



ENVIRONMENTAL  
PROTECTION

00 MAR 29 PM 12:36

2201 Broadway, Suite 101  
Oakland, CA 94612-3023  
Tel. 510.740.5800  
Fax. 510.663.3315

# 3858

March 27, 2000  
Project 791643

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

Re: Quarterly Groundwater Monitoring Results and Remediation System Performance  
Evaluation Report, Fourth Quarter 1999, for ARCO Service Station No. 2035,  
Located at 1001 San Pablo Avenue, Albany, California

Dear Mr. Supple:

IT Corporation (IT) is submitting the attached report, which presents the results of the fourth quarter 1999 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 2035, located at 1001 San Pablo Avenue, Albany, California. Operation and performance data for the site's soil-vapor extraction system (SVE) and groundwater remediation systems are also presented. The monitoring program complies with the Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

Please call if you have questions.

Sincerely,

IT Corporation

Dan Lescure  
Project Manager

Dan Easter, R.G. 5722  
Project Geologist

Attachment: Quarterly Groundwater Monitoring Report, Fourth Quarter 1999

cc: **Barney Chan, ACHCSA**  
James A. Lestrangle, Property Owner  
Muriel & Emile Turpin, Trustees

Date: March 27, 2000**ARCO QUARTERLY GROUNDWATER MONITORING REPORT**

Station No.: 2035 Address: 1001 San Pablo Avenue, Albany, California  
 IT Project No.: 791643  
 ARCO Environmental Engineer/Phone No.: Paul Supple /(925) 299-8891  
 IT Project Manager/Phone No.: Dan Lescure /(510) 740-5804  
 Primary Agency/Regulatory ID No.: ACHCSA /Barney Chan

**WORK PERFORMED THIS QUARTER (FOURTH - 1999):**

1. Prepared and submitted quarterly groundwater monitoring report for third quarter 1999.
2. Performed quarterly groundwater monitoring and sampling for fourth quarter 1999.
3. Continued bubbling air into well RW-1 to introduce dissolved oxygen into the groundwater, thereby enhancing biodegradation of petroleum hydrocarbons in groundwater in the vicinity of the well.
4. As recommended by ACHCSA, MTBE concentration in MW-6 was confirmed by EPA method 8260.
5. Operated SVE system.
6. Shut down SVE system and air bubbling system per ARCO's Y2K program.

**WORK PROPOSED FOR NEXT QUARTER (FIRST - 2000):**

1. Prepare and submit quarterly groundwater monitoring report for fourth quarter 1999.
2. No groundwater monitoring is scheduled at the site during the first quarter 2000.
3. Restart SVE system and air bubbling system per ARCO's Y2K program.
4. Continue bubbling air into well RW-1.
5. Operate SVE system, if influent concentrations and mass extraction rate warrants.

**QUARTERLY MONITORING:**

Current Phase of Project: Groundwater Monitoring and Operation and Maintenance of Remediation Systems  
SVE and Enhanced Bioremediation

Frequency of Sampling: Annual (2nd quarter): MW-5  
Semi-annual (2nd/4th quarter): MW-1 through MW-4, MW-6, RW-1

Frequency of Monitoring: Semi-Annual (groundwater), Monthly (SVE)

Is Floating Product (FP) Present On-site:  Yes  No

Cumulative FP Recovered to Date: 27.9 gallons, Wells AS-1, AS-2, 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 in RW-1

Average Depth to Groundwater: 10.5 feet

Groundwater Flow Direction and Gradient (Average): 0.02 ft/ft toward West-Southwest

**SVE QUARTERLY OPERATION AND PERFORMANCE:**

Equipment Inventory:	Therm Tech Model VAC-10 Thermal/Catalytic Oxidizer
Operating Mode:	Catalytic Oxidation
BAAQMD Permit #:	10931
TPH Conc. End of Period (lab):	210 ppmv
Benzene Conc. End of Period (lab):	0.7 ppmv
SVE Flowrate End of Period:	115.2 cfm
Total HC Recovered This Period:	492 pounds
Total HC Recovered to Date:	3,685 pounds
Utility Usage	
Electric (kWh):	Not available
Gas (Therms):	Not available
Operating Hours This Period (SVE):	1315.99 hours
Operating Hours to Date (SVE):	10478.05 hours
Percent Operational (SVE):	54.3%
Operating Hours This Period (GWE):	0.0 hours
Percent Operational (GWE):	0.0%
Unit Maintenance:	Routine monthly maintenance
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	98.5% (POC >2,000 ppmv); 97% (POC >200 ppmv); 90% (POC <200 ppmv)
Percent TPH Conversion:	97%
Average Stack Temperature:	794.6°F
Average SVE Source Flow:	88.5 cfm
Average SVE Process Flow:	92.2 cfm
Average Source Vacuum:	13.5 inches of water

**DISCUSSION**

- ACHCSA has approved changing monitoring from quarterly to semi-annual (September 3, 1999). Sampling will be conducted during 2nd and 4th quarters.

**ATTACHMENTS:**

- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Table 2 - Groundwater Flow Direction and Gradient
- Table 3 - Fuel Oxygenates
- Table 4 - Operational Uptime Information for the SVE System
- Table 5 - Flow Rates and Analytical Results of Air Samples
- Table 6 - Extraction Rates, Emission Rates, Destruction Efficiency, and Mass Removed
- Figure 1 - Groundwater Analytical Summary Map
- Figure 2 - Groundwater Elevation Contour Map
- Appendix A - Sampling and Analysis Procedures
- Appendix B - Certified Analytical Reports and Chain-of-Custody Documentation
- Appendix C - Field Data Sheets
- Appendix D - Certified Analytical Reports and Chain-of-Custody Documentation for SVE System

**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**  
**1995 - Present\*\***

**ARCO Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Well Number	Date Gauged	TOC	Depth	FP	Groundwater	Date Sampled	TPH			Ethyl-	Total	MTBE	MTBE	Dissolved Oxygen	Purged/Not Purged (P/NP)
		Elevation (ft-MSL)	to Water (feet)	Thickness (feet)	Elevation [1] (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	benzene (µg/L)	Xylenes (µg/L)	8021B* (µg/L)	8240/8260 (µg/L)		
MW-1	03-24-95	41.41	6.21	ND	35.20	03-24-95	8,800	3,600	<50	62	99	--	--	--	
MW-1	05-24-95	41.41	9.37	ND	32.04	05-24-95	4,800	2,000	<20	52	<20	--	--	--	
MW-1	08-22-95	41.41	10.30	ND	31.11	08-22-95	780	310	<2.5	12	<2.5	14	--	--	
MW-1	11-09-95	41.41	12.25	ND	29.16	11-09-95	58	14	<0.5	<0.5	<0.5	--	--	--	
MW-1	02-27-96	41.41	9.08	ND	32.33	02-27-96	2,700	930	12	18	32	51	--	--	
MW-1	04-22-96	41.41	9.11	ND	32.30	04-22-96	2,700	1,000	<10	22	<10	<60	--	--	
MW-1	08-15-96	41.41	10.37	ND	31.04	08-15-96	300	52	<0.5	0.9	<0.5	22	--	--	
MW-1	12-10-96	41.41	8.79	ND	32.62	12-10-96	270	63	0.7	<0.5	1	25	--	--	
MW-1	03-27-97	41.41	9.80	ND	31.61	03-27-97	1,500	610	<5	15	7	56	--	--	
MW-1	05-22-97	41.41	9.65	ND	31.76	05-22-97	110	6	<0.5	<0.5	0.7	10	--	--	
MW-1	09-04-97	41.41	10.22	ND	31.19	09-04-97	180	40	<0.5	1.2	0.5	26	--	--	
MW-1	11-03-97	41.41	10.68	ND	30.73	11-03-97	83	8	<0.5	<0.5	<0.5	13	--	--	
MW-1	02-20-98	41.41	6.92	ND	34.49	02-20-98	1,800	540	7	27	31	46	--	--	
MW-1	05-18-98	41.41	9.28	ND	32.13	05-18-98	4,500	1,300	20	57	20	<60	--	--	
MW-1	08-20-98	41.41	10.05	ND	31.36	08-21-98	530	110	<5	<5	<5	400	--	--	
MW-1	10-20-98	41.41	10.42	ND	30.99	10-20-98	66	9.1	<0.5	<0.5	<0.5	8	--	--	
MW-1	02-16-99	41.41	8.10	ND	33.31	02-16-99	1,200	390	<5	<5	6	45	--	--	
MW-1	05-24-99	41.41	9.53	ND	31.88	05-24-99	1,300	600	3	13	3	26	--	--	
MW-1	08-24-99	41.41	10.03	ND	31.38	08-24-99	100	21	1.3	<0.5	<0.5	8	--	--	0.55 P
MW-1	11-16-99	41.41	9.80	ND	31.61	11-16-99	99	10	0.6	<0.5	<1	7	--	--	2.1 P
MW-2	03-24-95	40.38	6.96	ND	33.42	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	
MW-2	05-24-95	40.38	10.02	ND	30.36	05-24-95	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-2	08-22-95	40.38	10.87	ND	29.51	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	
MW-2	11-09-95	40.38	13.12	ND	27.26	11-09-95	Not sampled: well sampled semi-annually, during the first and third quarters								
MW-2	02-27-96	40.38	10.25	ND	30.13	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	
MW-2	04-22-96	40.38	9.98	ND	30.40	04-22-96	Not sampled: well sampled semi-annually, during the first and third quarters								

**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**  
**1995 - Present\*\***

**ARCO Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Well Number	Date Gauged	TOC Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation [1] (ft-MSL)	Date Sampled	TPH					Total Xylenes (µg/L)	MTBE 8021B* (µg/L)	MTBE 8240/8260 (µg/L)	TRPH (µg/L)	Dissolved Oxygen (mg/L)	Purged/ Not Purged (P/NP)
							Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)							
MW-2	08-15-96	40.38	11.10	ND	29.28	08-15-96	<50	<0.5	<0.5	<0.5	<0.5	4	--	--			
MW-2	12-10-96	40.38	10.00	ND	30.38	12-10-96	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-2	03-27-97	40.38	10.38	ND	30.00	03-27-97	<50	<0.5	<0.5	<0.5	<0.5	12	--	--			
MW-2	05-22-97	40.38	10.65	ND	29.73	05-22-97	Not sampled: well sampled semi-annually, during the first and third quarters										
MW-2	09-04-97	40.38	10.87	ND	29.51	09-04-97	<50	<0.5	<0.5	<0.5	<0.5	19	--	--			
MW-2	11-03-97	40.38	11.25	ND	29.13	11-03-97	<50	<0.5	<0.5	<0.5	<0.5	18	--	--			
MW-2	02-20-98	40.38	7.69	ND	32.69	02-20-98	<50	0.5	<0.5	<0.5	<0.5	12	--	--			
MW-2	05-18-98	40.38	9.88	ND	30.50	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	10	--	--			
MW-2	08-20-98	40.38	10.62	ND	29.76	08-21-98	<50	<0.5	<0.5	<0.5	<0.5	3	--	--			
MW-2	10-20-98	40.38	11.00	ND	29.38	10-20-98	<50	<0.5	<0.5	<0.5	<0.5	31	--	--			
MW-2	02-16-99	40.38	9.04	ND	31.34	02-16-99	<50	<0.5	<0.5	<0.5	<0.5	13	--	--			
MW-2	05-24-99	40.38	9.90	ND	30.48	05-24-99	<50	0.6	<0.5	<0.5	<0.5	47	--	--			
MW-2	08-24-99	40.38	10.60	ND	29.78	08-24-99	<50	<0.5	<0.5	<0.5	<0.5	20	--	--	0.88	P	
MW-2	11-16-99	40.38	10.45	ND	29.93	11-16-99	<50	<0.5	<0.5	<0.5	<1	3	--	--	2.5	P	
MW-3	03-24-95	41.44	7.29	ND	34.15	03-24-95	51	0.8	<0.5	2.4	<0.5	--	--	<500			
MW-3	05-24-95	41.44	9.53	ND	31.91	05-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	<500			
MW-3	08-22-95	41.44	11.19	ND	30.25	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	79	--	<500			
MW-3	11-09-95	41.44	12.77	ND	28.67	11-09-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	600			
MW-3	02-27-96	41.44	9.41	ND	32.03	02-27-96	120	3.6	<0.5	2.2	3.7	90	--	<0.5			
MW-3	04-22-96	41.44	9.63	ND	31.81	04-22-96	<50	<0.5	<0.5	<0.5	<0.5	90	--	--			
MW-3	08-15-96	41.44	11.12	ND	30.32	08-15-96	<50	<0.5	<0.5	<0.5	<0.5	54	--	--			
MW-3	12-10-96	41.44	10.34	ND	31.10	12-10-96	71	<0.5	<0.5	<0.5	<0.5	130	--	--			
MW-3	03-27-97	41.44	10.28	ND	31.16	03-27-97	<100	<1	<1	<1	<1	170	--	--			
MW-3	05-22-97	41.44	10.40	ND	31.04	05-22-97	<100	<1	<1	<1	<1	95	--	--			
MW-3	09-04-97	41.44	10.75	ND	30.69	09-04-97	<50	<0.5	<0.5	<0.5	<0.5	37	--	--			
MW-3	11-03-97	41.44	11.44	ND	30.00	11-03-97	<200	<2	<2	<2	<2	130	--	--			

**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**  
**1995 - Present\*\***

**ARCO Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Well Number	Date Gauged	TOC	Depth	FP	Groundwater	Date Sampled	TPH			Ethyl-	Total	MTBE	MTBE	TRPH	Dissolved	Purged/
		Elevation (ft-MSL)	to Water (feet)	Thickness (feet)	Elevation [1] (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	benzene (µg/L)	Xylenes (µg/L)	8021B* (µg/L)	8240/8260 (µg/L)		Oxygen (mg/L)	Not Purged (P/NP)
MW-3	02-20-98	41.44	7.48	ND	33.96	02-20-98	<200	<2	5	<2	8	140	--	<0.5		
MW-3	05-18-98	41.44	9.87	ND	31.57	05-18-98	<100	<1	<1	<1	<1	150	--	<0.5		
MW-3	08-20-98	41.44	10.72	ND	30.72	08-21-98	<200	<2	<2	<2	<2	210	--	<0.5		
MW-3	10-20-98	41.44	11.30	ND	30.14	10-20-98	<200	<2	<2	<2	<2	270	--	<0.5		
MW-3	02-16-99	41.44	8.60	ND	32.84	02-16-99	<500	<5	<5	<5	<5	700	--	--		
MW-3	05-24-99	41.44	9.87	ND	31.57	05-24-99	<50	<0.5	<0.5	<0.5	<0.5	150	140	--		
MW-3	08-24-99	41.44	10.83	ND	30.61	08-24-99	<50	<0.5	<0.5	<0.5	<0.5	54	71	--	0.41	P
MW-3	11-16-99	41.44	10.54	ND	30.90	11-16-99	100	<0.5	3.3	<0.5	<1	500	--	--	6.2	P
MW-4	03-24-95	40.33	5.92	ND	34.41	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--		
MW-4	05-24-95	40.33	9.23	ND	31.10	05-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--		
MW-4	08-22-95	40.33	10.61	ND	29.72	08-22-95	<50	<0.5	<0.5	<0.5	<0.5	99	--	--		
MW-4	11-09-95	40.33	11.97	ND	28.36	11-09-95	<50	<0.5	<0.5	<0.5	<0.5	--	89	--		
MW-4	02-27-96	40.33	8.84	ND	31.49	02-27-96	<50	0.8	<0.5	<0.5	<0.5	<3	--	--		
MW-4	04-22-96	40.33	9.15	ND	31.18	04-22-96	Not sampled: well sampled annually, during the first quarter									
MW-4	08-15-96	40.33	10.35	ND	29.98	08-15-96	Not sampled: well sampled annually, during the first quarter									
MW-4	12-10-96	40.33	8.70	ND	31.63	12-10-96	Not sampled: well sampled annually, during the first quarter									
MW-4	03-27-97	40.33	9.75	ND	30.58	03-27-97	<5,000	<50	<50	<50	<50	4,200	--	--		
MW-4	05-22-97	40.33	9.91	ND	30.42	05-22-97	Not sampled: well sampled annually, during the first quarter									
MW-4	09-04-97	40.33	10.25	ND	30.08	09-04-97	Not sampled: well sampled annually, during the first quarter									
MW-4	11-03-97	40.33	10.79	ND	29.54	11-03-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
MW-4	02-20-98	40.33	6.78	ND	33.55	02-20-98	<2,000	<20	<20	<20	<20	3,300	--	--		
MW-4	05-18-98	40.33	9.26	ND	31.07	05-18-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
MW-4	08-20-98	40.33	10.10	ND	30.23	08-21-98	<50	<0.5	<0.5	<0.5	<0.5	9	--	--		
MW-4	10-20-98	40.33	10.43	ND	29.90	10-20-98	<50	<0.5	<0.5	<0.5	<0.5	17	--	--		
MW-4	02-16-99	40.33	8.56	ND	31.77	02-16-99	<500	<5	<5	<5	<5	400	--	--		
MW-4	05-24-99	40.33	9.52	ND	30.81	05-24-99	<50	<0.5	<0.5	<0.5	<0.5	10	7.6	--		

**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**  
**1995 - Present\*\***

**ARCO Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Well Number	Date Gauged	TOC Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation [1] (ft-MSL)	Date Sampled	TPH					Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE 8021B* (µg/L)	MTBE 8240/8260 (µg/L)	TRPH (µg/L)	Dissolved Oxygen (mg/L)	Purged/Not Purged (P/NP)
							Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	benzene (µg/L)	Xylenes (µg/L)							
MW-4	08-24-99	40.33	9.99	ND	30.34	08-24-99	<2,500	<25	<25	<25	<25	1,200	1,300	--	--	0.84	NP	
MW-4	11-16-99	40.33	9.80	ND	30.53	11-16-99	<50	<0.5	<0.5	<0.5	<1	<3	--	--	0.0	NP		
MW-5	03-24-95	41.84	6.23	ND	35.61	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	
MW-5	05-24-95	41.84	9.61	ND	32.23	05-24-95	Not sampled: well sampled annually, during the first quarter											
MW-5	08-22-95	41.84	11.12	ND	30.72	08-22-95	Not sampled: well sampled annually, during the first quarter											
MW-5	11-09-95	41.84	12.52	ND	29.32	11-09-95	Not sampled: well sampled annually, during the first quarter											
MW-5	02-27-96	41.84	9.52	ND	32.32	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	
MW-5	04-22-96	41.84	9.44	ND	32.40	04-22-96	Not sampled: well sampled annually, during the first quarter											
MW-5	08-15-96	41.84	10.83	ND	31.01	08-15-96	Not sampled: well sampled annually, during the first quarter											
MW-5	12-10-96	41.84	9.20	ND	32.64	12-10-96	Not sampled: well sampled annually, during the first quarter											
MW-5	03-27-97	41.84	10.10	ND	31.74	03-27-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	
MW-5	05-22-97	41.84	10.28	ND	31.56	05-22-97	Not sampled: well sampled annually, during the first quarter											
MW-5	09-04-97	41.84	10.73	ND	31.11	09-04-97	Not sampled: well sampled annually, during the first quarter											
MW-5	11-03-97	41.84	11.23	ND	30.61	11-03-97	Not sampled: well sampled annually, during the first quarter											
MW-5	02-20-98	41.84	6.67	ND	35.17	02-20-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	
MW-5	05-18-98	41.84	9.61	ND	32.23	05-18-98	Not sampled: well sampled annually, during the first quarter											
MW-5	08-20-98	41.84	10.58	ND	31.26	08-21-98	Not sampled: well sampled annually, during the first quarter											
MW-5	10-20-98	41.84	10.66	ND	31.18	10-20-98	Not sampled: well sampled annually, during the first quarter											
MW-5	02-16-99	41.84	8.35	ND	33.49	02-16-99	Not sampled											
MW-5	05-24-99	41.84	9.95	ND	31.89	05-24-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	--	
MW-5	08-24-99	41.84	10.51	ND	31.33	08-24-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	0.79	NP		
MW-5	11-16-99	41.84	10.37	ND	31.47	11-16-99	Not sampled: well sampled annually, during the second quarter											
MW-6	03-24-95	40.13	9.03	ND	31.10	03-24-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	--	
MW-6	05-24-95	40.13	12.45	ND	27.68	05-24-95	Not sampled: well sampled annually, during the first quarter											
MW-6	08-22-95	40.13	13.32	ND	26.81	08-22-95	Not sampled: well sampled annually, during the first quarter											

**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**  
**1995 - Present\*\***

**ARCO Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Well Number	Date Gauged	TOC Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation [1] (ft-MSL)	Date Sampled	TPH Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE 8021B* (µg/L)	MTBE 8240/8260 (µg/L)	TRPH (µg/L)	Dissolved Oxygen (mg/L)	Purged/Not Purged (P/NP)
MW-6	11-09-95	40.13	14.13	ND	26.00	11-09-95	Not sampled: well sampled annually, during the first quarter									
MW-6	02-27-96	40.13	11.86	ND	28.27	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
MW-6	04-22-96	40.13	12.35	ND	27.78	04-22-96	Not sampled: well sampled annually, during the first quarter									
MW-6	08-15-96	40.13	13.18	ND	26.95	08-15-96	Not sampled: well sampled annually, during the first quarter									
MW-6	12-10-96	40.13	11.94	ND	28.19	12-10-96	Not sampled: well sampled annually, during the first quarter									
MW-6	03-27-97	40.13	13.10	ND	27.03	03-27-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--		
MW-6	05-22-97	40.13	13.00	ND	27.13	05-22-97	Not sampled: well sampled annually, during the first quarter									
MW-6	09-04-97	40.13	13.30	ND	26.83	09-04-97	Not sampled: well sampled annually, during the first quarter									
MW-6	11-03-97	40.13	13.42	ND	26.71	11-03-97	<50	<0.5	<0.5	<0.5	<0.5	19	--	--		
MW-6	02-20-98	40.13	10.57	ND	29.56	02-20-98	<100	<1	<1	<1	<1	95	--	--		
MW-6	05-18-98	40.13	12.64	ND	27.49	05-18-98	<100	<1	<1	<1	<1	180	--	--		
MW-6	08-20-98	40.13	13.13	ND	27.00	08-21-98	<100	<1	<1	<1	<1	180	--	--		
MW-6	10-20-98	40.13	13.48	ND	26.65	10-20-98	<100	<1	<1	<1	<1	180	--	--		
MW-6	02-16-99	40.13	11.92	ND	28.21	02-16-99	<200	<2	<2	<2	<2	200	--	--		
MW-6	05-24-99	40.13	12.80	ND	27.33	05-24-99	<50	<0.5	<0.5	<0.5	<0.5	120	--	--		
MW-6	08-24-99	40.13	13.03	ND	27.10	08-24-99	<50	<0.5	<0.5	<0.5	<0.5	44	--	--	0.46	NP
MW-6	11-16-99	40.13	12.70	ND	27.43	11-16-99	<50	<0.5	<0.5	<0.5	<1	17	17	--	0.0	NP
RW-1	03-24-95	40.33	9.32	0.01	31.02	03-24-95	11,000	560	660	150	1,700	--	--	--		
RW-1	05-24-95	40.33	9.75	0.03	30.60	05-24-95	Not sampled: well contained floating product									
RW-1	08-22-95	40.33	10.86	0.02	29.48	08-22-95	Not sampled: well contained floating product									
RW-1	11-09-95	40.33	20.61	ND	19.72	11-09-95	1,600	79	46	13	240	--	--	--		
RW-1	02-27-96	40.33	16.56	ND	23.77	02-27-96	210	44	7.5	2.5	24	29	--	--		
RW-1	04-22-96	40.33	9.65	ND	30.68	04-22-96	36,000	7,400	3,700	580	3,400	<300	--	--		
RW-1	08-15-96	40.33	10.60	ND	29.73	08-15-96	1,800	31	38	15	150	<30	--	--		
RW-1	12-10-96	40.33	8.72	ND	31.61	12-10-96	25,000	1,900	1,000	330	3,200	<100	--	--		
RW-1	03-27-97	40.33	10.33	ND	30.00	03-27-97	7,200	1,900	59	95	240	480	--	--		



**Table 1**  
**Historical Groundwater Elevation and Analytical Data**  
**Petroleum Hydrocarbons and Their Constituents**  
**1995 - Present\*\***

**ARCO Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Well Number	Date Gauged	TOC Elevation (ft-MSL)	Depth to Water (feet)	FP Thickness (feet)	Groundwater Elevation [1] (ft-MSL)	Date Sampled	TPH Gasoline ( $\mu\text{g/L}$ )	Benzene ( $\mu\text{g/L}$ )	Toluene ( $\mu\text{g/L}$ )	Ethylbenzene ( $\mu\text{g/L}$ )	Total Xylenes ( $\mu\text{g/L}$ )	MTBE 8021B* ( $\mu\text{g/L}$ )	MTBE 8240/8260 ( $\mu\text{g/L}$ )	TRPH ( $\mu\text{g/L}$ )	Dissolved Oxygen (mg/L)	Purged/Not Purged (P/NP)
RW-1	05-22-97	40.33	10.10	ND	30.23	05-22-97	3,000	630	84	45	340	<60	--	--		
RW-1	09-04-97	40.33	10.42	ND	29.91	09-04-97	7,100	120	55	14	160	<60	--	--		
RW-1	11-03-97	40.33	9.10	ND	31.23	11-03-97	<200	14	19	3	19	140	--	--		
RW-1	02-20-98	40.33	7.49	ND	32.84	02-20-98	3,800	1,000	85	64	220	950	--	--		
RW-1	05-18-98	40.33	8.90	ND	31.43	05-18-98	<200	45	<2	2	4	220	--	--		
RW-1	08-20-98	40.33	11.06	ND	29.27	08-21-98	480	200	<2	<2	30	180	--	--		
RW-1	10-20-98	40.33	11.12	ND	29.21	10-20-98	110	36	2.9	<0.5	4.1	5	--	--		
RW-1	02-16-99	40.33	7.70	ND	32.63	02-17-99	250	61	2	2	19	94	--	--		
RW-1	05-24-99	40.33	11.12	ND	29.21	05-24-99	4,500	2,000	7	<2	180	35	--	--		
RW-1	08-24-99	40.33	10.15	ND	30.18	08-24-99	2,600	1,100	6.3	2.3	17	39	--	--	0.52	NP
RW-1	11-16-99	40.33	9.95	ND	30.38	11-16-99	1,200	2,600	16	86	41	140	--	--	1.4	P

TOC: top of casing

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

TPH: total petroleum hydrocarbons as gasoline, California DHS LUFT Method

BTEX: benzene, toluene, ethylbenzene, total xylenes by EPA method 8021B. (EPA method 8020 prior to 11/16/99).

MTBE: Methyl tert-butyl ether

TRPH: total recoverable petroleum hydrocarbons, by EPA method 418.1

$\mu\text{g/L}$ : micrograms per liter

$\text{mg/L}$ : milligrams per liter

ND: none detected

--: not analyzed or not applicable

<: denotes concentration not present at or above laboratory detection limit stated to the right.

[1] = Computed by adding correction factor to groundwater elevation. Correction factor = free product thickness times 0.73 (approximate specific gravity of gasoline).

\*: EPA method 8020 prior to 11/16/99

\*\* : 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).

**Table 2**  
**Groundwater Flow Direction and Gradient**

**ARCO Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Date Measured	Average Flow Direction	Average Hydraulic Gradient
03-24-95	Northwest	0.037
05-24-95	West-Northwest	0.013
08-22-95	Southwest	0.012
11-09-95	West-Southwest	0.01
02-27-96	Southwest	0.009
04-22-96	West-Southwest	0.014
08-15-96	Southwest	0.011
12-10-96	West-Southwest	0.023
03-27-97	West-Southwest	0.026
05-22-97	West-Southwest	0.024
09-04-97	West	0.019
11-03-97	Southwest	0.038
02-20-98	West	0.031
05-18-98	West	0.02
08-20-98	West	0.02
10-20-98	West	0.02
02-16-99	West	0.03
05-24-99	West-Southwest	0.03
08-24-99	West-Southwest	0.01
11-16-99	West-Southwest	0.02

**Table 3  
Fuel Oxygenates**

**ARCO Service Station No. 2035  
1001 San Pablo Avenue, Albany, California**

Well I.D. Number	Field Date	TBA EPA 8260B ug/L	MTBE EPA 8260B ug/L	DIPE EPA 8260B ug/L	ETBE EPA 8260B ug/L	TAME EPA 8260B ug/L
MW-6	11/16/99	<20	17	<5	<5	<5
<p>TBA = Tert-butyl alcohol            MTBE = Methyl-tert-Butyl Ether            DIPE = Di-isopropyl ether            ETBE = Ethyl tert-butyl ether            TAME = Tert-amyl methyl ether            EPA = Environmental Protection Agency            ug/L = Microgram per liter            &lt; = less than laboratory detection limit to the right</p>						

**Table 4  
Operational Uptime Information for the  
Soil Vapor Extraction System (1997 - present)**

**ARCO Service Station No. 2035  
1001 San Pablo Avenue, Albany, California**

Date End	Hr-Meter Arrival	Operating Hours To Date	No. of Days Between Site Visits			Percent Uptime	Cumulative Days (begin 12/93)	
			Total Days	Uptime	Days Down		Total Days	Total Uptime
11/01/97		6873.20					1425	335
12/01/97	11484.46	7211.10	30	14	16	47%	1455	349
01/27/98	11484.46	7211.10	57	0	57	0%	1512	349
08/12/98	11484.46	7211.10	197	0	197	0%	1709	349
09/02/98	11484.69	7211.33	21	0	21	0%	1730	349
10/19/98	12279.71	8006.35	47	33	14	70%	1777	382
11/10/98	12809.36	8536.00	22	22	0	100%	1799	404
01/22/99	12809.36	8536.00	73	0	73	0%	1872	404
02/11/99	12809.53	8536.17	20	0	20	0%	1892	404
04/01/99	12809.64	8536.28	49	0	49	0%	1941	404
06/10/99	12810.03	8536.67	70	0	70	0%	2011	404
06/24/99	13146.19	8872.83	14	14	0	100%	2025	418
08/17/99	13146.19	8872.83	54	0	54	0%	2079	418
09/09/99	13146.76	8873.40	23	0	23	0%	2102	418
09/21/99	13435.42	9162.06	12	12	0	100%	2114	430
10/06/99	13450.28	9176.92	15	1	14	4%	2129	431
10/20/99	13474.88	9201.52	14	1	13	7%	2143	432
11/03/99	13811.70	9538.34	14	14	0	100%	2157	446
11/17/99	14148.06	9874.70	14	14	0	100%	2171	460
12/01/99	14391.11	10117.75	14	10	4	72%	2185	470
12/16/99	14751.38	10478.02	15	15	0	100%	2200	485
01/05/00	14751.41	10478.05	20	0	20	0%	2220	485
01/19/00	15087.10	10813.74	14	14	0	100%	2234	499
02/21/00	15087.15	10813.79	33	0	33	0%	2267	499
03/01/00	15303.43	11030.07	9	9	0	100%	2276	508

**Table 5**  
**Soil Vapor Extraction System**  
**Flow Rates and Analytical Results of Air Samples (1997 - present)**

**Arco Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Date	Sample Location	Vacuum (in. H2O)	Velocity (fpm)	Flowrate <sup>1</sup> (scfm)	Analyses (ppmv)					
					TPHG	Benzene	Toluene	Ethylbenzene	Xylene	MTBE
12/01/97	Influent			221.4	160	0.6	<0.1	1.6	2.5	
	Effluent				8	<0.1	0.1	<0.1	0.3	
01/27/98	Influent	NA	NA	NA	NA	NA	NA	NA	NA	
	Effluent									
08/12/98	Influent	NA	NA	NA	NA	NA	NA	NA	NA	
	Effluent									
09/02/98	Influent	30	600	27	610	<1	<1	2	3	
	Effluent		1050	92.4	9	<0.1	<0.1	0.1	<0.2	
10/19/98	Influent	20	500	23	64	<0.1	0.7	<0.1	<0.2	
	Effluent		1200	106.5	<5	<0.1	<0.1	<0.1	<0.2	
11/10/98	Influent	20	500	23	8	<0.1	0.1	<0.1	<0.2	
	Effluent		1200	106.5	<5	<0.1	<0.1	<0.1	<0.2	
06/10/99	Influent	35	1500	67	100	0.5	3	<0.1	0.9	<1
	Effluent		975	74.9	<5	<0.1	<0.1	<0.1	<0.2	<1
09/09/99	Influent	15.4	1900	90	<49	0.7	1.1	<0.1	<0.2	33
	Effluent		1200	92.1	<5	<0.1	<0.1	<0.1	<0.2	<0.8
10/06/99	Influent	16	1825	86	240	1	2.9	<0.1	0.7	67
	Effluent		900	69.1	9	<0.1	0.1	0.1	<0.2	<0.8
12/01/99	Influent	11	1900	91	210	0.7	0.8	<0.2	0.2	61
	Effluent		1500	115.2	<5	<0.1	<0.1	<0.1	<0.2	1.4

<sup>1</sup> Influent Flow Rate, cfm = (Velocity, fpm)(Influent Pipe Area, sq. ft.)(406.8 in.H2O - Vacuum, in.H2O) / (406.8 in.H2O)

where Influent Pipe Diameter = 3"

Effluent Flow Rate, cfm = (Velocity, fpm)(Effluent Pipe Area, sq.ft.)/[(460° R + 77° F)/(460° R + Vapor Temp F)]

where Effluent (after blower) Pipe Diameter = 4"

**Table 6**  
**Soil Vapor Extraction System**  
**Extraction Rates, Emission Rates, Destruction Efficiency, and Mass Removed**  
**(1997 - present)**

**ARCO Service Station No. 2035**  
**1001 San Pablo Avenue, Albany, California**

Date End	Extraction Rate from Wellfield <sup>1</sup>		Emission Rate to Atmosphere <sup>2</sup>		Destruction Efficiency <sup>3</sup>		Period Removal <sup>4</sup>		Cumulative Removal	
	TPHG (lbs/day)	Benzene (lbs/day)	TPHG (lbs/day)	Benzene (lbs/day)	TPHG (%)	Benzene (%)	TPHG (lbs)	Benzene (lbs)	TPHG (lbs)	Benzene (lbs)
12/01/97	13.02	0.0381	0.6508	<0.0064	95%	NC	0.000	0.000	3023	251
09/02/98	6.11	0.0000	0.3057	<0.0027	95%	NC	135	0.000	3157	251
10/19/98	0.549	0.0000	<0.1956	<0.0031	NC	NC	0.000	0.000	3157	251
11/10/98	0.069	0.0000	<0.1956	<0.0031	NC	NC	0.000	0.000	3157	251
06/10/99	2.47	0.0097	<0.1375	<0.0021	94%	NC	34.7	0.135	3192	251
09/09/99	0.0000	0.0180	<0.1693	<0.0026	NC	NC	0.000	0.217	3192	251
10/06/99	7.59	0.0247	0.2285	<0.0020	97%	92%	316	1.03	3509	252
12/01/99	7.00	0.0182	<0.2116	<0.0033	97%	82%	176	0.458	3685	252

<sup>1</sup> Extraction Rate, lbs/day = (Influent Flow, cfm)(Influent conc., ppmv)(g/mole)(60 min/hr)(24 hr/day)(28.3 L/cf) / (10<sup>6</sup>)(24.45 moles/L)(453.6 g/lb)  
where TPHG = 100 g/mole and Benzene = 78.1 g/mole; Influent conc. = 0, if reported as non-detect

<sup>2</sup> Emission Rate, lbs/day = (Effluent Flow, cfm)(Effluent conc., ppmv)(g/mole)(60 min/hr)(24 hr/day)(28.3 L/cf) / (10<sup>6</sup>)(24.45 moles/L)(453.6 g/lb)  
where TPHG = 100 g/mole and Benzene = 78.1 g/mole; Effluent conc. = Method Reporting Limit, if reported as non-detect

<sup>3</sup> Destruction Efficiency, % = (Extraction Rate - Emission Rate)(100) / (Extraction Rate); NC = Not Calculated due to non-detection.

<sup>4</sup> Period Removal, lbs = (Extraction Rate)(Uptime)



SHELL STATION

SIDEWALK

MARIN AVENUE

SAN PABLO AVENUE

MW-6  
( $<50/<0.5/17^*$ )

RW-1  
(1,200/2,600/140)

MW-2  
( $<50/<0.5/<3$ )

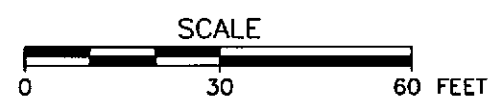
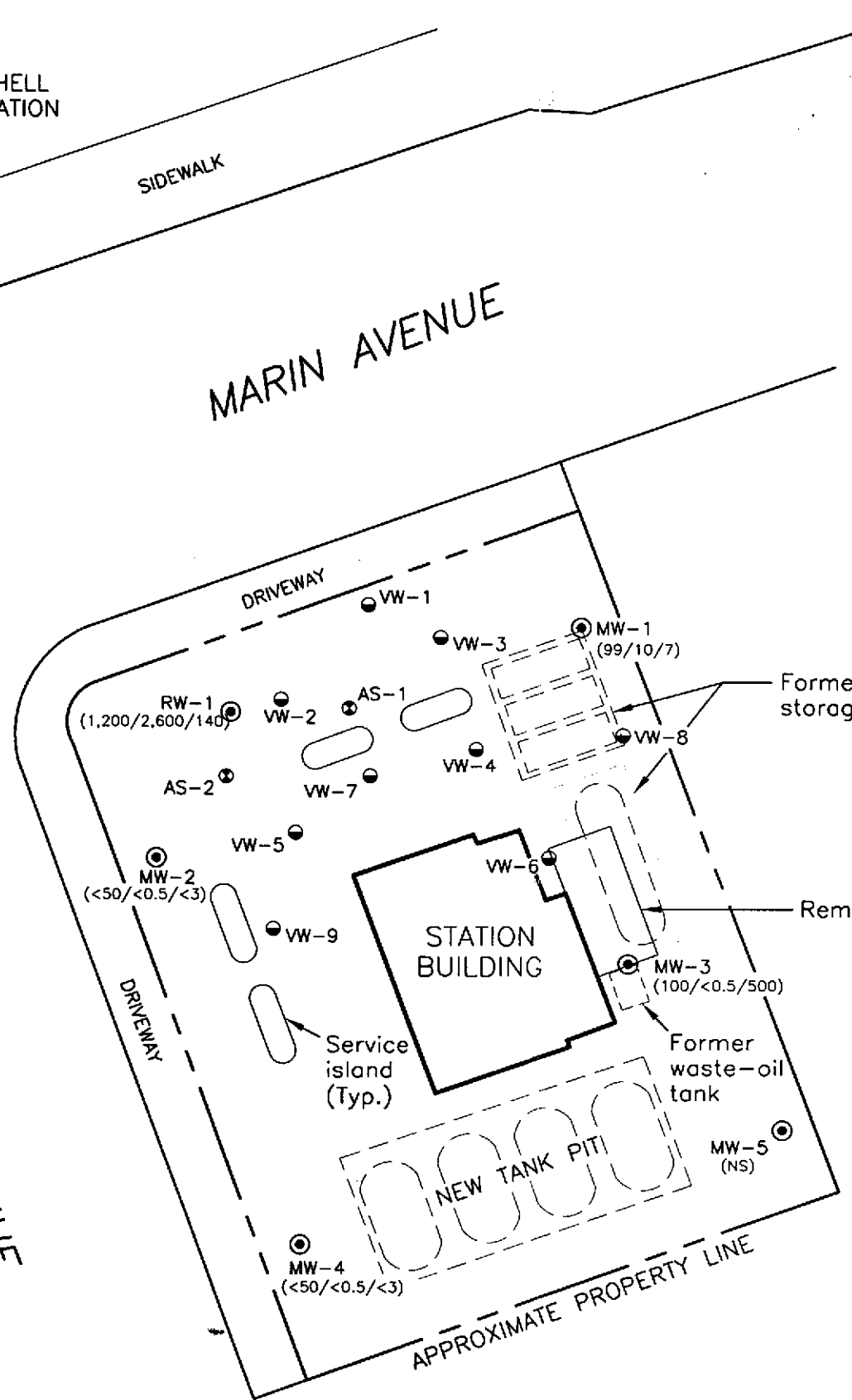
MW-4  
( $<50/<0.5/<3$ )

MW-5  
(NS)

MW-1  
(99/10/7)

MW-3  
(100/ $<0.5/500$ )

- EXPLANATION
- ⊙ Groundwater monitoring well
  - Vapor extraction well
  - ⊕ Air sparge well
- (99/10/7) Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 11/16/99
- < Not detected at or above the indicated laboratory detection limit
- Analyzed by EPA Method 8260



ARCO PRODUCTS COMPANY  
SERVICE STATION 2035

FIGURE 1  
 GROUNDWATER ANALYTICAL SUMMARY  
 FOURTH QUARTER 1999  
 1001 SAN PABLO AVENUE  
 ALBANY, CALIFORNIA



SHELL STATION

SIDEWALK

MARIN AVENUE

SAN PABLO AVENUE

SIDEWALK

Service island (Typ.)

STATION BUILDING

NEW TANK PIT

APPROXIMATE PROPERTY LINE

Former gasoline storage tank pit

Remediation compound

Former waste-oil tank

- EXPLANATION
- ⊙ Groundwater monitoring well
  - (31.61) Groundwater elevation (Ft.-MSL); measured 11/16/99
  - ? - - - Groundwater elevation contour (Ft.-MSL)
  - ← Approximate direction of groundwater flow showing gradient

MW-6 (27.43)

28

MW-2 (29.93)

29

RW-1 (30.38)

30

DRIVEWAY

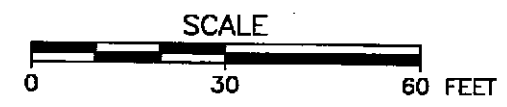
MW-4 (30.53)

MW-1 (31.61)

MW-3 (30.90)

MW-5 (31.47)

0.02



ARCO PRODUCTS COMPANY  
 SERVICE STATION 2035

FIGURE 2  
 GROUNDWATER ELEVATION CONTOURS  
 FOURTH QUARTER 1999  
 1001 SAN PABLO AVENUE  
 ALBANY, CALIFORNIA



**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<sup>®</sup> 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 IT's San Jose or Sacramento office location for temporary storage. IT 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 IT 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 IT to an ARCO-approved laboratory by courier or taken directly to the laboratory by the environmental sampler. Sample shipments from IT 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 IT 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)

# 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:

$$P = \pi r^2 h \times 7.48 \times 3$$

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 =  $\pm 0.1$  pH units

COND. =  $\pm 10\%$

TEMP. =  $\pm 1.0$  °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.

MONITORING WELL PURGING PROTOCOL

FIGURE

A-1



# WATER SAMPLE FIELD DATA SHEET

PROJECT NO: \_\_\_\_\_ SAMPLE ID: \_\_\_\_\_  
 PURGED BY: \_\_\_\_\_ CLIENT NAME: \_\_\_\_\_  
 SAMPLED BY: \_\_\_\_\_ 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  
 \_\_\_\_\_ Centrifugal Pump  
 \_\_\_\_\_ Submersible Pump  
 \_\_\_\_\_ Well Wizard™  
 Other: \_\_\_\_\_

\_\_\_\_\_ Bailer (Teflon)  
 \_\_\_\_\_ Bailer (PVC)  
 \_\_\_\_\_ Bailer (Stainless Steel)  
 \_\_\_\_\_ Dedicated

\_\_\_\_\_ 2" Bladder Pump  
 \_\_\_\_\_ Bomb Sampler  
 \_\_\_\_\_ Dipper  
 \_\_\_\_\_ Well Wizard™  
 Other: \_\_\_\_\_

\_\_\_\_\_ Bailer (Teflon)  
 \_\_\_\_\_ Bailer (Stainless Steel)  
 \_\_\_\_\_ Submersible Pump  
 \_\_\_\_\_ Dedicated

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 \_\_\_\_\_



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



RECEIVED  
DEC 28 1999  
BY:

December 13, 1999

Service Request No.: S9903605

Mr. Glen Vanderveen  
IT/EMCON  
2201 Broadway, Suite 101  
Oakland, CA 94612

RE: TO#24118.00/RAT8/2035 ALBANY

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on November 17, 1999. All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply to the sample(s) analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Signature of this CAS Analytical Report confirms that pages 2 through 13, following, have been thoroughly reviewed and approved for release.

Columbia Analytical Services is certified for environmental analyses by the California Department of Health Services (certificate number: 2352, expiration: January 31, 2001).

If you have any questions, please call me at (408) 748-9700.

Respectfully submitted,

Columbia Analytical Services, Inc.

Bernadette Troncales  
Project Chemist

Greg Jordan  
Laboratory Director

**COLUMBIA ANALYTICAL SERVICES, Inc.**

**Acronyms**

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company  
Project: TO#24118.00/RAT8/2035 ALBANY  
Sample Matrix: Water

Service Request: S9903605  
Date Collected: 11/16/99  
Date Received: 11/17/99

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-4(10)  
Lab Code: S9903605-001  
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	11/26/99	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	11/26/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	11/26/99	ND	

Approved By: \_\_\_\_\_

*MT*

Date: \_\_\_\_\_

12/13/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company  
Project: TO#24118.00/RAT8/2035 ALBANY  
Sample Matrix: Water

Service Request: S9903605  
Date Collected: 11/16/99  
Date Received: 11/17/99

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-6(13)  
Lab Code: S9903605-002  
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	11/26/99	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	11/26/99	ND	
Methyl tert -Butyl Ether	EPA 5030	8021B	3	1	NA	11/26/99	17	

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

12/13/99

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** TO#24118.00/RAT8/2035 ALBANY  
**Sample Matrix:** Water

**Service Request:** S9903605  
**Date Collected:** 11/16/99  
**Date Received:** 11/17/99

BTEX, MTBE and TPH as Gasoline

**Sample Name:** MW-3(30)  
**Lab Code:** S9903605-003  
**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	11/26/99	100	
Benzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	11/26/99	3.3	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	11/26/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	11/26/99	500	

Approved By: \_\_\_\_\_

*ht*

Date: \_\_\_\_\_

12/13/99





**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** TO#24118.00/RAT8/2035 ALBANY  
**Sample Matrix:** Water

**Service Request:** S9903605  
**Date Collected:** 11/16/99  
**Date Received:** 11/17/99

BTEX, MTBE and TPH as Gasoline

**Sample Name:** MW-1(26)  
**Lab Code:** S9903605-005  
**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	11/26/99	99	
Benzene	EPA 5030	8021B	0.5	1	NA	11/26/99	10	
Toluene	EPA 5030	8021B	0.5	1	NA	11/26/99	0.6	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	11/26/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	11/26/99	7	

Approved By: \_\_\_\_\_

*Handwritten signature*

Date: \_\_\_\_\_

*12/13/99*

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company  
Project: TO#24118.00/RAT8/2035 ALBANY  
Sample Matrix: Water

Service Request: S9903605  
Date Collected: 11/16/99  
Date Received: 11/17/99

BTEX, MTBE and TPH as Gasoline

Sample Name: RW-1(24)  
Lab Code: S9903605-006  
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	1	NA	11/26/99	1200	
Benzene	EPA 5030	8021B	0.5	50	NA	11/27/99	2600	
Toluene	EPA 5030	8021B	0.5	1	NA	11/26/99	16	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	11/26/99	86	
Xylenes, Total	EPA 5030	8021B	1	1	NA	11/26/99	41	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	11/26/99	140	

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

12/13/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company  
Project: TO#24118.00/RAT8/2035 ALBANY  
Sample Matrix: Water

Service Request: S9903605  
Date Collected: NA  
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank  
Lab Code: S991125-WB2  
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	11/25/99	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	11/25/99	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	11/25/99	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	11/25/99	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	11/25/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	11/25/99	ND	

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

12/13/99

**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** TO#24118.00/RAT8/2035 ALBANY  
**Sample Matrix:** Water

**Service Request:** S9903605  
**Date Collected:** NA  
**Date Received:** NA

BTEX, MTBE and TPH as Gasoline

**Sample Name:** Method Blank  
**Lab Code:** S991126-WB3  
**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	11/26/99	ND	
Benzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Toluene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Ethylbenzene	EPA 5030	8021B	0.5	1	NA	11/26/99	ND	
Xylenes, Total	EPA 5030	8021B	1	1	NA	11/26/99	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	3	1	NA	11/26/99	ND	

Approved By: \_\_\_\_\_

*PT*

Date: \_\_\_\_\_

12/13/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company  
 Project: TO#24118.00/RAT8/2035 ALBANY  
 Sample Matrix: Water

Service Request: S9903605  
 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: 8021B CA/LUFT

Units: PERCENT  
 Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			a,a,a-Trifluorotoluene	Fluorobenzene
MW-4(10)	S9903605-001		101	93
MW-6(13)	S9903605-002		101	93
MW-3(30)	S9903605-003		106	93
MW-2(16)	S9903605-004		97	93
MW-1(26)	S9903605-005		100	92
RW-1(24)	S9903605-006		91	92
Lab Control Sample	S991125-LCS		98	105
Dup Lab Control Sample	S991125-DLCS		95	105
Method Blank	S991125-WB2		104	92
Method Blank	S991126-WB3		101	93

CAS Acceptance Limits: 69-116 60-140

Approved By: \_\_\_\_\_

*BT*

Date: \_\_\_\_\_

12/13/99

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** ARCO Products Company  
**Project:** TO#24118.00/RAT8/2035 ALBANY  
**LCS Matrix:** Water

**Service Request:** S9903605  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** NA  
**Date Analyzed:** 11/25/99

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary  
 BTEX and TPH as Gasoline

**Sample Name:** Dup Lab Control Sample Units: ug/L (ppb)  
**Lab Code:** S991125-LCS, S991125-DLCS Basis: NA  
**Test Notes:**

**Percent Recovery**

Analyte	Prep Method	Analysis Method	True Value		Result		Percent Recovery		CAS Acceptance Limits	Relative Percent Difference	Result Notes
			LCS	DLCS	LCS	DLCS	LCS	DLCS			
Benzene	EPA 5030	8021B	50	50	50	48	100	96	75-135	4	
Toluene	EPA 5030	8021B	50	50	50	47	100	94	73-136	6	
Ethylbenzene	EPA 5030	8021B	50	50	49	47	98	94	69-142	4	
Gasoline	EPA 5030	CA/LUFT	500	500	480	470	96	94	75-135	2	

Approved By: \_\_\_\_\_

*Handwritten signature*

Date: \_\_\_\_\_

*Handwritten date: 12/13/99*

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company  
 Project: TO#24118.00/RAT8/2035 ALBANY

Service Request: S9903605  
 Date Analyzed: 11/25/99

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

Sample Name: ICV  
 Lab Code: ICV1  
 Test Notes:

Units: ug/L (ppb)  
 Basis: NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS	Percent Recovery	Result Notes
					Percent Recovery Acceptance Limits		
TPH as Gasoline	EPA 5030	CA/LUFT	500	480	85-115	96	
Benzene	EPA 5030	8021B	50	50	85-115	100	
Toluene	EPA 5030	8021B	50	49	85-115	98	
Ethylbenzene	EPA 5030	8021B	50	49	85-115	98	
Xylenes, Total	EPA 5030	8021B	150	150	85-115	100	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8021B	50	53	85-115	106	

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

12/13/99

ICV/032196



ARCO Facility no. **2035** City (Facility) **Albany** Project manager (Consultant) **Glen Vander Veen**  
 ARCO engineer **Paul Supple** Telephone no. (ARCO) Telephone no. (Consultant) **(408)453-7300** Fax no. (Consultant) **(408)437-9526**  
 Consultant name **EMCON** Address (Consultant) **2201 Broadway #101 Oakland, CA 94612**

Laboratory name **CAS**  
Contract number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 802/EPA 8020	BTEX/TPH/PCs/PAHs EPA 1602/816/20015	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM503E	EPA 801/8010	EPA 824/8240	EPA 825/8270	Semi Metals VOA <input type="checkbox"/> VOA <input type="checkbox"/>		CMM Metals EPA 8010/7000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org./DHS Lead EPA 7420/7421 <input type="checkbox"/>	Oxygenates (EPA 9260)
			Soil	Water	Other	Ice	Acid															

Method of shipment  
**Sampler will deliver**

MW-4(10)	2	①	X			X	HCL	11/16/99	9:30		X												
MW-6(13)	4	②	X			X	HCL		11:50		X											X	
MW-3(30)	2	③	X			X	HCL		10:30		X												
MW-2(16)	2	④	X			X	HCL		11:05		X												
MW-1(26)	2	⑤	X			X	HCL		9:45		X												
RW-1(24)	2	⑥	X			X	HCL	✓	11:30		X												

Special detection Limit/reporting  
**Lowest Possible**

Special QA/QC  
**As Normal**

Remarks  
**RAT 8**  
**2-40ml HCL**  
**VOAs**  
**#791643**

Condition of sample: **Received samples in cooler on ice 11/17/99 BY** Temperature received: **Due: 12/3/99 R11/D2**

Relinquished by sampler <i>Don W...</i>	Date 11/16/99	Time 13:40	Received by <i>Brian...</i>	Date 11/17/99	Time 10:55
Relinquished by	Date	Time	Received by	Date	Time
Relinquished by	Date	Time	Received by laboratory	Date	Time

Lab number

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

# Entech Analytical Labs, Inc.

CA ELAP# I-2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

December 07, 1999

Bernadette Troncales  
Columbia Analytical Services  
3334 Victor Court  
Santa Clara, CA 95054

<b>Order:</b> 17855	<b>Date Collected:</b> 11/16/99
<b>Project Name:</b> Arco 2035/Albany	<b>Date Received:</b> 11/30/99
<b>Project Number:</b> TO# 24118.00	<b>P.O. Number:</b> S9903605

**Project Notes:**

On November 30, 1999, 1 sample was received under documented chain of custody. Results for the following analyses are attached:

<u>Matrix</u>	<u>Test</u>	<u>Method</u>
Liquid	Oxygenates by EPA 8260B	EPA 8260B

Chemical analysis of these samples has been completed. Summaries of the data are contained on the following pages. USEPA protocols for sample storage and preservation were followed.

Entech Analytical Labs, Inc. is certified by the State of California (#I-2346). If you have any questions regarding procedures or results, please call me at 408-735-1550.

Sincerely,



Michelle L. Anderson  
Lab Director

# Entech Analytical Labs, Inc.

CA ELAP# I-2346

525 Del Rey Avenue, Suite E • Sunnyvale, CA 94086 • (408) 735-1550 • Fax (408) 735-1554

Columbia Analytical Services  
3334 Victor Court  
Santa Clara, CA 95054  
Attn: Bernadette Troncales

Date: 12/7/99  
Date Received: 11/30/99  
Project Name: Arco 2035/Albany  
Project Number: TO# 24118.00  
P.O. Number: S9903605  
Sampled By: Client

## Certified Analytical Report

Order ID: 17855

Lab Sample ID: 17855-001

Client Sample ID: MW-6

Sample Time: 11:50 AM

Sample Date: 11/16/99

Matrix: Liquid

Parameter	Result	Flag	DF	PQL	DLR	Units	Analysis Date	QC Batch ID	Method
tert-Butanol	ND		1	20	20	µg/L	11/30/99	WMS991130	EPA 8260B
Methyl-t-butyl Ether	17		1	5	5	µg/L	11/30/99	WMS991130	EPA 8260B
Diisopropyl Ether	ND		1	5	5	µg/L	11/30/99	WMS991130	EPA 8260B
Ethyl-t-butyl Ether	ND		1	5	5	µg/L	11/30/99	WMS991130	EPA 8260B
tert-Amyl Methyl Ether	ND		1	5	5	µg/L	11/30/99	WMS991130	EPA 8260B

Surrogate	Surrogate Recovery	Control Limits (%)
4-Bromofluorobenzene	94	65 - 135
Dibromofluoromethane	78	65 - 135
Toluene-d8	100	65 - 135

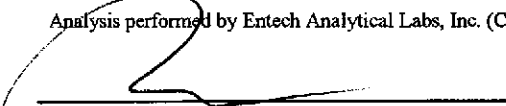
DF = Dilution Factor

ND = Not Detected

DLR = Detection Limit Reported

PQL = Practical Quantitation Limit

Analysis performed by Entech Analytical Labs, Inc. (CA ELAP #I-2346)

  
Michelle L. Anderson, Laboratory Director

Page 1 of 1

Environmental Analysis Since 1983

Entech Analytical Labs, Inc.

525 Del Rey Avenue, Suite E  
Sunnyvale, CA 94086

**QUALITY CONTROL RESULTS SUMMARY**

Volatile Organic Compounds  
Matrix Spike and Matrix Spike Duplicate

QC Batch #: WGCMS991130  
Matrix: Liquid  
Units: µg/L

Date analyzed: 12/02/99  
Spiked Sample: 17771-021

PARAMETER	Method #	SA µg/L	SR µg/L	SP µg/L	SP %R	SPD µg/L	SPD %R	RPD	QC LIMITS	
									RPD	%R
1,1- Dichloroethene	8240/8260	25.0	ND	17.7	71	17.6	70	0.6	25	50-150
Methyl-tert-butyl ether	8240/8260	25.0	ND	23.4	94	19.3	77	19.2	25	50-150
Benzene	8240/8260	25.0	ND	23.6	94	23.5	94	0.4	25	50-150
Trichloroethene	8240/8260	25.0	ND	19.6	78	19.5	78	0.5	25	50-150
Toluene	8240/8260	25.0	ND	24.2	97	24.9	100	2.9	25	50-150
Chlorobenzene	8240/8260	25.0	ND	23.3	93	23.1	92	0.9	25	50-150
<i>Surrogates</i>										
Dibromofluoromethane	8240/8260		76%	87%		76%				65-135
MTBE-d3	8240/8260		128%	131%		101%				65-135
Toluene -d8	8240/8260		96%	97%		95%				65-135
4-Bromofluorobenzene	8240/8260		92%	103%		103%				65-135

Definition of Terms:

- na: Not Analyzed in QC batch
- SA: Spike Added
- SR: Sample Result
- RPD(%): Duplicate Analysis - Relative Percent Difference
- SP: Spike Result
- SP (%R): Spike % Recovery
- SPD: Spike Duplicate Result
- SPD (%R): Spike Duplicate % Recovery

## QUALITY CONTROL RESULTS SUMMARY

Volatile Organic Compounds  
Laboratory Control SampleQC Batch #: WMS991130  
Matrix: Liquid  
Units: µg/LDate analyzed: 11/30/99  
Spiked Sample: Blank Spike

PARAMETER	Method #	SA µg/L	SR µg/L	SP µg/L	SP %R	SPD µg/L	SPD %R	RPD	QC LIMITS	
									RPD	%R
1,1- Dichloroethene	8240/8260	40	ND	42.1	105	42.7	107	1.4	25	50-150
Methyl-tert-butyl ether	8240/8260	40	ND	38.0	95	38.2	96	0.5	25	50-150
Benzene	8240/8260	40	ND	40.5	101	39.8	100	1.7	25	50-150
Trichloroethene	8240/8260	40	ND	38.2	96	40.0	100	4.6	25	50-150
Toluene	8240/8260	40	ND	41.6	104	41.5	104	0.2	25	50-150
Chlorobenzene	8240/8260	40	ND	40.9	102	40.4	101	1.2	25	50-150
<i>Surrogates</i>										
Dibromofluoromethane	8240/8260		82%	104%		85%				65-135
MTBE-d3	8240/8260		104%	87%		103%				65-135
Toluene -d8	8240/8260		101%	96%		95%				65-135
4-Bromofluorobenzene	8240/8260		98%	103%		98%				65-135

## Definition of Terms:

- na: Not Analyzed in QC batch
- SA: Spike Added
- SR: Sample Result
- RPD(%): Duplicate Analysis - Relative Percent Difference
- SP: Spike Result
- SP (%R): Spike % Recovery
- SPD: Spike Duplicate Result
- SPD (%R): Spike Duplicate % Recovery



**APPENDIX C**  
**FIELD DATA SHEETS**

**FIELD REPORT**  
**DEPTH TO WATER / FLOATING PRODUCT SURVEY**

PROJECT # : 792211

STATION ADDRESS : 101 San Pablo Avenue, Albany

DATE : 11/16/99

ARCO STATION # : 2035

FIELD TECHNICIAN : Don Watenpaugh

DAY : Tuesday

DTW Order	WELL ID	Well Box Seal Condition	Type Of Well Box	Well Box Secure	Lock Number	Type Of Well Cap	TDC/TOB		DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
							FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)				
1	MW-04	OK	15/16"	yp	ARCO	LWC	9.80/10.45	9.80/10.45	NA	NA	25.0/25.65	
2	MW-6	0	15/16"	yp	ARCO	LWC	12.70/13.25	12.70/13.25	NA	NA	24.8/25.35	
3	MW-3	OK	15/16"	yp	ARCO	LWC	10.54/11.15	10.54/11.15	NA	NA	32.8/33.41	
4	MW-05	OK	15/16"	yp	ARCO	LWC	10.37/11.02	10.37/11.02	NA	NA	24.25/24.95	
5	MW-2	OK	15/16"	yp	ARCO	LWC	10.95/10.78	10.45/10.78	NA	NA	28.75/29.08	
6	MW-1	OK	15/16"	OK		LWC	9.80/10.20	9.80/10.20	NA	NA	29.65/30.00	8:50
7	RW-1	OK	3/4"	yp	None	LWC	9.95/10.6	9.95/10.6	NA	NA	25.4/26.05	

**SURVEY POINTS ARE TOP OF WELL CASINGS**

**RECEIVED**  
JAN 12 2000  
BY: \_\_\_\_\_





# WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

**EMCON**

PROJECT NO : 792211  
 PURGED BY : Don Watenpaugh  
 SAMPLED BY : Don Watenpaugh

SAMPLE ID : MW-4(10')  
 CLIENT NAME : ARCO #2035  
 LOCATION : Albany, California

TYPE: Groundwater X Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_  
 CASING DIAMETER (inches): 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 X 4.5 \_\_\_\_\_ 6 \_\_\_\_\_ Other \_\_\_\_\_

CASING ELEVATION (feet/MSL) : N/A VOLUME IN CASING (gal.) : \_\_\_\_\_  
 DEPTH OF WELL (feet) : 25.0 CALCULATED PURGE (gal.) : NA  
 DEPTH OF WATER (feet) : 9.80 ACTUAL PURGE VOL. (gal.) : \_\_\_\_\_

DATE PURGED : 11/16/99 END PURGE : NA  
 DATE SAMPLED : 11/16/99 SAMPLING TIME : 9:30

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>9:30</u>	<u>NA</u>	<u>7.10</u>	<u>230</u>	<u>63.3</u>	<u>Clear</u>	<u>trace</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

OTHER: Dissolved Oxygen= 0.0 ODOR: None \_\_\_\_\_  
 (COBALT 0-100) (NTU 0-200)

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

### PURGING EQUIPMENT

### SAMPLING EQUIPMENT

2" Bladder Pump     Bailer (Teflon)  
 Centrifugal Pump     Bailer (PVC)  
 Submersible Pump     Bailer (Stainless Steel)  
 Well Wizard<sup>®</sup>     Dedicated  
 Other: NA

2" Bladder Pump     Bailer (Teflon)  
 Bomb Sampler     Bailer (Stainless Steel)  
 Dipper     Submersible Pump  
 Well Wizard<sup>®</sup>     Dedicated  
 Other: Disposable Teflon Bailer

WELL INTEGRITY: OK LOCK: OK

REMARKS: NO Purge - H<sub>2</sub>O level below screen

pH, E.C., Temp. Meter Calibration: Date: \_\_\_\_\_ Time: \_\_\_\_\_ Meter Serial No.: \_\_\_\_\_  
 E.C. 1000 / \_\_\_\_\_ pH 7 / \_\_\_\_\_ pH 10 / \_\_\_\_\_ pH 4 / \_\_\_\_\_  
 Temperature °F \_\_\_\_\_  
 SIGNATURE: Don Watenpaugh REVIEWED BY: \_\_\_\_\_ PAGE 1 OF 6



# WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

**EMCON**

PROJECT NO : 792211

SAMPLE ID : MW-6 ( )

PURGED BY : Don Watenpaugh

CLIENT NAME : ARCO #2035

SAMPLED BY : Don Watenpaugh

LOCATION : Albany, California

TYPE: Groundwater  Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_

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

CASING ELEVATION (feet/MSL) : N/A VOLUME IN CASING (gal.) : \_\_\_\_\_

DEPTH OF WELL (feet) : 12.70 CALCULATED PURGE (gal.) : \_\_\_\_\_

DEPTH OF WATER (feet) : 24.15 ACTUAL PURGE VOL. (gal.) : \_\_\_\_\_

DATE PURGED : 11/16/99 END PURGE : NA

DATE SAMPLED : 11/16/99 SAMPLING TIME : 11:50

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>11:50</u>	<u>NA</u>	<u>6.99</u>	<u>400</u>	<u>64.8</u>	<u>clear</u>	<u>trace</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

OTHER: Dissolved Oxygen= 0.0 ODOR: \_\_\_\_\_

N/A (COBALT 0-100) N/A (NTU 0-200)

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

### PURGING EQUIPMENT

### SAMPLING EQUIPMENT

<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)
<input checked="" type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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 <sup>®</sup>	<input type="checkbox"/> Dedicated	<input type="checkbox"/> Well Wizard <sup>®</sup>	<input type="checkbox"/> Dedicated
Other: _____		Other: <u>Disposable Teflon Bailer</u>	

WELL INTEGRITY: \_\_\_\_\_ LOCK: \_\_\_\_\_

REMARKS: Water level below screen / NO purge

\_\_\_\_\_

\_\_\_\_\_

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

E.C. 1000 / \_\_\_\_\_ pH 7 / \_\_\_\_\_ pH 10 / \_\_\_\_\_ pH 4 / \_\_\_\_\_

Temperature °F \_\_\_\_\_

SIGNATURE: Don Watenpaugh REVIEWED BY: \_\_\_\_\_ PAGE 2 OF 6

# WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



PROJECT NO : 792211                      SAMPLE ID : MW-3 ( )  
 PURGED BY : Don Watenpaugh                      CLIENT NAME : ARCO #2035  
 SAMPLED BY : Don Watenpaugh                      LOCATION : Albany, California

TYPE: Groundwater X    Surface Water \_\_\_\_\_    Leachate \_\_\_\_\_    Other \_\_\_\_\_  
 CASING DIAMETER (inches): 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 X 4.5 \_\_\_\_\_ 6 \_\_\_\_\_ Other \_\_\_\_\_

CASING ELEVATION (feet/MSL) : N/A                      VOLUME IN CASING (gal.) : 14.6  
 DEPTH OF WELL (feet) : 10.54                      CALCULATED PURGE (gal.) : 44  
 DEPTH OF WATER (feet) : 32.8                      ACTUAL PURGE VOL. (gal.) : 24

DATE PURGED : 11/16/99                      END PURGE : 10:22  
 DATE SAMPLED : 11/16/99                      SAMPLING TIME : 10:30

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>10:16</u>	<u>14</u>	<u>6.95</u>	<u>360</u>	<u>64.0</u>	<u>Cloudy</u>	<u>Light</u>
<u>10:22</u>	<u>24</u>	<u>6.91</u>	<u>370</u>	<u>65.8</u>	<u>Cloudy</u>	<u>Light</u>

OTHER: Dissolved Oxygen= 6.2                      ODOR: Slight/Faint                      N/A                      N/A  
(COBALT 0-100)                      (NTU 0-200)

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

PURGING EQUIPMENT

SAMPLING EQUIPMENT

<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)
<input checked="" type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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 <sup>®</sup>	<input type="checkbox"/> Dedicated	<input type="checkbox"/> Well Wizard <sup>®</sup>	<input type="checkbox"/> Dedicated
Other: _____		Other: <u>Disposable Teflon Bailer</u>	

WELL INTEGRITY: \_\_\_\_\_ LOCK: \_\_\_\_\_

REMARKS: Well dry @ 24 gallons

---



---



---

pH, E.C., Temp. Meter Calibration: Date: \_\_\_\_\_ Time: \_\_\_\_\_ Meter Serial No.: \_\_\_\_\_  
 E.C. 1000 / \_\_\_\_\_ pH 7 / \_\_\_\_\_ pH 10 / \_\_\_\_\_ pH 4 / \_\_\_\_\_

Temperature °F \_\_\_\_\_  
 SIGNATURE: Don Watenpaugh                      REVIEWED BY: \_\_\_\_\_ PAGE 3 OF 6



# WATER SAMPLE FIELD DATA SHEET

Rev. 1/97

**EMCON**

PROJECT NO : 792211

SAMPLE ID : MW-2 ( )

PURGED BY : Don Watenpaugh

CLIENT NAME : ARCO #2035

SAMPLED BY : Don Watenpaugh

LOCATION : Albany, California

TYPE: Groundwater X Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_

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

CASING ELEVATION (feet/MSL) : N/A VOLUME IN CASING (gal.) : 12.0  
 DEPTH OF WELL (feet) : 10.45 CALCULATED PURGE (gal.) : 36.0  
 DEPTH OF WATER (feet) : 28.75 ACTUAL PURGE VOL. (gal.) : 36

DATE PURGED : 11/16/99 END PURGE : 11:00  
 DATE SAMPLED : 11/16/99 SAMPLING TIME : 11:05

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>10:50</u>	<u>12</u>	<u>7.02</u>	<u>420</u>	<u>66.4</u>	<u>clear</u>	<u>trace</u>
<u>10:55</u>	<u>24</u>	<u>7.18</u>	<u>440</u>	<u>67.8</u>	<u>clear</u>	<u>trace</u>
<u>11:00</u>	<u>36</u>	<u>7.17</u>	<u>450</u>	<u>69.0</u>	<u>clear</u>	<u>trace</u>
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

OTHER: Dissolved Oxygen= 2.5 ODOR: faint \_\_\_\_\_ N/A \_\_\_\_\_ N/A  
(COBALT 0-100) (NTU 0-200)

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

### PURGING EQUIPMENT

### SAMPLING EQUIPMENT

2" Bladder Pump       Bailer (Teflon)  
 Centrifugal Pump       Bailer (PVC)  
 Submersible Pump       Bailer (Stainless Steel)  
 Well Wizard<sup>®</sup>       Dedicated  
 Other: \_\_\_\_\_

2" Bladder Pump       Bailer (Teflon)  
 Bomb Sampler       Bailer (Stainless Steel)  
 Dipper       Submersible Pump  
 Well Wizard<sup>®</sup>       Dedicated  
 Other: Disposable Teflon Bailer

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 4 OF 6

62  
12  
74  
86  
98

# WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



PROJECT NO: 792211  
 PURGED BY: Don Watenpaugh  
 SAMPLED BY: Don Watenpaugh

SAMPLE ID: MW-1 (29)  
 CLIENT NAME: ARCO #2035  
 LOCATION: Albany, California

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

CASING ELEVATION (feet/MSL): N/A VOLUME IN CASING (gal.): 131  
 (TOL) DEPTH OF WELL (feet): 29.65 CALCULATED PURGE (gal.): 40.0  
 DEPTH OF WATER (feet): 9.80 ACTUAL PURGE VOL. (gal.): 14.0

DATE PURGED: 11/16/99 END PURGE: 9:13  
 DATE SAMPLED: 11/16/99 SAMPLING TIME: 9:45

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>9:09</u>	<u>10</u>	<u>7.46</u>	<u>380</u>	<u>63.7</u>	<u>cloudy</u>	<u>light</u>
<u>9:13</u>	<u>14</u>	<u>7.42</u>	<u>370</u>	<u>66.5</u>	<u>cloudy</u>	<u>light</u>

OTHER: Dissolved Oxygen= 2.1 ppm ODOR: none N/A N/A  
(COBALT 0-100) (NTU 0-200)

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

**PURGING EQUIPMENT**

2" Bladder Pump  Bailer (Teflon)  
 Centrifugal Pump  Bailer (PVC)  
 Submersible Pump  Bailer (Stainless Steel)  
 Well Wizard<sup>®</sup>  Dedicated  
 Other: \_\_\_\_\_

**SAMPLING EQUIPMENT**

2" Bladder Pump  Bailer (Teflon)  
 Bomb Sampler  Bailer (Stainless Steel)  
 Dipper  Submersible Pump  
 Well Wizard<sup>®</sup>  Dedicated  
 Other:  Disposable Teflon Bailer

WELL INTEGRITY: OK LOCK: LO

REMARKS: DO<sub>2</sub> - 2.1 ppm Well dry @ 14 gallons

pH, E.C., Temp. Meter Calibration: Date: \_\_\_\_\_ Time: \_\_\_\_\_ Meter Serial No.: \_\_\_\_\_  
 E.C. 1000 / \_\_\_\_\_ pH 7 / \_\_\_\_\_ pH 4 / \_\_\_\_\_

Temperature °F \_\_\_\_\_

SIGNATURE: Don Watenpaugh REVIEWED BY: \_\_\_\_\_ PAGE 5 OF 6

# WATER SAMPLE FIELD DATA SHEET

Rev. 1/97



**emcon**

PROJECT NO: 792211

SAMPLE ID: RW-1 ( )

PURGED BY: Don Watenpaugh

CLIENT NAME: ARCO #2035

SAMPLED BY: Don Watenpaugh

LOCATION: Albany, California

TYPE: Groundwater X Surface Water \_\_\_\_\_ Leachate \_\_\_\_\_ Other \_\_\_\_\_

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

CASING ELEVATION (feet/MSL): N/A VOLUME IN CASING (gal.): ~~200~~ 225  
 DEPTH OF WELL (feet): 25.0 CALCULATED PURGE (gal.): 0 67.5  
 DEPTH OF WATER (feet): 9.95 ACTUAL PURGE VOL. (gal.): ~~45~~ 35

DATE PURGED: 11/16/99 END PURGE: 11:20  
 DATE SAMPLED: 11/16/99 SAMPLING TIME: 11:30

TIME (2400 HR)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>11:15</u>	<u>22</u>	<u>7.07</u>	<u>490</u>	<u>67.7</u>	<u>clear</u>	<u>trace</u>
<u>11:20</u>	<u>39</u>	<u>6.99</u>	<u>490</u>	<u>68.8</u>	<u>clear</u>	<u>trace</u>

OTHER: Dissolved Oxygen= 1.4 ppm ODOR: fruit N/A N/A  
(COBALT 0-100) (NTU 0-200)

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

PURGING EQUIPMENT

SAMPLING EQUIPMENT

<input checked="" type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailer (Teflon)
<input checked="" type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailer (PVC)	<input type="checkbox"/> Bomb 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 <sup>®</sup>	<input type="checkbox"/> Dedicated	<input type="checkbox"/> Well Wizard <sup>®</sup>	<input type="checkbox"/> Dedicated
Other: _____		Other: <u>Disposable Teflon Bailer</u>	

WELL INTEGRITY: \_\_\_\_\_ LOCK: \_\_\_\_\_

REMARKS: Well dry @ 35 gallons

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

E.C. 1000 / \_\_\_\_\_ pH 7 / \_\_\_\_\_ pH 10 / \_\_\_\_\_ pH 4 / \_\_\_\_\_

Temperature °F \_\_\_\_\_

SIGNATURE: Don Watenpaugh REVIEWED BY: \_\_\_\_\_ PAGE 6 OF 6



**APPENDIX D**

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





October 8, 1999

Service Request No.: S9903109

Mr. Glen Vanderveen  
IT/EMCON  
2201 Broadway, Suite 101  
Oakland, CA 94612

**RE: TO#24057.00/RAT8/2035 OAKLAND**

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on October 6, 1999. All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply to the sample(s) analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Signature of this CAS Analytical Report confirms that pages 2 through 13, following, have been thoroughly reviewed and approved for release.

Columbia Analytical Services is certified for environmental analyses by the California Department of Health Services (certificate number: 1496, expiration: January 31, 2001).

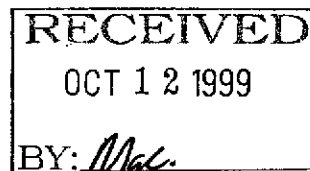
If you have any questions, please call me at (408) 748-9700.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Bernadette Troncales  
Project Chemist

Greg Jordan  
Laboratory Director



**COLUMBIA ANALYTICAL SERVICES, Inc.**

**Acronyms**

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



**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** ARCO Products Company  
**Project:** TO#24057.00/RAT8/2035 OAKLAND  
**Sample Matrix:** Air

**Service Request:** S9903109  
**Date Collected:** 10/6/99  
**Date Received:** 10/6/99

BTEX and Total Volatile Hydrocarbons

**Sample Name:** I-1  
**Lab Code:** S9903109-001  
**Test Notes:**

**Units:** ppmV  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.1	1	NA	10/6/99	1	
Toluene	NONE	8021B	0.1	1	NA	10/6/99	2.9	
Ethylbenzene	NONE	8021B	0.1	1	NA	10/6/99	ND	
Xylenes, Total	NONE	8021B	0.2	1	NA	10/6/99	0.7	
<b>Total Volatile Hydrocarbons:</b>								
C1 - C5	NONE	8015M	5	1	NA	10/6/99	720	
C6 - C12	NONE	8015M	5	1	NA	10/6/99	240	
TPH as Gasoline*	NONE	8015M	5	1	NA	10/6/99	240	
Methyl tert-Butyl Ether	NONE	8021B	0.8	1	NA	10/6/99	67	

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

Approved By: \_\_\_\_\_ *AS* \_\_\_\_\_ Date: 10/11/99











**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** ARCO Products Company  
**Project:** TO#24057.00/RAT8/2035 OAKLAND  
**Sample Matrix:** Air

**Service Request:** S9903109  
**Date Collected:** 10/6/99  
**Date Received:** 10/6/99  
**Date Extracted:** NA  
**Date Analyzed:** 10/6/99

Duplicate Summary  
 BTEX and Total Volatile Hydrocarbons

**Sample Name:** BATCH QC  
**Lab Code:** S9903054-001DUP  
**Test Notes:**

**Units:** mg/m3  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	NONE	8021B	0.4	7.1	7.1	7.1	<1	
Toluene	NONE	8021B	0.4	45	44	45	2	
Ethylbenzene	NONE	8021B	0.5	5.1	4.5	4.8	13	
Xylenes, Total	NONE	8021B	0.9	24	26	25	8	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8015M	12	1740	1780	1760	2	
C6 - C12	NONE	8015M	20	960	890	925	8	
TPH as Gasoline*	NONE	8015M	20	960	890	925	8	
Methyl tert-Butyl Ether	NONE	8021B	3	44	45	45	2	

Approved By: \_\_\_\_\_

*ds*

Date: \_\_\_\_\_

*10/11/99*

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** ARCO Products Company  
**Project:** TO#24057.00/RAT8/2035 OAKLAND  
**Sample Matrix:** Air

**Service Request:** S9903109  
**Date Collected:** 10/6/99  
**Date Received:** 10/6/99  
**Date Extracted:** NA  
**Date Analyzed:** 10/6/99

Duplicate Summary  
 BTEX and Total Volatile Hydrocarbons

**Sample Name:** BATCH QC  
**Lab Code:** S9903054-001DUP  
**Test Notes:**

**Units:** ppmV  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	NONE	8021B	0.1	2.2	2.2	2	<1	
Toluene	NONE	8021B	0.1	12	12	12	<1	
Ethylbenzene	NONE	8021B	0.1	1.2	1.0	1.1	10	
Xylenes, Total	NONE	8021B	0.2	5.5	6.0	5.8	3	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8015M	5	733	750	742	2	
C6 - C12	NONE	8015M	5	234	218	226	8	
TPH as Gasoline*	NONE	8015M	5	234	218	226	8	
Methyl tert-Butyl Ether	NONE	8021B	0.8	12	13	13	8	

Approved By: \_\_\_\_\_

*mt*

Date: \_\_\_\_\_

*10/11/99*

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client:** ARCO Products Company  
**Project:** TO#24057.00/RAT8/2035 OAKLAND  
**LCS Matrix:** Air

**Service Request:** S9903109  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** NA  
**Date Analyzed:** 10/6/99

Laboratory Control Sample Summary  
 BTEX and TPH as Gasoline

**Sample Name:** Lab Control Sample  
**Lab Code:** S991006-LCS  
**Test Notes:**

**Units:** mg/m3  
**Basis:** NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	NONE	8021B	24	25	104	60-140	
Toluene	NONE	8021B	24	24	100	60-140	
Ethylbenzene	NONE	8021B	24	25	104	60-140	
Gasoline	NONE	8015M	210	213	101	60-140	

Approved By: \_\_\_\_\_

*ds*

Date: \_\_\_\_\_

*10/11/99*

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company  
Project: TO#24057.00/RAT8/2035 OAKLAND  
LCS Matrix: Air

Service Request: S9903109  
Date Collected: NA  
Date Received: NA  
Date Extracted: NA  
Date Analyzed: 10/6/99

Laboratory Control Sample Summary  
BTEX and TPH as Gasoline

Sample Name: Lab Control Sample  
Lab Code: S991006-LCS  
Test Notes:

Units: ppmV  
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	NONE	8021B	7.5	7.8	104	60-140	
Toluene	NONE	8021B	6.4	6.4	100	60-140	
Ethylbenzene	NONE	8021B	5.5	5.8	105	60-140	
Gasoline	NONE	8015M	210	52	25	60-140	

Approved By: \_\_\_\_\_

*HT*

Date: \_\_\_\_\_

*10/6/99*

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company  
Project: TO#24057.00/RAT8/2035 OAKLAND

Service Request: S9903109  
Date Analyzed: 10/6/99

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

Sample Name: ICV Units: mg/m3  
Lab Code: ICV1 Basis: NA  
Test Notes:

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	NONE	8021B	25	26	104	
Toluene	NONE	8021B	25	25	100	
Ethylbenzene	NONE	8021B	25	26	104	
Xylenes, Total	NONE	8021B	75	77	103	
Gasoline	NONE	8015M	250	241	96	
Methyl tert-Butyl Ether	NONE	8021B	25	25	100	

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

10/11/99

ICV032196



2035



December 2, 1999

Service Request No.: S9903807

Mr. Glen Vanderveen  
IT/EMCON  
2201 Broadway, Suite 101  
Oakland, CA 94612

**RE: TO#24057.00/RAT8**

Dear Mr. Vanderveen:

Enclosed are the results of the sample(s) submitted to our laboratory on December 1, 1999. All analyses were performed in accordance with our laboratory's quality assurance program. Results are intended to be considered in their entirety and apply to the sample(s) analyzed. Columbia Analytical Services is not responsible for use of less than the complete report. Signature of this CAS Analytical Report confirms that pages 2 through 15, following, have been thoroughly reviewed and approved for release.

Columbia Analytical Services is certified for environmental analyses by the California Department of Health Services (certificate number: 2352, expiration: January 31, 2001).

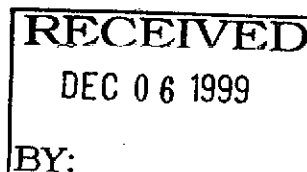
If you have any questions, please call me at (408) 748-9700.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Bernadette Troncales  
Project Chemist

Greg Jordan  
Laboratory Director



**COLUMBIA ANALYTICAL SERVICES, Inc.**

**Acronyms**

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





**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** IT/Emcon  
**Project:** TO#24057.00/RAT8  
**Sample Matrix:** Air

**Service Request:** S9903807  
**Date Collected:** 12/1/99  
**Date Received:** 12/1/99

BTEX and Total Volatile Hydrocarbons

**Sample Name:** I-1  
**Lab Code:** S9903807-001  
**Test Notes:**

**Units:** ppmV  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.1	2	NA	12/2/99	0.7	
Toluene	NONE	8021B	0.1	2	NA	12/2/99	0.8	
Ethylbenzene	NONE	8021B	0.1	2	NA	12/2/99	<2	C1
Xylenes, Total	NONE	8021B	0.2	2	NA	12/2/99	0.2	
<b>Total Volatile Hydrocarbons:</b>								
C1 - C5	NONE	8015M	5	2	NA	12/2/99	720	
C6 - C12	NONE	8015M	5	2	NA	12/2/99	210	
TPH as Gasoline*	NONE	8015M	5	2	NA	12/2/99	210	
Methyl tert-Butyl Ether	NONE	8021B	0.8	2	NA	12/2/99	61	

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

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

Approved By: \_\_\_\_\_

*Levi Z...*

Date: 12-2-99



**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

**Client:** IT/Emcon  
**Project:** TO#24057.00/RAT8  
**Sample Matrix:** Air

**Service Request:** S9903807  
**Date Collected:** 12/1/99  
**Date Received:** 12/1/99

BTEX and Total Volatile Hydrocarbons

**Sample Name:** E-1  
**Lab Code:** S9903807-002  
**Test Notes:**

**Units:** ppmV  
**Basis:** NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Benzene	NONE	8021B	0.1	1	NA	12/1/99	ND	
Toluene	NONE	8021B	0.1	1	NA	12/1/99	ND	
Ethylbenzene	NONE	8021B	0.1	1	NA	12/1/99	ND	
Xylenes, Total	NONE	8021B	0.2	1	NA	12/1/99	ND	
<b>Total Volatile Hydrocarbons:</b>								
C1 - C5	NONE	8015M	5	1	NA	12/1/99	8.8	
C6 - C12	NONE	8015M	5	1	NA	12/1/99	ND	
TPH as Gasoline*	NONE	8015M	5	1	NA	12/1/99	ND	
Methyl tert-Butyl Ether	NONE	8021B	0.8	1	NA	12/1/99	1.4	

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

Approved By: \_\_\_\_\_

*Ken J...*

Date: 12-2-99











COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IT/Emcon  
 Project: TO#24057.00/RAT8  
 Sample Matrix: Air

Service Request: S9903807  
 Date Collected: 12/1/99  
 Date Received: 12/1/99  
 Date Extracted: NA  
 Date Analyzed: 12/1/99

Duplicate Summary  
 BTEX and Total Volatile Hydrocarbons

Sample Name: BATCH QC  
 Lab Code: S9903778-001DUP  
 Test Notes:

Units: mg/m3  
 Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	NONE	8021B	0.4	18	16	17	12	
Toluene	NONE	8021B	0.4	62	58	60	6.7	
Ethylbenzene	NONE	8021B	0.5	8.6	7.7	8.2	11	
Xylenes, Total	NONE	8021B	0.9	55	45	50	20	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8015M	12	3300	3100	3200	6.3	
C6 - C12	NONE	8015M	20	2500	2500	2500	<1	
TPH as Gasoline*	NONE	8015M	20	2500	2500	2500	<1	
Methyl tert-Butyl Ether	NONE	8021B	3	72	72	72	<1	

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

12-2-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IT/Emcon  
 Project: TO#24057.00/RAT8  
 Sample Matrix: Air

Service Request: S9903807  
 Date Collected: 12/1/99  
 Date Received: 12/1/99  
 Date Extracted: NA  
 Date Analyzed: 12/1/99

Duplicate Summary  
 BTEX and Total Volatile Hydrocarbons

Sample Name: BATCH QC  
 Lab Code: S9903778-001DUP  
 Test Notes:

Units: ppmV  
 Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
Benzene	NONE	8021B	0.1	5.6	5.0	5.3	11	
Toluene	NONE	8021B	0.1	16	15	16	6.3	
Ethylbenzene	NONE	8021B	0.1	2.0	1.8	1.9	11	
Xylenes, Total	NONE	8021B	0.2	13	10	12	25	
Total Volatile Hydrocarbons								
C1 - C5	NONE	8015M	5	1400	1300	1,350	7	
C6 - C12	NONE	8015M	5	610	610	610	<1	
TPH as Gasoline*	NONE	8015M	5	610	610	610	<1	
Methyl tert-Butyl Ether	NONE	8021B	0.8	20	20	20	<1	

Approved By: \_\_\_\_\_



Date: 12-2-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IT/Emcon  
 Project: TO#24057.00/RAT8  
 LCS Matrix: Air

Service Request: S9903807  
 Date Collected: NA  
 Date Received: NA  
 Date Extracted: NA  
 Date Analyzed: 12/1/99

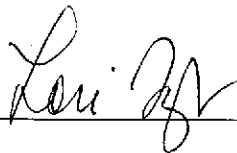
Laboratory Control Sample Summary  
 BTEX and TPH as Gasoline

Sample Name: Lab Control Sample  
 Lab Code: S991201-LCS  
 Test Notes:

Units: mg/m3  
 Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS	Result Notes
						Percent Recovery Acceptance Limits	
Benzene	NONE	8021B	24	24	100	60-140	
Toluene	NONE	8021B	24	18	75	60-140	
Ethylbenzene	NONE	8021B	24	26	108	60-140	
Gasoline	NONE	8015M	210	190	90	60-140	

Approved By: \_\_\_\_\_



Date: \_\_\_\_\_

12-2-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IT/Emcon  
Project: TO#24057.00/RAT8  
LCS Matrix: Air

Service Request: S9903807  
Date Collected: NA  
Date Received: NA  
Date Extracted: NA  
Date Analyzed: 12/1/99

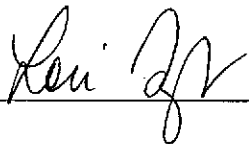
Laboratory Control Sample Summary  
BTEX and TPH as Gasoline

Sample Name: Lab Control Sample  
Lab Code: S991201-LCS  
Test Notes:

Units: ppmV  
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Benzene	NONE	8021B	7.5	7.5	100	60-140	
Toluene	NONE	8021B	6.4	4.8	75	60-140	
Ethylbenzene	NONE	8021B	5.5	6.0	109	60-140	
Gasoline	NONE	8015M	51	46	90	60-140	

Approved By: \_\_\_\_\_



Date: 12-2-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IT/Emcon  
Project: TO#24057.00/RAT8

Service Request: S9903807  
Date Analyzed: 12/1/99

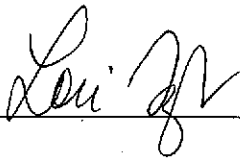
Initial Calibration Verification (ICV) Summary  
BTEX and Total Volatile Hydrocarbons

Sample Name: ICV Units: mg/m3  
Lab Code: ICV1 Basis: NA  
Test Notes:

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	Result Notes
Benzene	NONE	8021B	25	24	96	
Toluene	NONE	8021B	25	23	92	
Ethylbenzene	NONE	8021B	25	24	96	
Xylenes, Total	NONE	8021B	75	72	96	
Gasoline	NONE	8015M	250	240	96	
Methyl tert-Butyl Ether	NONE	8021B	25	22	88	

Approved By: \_\_\_\_\_



Date: 12-2-99

ICV/032196

