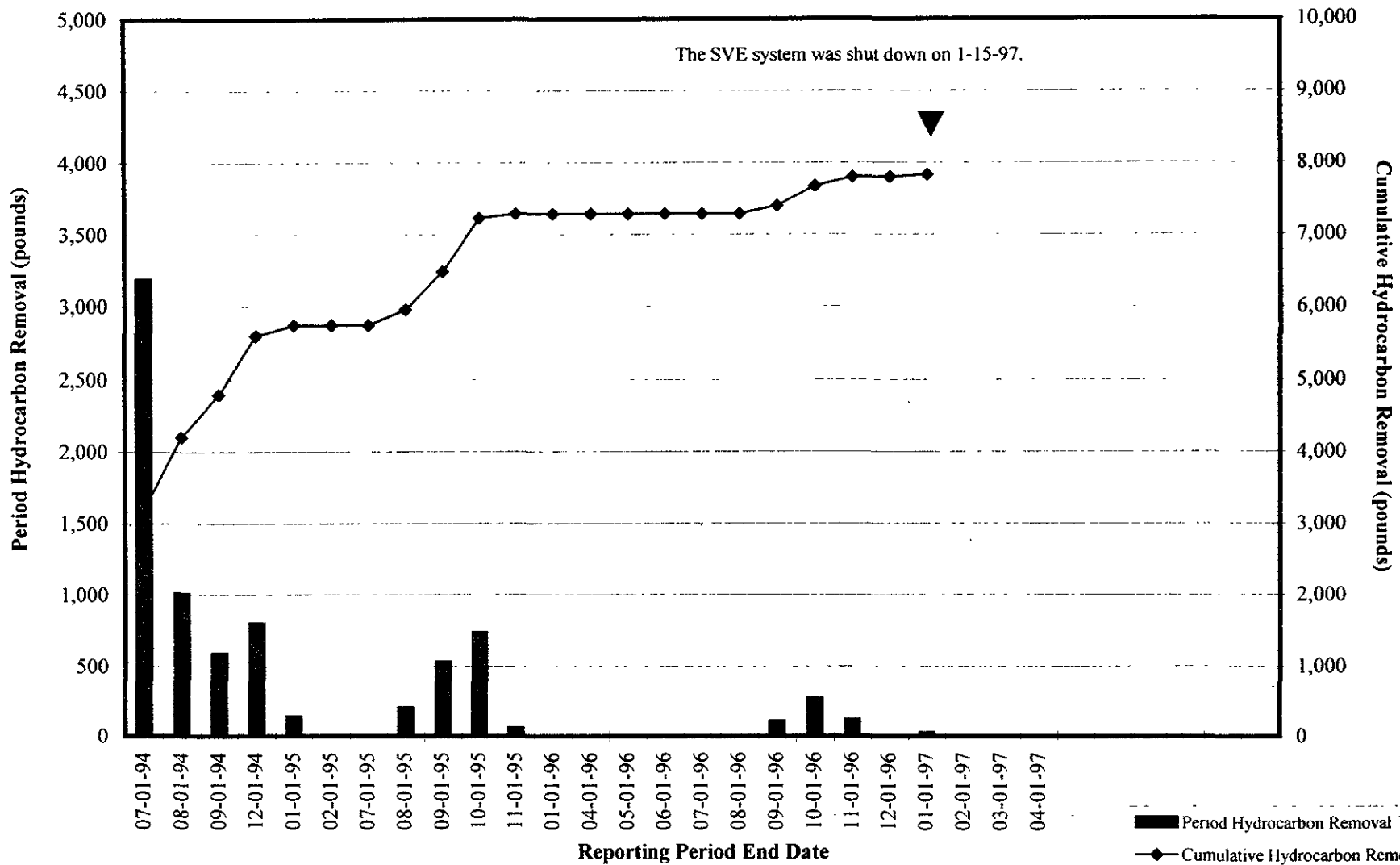
The SVE system was shut down on 1-15-97.

■ TVHG Concentration
◆ Benzene Concentration

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

Figure 4

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



APPENDIX A
SAMPLING AND ANALYSIS PROCEDURES

APPENDIX A

SAMPLING AND ANALYSIS PROCEDURES

The sampling and analysis procedures for water quality monitoring programs are contained in this appendix. The procedures provided for consistent and reproducible sampling methods, proper application of analytical methods, and accurate and precise analytical results. Finally, these procedures provided guidelines so that the overall objectives of the monitoring program were achieved.

The following documents have been used as guidelines for developing these procedures:

- Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities, Environmental Protection Agency (EPA)-530/SW-611, August 1977
- Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document, Office of Solid Waste and Emergency Response (OSWER) 9950.1, September 1986
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA SW-846, 3rd edition, November 1986
- Methods for Organic Chemical Analysis of Municipal and Industrial Waste Water, EPA-600/4-82-057, July 1982
- Methods for Organic Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983
- Leaking Underground Fuel Tank (LUFT) Field Manual, California State Water Resources Control Board, revised October 1989

Sample Collection

Sample collection procedures include equipment cleaning, water level and total well depth measurements, and well purging and sampling.

Equipment Cleaning

Before the sampling event was started, equipment that was used to sample groundwater was disassembled and cleaned with detergent water and then rinsed with deionized water. During field sampling, equipment surfaces that were placed in the well or came into contact with groundwater during field sampling were steam cleaned with deionized water before the next well was purged or sampled.

Water Level, Floating Hydrocarbon, and Total Well Depth Measurements

Before purging and sampling occurred, the depth to water, floating hydrocarbon thickness, and total well depth were measured using an oil/water interface measuring system. The oil/water interface measuring system consists of a probe that emits a continuous audible tone when immersed in a nonconductive fluid, such as oil or gasoline, and an intermittent tone when immersed in a conductive fluid, such as water. The floating hydrocarbon thickness and water level were measured by lowering the probe into the well. Liquid levels were recorded relative to the tone emitted at the groundwater surface. The sonic probe was decontaminated by being rinsed with deionized water or steam cleaned after each use. A bottom-filling, clear Teflon[®] bailer was used to verify floating hydrocarbon thickness measurements of less than 0.02 foot. Alternatively, an electric sounder and a bottom-filling Teflon bailer may have been used to record floating hydrocarbon thickness and depth to water.

The electric sounder is a transistorized instrument that uses a reel-mounted, two-conductor, coaxial cable that connects the control panel to the sensor. Cable markings are stamped at 1-foot intervals. The water level was measured by lowering the sensor into the monitoring well. A low-current circuit was completed when the sensor contacted the water, which served as an electrolyte. The current was amplified and fed into an indicator light and audible buzzer, signaling when water had been contacted. A sensitivity control compensated for highly saline or conductive water. The electric sounder was decontaminated by being rinsed with deionized water after each use. The bailer was lowered to a point just below the liquid level, retrieved, and observed for floating hydrocarbon.

Liquid measurements were recorded to the nearest 0.01 foot on the depth to water/floating product survey form. The groundwater elevation at each monitoring well was calculated by subtracting the measured depth to water from the surveyed elevation of the top of the well casing. (Every attempt was made to measure depth to water for all wells on the same day.) Total well depth was then measured by lowering the sensor to the bottom of the well. Total well depth, used to calculate purge volumes and to determine whether the well screen was partially obstructed by silt, was recorded to the nearest 0.1 foot on the depth to water/floating product survey form.

Well Purging

If the depth to groundwater was above the top of screens of the monitoring wells, then the wells were purged. Before sampling occurred, a polyvinyl chloride (PVC) bailer, centrifugal pump, low-flow submersible pump, or Teflon bailer was used to purge standing water in the casing and gravel pack from the monitoring well. Monitoring wells were purged according to the protocol presented in Figure A-1. In most monitoring wells, the amount of water purged before sampling was greater than or equal to three casing volumes. Some monitoring wells were expected to be evacuated to dryness after removing fewer than three casing volumes. These low-yield monitoring wells were allowed to recharge for up to 24 hours. Samples were obtained as soon as the monitoring wells recharged to a level sufficient for sample collection. If insufficient water recharged after 24 hours, the monitoring well was recorded as dry for the sampling event.

Groundwater purged from the monitoring wells was transported in a 500-gallon water trailer, 55-gallon drum, or a 325-gallon truck-mounted tank to EMCON's San Jose or Sacramento office location for temporary storage. EMCON arranged for transport and disposal of the purged groundwater through Integrated Waste Stream Management, Inc.

Field measurements of pH, specific conductance, and temperature were recorded in a waterproof field logbook. Figure A-2 shows an example of the water sample field data sheet on which field data are recorded. Field data sheets were reviewed for completeness by the sampling coordinator after the sampling event was completed.

The pH, specific conductance, and temperature meter were calibrated each day before field activities were begun. The calibration was checked once each day to verify meter performance. Field meter calibrations were recorded on the water sample field data sheet.

Well Sampling

A Teflon bailer was the only equipment acceptable for well sampling. When samples for volatile organic analysis were being collected, the flow of groundwater from the bailer was regulated to minimize turbulence and aeration. Glass bottles of at least 40-milliliters volume and fitted with Teflon-lined septa were used in sampling for volatile organics. These bottles were filled completely to prevent air from remaining in the bottle. A positive meniscus formed when the bottle was completely full. A convex Teflon septum was placed over the positive meniscus to eliminate air. After the bottle was capped, it was inverted and tapped to verify that it contained no air bubbles. The sample containers for other parameters were filled, filtered as required, and capped.

When required, dissolved concentrations of metals were determined using appropriate field filtration techniques. The sample was filtered by emptying the contents of the Teflon bailer into a pressure transfer vessel. A disposable 0.45-micron acrylic copolymer filter was threaded onto the transfer vessel at the discharge point, and the vessel was sealed. Pressure was applied to the vessel with a hand pump and the filtrate directed into the appropriate containers. Each filter was used once and discarded.

Sample Preservation and Handling

The following section specifies sample containers, preservation methods, and sample handling procedures.

Sample Containers and Preservation

Sample containers vary with each type of analytical parameter. Container types and materials were selected to be nonreactive with the particular analytical parameter tested.

Sample Handling

Sample containers were labeled immediately prior to sample collection. Samples were kept cool with cold packs until received by the laboratory. At the time of sampling, each sample was logged on an ARCO chain-of-custody record that accompanied the sample to the laboratory.

Samples that required overnight storage prior to shipping to the laboratory were kept cool (4° C) in a refrigerator. The refrigerator was kept in a warehouse, which was locked when not occupied by an EMCON employee. A sample/refrigerator log was kept to record the date and time that samples were placed into and removed from the refrigerator.

Samples were transferred from EMCON to an ARCO-approved laboratory by courier or taken directly to the laboratory by the environmental sampler. Sample shipments from EMCON to laboratories performing the selected analyses routinely occurred within 24 hours of sample collection.

Sample Documentation

The following procedures were used during sampling and analysis to provide chain-of-custody control during sample handling from collection through storage. Sample documentation included the use of the following:

- Water sample field data sheets to document sampling activities in the field
- Labels to identify individual samples
- Chain-of-custody record sheets for documenting possession and transfer of samples
- Laboratory analysis request sheets for documenting analyses to be performed

Field Logbook

In the field, the sampler recorded the following information on the water sample field data sheet (see Figure A-2) for each sample collected:

- Project number
- Client's name
- Location
- Name of sampler
- Date and time
- Well accessibility and integrity
- Pertinent well data (e.g., casing diameter, depth to water, well depth)
- Calculated and actual purge volumes
- Purging equipment used
- Sampling equipment used
- Appearance of each sample (e.g., color, turbidity, sediment)
- Results of field analyses (temperature, pH, specific conductance)
- General comments

The water sample field data sheet was signed by the sampler and reviewed by the sampling coordinator.

Labels

Sample labels contained the following information:

- Project number
- Sample number (i.e., well designation)
- Sample depth
- Sampler's initials
- Date and time of collection
- Type of preservation used (if any)

Sampling and Analysis Chain-of-Custody Record

The ARCO chain-of-custody record initiated at the time of sampling contained, at a minimum, the sample designation (including the depth at which the sample was collected), sample type, analytical request, date of sampling, and the name of the sampler. The record sheet was signed, timed, and dated by the sampler when transferring the samples. The number of custodians in the chain of possession was minimized. A copy of the ARCO chain-of-custody record was returned to EMCON with the analytical results.

Groundwater Sampling and Analysis Request Form

A groundwater sampling and analysis request form (see Figure A-3) was used to communicate to the environmental sampler the requirements of the monitoring event. At a minimum, the groundwater sampling and analysis request form included the following information:

- Date scheduled
- Site-specific instructions
- Specific analytical parameters
- Well number
- Well specifications (expected total depth, depth of water, and product thickness)



OWT

MONITORING WELL PURGING PROTOCOL

MEASURE AND RECORD DEPTH TO WATER AND WELL TOTAL DEPTH

CHECK FOR FLOATING PRODUCT

YES

MEASURE AND DOCUMENT FLOATING PRODUCT THICKNESS. DO NOT SAMPLE WELL FOR DISSOLVED CONSTITUENTS.

NO

CALCULATE PURGE VOLUME BY USING THE FOLLOWING EQUATION:
 $P = \pi r^2 \times 7.48 \times h$

where:

P = calculated purge volume (gallons)

$\pi = 3.14$

r = radius of well casing in feet

h = height of water column in feet

WELL EVACUATED TO PRACTICAL LIMITS OF DRYNESS BEFORE REMOVING CALCULATED PURGE VOLUME

EVACUATE WATER FROM WELL EQUAL TO THE CALCULATED PURGE VOLUME WHILE MONITORING GROUNDWATER STABILIZATION INDICATOR PARAMETERS (pH, CONDUCTIVITY, TEMPERATURE) AT INTERVALS OF ONE CASING VOLUME.

NO

YES

FINAL TWO SETS OF GROUNDWATER STABILIZATION INDICATOR PARAMETER MEASUREMENTS MEET THE FOLLOWING CRITERIA:

pH = ± 0.1 pH units
COND. = ± 10 %
TEMP. = ± 1.0 °F

WELL RECHARGES TO A LEVEL SUFFICIENT FOR SAMPLE COLLECTION WITHIN 24 HOURS OF EVACUATION TO DRYNESS.

YES

NO

YES

NO

WELL PURGING CRITERIA MET: PROCEED TO WELL SAMPLING.

CONTINUE PURGING: EVACUATE ADDITIONAL CASING VOLUME OF WATER, MONITORING INDICATOR PARAMETERS FOR STABILITY.

FIELD TEST FIRST RECHARGE WATER FOR INDICATOR PARAMETERS, THEN PROCEED TO WELL SAMPLING.

RECORD WELL AS DRY FOR PURPOSES OF SAMPLING.



EMCON

MONITORING WELL PURGING PROTOCOL

FIGURE

A-1

WATER SAMPLE FIELD DATA SHEET

Rev. 5/96



OWT

PROJECT NO : _____
 PURGED BY : _____
 SAMPLED BY : _____

SAMPLE ID : _____
 CLIENT NAME : _____
 LOCATION : _____

TYPE: Groundwater _____ Surface Water _____ Leachate _____ Other _____

CASING DIAMETER (Inches): 2 _____ 3 _____ 4 _____ 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL) : _____ VOLUME IN CASING (gal.) : _____
 DEPTH OF WELL (feet) : _____ CALCULATED PURGE (gal.) : _____
 DEPTH OF WATER (feet) : _____ ACTUAL PURGE VOL. (gal.) : _____

DATE PURGED : _____ END PURGE : _____
 DATE SAMPLED : _____ SAMPLING TIME : _____

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	TURBIDITY (visual/NTU)	TIME (2400 HR)
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

OTHER: _____ ODOR: _____
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1) : _____

PURGING EQUIPMENT

SAMPLING EQUIPMENT

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

_____ 2" Bladder Pump _____ Bailer (Teflon)
 _____ Bomb Sampler _____ Bailer (Stainless Steel)
 _____ Dipper _____ Submersible Pump
 _____ Well Wizard™ _____ Dedicated
 Other: _____

WELL INTEGRITY: _____ LOCK: _____

REMARKS: _____

pH, E.C., Temp. Meter Calibration: Date: _____ Time: _____ Meter Serial No.: _____

E.C. 1000 / _____ pH 7 / _____ pH 10 / _____ pH 4 / _____

Temperature °F _____

SIGNATURE: _____ REVIEWED BY: _____ PAGE _____ OF _____



WATER SAMPLE FIELD DATA SHEET

FIGURE
A-2



OWT

**EMCON - SACRAMENTO
GROUNDWATER SAMPLING AND ANALYSIS REQUEST FORM**

PROJECT NAME :

SCHEDULED DATE :

SPECIAL INSTRUCTIONS / CONSIDERATIONS :

[Empty box for special instructions]

Project Authorization: _____
EMCON Project No.: _____
OWT Project No.: _____
Task Code: _____
Originals To: _____
cc: _____

Well Lock Number (s)

CHECK BOX TO AUTHORIZE DATA ENTRY

Site Contact: _____
Name Phone #

Well Number or Source	Casing Diameter (inches)	Casing Length (feet)	Depth to Water (feet)	ANAYSES REQUESTED

Laboratory and Lab QC Istructions:



EMCON

SAMPLING AND ANALYSIS REQUEST FORM

FIGURE

A-3

APPENDIX B
**CERTIFIED ANALYTICAL REPORTS,
AND CHAIN OF CUSTODY DOCUMENTATION**



March 9, 1998

Service Request No.: S9800383

Gary Messerotes
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

RE: 20805-129.004/TO#22312.00/2169 OAKLAND

Dear Mr. Messerotes:

The following pages contain analytical results for sample(s) received by the laboratory on February 24, 1998. 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 18, 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,

A handwritten signature in black ink that reads 'Steven L. Green' in a cursive style.

Steven L. Green
Project Chemist

A handwritten signature in black ink that reads 'Bernadette J. Cox for' in a cursive style.

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: 2/20/98
Date Received: 2/24/98

BTEX, MTBE and TPH as Gasoline

Sample Name: A-4(8)
Lab Code: S9800383-001
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	2/26/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/26/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: 2/20/98
Date Received: 2/24/98

BTEX, MTBE and TPH as Gasoline

Sample Name: A-3(10)
Lab Code: S9800383-002
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	2/26/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/26/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: 2/20/98
Date Received: 2/24/98

BTEX, MTBE and TPH as Gasoline

Sample Name: AR-2(10)
Lab Code: S9800383-003
Test Notes: .

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	2/24/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	2/24/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	2/24/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	2/24/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	2/24/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/24/98	43	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: 2/23/98
Date Received: 2/24/98

BTEX, MTBE and TPH as Gasoline

Sample Name: AR-1(14)
Lab Code: S9800383-004
Test Notes: C1

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	4	NA	3/5/98	<200	C1
Benzene	EPA 5030	8020	0.5	4	NA	3/5/98	<2	C1
Toluene	EPA 5030	8020	0.5	4	NA	3/5/98	<2	C1
Ethylbenzene	EPA 5030	8020	0.5	4	NA	3/5/98	<2	C1
Xylenes, Total	EPA 5030	8020	0.5	4	NA	3/5/98	<2	C1
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	4	NA	3/5/98	160	

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: 2/20/98
Date Received: 2/24/98

BTEX, MTBE and TPH as Gasoline

Sample Name: A-2(10)
Lab Code: S9800383-005
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	2/25/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	2/25/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	2/25/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	2/25/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	2/25/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/25/98	17	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: 2/20/98
Date Received: 2/24/98

BTEX, MTBE and TPH as Gasoline

Sample Name: ADR-2(9)
Lab Code: S9800383-006
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	10	NA	2/28/98	4700	
Benzene	EPA 5030	8020	0.5	10	NA	2/28/98	320	
Toluene	EPA 5030	8020	0.5	10	NA	2/28/98	30	
Ethylbenzene	EPA 5030	8020	0.5	10	NA	2/28/98	130	
Xylenes, Total	EPA 5030	8020	0.5	10	NA	2/28/98	360	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/26/98	20	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: 2/20/98
Date Received: 2/24/98

BTEX, MTBE and TPH as Gasoline

Sample Name: A-6(8)
Lab Code: S9800383-007
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	2/25/98	60	
Benzene	EPA 5030	8020	0.5	1	NA	2/25/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	2/25/98	0.6	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	2/25/98	1.3	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	2/25/98	0.5	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/25/98	4	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: 2/23/98
Date Received: 2/24/98

BTEX, MTBE and TPH as Gasoline

Sample Name: A-1(20)
Lab Code: S9800383-008
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	4	NA	2/28/98	590	
Benzene	EPA 5030	8020	0.5	4	NA	2/28/98	160	
Toluene	EPA 5030	8020	0.5	4	NA	2/28/98	22	
Ethylbenzene	EPA 5030	8020	0.5	4	NA	2/28/98	15	
Xylenes, Total	EPA 5030	8020	0.5	4	NA	2/28/98	28	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	4	NA	2/28/98	70	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980224-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	2/24/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	2/24/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	2/24/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	2/24/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	2/24/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/24/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980226-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	2/26/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	2/26/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/26/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S9800228-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	2/28/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	2/28/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	2/28/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	2/28/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	2/28/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	2/28/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S9800305-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	3/5/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	3/5/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	3/5/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	3/5/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	3/5/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	3/5/98	ND	

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
 BTEX, MTBE and TPH as Gasoline

Prep Method: EPA 5030
Analysis Method: 8020 CALUFT

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
A-4(8)	S9800383-001		100	78
A-3(10)	S9800383-002		104	81
AR-2(10)	S9800383-003		95	87
AR-1(14)	S9800383-004		105	73
A-2(10)	S9800383-005		98	99
ADR-2(9)	S9800383-006		102	73
A-6(8)	S9800383-007		97	104
A-1(20)	S9800383-008		105	70
A-4(8)	S9800383-001MS		97	92
A-4(8)	S9800383-001DMS		96	91
Method Blank	S980224-WB2		97	104
Method Blank	S980226-WB1		100	78
Method Blank	S980228-WB1		100	76
Method Blank	S980305-WB1		100	101

CAS Acceptance Limits: 69-116 69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND
Sample Matrix: Water

Service Request: S9800383
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 2/25/98

Matrix Spike/Duplicate Matrix Spike Summary
 TPH as Gasoline

Sample Name: A-4(8) **Units:** ug/L (ppb)
Lab Code: S9800383-001MS, S9800383-001DMS **Basis:** NA
Test Notes:

Analyte	Prep Method	Analysis Method	Percent Recovery										Result Notes
			Spike Level			Sample Result	Spike Result		CAS		Relative Percent Difference		
			MRL	MS	DMS		MS	DMS	MS	DMS		Acceptance Limits	
Gasoline	EPA 5030	CA/LUFT	50	250	250	ND	250	270	100	108	75-135	8	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-129.004/TO#22312.00/2169 OAKLAND

Service Request: S9800383
Date Analyzed: 2/24/98

Initial Calibration Verification (ICV) Summary
 BTEX, MTBE and TPH as Gasoline

Sample Name: ICV **Units:** ug/L (ppb)
Lab Code: ICV1 **Basis:** NA
Test Notes:

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS		Result Notes
					Acceptance Limits	Percent Recovery	
TPH as Gasoline	EPA 5030	CA/LUFT	250	230	90-110	92	
Benzene	EPA 5030	8020	25	26	85-115	104	
Toluene	EPA 5030	8020	25	26	85-115	104	
Ethylbenzene	EPA 5030	8020	25	24	85-115	96	
Xylenes, Total	EPA 5030	8020	75	73	85-115	97	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	25	23	85-115	92	

ARCO Products Company

Division of Atlantic/Richfield Company

Task Order No. **77312.00**

RAT-8

Chain of Custody

ARCO Facility no. 2169	City (Facility) Oakland	Project manager (Consultant) Gary Messerotes
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 453-7300
Consultant name EMCON	Address (Consultant) 1971 Ringwood Ave. San Jose, CA 95131	
		Fax no. (Consultant) (408) 437-9526

Laboratory Name
CAS

Contract Number

Method of shipment
Sampler will deliver

Special Detection Limit/reporting
Lowest Possible

Special QA/QC
As Normal

Remarks
For A2, A5, ADR-1, + ADR-2 please run undiluted first before diluting for a second run if necessary.

#20805-129.004
Lab Number
59800383

Turnaround Time:

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

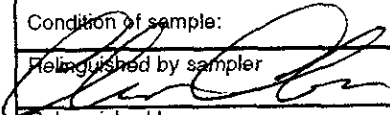
Due 3/9/98

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602EPA 8020	BTEX/TPH inc. HITE EPA 8020/8060/8065	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM 500E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCMP Sery Metals VOAC VOAD	Cadm Metals EPA 6010/7000 TLOC STLOC	Lead Org/DMSO Lead EPA 7420/7421D	
			Soil	Water	Other	Ice	Acid														
A-4(9)	1	7		X		X	HCL	2-20-98	11:43		X										
A-3(10)	2	7		X		X	HCL	↓	12:04		X										
AR-2(13)	3	7		X		X	HCL	↓	12:25		X										
AR-1(14)	4	7		X		X	HCL	2-23-98	12:40		X										
A-2()	5	7		X		X	HCL	2-20-98	12:44		X										
A-5()	2			X		X	HCL				X										
ADR-2(9)	6	2		X		X	HCL	2-20-98	12:50		X										
ADR-1()	2			X		X	HCL				X										
A-6(8)	7	2		X		X	HCL	2-20-98	13:00		X										
A-1(2)	8	2		X		X	HCL	2-23-98	13:20		X										

NO SAMPLE Collected

NO SAMPLE Collected

Condition of sample:

Relinquished by sampler  Date **2-24-98** Time **09:55**

Relinquished by _____ Date _____ Time _____

Relinquished by _____ Date _____ Time _____

Temperature received:

Received by **Kay Fowler - CAS** Date **2/24/98** Time **9:55**

APPENDIX C
FIELD DATA SHEETS

EMCON - Groundwater Sampling and Analysis Request Form

PROJECT NAME : **ARCO STATION 2169**
889 West Grand Avenue, Oakland

Sampling Project #: **21775-235.003**
 Reporting Project #: **20805-129.004**

DATE REQUESTED : **20-Feb-98**

Project Manager: **Gary Messerotes**

Groundwater Monitoring Instructions	Treatment System Instructions
<p>Quarterly Monitoring- 2nd Month Of The Quarter Bring a trailer for purge water transport. Perform a water level survey prior to sampling. The survey points are the tops of the well casings. Purge three (3) casing volumes. Please use the Reporting Project Number (#20805-129.004) on the chain-of-custody form, sample containers, and analytical results. Sample ID's on the chain-of-custody and the sample containers must include the depth at which the sample was collected.[i.e. MW-1(30)]</p>	<p>Treatment system must be off for one week prior to sampling. Sample wells as normal. SVE system may be running, but sparge system will be turned off.</p> <p>Lisle Rath Pager # (888) 606-0933</p>

Site Contact: _____ Site Phone: _____ Well Locks: _____

Well ID or Source	Casing Diameter (inches)	Casing Length (feet)	Top Of Screen (feet)	Analyses Requested
A-4	3.0	28.4	8.0	<p align="center">Water levels Dissolved Oxygen TPHG BTEX MTBE by EPA 8020a (Fill 2- 40ml HCL VOAs)</p>
A-3	3.0	30.1	9.0	
AR-2	4.0	29.3	8.5	
AR-1	6.0	28.0	8.5	
A-2	3.0	26.2	10.0	
A-5	2.0	30.0	5.0	
ADR-2	4.0	26.3	5.0	
ADR-1	4.0	21.9	5.0	
A-6	2.0	28.5	5.0	
A-1	3.0	24.5	9.0	
Above wells in indicated order				

Laboratory Instruction IP = Intermittent Product

Provide lowest detection limits possible.

Please use the EMCON Reporting Project Number (#2805-129.004) on the CARs.

ND = None Detected

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : 21775-235.003

STATION ADDRESS : 899 West Grand Avenue, Oakland

DATE : 2/20/98

ARCO STATION # : 2169

FIELD TECHNICIAN : Manuel Gallegos/ Chris Chaco

DAY : Friday

DTW Order	WELL ID	Well Box Seal	Type Of Well Lid	Well Lid Secure	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	A-4	OK	VAULT	OK	NONE	TEC	6.25	6.25	NID	NIR	27.6	
2	A-3		VAULT		NONE	TEC	8.06	8.06	NID	NIR	28.3	
3	AR-2		VAULT		NONE	TEC	8.00	8.00	NID	NIR	28.4	
4	AR-1		VAULT		NONE	TEC	6.42	6.42	NID	NIR	27.4	
5	A-2		VAULT		NONE	TEC	7.68	7.68	NID	NIR	24.4	
6	A-5		G-5		ARCO	LWC	NIR	NIR	NIR	NIR	NIR	SOLIC STUCK IN WELL NO WATER LEVEL TAKEN
7	ADR-2		VAULT		NONE	TEC	7.67	7.67	NID	NID	26.3	
8	ADR-1		VAULT		NONE	TEC				INACCESSIBLE		Bolts were unable to remove
9	A-6		G-5		ARCO	LWC	6.73	6.73	NID	NIR	27.0	
10	A-1	✓	VAULT	✓	NONE	TEC	7.10	7.10	NID	NIR	23.8	

SURVEY POINTS ARE TOP OF WELL CASINGS



WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: A-11(10)

PURGED BY: MG/f.c.

CLIENT NAME: ARCO #2169

SAMPLED BY: IV

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>5.07</u>
DEPTH TO WATER (feet): <u>6-20</u>	CALCULATED PURGE (gal.): <u>18.59</u>
DEPTH OF WELL (feet): <u>23.8</u>	ACTUAL PURGE VOL. (gal.): <u>19.0</u>

DATE PURGED: 2-23-98 Start (2400 Hr) 13:00 End (2400 Hr) 13:09
 DATE SAMPLED: ↓ Start (2400 Hr) 13:20 End (2400 Hr) ---

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>13:03</u>	<u>6.0</u>	<u>8.96</u>	<u>1200</u>	<u>64.2</u>	<u>Cloudy</u>	<u>High</u>
<u>13:06</u>	<u>12.5</u>	<u>8.81</u>	<u>1272</u>	<u>64.3</u>	<u>cloudy</u>	<u>med</u>
<u>13:09</u>	<u>19</u>	<u>8.86</u>	<u>1316</u>	<u>64.0</u>	<u>clr</u>	<u>light</u>

D. O. (ppm): 1-2 ODOR: light (COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR Parameters field filtered at this well: NR

- | PURGING EQUIPMENT | SAMPLING EQUIPMENT |
|--|---|
| <input type="checkbox"/> 2' Bladder Pump
<input type="checkbox"/> Centrifugal Pump
<input checked="" type="checkbox"/> Submersible Pump
<input type="checkbox"/> Well Wizard™
Other: _____ | <input type="checkbox"/> Bailer (Teflon®)
<input type="checkbox"/> Bailer (PVC)
<input type="checkbox"/> Bailer (Stainless Steel)
<input type="checkbox"/> Dedicated
<input type="checkbox"/> 2' Bladder Pump
<input checked="" type="checkbox"/> Bailer (Teflon®)
<input type="checkbox"/> Bailer (Stainless Steel)
<input type="checkbox"/> Submersible Pump
<input type="checkbox"/> Dipper
<input type="checkbox"/> Well Wizard™
<input type="checkbox"/> Dedicated
Other: _____ |

WELL INTEGRITY: OK LOCK #: NA

REMARKS: All samples taken

Meter Calibration: Date: 2/20/98 Time: _____ Meter Serial #: 87m Temperature °F: _____
 (EC 1000 _____ / _____) (DI _____) (pH 7 _____ / _____) (pH 10 _____ / _____) (pH 4 _____ / _____)

Location of previous calibration: _____
 Signature: [Signature] Reviewed By: JA Page 1 of 10



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: A-2 (10')

PURGED BY: MG/f.c.

CLIENT NAME: ARCO #2169

SAMPLED BY: IV

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL):	<u>NR</u>	VOLUME IN CASING (gal.):	<u>6.20</u>
DEPTH TO WATER (feet):	<u>7.68</u>	CALCULATED PURGE (gal.):	<u>18.61</u>
DEPTH OF WELL (feet):	<u>24.6</u>	ACTUAL PURGE VOL. (gal.):	<u>19.0</u>

DATE PURGED:	<u>2-20-98</u>	Start (2400 Hr)	<u>12:35</u>	End (2400 Hr)	<u>12:39</u>
DATE SAMPLED:	<u>IV</u>	Start (2400 Hr)	<u>12:44</u>	End (2400 Hr)	<u>---</u>

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>12:37</u>	<u>6.0</u>	<u>7.08</u>	<u>910.0</u>	<u>68.3</u>	<u>cloudy</u>	<u>mod</u>
<u>12:38</u>	<u>12.5</u>	<u>698</u>	<u>1073</u>	<u>69.0</u>	<u>clr</u>	<u>mod</u>
<u>12:39</u>	<u>19.0</u>	<u>692</u>	<u>1098</u>	<u>69.5</u>	<u>clr</u>	<u>light</u>

D. O. (ppm): 1-2 ODOR: None NR NR
(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR Parameters field filtered at this well: NR

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
<input type="checkbox"/> 2' Bladder Pump	<input type="checkbox"/> Bailer (Teflon®)	<input type="checkbox"/> 2' Bladder Pump	<input checked="" type="checkbox"/> Bailer (Teflon®)
<input checked="" type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> DDL Sampler	<input type="checkbox"/> Bailer (Stainless Steel)
<input type="checkbox"/> Submersible Pump	<input type="checkbox"/> Bailer (Stainless Steel)	<input type="checkbox"/> Dipper	<input type="checkbox"/> Submersible Pump
<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dedicated	<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dedicated
Other: _____		Other: _____	

WELL INTEGRITY: OK LOCK #: None

REMARKS: All samples taken

Meter Calibration: Date: 2/20/98 Time: _____ Meter Serial #: 87m Temperature °F: _____
 (EC 1000 _____ / _____) (DI _____) (pH 7 _____ / _____) (pH 10 _____ / _____) (pH 4 _____ / _____)

Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 2 of 10



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: A-3 (10')

PURGED BY: MG/f.c.

CLIENT NAME: ARCO #2169

SAMPLED BY: ✓

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>7.42</u>
DEPTH TO WATER (feet): <u>8.06</u>	CALCULATED PURGE (gal.): <u>22.26</u>
DEPTH OF WELL (feet): <u>28.3</u>	ACTUAL PURGE VOL (gal.): <u>23.0</u>

DATE PURGED: 2-20-98 Start (2400 Hr) 11:55 End (2400 Hr) 12:01

DATE SAMPLED: ✓ Start (2400 Hr) 12:04 End (2400 Hr) ---

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>10:57</u>	<u>7</u>	<u>6.95</u>	<u>934.2</u>	<u>68.0</u>	<u>cloudy</u>	<u>mod</u>
<u>11:59</u>	<u>15</u>	<u>6.99</u>	<u>972.8</u>	<u>68.7</u>	<u>"</u>	<u>High</u>
<u>12:01</u>	<u>23</u>	<u>7.01</u>	<u>497.3</u>	<u>68.5</u>	<u>cloudy</u>	<u>High</u>

D. O. (ppm): 0-1 ODOR: None COLOR: NR TURBIDITY: NR
(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

PURGING EQUIPMENT

SAMPLING EQUIPMENT

- | | | | |
|--|---|--|--|
| <input type="checkbox"/> 2" Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input checked="" type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |

Other: _____

Other: _____

WELL INTEGRITY: OK LOCK #: NA

REMARKS: All samples taken

Meter Calibration: Date: 2/20/98 Time: _____ Meter Serial #: 87M Temperature °F: _____

(EC 1000 _____) (DI _____) (pH 7 _____) (pH 10 _____) (pH 4 _____)

Location of previous calibration: _____

Signature: [Signature] Reviewed By: NA Page 3 of 10



WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: A-4 (8)

PURGED BY: MG/K.C.

CLIENT NAME: ARCO #2169

SAMPLED BY: ✓

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>7.82</u>
DEPTH TO WATER (feet): <u>6.25</u>	CALCULATED PURGE (gal.): <u>23.18</u>
DEPTH OF WELL (feet): <u>27.6</u>	ACTUAL PURGE VOL. (gal.): <u>24.0</u>

DATE PURGED: 2-20-98 Start (2400 Hr) 11:32 End (2400 Hr) 11:38
 DATE SAMPLED: ✓ Start (2400 Hr) 11:43 End (2400 Hr) ---

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>11:34</u>	<u>8</u>	<u>5.90</u>	<u>933.2</u>	<u>67.0</u>	<u>cloudy</u>	<u>med</u>
<u>11:36</u>	<u>16</u>	<u>5.94</u>	<u>947.2</u>	<u>67.5</u>	<u>"</u>	<u>"</u>
<u>11:38</u>	<u>24</u>	<u>5.98</u>	<u>968.8</u>	<u>67.7</u>	<u>"</u>	<u>"</u>

D. O. (ppm): 0-1 ODOR: NONE COLOR: NR TURBIDITY: NR
(COBALT 0 - 500) (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)
- Dedicated

Other: _____

SAMPLING EQUIPMENT

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

Other: _____

WELL INTEGRITY: OK LOCK #: None

REMARKS: All samples taken

Meter Calibration: Date: 2/20/98 Time: _____ Meter Serial #: 87M Temperature °F: 52.6
 (EC 1000 1012 / 1000) (DI _____) (pH 7 704 / 700) (pH 10 1012 / 1000) (pH 4 400 / 400)

Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 4 of 10

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



PROJECT NO 21775-235.003
 PURGED BY MG/CC
 SAMPLED BY ↓

SAMPLE ID A-5
 CLIENT NAME ARCO 2169
 LOCATION Oakland

TYPE Groundwater _____ Surface Water _____ Leachate _____ Other _____
 CASING DIAMETER (inches) 2 _____ 3 _____ 4 _____ 4.5 _____ 6 _____ Other _____

CASING ELEVATION (feet/MSL) _____ VOLUME IN CASING (gal) _____
 DEPTH OF WELL (feet) NA CALCULATED PURGE (gal) NA
 DEPTH OF WATER (feet) _____ ACTUAL PURGE VOL (gal) _____

DATE PURGED 2-20-98 END PURGE _____
 DATE SAMPLED _____ SAMPLING TIME _____

TIME (2400 HR)	VOLUME (gal)	pH (units)	E C (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

OTHER: _____ ODOR _____
(COBALT 0-100) (NTU 0-200)

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): _____

PURGING EQUIPMENT

_____ 2" Bladder Pump
 _____ Centrifugal Pump
 _____ Submersible Pump
 _____ Well Wizard™
 Other _____

_____ Bailer (Teflon)
 _____ Bailer (PVC)
 _____ Bailer (Stainless Steel)
 _____ Dedicated

SAMPLING EQUIPMENT

_____ 2" Bladder Pump
 _____ Bomb Sampler
 _____ Dipper
 _____ Well Wizard™
 Other _____

_____ Bailer (Teflon)
 _____ Bailer (Stainless Steel)
 _____ Submersible Pump
 _____ Dedicated

WELL INTEGRITY: _____ LOCK: _____

REMARKS: NO SAMPLE OR WATER LEVELS COLLECTED
DUE TO OXYGEN SUCK STUCK IN THE WELL.

pH, E.C., Temp Meter Calibration Date _____ Time _____ Meter Serial No _____
 E.C. 1000 _____ pH 7 _____ pH 10 _____ pH 4 _____
 Temperature °F _____
 SIGNATURE: [Signature] REVIEWED BY GA PAGE 5 OF 10



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: A-6 (8')

PURGED BY: MG/C.C.

CLIENT NAME: ARC0#2169

SAMPLED BY: ✓

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.):
 DEPTH TO WATER (feet): 6.73 CALCULATED PURGE (gal.):
 DEPTH OF WELL (feet): 27.0 ACTUAL PURGE VOL (gal.):

DATE PURGED: 2-20-98 Start (2400 Hr) End (2400 Hr)
 DATE SAMPLED: Start (2400 Hr) 13:00 End (2400 Hr)

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>13:00</u>	<u>Grab</u>	<u>7.18</u>	<u>1030</u>	<u>67.0</u>	<u>clr</u>	<u>0</u>

D. O. (ppm): 0-1 ODOR: None NR NR
 (COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)
 Field QC samples collected at this well: NR Parameters field filtered at this well: NR

- | PURGING EQUIPMENT | | SAMPLING EQUIPMENT | |
|---|---|--|--|
| <input type="checkbox"/> 2' Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2' Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |
| Other: <u> </u> | | Other: <u> </u> | |

WELL INTEGRITY: OK LOCK #: ARC0

REMARKS: All samples taken

Meter Calibration: Date: 2/20/98 Time: Meter Serial #: 87M Temperature °F:
 (EC 1000 /) (DI) (pH 7 /) (pH 10 /) (pH 4 /)

Location of previous calibration:
 Signature: [Signature] Reviewed By: JA Page 6 of 10



WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: AR-1 (15)

PURGED BY: MG/f.c.

CLIENT NAME: ARCO #2169

SAMPLED BY: ✓

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>36.0</u>
DEPTH TO WATER (feet): <u>6.00</u>	CALCULATED PURGE (gal.): <u>95.25</u>
DEPTH OF WELL (feet): <u>22.6</u>	ACTUAL PURGE VOL (gal.): <u>96.0</u>

DATE PURGED: 2-23-98 Start (2400 Hr): 11:55 End (2400 Hr): 12:31
 DATE SAMPLED: ✓ Start (2400 Hr): 12:40 End (2400 Hr): ---

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>12:07</u>	<u>32</u>	<u>9.41</u>	<u>1136</u>	<u>66.4</u>	<u>cloudy</u>	<u>mod</u>
<u>12:19</u>	<u>64</u>	<u>9.26</u>	<u>1102</u>	<u>66.1</u>	<u>cloudy</u>	<u>mod</u>
<u>12:31</u>	<u>96</u>	<u>9.30</u>	<u>1081</u>	<u>66.3</u>	<u>clr</u>	<u>light</u>

D. O. (ppm): 1-2 ODOR: NONE COLOR: NR TURBIDITY: NR
(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR Parameters field filtered at this well: NR

- | PURGING EQUIPMENT | | SAMPLING EQUIPMENT | |
|--|---|--|--|
| <input type="checkbox"/> 2" Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input checked="" type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input checked="" type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |
| Other: _____ | | Other: _____ | |

WELL INTEGRITY: OK LOCK #: NA

REMARKS: All samples taken

Meter Calibration: Date: 2/20/98 Time: _____ Meter Serial #: 87M Temperature °F: _____
(EC 1000 _____) (DI _____) (pH 7 _____) (pH 10 _____) (pH 4 _____)

Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 7 of 10



WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: AR-2 (10')

PURGED BY: MG/C.C.

CLIENT NAME: ARCO #2169

SAMPLED BY: IV

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 13.45
 DEPTH TO WATER (feet): 8.00 CALCULATED PURGE (gal.): 40.37
 DEPTH OF WELL (feet): 28.6 ACTUAL PURGE VOL. (gal.): 41.5

DATE PURGED: 2-20-98 Start (2400 Hr) 12:15 End (2400 Hr) 12:21
 DATE SAMPLED: IV Start (2400 Hr) 12:25 End (2400 Hr) ---

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>12:17</u>	<u>13</u>	<u>7.45</u>	<u>909.1</u>	<u>67.1</u>	<u>Bray Test</u>	<u>mod</u>
<u>12:19</u>	<u>27</u>	<u>7.28</u>	<u>860.4</u>	<u>66.8</u>	<u>---</u>	<u>mod</u>
<u>12:21</u>	<u>41</u>	<u>7.24</u>	<u>863.7</u>	<u>66.3</u>	<u>clear</u>	<u>light</u>
---	---	---	---	---	---	---
---	---	---	---	---	---	---

D. O. (ppm): 1-2 ODOR: light COLOR: NR TURBIDITY: NR
(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR Parameters field filtered at this well: NR

- | PURGING EQUIPMENT | | SAMPLING EQUIPMENT | |
|---|---|---|--|
| <input checked="" type="checkbox"/> 2' Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input checked="" type="checkbox"/> 2' Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input type="checkbox"/> Centrifugal Pump | <input type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> ODL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |
| Other: _____ | | Other: _____ | |

WELL INTEGRITY: OK LOCK #: NDNC

REMARKS: All samples taken

Meter Calibration: Date: 2/20/98 Time: _____ Meter Serial #: 87M Temperature °F: _____
 (EC 1000 1) (DI ---) (pH 7 ---) (pH 10 ---) (pH 4 ---)

Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 8 of 10



WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: ADR-1

PURGED BY: MB/ce

CLIENT NAME: ARCO 2165

SAMPLED BY: _____

LOCATION: Oakland

TYPE: Ground Water Surface Water _____ Treatment Effluent _____ Other _____

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

CASING ELEVATION (feet/MSL): _____	VOLUME IN CASING (gal.): _____
DEPTH TO WATER (feet): <u>NA</u>	CALCULATED PURGE (gal.): <u>NA</u>
DEPTH OF WELL (feet): _____	ACTUAL PURGE VOL. (gal.): _____

DATE PURGED: 2-20-88 Start (2400 Hr) _____ End (2400 Hr) _____

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

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

D. O. (ppm): _____ ODOR: _____

(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: _____ Parameters field filtered at this well: _____

PURGING EQUIPMENT

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

Other: _____

SAMPLING EQUIPMENT

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

Other: _____

WELL INTEGRITY: _____ LOCK #: _____

REMARKS: no samples collected due to well inaccessible

Meter Calibration: Date: _____ Time: _____ Meter Serial #: _____ Temperature °F: _____

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

Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 9 of 10



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 21775-235-003

SAMPLE ID: ADR-2 (9')

PURGED BY: MG/f.c.

CLIENT NAME: ARCO #2169

SAMPLED BY: ✓

LOCATION: OAKLAND, CA

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): NA
 DEPTH TO WATER (feet): 7.67 CALCULATED PURGE (gal.): NA
 DEPTH OF WELL (feet): 26.3 ACTUAL PURGE VOL. (gal.): NA

DATE PURGED: 2-20-98 Start (2400 Hr) — End (2400 Hr) —

DATE SAMPLED: ✓ Start (2400 Hr) 12:50 End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>12:50</u>	<u>0.1rb</u>	<u>6.88</u>	<u>1432</u>	<u>68.1</u>	<u>cloudy</u>	<u>1rb</u>

D. O. (ppm): 1-2 ODOR: straw NR NR
(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

Field QC samples collected at this well: NR Parameters field filtered at this well: NR

PURGING EQUIPMENT

SAMPLING EQUIPMENT

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

Other: _____

WELL INTEGRITY: OK LOCK #: ARCO

REMARKS: All samples taken

Meter Calibration: Date: 2/20/98 Time: _____ Meter Serial #: 87M Temperature °F: _____

(EC 1000 1), (DI 1) (pH 7 1) (pH 10 1) (pH 4 1)

Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 10 of 10

1921 Ringwood Avenue
San Jose, California

1998

ARCO 2169
21775-235.003

Well ID	Quarter	Date	Purge Volume (gallons)	Did well dry	Well Contained Product	Gallons			
						First	Second	Third	Fourth
A-1	First	2-23-98	19.0	NO	NO	0.00	51.00	0.00	0.00
	Second	05/21/97	NA	NA	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	GRAB	NO	NO				
A-2	First	2-20-98	49.0	NO	NO				
	Second	05/21/97	NA	NA	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	NA	NA	NO				
A-3	First	2-20-98	23.0	NO	NO				
	Second	05/21/97	NA	NA	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	NA	NA	NO				
A-4	First	2-20-98	21.0	NO	NO				
	Second	05/21/97	NA	NA	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	NA	NA	NO				
A-5	First	2-20-98				no sample/inaccessible			
	Second	05/21/97	GRAB	NO	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	GRAB	NO	NO				
A-6	First	2-20-98	Grab	NO	NO				
	Second	05/21/97	GRAB	NO	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	NA	NA	NO				
AR-1	First	2-23-98	96	NO	NO				
	Second	05/21/97	NA	NA	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	NA	NA	NO				
AR-2	First	2-20-98	41.0	NO	NO				
	Second	05/21/97	NA	NA	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	NA	NA	NO				
ADR-1	First	2-20-98				no sample/inaccessible			
	Second	05/21/97	GRAB	NO	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	GRAB	NO	NO				
ADR-2	First	2-20-98	Grab			Steam water (gal) _____			
	Second	05/21/97	GRAB	NO	NO				
	Third	08/08/97	GRAB	NO	NO				
	Fourth	11/18/97	GRAB	NO	NO				

1921 Ringwood Avenue
San Jose, California

1998

ARCO 2169
21775-235.003

Well ID	Quarter	Date	Purge Volume (gallons)	Did well dry	Well Contained Product	Gallons			
						First	Second	Third	Fourth
						252.00	0.00	0.00	0.00
A-1	First	02/23/98	19.00	NO	NO				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97	0.00	GRAB	NO				
A-2	First	02/23/98	49.00	NO	NO				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97		NA	NO				
A-3	First	02/23/98	23.00	NO	NO				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97		NA	NO				
A-4	First	02/23/98	24.00	NO	NO				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97		NA	NO				
A-5	First	02/23/98		NA	NO				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97	0.00	GRAB	NO				
A-6	First	02/23/98	0.00	GRAB	NO				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97		NA	NO				
AR-1	First	02/23/98	96.00	NO	NO				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97		NA	NO				
AR-2	First	02/23/98	41.00	NO	NO				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97		NA	NO				
ADR-1	First	02/23/98		NA	NA				
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97	0.00	GRAB	NO				
ADR-2	First	02/23/98	0.00	GRAB	NO	Steam water (gal) _____			
	Second								
	Third	08/08/97	0.00	GRAB	NO				
	Fourth	11/18/97	0.00	GRAB	NO				

APPENDIX D
SVE SYSTEM MONITORING DATA LOG SHEETS

ARCO 2169
SVE SYSTEM
MONITORING DATA

Reporting Period		Hours in Period		Operation + Down Hours																											
01/01/98 00 00		744 00		744 00																											
02/01/98 00 00		Days in Period		Operation + Down Days																											
		31 00		31 00																											
Reading Date & Time	Field Monitoring Data						Laboratory Monitoring Data																								
	Flow Rates		FID or PID Results				Well Field Influent		System Influent		System Effluent		Emissions		Operational Data																
	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																
01/01/98 00 00																514.75	7364.80	0.6	0.03	513.66	21.41										
01/22/98 10 45	128.0	128.0	46.6													229.25	7364.80	0.0	0.00	229.25	8.56										
02/01/98 00 00	0.0	0.0																													
Period Totals																744.00		0.79	0.03	743.21	30.97										
Period Averages																128.0	128.0	47													

**ARCO 2189
SVE SYSTEM
MONITORING DATA**

Reporting Period 03/01/98 00 00		Hours in Period 744 00		Operation + Down Hours 744 00																				
04/01/98 00 00		Days in Period 31 00		Operation + Down Days 31 00																				
Reading Date & Time	Field Monitoring Data				Laboratory Monitoring Data							Period Hours	Meter Hours	Hours of Operation	Days of Operation	Down Hours	Down Days							
	Flow Rates		FID or PID Results			Well Field Influent		System Influent		System Effluent														
	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		
scfm	scfm	ppm	ppm	ppm	ppmv			mg/m3	ppmv	mg/m3	ppmv	mg/m3	ppmv	mg/m3	%	lb/day	lb/day							
03/01/98 00 00																		538 42	7365 36	0 0	0 00	538 42	22 43	
03/23/98 10 25	0 0	0 0	112 1															205 58	7365 36	0 0	0 00	205 58	8 57	
04/01/98 00 00	0 0	0 0																						
Period Totals																		744 00		0 00	0 00	744 00	31 00	
Period Averages		0 0	0 0	112 1																				