

C A M B R I A

3142

January 15, 2001

Mr. Amir Gholami,  
Alameda County Health Care Services Agency  
1131 Harbor Bay Parkway, 2nd Floor  
Alameda, California 94502

NEW  
2/1/01  
AG

Re: **Fourth Quarter 2000 Monitoring Report**  
Former ARCO Service Station No. 6002  
6235 Seminary Avenue  
Oakland, California  
Cambria Project #436-1609



Dear Mr. Gholami:

On behalf of ARCO, Cambria Environmental Technology, Inc. (Cambria) is submitting the attached report which presents the results of the fourth quarter 2000 groundwater monitoring program at former ARCO Service Station No. 6002, located at 6235 Seminary Avenue, Oakland, California. 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,

**Cambria Environmental Technology, Inc.**

Ron Scheele, RG  
Senior Project Manager

Attachment: Quarterly Groundwater Monitoring Report, Fourth Quarter 2000

cc: Mr. Paul Supple, ARCO, PO Box 6549 Moraga, CA 94570

Oakland, CA  
San Ramon, CA  
Sonoma, CA  
Portland, OR

**Cambria  
Environmental  
Technology, Inc.**

1144 65th Street  
Suite B  
Oakland, CA 94608  
Tel (510) 420-0700  
Fax (510) 420-9170

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## Quarterly Groundwater Monitoring Report

### Fourth Quarter 2000

Former Arco Service Station 6002  
6235 Seminary Avenue  
Oakland, California  
Cambria Project #436-1609



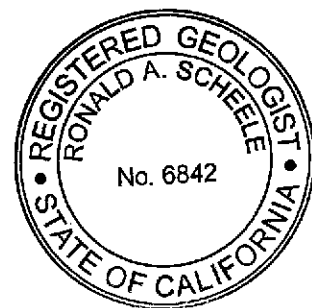
Prepared For:

Mr. Paul Supple  
ARCO

January 15, 2001

Prepared By:

Cambria Environmental Technology, Inc.  
1144 65<sup>th</sup> Street, Suite B  
Oakland, California 94608



Written by:

Jason D. Olson  
Staff Environmental Scientist

Ron Scheele, RG  
Senior Project Manager

Date: January 15, 2001

Quarter: 4<sup>th</sup> Quarter, 2000

## ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Station No.:	<u>6002</u>	Address:	<u>6235 Seminary Avenue, Oakland, California</u>
ARCO Environmental Engineer			<u>Paul Supple</u>
Consulting Co./Contact Person:			<u>Cambria Environmental Technology, Inc./Ron Scheele, RG</u>
Consultant Project No.:			<u>436-1609</u>
Primary Agency/Regulatory ID No.:			<u>ACHCSA</u>

### WORK PERFORMED THIS QUARTER (FOURTH - 2000):

1. Submitted quarterly groundwater monitoring report for third quarter 2000.
2. Performed fourth quarter groundwater monitoring and sampling on November 10, 2000.

### WORK PROPOSED FOR NEXT QUARTER (FIRST - 2001):

1. Prepare and submit quarterly groundwater monitoring report for fourth quarter 2000.
2. Perform quarterly groundwater monitoring and sampling for first quarter 2001.

### QUARTERLY MONITORING:

Current Phase of Project:	<u>Quarterly Groundwater Monitoring</u>
Frequency of Sampling:	<u>Annual (1st Quarter): MW-3, MW-6</u> <u>Quarterly: MW-4, MW-5, MW-7, MW-8, VW-1, VW-4</u>
Frequency of Monitoring:	<u>Quarterly (groundwater)</u>
Is Floating Product (FP) Present On-site:	<u>No</u>
Bulk Soil Removed to Date :	<u>Approximately 370 cubic yards of TPH impacted soil</u>
Bulk Soil Removed This Quarter :	<u>None</u>
Water Wells or Surface Waters, within 2000 ft., impacted by site:	<u>None</u>
Current Remediation Techniques:	<u>Natural Attenuation</u>
Average Depth to Groundwater:	<u>9.28 ft</u>
Groundwater Flow Direction and Gradient (Average):	<u>0.080 ft/ft toward West-Southwest</u>

### DISCUSSION:

Based on field measurements collected on November 10, 2000, groundwater beneath the site flows towards the west-southwest at a gradient of 0.080 ft/ft. This is consistent with the historic groundwater flow direction and gradient.

Hydrocarbon concentrations detected this quarter are consistent with the previous sampling event. The maximum TPHg and benzene concentrations were detected in well MW-5 at 7,030 and 19.7 micrograms per liter ( $\mu\text{g/L}$ ), respectively. The maximum MTBE concentration was detected in well VW-4 at 8,840  $\mu\text{g/L}$ .



Date: January 15, 2001

Quarter: 4<sup>th</sup> Quarter, 2000

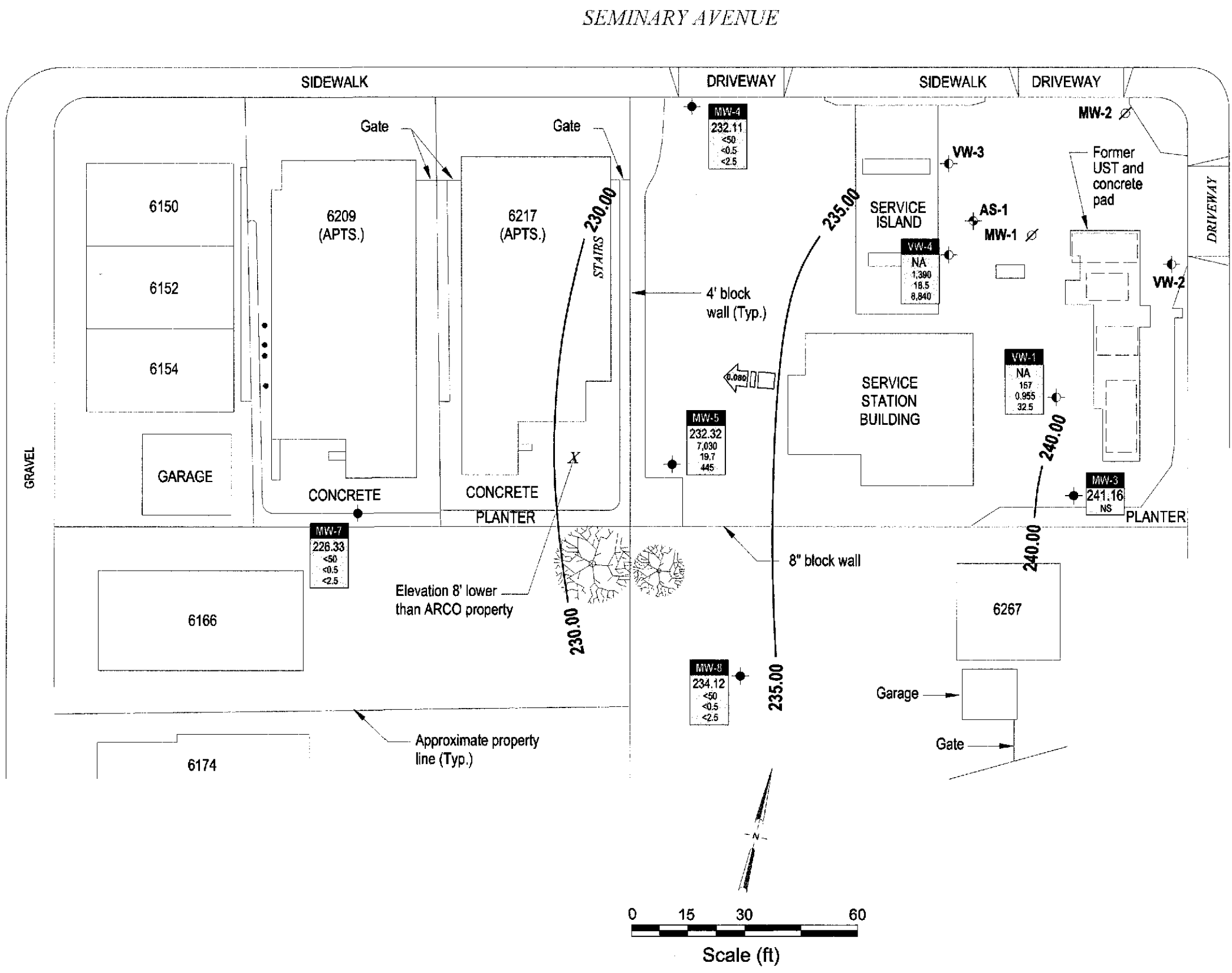
**ATTACHMENTS:**

- Figure 1 - Groundwater Elevation Contour and Analytical Summary Map
- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- Table 2 - Groundwater Flow Direction and Gradient
- Appendix A - Sampling and Analysis Procedures
- Appendix B - Certified Analytical Reports and Chain-of-Custody Documentation
- Appendix C - Field Data Sheets



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OVERDALE AVENUE



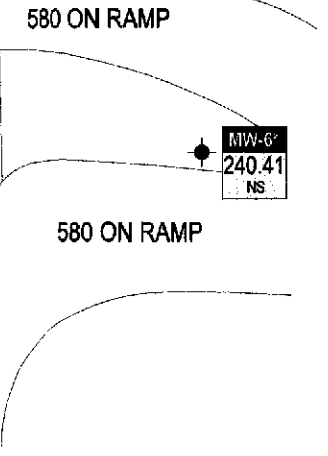
**EXPLANATION**

- MW-1 ● Monitoring Well Location
- SB-1 / Decommissioned monitoring well
- MW-1 ◊ Vapor extraction well
- SB-1 ◊ Air sparge well

Well ID	ELEV	TPH	Benzene	MTBE
MW-4	232.11	<50	<0.5	<2.5
MW-5	232.32	7,030	19.7	445
MW-7	226.33	<50	<0.5	<2.5
MW-8	234.12	<50	<0.5	<2.5
MW-3	241.16	NS		
MW-6	240.41	NS		
VW-4	NA	1,390	18.5	8,840
VW-1	NA	157	0.955	32.5

- Well Designation
- Groundwater Elevation
- Concentration of total petroleum hydrocarbons as gasoline, benzene, and MTBE in groundwater in micrograms per liter (ug/l). Samples collected on 11/10/00
- NA Not Available, well casing not surveyed
- \* Improperly screened well, data not used for contouring
- NS Not Sampled, not part of schedule
- 240.00 Groundwater elevation contour
- Approximate groundwater flow direction and gradient

SUNNYMERE AVENUE



**FIGURE 1**

Basemap from IT Corporation



**Groundwater Elevation Contour and Analytical Summary Map**  
November 10, 2000

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**ARCO Service Station 6002**  
6235 Seminary Avenue  
Oakland, California

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

**ARCO Service Station 6002**  
**6235 Seminary Avenue, Oakland, California**

Well Number	Date Gauged	TOC	Depth to	FP	Groundwater	Date Sampled	TPH			Ethyl-	Total	MTBE	MTBE	Dissolved	Purged/	
		Elevation (ft-MSL)	Water (feet)	Thickness (feet)	Elevation (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	benzene (µg/L)	Xylenes (µg/L)	8021B* (µg/L)	8260 (µg/L)	Oxygen (mg/L)	Not Purged (P/NP)	
MW-1	03-15-95	247.06	7.37	0.00	239.69	03-15-95	13,000	1,200	44	770	1,100	--	--			
MW-1	05-30-95	247.06	8.48	0.00	238.58	05-30-95	19,000	1,600	30	890	1,400	--	--			
MW-1	09-01-95	247.06	9.47	0.00	237.59	09-01-95	14,000	1,300	28	480	780	24,000	--			
MW-1	11-13-95	247.06	8.78	0.01	238.29[1]	11-13-95	11,000	570	17	260	410	--	25,000[2]			
MW-1	02-23-96	247.06	Well was decommissioned on 2-12-96													
MW-2	03-15-95	249.30	8.25	0.00	241.05	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	--	--			
MW-2	05-30-95	249.30	9.93	0.00	239.37	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--			
MW-2	09-01-95	249.30	10.69	0.00	238.61	09-01-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-2	11-13-95	249.30	10.32	0.00	238.98	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	--	--			
MW-2	02-23-96	249.30	Well was decommissioned on 2-12-96													
MW-3	03-15-95	248.35	6.76	0.00	241.59	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	--	--			
MW-3	05-30-95	248.35	7.81	0.00	240.54	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--			
MW-3	09-01-95	248.35	8.65	0.00	239.70	09-01-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-3	11-13-95	248.35	8.25	0.00	240.10	11-13-95	120	45	0.7	<0.5	6.2	--	--			
MW-3	02-23-96	248.35	6.64	0.00	241.71	03-01-96	<50	<0.5	<0.5	0.6	1.9	<3	--			
MW-3	05-10-96	248.35	7.95	0.00	240.40	05-10-96	Not sampled: well sampled annually, during the first quarter									
MW-3	08-09-96	248.35	8.06	0.00	240.29	08-09-96	Not sampled: well sampled annually, during the first quarter									
MW-3	11-08-96	248.35	Not surveyed: inaccessible				11-11-96	Not sampled: inaccessible								
MW-3	03-21-97	248.35	8.21	0.00	240.14	03-21-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-3	05-27-97	248.35	8.25	0.00	240.10	05-27-97	Not sampled: well sampled annually, during the first quarter									
MW-3	08-05-97	248.35	8.29	0.00	240.06	08-05-97	Not sampled: well sampled annually, during the first quarter									
MW-3	10-29-97	248.35	8.58	0.00	239.77	10-29-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-3	02-25-98	248.35	7.69	0.00	240.66	02-25-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-3	05-12-98	248.35	8.20	0.00	240.15	05-12-98	Not sampled: well sampled annually, during the first quarter									
MW-3	07-28-98	248.35	8.55	0.00	239.80	07-28-98	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 6002**  
**6235 Seminary Avenue, Oakland, California**

Well Number	Date Gauged	TOC	Depth to	FP	Groundwater	Date Sampled	TPH			Ethyl-benzene	Total Xylenes	MTBE 8021B*	MTBE 8260	Dissolved Oxygen	Purged/Not Purged (P/NP)
		Elevation (ft-MSL)	Water (feet)	Thickness (feet)	Elevation (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)						
MW-3	10-27-98	248.35	8.30	0.00	240.05	10-27-98	Not sampled: well sampled annually, during the first quarter								
MW-3	02-08-99	248.35	7.90	0.00	240.45	02-08-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-3	06-01-99	248.35	8.40	0.00	239.95	06-01-99	Not sampled: well sampled annually, during the first quarter								
MW-3	08-25-99	248.35	8.49	0.00	239.86	08-25-99	Not sampled: well sampled annually, during the first quarter								1.67
MW-3	10-29-99	248.35	8.52	0.00	239.83	10-29-99	Not sampled: well sampled annually, during the first quarter								6.90
MW-3	02-16-00	248.35	8.03	0.00	240.32	02-16-00	<50	<0.5	0.8	<0.5	<1	<3	--	8.51	NP
MW-3	06-23-00	248.35	7.55	0.00	240.80	06-23-00	Not sampled: well sampled annually, during the first quarter								2.10
MW-3	08-17-00	248.35	8.65	0.00	239.70	08-17-00	Not sampled: well sampled annually, during the first quarter								1.10
MW-3	11-10-00	248.35	7.19	0.00	241.16	11-10-00	Not sampled: well sampled annually, during the first quarter								NM
MW-4	03-15-95	242.91	9.37	0.00	233.54	03-15-95	<50	<0.5	<0.5	<0.5	<0.5	--	--		
MW-4	05-30-95	242.91	11.47	0.00	231.44	05-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--		
MW-4	09-01-95	242.91	12.28	0.00	230.63	09-01-95	78	<0.5	0.7	<0.5	<0.5	<3	--		
MW-4	11-13-95	242.91	11.75	0.00	231.16	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	--	--		
MW-4	02-23-96	242.91	8.51	0.00	234.40	03-01-96	59	1.2	7.4	1.6	9.3	3	--		
MW-4	05-10-96	242.91	11.35	0.00	231.56	05-10-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	08-09-96	242.91	9.70	0.00	233.21	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	11-08-96	242.91	11.79	0.00	231.12	11-08-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	03-21-97	242.91	10.94	0.00	231.97	03-21-97	<50	<0.5	<0.5	<0.5	<0.5	81	--		
MW-4	05-27-97	242.91	11.51	0.00	231.40	05-27-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	08-05-97	242.91	11.90	0.00	231.01	08-05-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	10-29-97	242.91	12.00	0.00	230.91	10-29-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	02-25-98	242.91	8.34	0.00	234.57	02-25-98	<50	<0.5	0.9	<0.5	0.9	4	--		
MW-4	05-12-98	242.91	10.93	0.00	231.98	05-12-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	07-28-98	242.91	12.08	0.00	230.83	07-28-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-4	10-27-98	242.91	11.40	0.00	231.51	10-27-98	<5,000	<50	<50	160	64	6,400	--		
MW-4	02-08-99	242.91	8.40	0.00	234.51	02-08-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--		

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

**ARCO Service Station 6002**  
**6235 Seminary Avenue, Oakland, California**

Well Number	Date Gauged	TOC	Depth to	FP	Groundwater	Date Sampled	TPH			Ethyl-	Total	MTBE	MTBE	Dissolved	Purged/
		Elevation (ft-MSL)	Water (feet)	Thickness (feet)	Elevation (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	benzene (µg/L)	Xylenes (µg/L)	8021B* (µg/L)	8260 (µg/L)	Oxygen (mg/L)	Not Purged (P/NP)
MW-4	06-01-99	242.91	11.93	0.00	230.98	06-01-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	4.0	NP
MW-4	08-25-99	242.91	12.21	0.00	230.70	08-25-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--	1.29	NP
MW-4	10-29-99	242.91	12.37	0.00	230.54	10-29-99	<50	<0.5	<0.5	<0.5	<1	<3	--	1.50	NP
MW-4	02-16-00	242.91	7.45	0.00	235.46	02-16-00	<50	<0.5	<0.5	<0.5	<1	<3	--	2.38	NP
MW-4	06-23-00	242.91	12.31	0.00	230.60	06-23-00	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	--	2.80	NP
DUP	08-17-00	--	--	--	--	08-17-00	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	--	--	--
MW-4	08-17-00	242.91	11.92	0.00	230.99	08-17-00	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	--	2.38	NP
<b>MW-4</b>	<b>11-10-00</b>	<b>242.91</b>	<b>10.80</b>	<b>0.00</b>	<b>232.11</b>	<b>11-10-00</b>	<b>&lt;50.0</b>	<b>&lt;0.500</b>	<b>&lt;0.500</b>	<b>&lt;0.500</b>	<b>&lt;0.500</b>	<b>&lt;2.50</b>	<b>--</b>	<b>1.55</b>	<b>NP</b>
MW-5	03-15-95	244.82	11.99	0.00	232.83	03-15-95	21,000	870	22	1,600	1,900	--	--		
MW-5	05-30-95	244.82	12.97	0.00	231.85	05-30-95	17,000	2,100	250	1,000	520	--	--		
MW-5	09-01-95	244.82	14.03	0.00	230.79	09-01-95	19,000	1,500	25	1,600	880	8,300	--		
MW-5	11-13-95	244.82	13.65	0.00	231.17	11-13-95	21,000	1,300	22	1,400	630	--	--		
MW-5	02-23-96	244.82	11.93	0.00	232.89	03-01-96	27,000	1,300	<50	1,600	1,500	730	--		
MW-5	05-10-96	244.82	13.05	0.00	231.77	05-10-96	17,000	460	21	760	480	1,000	--		
MW-5	08-09-96	244.82	13.22	0.00	231.60	08-09-96	16,000	420	14	870	390	1,500	--		
MW-5	11-08-96	244.82	Not surveyed: inaccessible			11-11-96	Not sampled: well inaccessible								
MW-5	03-21-97	244.82	13.24	0.00	231.58	03-21-97	18,000	110	<50	730	1,500	1,800	--		
MW-5	05-27-97	244.82	13.10	0.00	231.72	05-27-97	21,000	86	<20	810	610	1,700	--		
MW-5	08-05-97	244.82	13.14	0.00	231.68	08-05-97	340	2.2	<0.5	15	8.8	39	--		
MW-5	10-29-97	244.82	13.03	0.00	231.79	10-29-97	19,000	130	<20	1,400	620	1,700	--		
MW-5	02-25-98	244.82	11.33	0.00	233.49	02-25-98	8,500	19	13	190	100	170	--		
MW-5	05-12-98	244.82	12.81	0.00	232.01	05-12-98	10,000	34	<10	390	220	610	--		
MW-5	07-28-98	244.82	13.12	0.00	231.70	07-28-98	15,000	68	<10	690	620	1,000	--		
MW-5	10-27-98	244.82	12.90	0.00	231.92	10-27-98	15,000	60	<10	770	400	890	--		
MW-5	02-08-99	244.82	11.08	0.00	233.74	02-08-99	8,200	23	<10	290	120	<60	--		
MW-5	06-01-99	244.82	12.95	0.00	231.87	06-01-99	11,000	33	3.3	340	180	580	--	1.0	NP



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

**ARCO Service Station 6002**  
**6235 Seminary Avenue, Oakland, California**

Well Number	Date Gauged	TOC	Depth to	FP	Groundwater	Date Sampled	TPH			Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE 8021B* (µg/L)	MTBE 8260 (µg/L)	Dissolved Oxygen (mg/L)	Purged/Not Purged (P/NP)	
		Elevation (ft-MSL)	Water (feet)	Thickness (feet)	Elevation (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)							
MW-5	08-25-99	244.82	12.99	0.00	231.83	08-25-99	9,200	26	14	420	270	1,100	--	0.37	NP	
MW-5	10-29-99	244.82	13.10	0.00	231.72	10-29-99	11,000	19	9.8	260	150	590	--	1.27	NP	
MW-5	02-16-00	244.82	8.21	0.00	236.61	02-16-00	12,000	8.1	10	340	160	130	--	1.42	NP	
MW-5	06-23-00	244.82	12.90	0.00	231.92	06-23-00	9,680	38.0	<20.0	212	114	930	--	1.40	NP	
MW-5	08-17-00	244.82	13.00	0.00	231.82	08-17-00	10,500	15.0	7.98	223	118	430	--	0.68	NP	
MW-5	11-10-00	244.82	12.50	0.00	232.32	11-10-00	7,030	19.7	<10.0	190	43.6	445	--	1.27	NP	
MW-6	06-29-95	NR	6.63	0.00	NR	06-30-95	<50	<0.5	<0.5	<0.5	<0.5	--	--			
MW-6	09-01-95	NR	Not surveyed			09-01-95	Not sampled									
MW-6	11-13-95	NR	7.70	0.00	NR	11-13-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-6	02-23-96	NR	9.82	0.00	NR	03-01-96	<50	<0.5	0.8	<0.5	0.6	<3	--			
MW-6	05-10-96	NR	15.25	0.00	NR	05-10-96	Not sampled: well sampled annually, during the first quarter									
MW-6	08-09-96	252.20	11.11	0.00	241.09	08-09-96	Not sampled: well sampled annually, during the first quarter									
MW-6	11-08-96	252.20	9.31	0.00	242.89	11-11-96	Not sampled: well sampled annually, during the first quarter									
MW-6	03-21-97	252.20	9.40	0.00	242.80	03-21-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-6	05-27-97	252.20	7.08	0.00	245.12	05-27-97	Not sampled: well sampled annually, during the first quarter									
MW-6	08-05-97	252.20	7.12	0.00	245.08	08-05-97	Not sampled: well sampled annually, during the first quarter									
MW-6	10-29-97	252.20	7.42	0.00	244.78	10-29-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-6	02-25-98	252.20	10.35	0.00	241.85	02-25-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-6	05-12-98	252.20	15.83	0.00	236.37	05-12-98	Not sampled: well sampled annually, during the first quarter									
MW-6	07-28-98	252.20	11.84	0.00	240.36	07-28-98	Not sampled: well sampled annually, during the first quarter									
MW-6	10-27-98	252.20	9.73	0.00	242.47	10-27-98	Not sampled: well sampled annually, during the first quarter									
MW-6	02-08-99	252.20	8.10	0.00	244.10	02-08-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--			
MW-6	06-01-99	252.20	17.84	0.00	234.36	06-01-99	Not sampled: well sampled annually, during the first quarter									
MW-6	08-25-99	252.20	11.00	0.00	241.20	08-25-99	Not sampled: well sampled annually, during the first quarter									0.77
MW-6	10-29-99	252.20	9.03	0.00	243.17	10-29-99	Not sampled: well sampled annually, during the first quarter									3.42
MW-6	02-16-00	252.20	7.71	0.00	244.49	02-16-00	<50	<0.5	<0.5	<0.5	<1	<3	--	2.42	P	

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

**ARCO Service Station 6002**  
**6235 Seminary Avenue, Oakland, California**

Well Number	Date Gauged	TOC	Depth to	FP	Groundwater	Date Sampled	TPH			Ethyl-	Total	MTBE	MTBE	Dissolved	Purged/
		Elevation (ft-MSL)	Water (feet)	Thickness (feet)	Elevation (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	benzene (µg/L)	Xylenes (µg/L)	8021B* (µg/L)	8260 (µg/L)	Oxygen (mg/L)	Not Purged (P/NP)
MW-6	06-23-00	252.20	6.69	0.00	245.51	06-23-00	Not sampled: well sampled annually, during the first quarter							2.30	
MW-6	08-17-00	252.20	6.95	0.00	245.25	08-17-00	Not sampled: well sampled annually, during the first quarter							2.51	
MW-6	11-10-00	<b>252.20</b>	<b>11.79</b>	<b>0.00</b>	<b>240.41</b>	<b>11-10-00</b>	<b>Not sampled: well sampled annually, during the first quarter</b>							<b>NM</b>	
MW-7	08-09-96	235.95	Not surveyed: well was dry			08-09-96	Not sampled: well was dry								
MW-7	11-08-96	235.95	Not surveyed: well was dry			11-11-96	Not sampled: well was dry								
MW-7	01-27-97	235.95	NR	0.00	NR	01-27-97	2,900	29	<5	<5	580	220	--		
MW-7	03-21-97	235.95	7.13	0.00	228.82	03-21-97	590	3.5	<0.5	<0.5	1.3	90	--		
MW-7	05-27-97	235.95	9.02	0.00	226.93	05-27-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	08-05-97	235.95	12.33	0.00	223.62	08-05-97	110	0.5	<0.5	<0.5	0.8	81	--		
MW-7	10-29-97	235.95	Not surveyed: well was dry			10-29-97	Not sampled: well was dry								
MW-7	02-25-98	235.95	8.04	0.00	227.91	02-25-98	<50	<0.5	0.6	<0.5	0.7	<3	--		
MW-7	05-12-98	235.95	8.88	0.00	227.07	05-12-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	07-28-98	235.95	10.50	0.00	225.45	07-28-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	10-27-98	235.95	8.75	0.00	227.20	10-27-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	02-08-99	235.95	9.35	0.00	226.60	02-08-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-7	06-01-99	235.95	9.85	0.00	226.10	06-01-99	250	<0.5	0.6	<0.5	1.6	18	--	1.0	NP
MW-7	08-25-99	235.95	11.31	0.00	224.64	08-25-99	119	<0.5	5.7	<0.5	<0.5	11	--	0.41	NP
MW-7	10-29-99	235.95	9.08	0.00	226.87	10-29-99	<50	<0.5	<0.5	<0.5	<1	<3	--	1.29	NP
MW-7	02-25-00	235.95	8.02	0.00	227.93	02-25-00	<50	<0.5	<0.5	<0.5	<1	38	--	2.10	NP
MW-7	06-23-00	235.95	10.68	0.00	225.27	06-23-00	<50.0	<0.500	<0.500	<0.500	<0.500	14.4	--	1.60	NP
MW-7	08-17-00	235.95	11.85	0.00	224.10	08-17-00	70.0	<0.500	0.678	<0.500	1.07	14.2	--	1.59	NP
MW-7	11-10-00	<b>235.95</b>	<b>9.62</b>	<b>0.00</b>	<b>226.33</b>	<b>11-10-00</b>	<b>&lt;50.0</b>	<b>&lt;0.500</b>	<b>&lt;0.500</b>	<b>&lt;0.500</b>	<b>&lt;0.500</b>	<b>&lt;2.50</b>	<b>--</b>	<b>1.09</b>	<b>NP</b>
MW-8	08-09-96	240.37	9.41	0.00	230.96	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-8	11-08-96	240.37	9.19	0.00	231.18	11-11-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-8	03-21-97	240.37	8.55	0.00	231.82	03-21-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--		

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

**ARCO Service Station 6002**  
**6235 Seminary Avenue, Oakland, California**

Well Number	Date Gauged	TOC	Depth to	FP	Groundwater	Date Sampled	TPH			Ethyl-	Total	MTBE	MTBE	Dissolved	Purged/
		Elevation (ft-MSL)	Water (feet)	Thickness (feet)	Elevation (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)	benzene (µg/L)	Xylenes (µg/L)	8021B* (µg/L)	8260 (µg/L)	Oxygen (mg/L)	Not Purged (P/NP)
MW-8	05-27-97	240.37	11.06	0.00	229.31	05-27-97	91	0.6	<0.5	<0.5	0.6	66	--		
MW-8	08-05-97	240.37	9.32	0.00	231.05	08-05-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-8	10-29-97	240.37	9.35	0.00	231.02	10-29-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-8	02-25-98	240.37	7.08	0.00	233.29	02-25-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-8	05-12-98	240.37	8.61	0.00	231.76	05-12-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-8	07-28-98	240.37	9.63	0.00	230.74	07-28-98	<50	<0.5	<0.5	<0.5	<0.5	4	--		
MW-8	10-27-98	240.37	9.30	0.00	231.07	10-27-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-8	02-08-99	240.37	5.56	0.00	234.81	02-17-99	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
MW-8	06-01-99	240.37	Not surveyed: inaccessible			06-01-99	Not sampled: well inaccessible								
MW-8	08-25-99	240.37	Not surveyed: inaccessible			08-25-99	Not sampled: well inaccessible								
MW-8	10-29-99	240.37	Not surveyed: inaccessible			10-29-99	Not sampled: well inaccessible								
MW-8	02-16-00	240.37	Not surveyed: inaccessible			02-16-00	Not sampled: well inaccessible								
MW-8	06-23-00	240.37	9.45	0.00	230.92	06-23-00	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50		1.90	NP
MW-8	08-17-00	240.37	6.40	0.00	233.97	08-17-00	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50		2.56	NP
MW-8	11-10-00	240.37	6.25	0.00	234.12	11-10-00	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	--	1.93	NP
DUP	11-10-00	--	--	--	--	11-10-00	<50.0	<0.500	<0.500	<0.500	<0.500	<2.50	--	--	
AS-1	06-29-95	NR	9.20	0.00	NR	06-30-95	<50	1.6	<0.5	0.9	0.9	--	--		
VW-1	02-23-96	NR	5.29	0.00	NR	03-01-96	21,000	490	57	520	1,500	240	--		
VW-1	05-10-96	NR	6.80	0.00	NR	05-10-96	3,700	61	<5	100	50	200	--		
VW-1	08-09-96	NR	7.03	0.00	NR	08-09-96	970	2.7	<2.5	2.7	3.7	180	--		
VW-1	11-08-96	NR	Not surveyed: inaccessible			11-11-96	Not sampled: well inaccessible								
VW-1	03-21-97	NR	7.51	0.00	NR	03-21-97	640	<4	<1	1	3	194	--		
VW-1	05-27-97	NR	7.51	0.00	NR	05-27-97	Not sampled: well sampled semi-annually, during the first and third quarters								
VW-1	08-05-97	NR	7.51	0.00	NR	08-05-97	630	<1	<1	3	2	120	--		
VW-1	10-29-97	NR	7.53	0.00	NR	10-29-97	600	<0.5	<0.5	<0.5	1.6	84	--		

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

**ARCO Service Station 6002**  
**6235 Seminary Avenue, Oakland, California**

Well Number	Date Gauged	TOC	Depth to	FP	Groundwater	Date Sampled	TPH			Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	MTBE 8021B* (µg/L)	MTBE 8260 (µg/L)	Dissolved Oxygen (mg/L)	Purged/Not Purged (P/NP)
		Elevation (ft-MSL)	Water (feet)	Thickness (feet)	Elevation (ft-MSL)		Gasoline (µg/L)	Benzene (µg/L)	Toluene (µg/L)						
VW-1	02-25-98	NR	6.77	0.00	NR	02-25-98	230	<4	<0.7	1.2	0.5	27	--		
VW-1	05-12-98	NR	7.43	0.00	NR	05-12-98	340	<0.5	0.5	2.3	0.8	29	--		
VW-1	07-28-98	NR	7.00	0.00	NR	07-28-98	240	<0.5	<0.5	<0.5	1.1	54	--		
VW-1	10-27-98	NR	7.52	0.00	NR	10-27-98	230	<0.5	<0.5	<0.5	<0.5	65	--		
VW-1	02-08-99	NR	7.05	0.00	NR	02-08-99	<50	<0.5	<0.5	<0.5	<0.5	<3	36[3]		
VW-1	06-01-99	NR	7.55	0.00	NR	06-01-99	180	<0.5	<0.5	<0.5	<0.5	23	--	1.0 NP	
VW-1	08-25-99	NR	7.66	0.00	NR	08-25-99	130	<0.5	5.6	<0.5	<0.5	40	--	0.39 NP	
VW-1	10-29-99	NR	7.59	0.00	NR	10-29-99	200	1.0	<0.5	0.6	1.6	36	--	0.89 NP	
VW-1	02-16-00	NR	7.03	0.00	NR	02-16-00	210	<0.5	0.9	2.2	1.9	11	--	1.41 NP	
VW-1	06-23-00	NR	7.71	0.00	NR	06-23-00	175	1.04	<0.500	<0.500	<0.500	14.4	--	1.90 NP	
VW-1	08-17-00	NR	7.75	0.00	NR	08-17-00	180	<0.500	<0.500	0.622	0.760	23.7	--	0.63 NP	
VW-1	11-10-00	NR	6.83	0.00	NR	11-10-00	157	0.955	<0.500	0.973	<0.500	32.5	--	1.03 NP	
VW-2	02-23-96	NR	6.92	0.00	NR	03-01-96	Not sampled: well not part of sampling program								
VW-4	05-10-96	NR	8.58	0.00	NR	05-10-96	13,000	2,500	41	420	660	43,000	--		
VW-4	08-09-96	NR	11.70	0.00	NR	08-09-96	<50	<0.5	<0.5	<0.5	<0.5	6,200	--		
VW-4	11-08-96	NR	9.38	0.00	NR	11-08-96	7,800	510	7	180	370	21,000	--		
VW-4	03-21-97	NR	9.11	0.00	NR	03-21-97	10,000	290	10	270	230	8,900	--		
VW-4	05-27-97	NR	9.34	0.00	NR	05-27-97	Not sampled: well sampled semi-annually, during the first and third quarters								
VW-4	08-05-97	NR	9.47	0.00	NR	08-05-97	<10,000	180	<100	<100	110	12,000	--		
VW-4	10-29-97	NR	9.35	0.00	NR	10-29-97	9,800	200	69	260	360	4,900	--		
VW-4	02-25-98	NR	7.08	0.00	NR	02-25-98	<50	2.5	<0.5	<0.5	0.7	<3	--		
VW-4	05-12-98	NR	9.17	0.00	NR	05-12-98	3,200	<20	22	29	52	2,100	--		
VW-4	07-28-98	NR	9.55	0.00	NR	07-28-98	<10,000	<100	<100	<100	<100	5,100	--		
VW-4	10-27-98	NR	9.92	0.00	NR	10-27-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--		
VW-4	02-08-99	NR	7.50	0.00	NR	02-08-99	<2,500	<25	<25	28	<25	2,400	3,100[3]		

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

**ARCO Service Station 6002**  
**6235 Seminary Avenue, Oakland, California**

Well Number	Date Gauged	TOC	Depth to	FP	Groundwater	Date Sampled	TPH				Ethyl-benzene	Total Xylenes	MTBE 8021B*	MTBE 8260	Dissolved Oxygen	Purged/Not Purged (P/NP)
		Elevation (ft-MSL)	Water (feet)	Thickness (feet)	Elevation (ft-MSL)		Gasoline ( $\mu\text{g/L}$ )	Benzene ( $\mu\text{g/L}$ )	Toluene ( $\mu\text{g/L}$ )	( $\mu\text{g/L}$ )						
VW-4	06-01-99	NR	9.87	0.00	NR	06-01-99	2,100	2.5	1.1	2.5	15	3,300	--	2.0	NP	
VW-4	08-25-99	NR	9.78	0.00	NR	08-25-99	1,300	4.4	4.9	1.7	2.9	4,600	--	0.36	NP	
VW-4	10-29-99	NR	9.93	0.00	NR	10-29-99	1,400	<0.5	1.8	1.6	3.0	4,200	--	1.18	NP	
VW-4	02-16-00	NR	7.45	0.00	NR	02-16-00	1,800	<0.5	2.9	15	10	3,400	--	1.01	NP	
DUP 1	06-23-00	--	--	--	--	06-23-00	1,260	<2.00	<2.00	<2.00	2.73	2,720	--	--	--	
VW-4	06-23-00	NR	9.74	0.00	NR	06-23-00	1,360	<2.00	2.26	<2.00	2.25	4,900	--	1.50	NP	
VW-4	08-17-00	NR	9.95	0.00	NR	08-17-00	2,230	<10.0	<10.0	<10.0	<10.0	5,310	--	1.13	NP	
VW-4	11-10-00	NR	9.22	0.00	NR	11-10-00	1,390	18.5	<5.00	<5.00	<5.00	8,840	--	1.25	NP	

TPH: Total petroleum hydrocarbons by modified EPA method 8015

BTEX: Benzene, toluene, ethylbenzene, xylenes by EPA method 8021B. (EPA method 8020 prior to 10/29/99).

MTBE: Methyl tert-butyl ether

\*: EPA method 8020 prior to 10/29/99

TOC: Top of Casing

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

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

mg/L: milligrams per liter

0.00: none detected

NR: not reported; data not available or not measurable

--: not analyzed or not applicable

<: less than laboratory detection limit stated to the right

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

[2]: analyzed by EPA method 8240

[3]: also analyzed for fuel oxygenates

\*\*: For previous historical groundwater elevation data please refer to Fourth Quarter 1995 Groundwater Monitoring Program Results, ARCO Service Station 6002, Oakland, California,

(EMCON, February 23, 1996)

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

**ARCO Service Station 6002**  
**6235 Seminary Avenue, Oakland, California**

<b>Date Measured</b>	<b>Average Flow Direction</b>	<b>Average Hydraulic Gradient</b>
03-15-95	West-Southwest	0.08
05-30-95	West-Southwest	0.08
09-01-95	West-Southwest	0.09
11-13-95	West-Southwest	0.08
02-23-96	West-Southwest	0.08
05-10-96	West-Southwest	0.08
08-09-96	Southwest	0.08
11-08-96	Southwest	0.055
03-21-97	West-Southwest	0.051
05-27-97	West-Southwest	0.069
08-05-97	West	0.076
10-29-97	West-Southwest	0.036
02-25-98	West-Southwest	0.052
05-12-98	West	0.07
07-28-98	West	0.07
10-27-98	West-Southwest	0.06
02-08-99	West-Southwest	0.07
06-01-99	West-Northwest	0.07
08-25-99	West-Southwest	0.07
10-29-99	West	0.07
02-16-00	Southwest	0.05
06-23-00	West	0.042
08-17-00	West	0.087
<b>11-10-00</b>	<b>West-Southwest</b>	<b>0.080</b>

## **APPENDIX A**

### **SAMPLING AND ANALYSIS PROCEDURES**

## **APPENDIX A**

### **SAMPLING AND ANALYSIS PROCEDURES**

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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 tap water. During field sampling, equipment surfaces that were placed in the well or came into



contact with groundwater during field sampling were washed with detergent and double rinsed with tap 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 after each use. A bottom-filling, clear disposable 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 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, otherwise non-purge groundwater samples were collected. Before sampling occurred, a polyvinyl chloride (PVC) bailer, centrifugal pump, low-flow submersible pump, or disposable bailer was used to purge standing water in the casing and gravel pack from the monitoring well. 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 240-gallon truck-mounted tank to Integrated Waste Management's Milpitas storage facility for disposal.

Field measurements of pH, specific conductance, and temperature were recorded in a waterproof field logbook. 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 disposable 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 disposable 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 or ice 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.

Samples were transferred from Cambria to an ARCO-approved laboratory by courier or taken directly to the laboratory by the environmental sampler. Sample shipments from Cambria to laboratories performing the selected analyses routinely occurred within two to three days 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 Cambria 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)

**APPENDIX B**

**CERTIFIED ANALYTICAL REPORTS  
AND CHAIN-OF-CUSTODY DOCUMENTATION**



# Sequoia Analytical

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885 Jarvis Drive  
Morgan Hill, CA 95037  
(408) 776-9600  
FAX (408) 782-6308  
[www.sequoialabs.com](http://www.sequoialabs.com)

30 November, 2000

Ron Scheele  
Cambria - Oakland  
1144 65th St, Suite B  
Oakland, CA 94608

RE: Arco 6002  
Sequoia Report: MJK0631

Enclosed are the results of analyses for samples received by the laboratory on 11/17/00 18:54. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Jeff Smyly  
Project Manager

CA ELAP Certificate #1210





Cambria - Oakland  
1144 65th St, Suite B  
Oakland CA, 94608

Project: Arco 6002  
Project Number: 436-1609  
Project Manager: Ron Scheele

**Reported:**  
11/30/00 20:15

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-4	MJK0631-01	Water	11/10/00 13:00	11/17/00 18:54
MW-5	MJK0631-02	Water	11/10/00 13:10	11/17/00 18:54
MW-7	MJK0631-03	Water	11/10/00 12:50	11/17/00 18:54
MW-8	MJK0631-04	Water	11/10/00 12:40	11/17/00 18:54
VW-1	MJK0631-05	Water	11/10/00 13:30	11/17/00 18:54
VW-4	MJK0631-06	Water	11/10/00 13:20	11/17/00 18:54
DUP	MJK0631-07	Water	11/10/00 00:00	11/17/00 18:54

Sequoia Analytical - Morgan Hill

Jeff Smyly, Project Manager

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*





Cambria - Oakland  
1144 65th St, Suite B  
Oakland CA, 94608

Project: Arco 6002  
Project Number: 436-1609  
Project Manager: Ron Scheele

**Reported:**  
11/30/00 20:15

**Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT  
Sequoia Analytical - Morgan Hill**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>MW-4 (MJK0631-01) Water Sampled: 11/10/00 13:00 Received: 11/17/00 18:54</b>									
Purgeable Hydrocarbons	ND	50.0	ug/l	1	0K22003	11/22/00	11/22/00	DHS LUFT	
Benzene	ND	0.500	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	0.500	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	2.50	"	"	"	"	"	"	
<i>Surrogate: a,a,a-Trifluorotoluene</i>		90.4 %	70-130	"	"	"	"	"	
<b>MW-5 (MJK0631-02) Water Sampled: 11/10/00 13:10 Received: 11/17/00 18:54</b>									
Purgeable Hydrocarbons	7030	1000	ug/l	20	0K27002	11/27/00	11/27/00	DHS LUFT	H-02,P-01
Benzene	19.7	10.0	"	"	"	"	"	"	H-02
Toluene	ND	10.0	"	"	"	"	"	"	H-02
Ethylbenzene	190	10.0	"	"	"	"	"	"	H-02
Xylenes (total)	43.6	10.0	"	"	"	"	"	"	H-02
Methyl tert-butyl ether	445	50.0	"	"	"	"	"	"	H-02
<i>Surrogate: a,a,a-Trifluorotoluene</i>		2080 %	70-130	"	"	"	"	"	H-02
<b>MW-7 (MJK0631-03) Water Sampled: 11/10/00 12:50 Received: 11/17/00 18:54</b>									
Purgeable Hydrocarbons	ND	50.0	ug/l	1	0K22003	11/22/00	11/22/00	DHS LUFT	
Benzene	ND	0.500	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	0.500	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	2.50	"	"	"	"	"	"	
<i>Surrogate: a,a,a-Trifluorotoluene</i>		98.8 %	70-130	"	"	"	"	"	







Cambria - Oakland  
1144 65th St, Suite B  
Oakland CA, 94608

Project: Arco 6002  
Project Number: 436-1609  
Project Manager: Ron Scheele

Reported:  
11/30/00 20:15

## Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT Sequoia Analytical - Morgan Hill

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>MW-8 (MJK0631-04) Water</b> Sampled: 11/10/00 12:40 Received: 11/17/00 18:54									
Purgeable Hydrocarbons	ND	50.0	ug/l	1	0K22003	11/22/00	11/22/00	DHS LUFT	
Benzene	ND	0.500	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	0.500	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	2.50	"	"	"	"	"	"	
<i>Surrogate: a,a,a-Trifluorotoluene</i>		99.8 %	70-130	"	"	"	"	"	
<b>VW-1 (MJK0631-05) Water</b> Sampled: 11/10/00 13:30 Received: 11/17/00 18:54									
Purgeable Hydrocarbons	157	50.0	ug/l	1	0K27002	11/27/00	11/27/00	DHS LUFT	H-02,P-01
Benzene	0.955	0.500	"	"	"	"	"	"	H-02
Toluene	ND	0.500	"	"	"	"	"	"	H-02
Ethylbenzene	0.973	0.500	"	"	"	"	"	"	H-02
Xylenes (total)	ND	0.500	"	"	"	"	"	"	H-02
Methyl tert-butyl ether	32.5	2.50	"	"	"	"	"	"	H-02
<i>Surrogate: a,a,a-Trifluorotoluene</i>		91.7 %	70-130	"	"	"	"	"	H-02
<b>VW-4 (MJK0631-06) Water</b> Sampled: 11/10/00 13:20 Received: 11/17/00 18:54									
Purgeable Hydrocarbons	1390	500	ug/l	10	0K22003	11/22/00	11/22/00	DHS LUFT	P-03
Benzene	18.5	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Xylenes (total)	ND	5.00	"	"	"	"	"	"	
Methyl tert-butyl ether	8840	250	"	100	"	"	11/27/00	"	M-03
<i>Surrogate: a,a,a-Trifluorotoluene</i>		104 %	70-130	"	"	"	11/22/00	"	





Cambria - Oakland  
1144 65th St, Suite B  
Oakland CA, 94608

Project: Arco 6002  
Project Number: 436-1609  
Project Manager: Ron Scheele

**Reported:**  
11/30/00 20:15

**Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT  
Sequoia Analytical - Morgan Hill**

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
<b>DUP (MJK0631-07) Water</b> <b>Sampled: 11/10/00 00:00</b> <b>Received: 11/17/00 18:54</b>									
Purgeable Hydrocarbons	ND	50.0	ug/l	1	OK22003	11/22/00	11/22/00	DHS LUFT	
Benzene	ND	0.500	"	"	"	"	"	"	
Toluene	ND	0.500	"	"	"	"	"	"	
Ethylbenzene	ND	0.500	"	"	"	"	"	"	
Xylenes (total)	ND	0.500	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	2.50	"	"	"	"	"	"	
<i>Surrogate: a,a,a-Trifluorotoluene</i>		92.6 %		70-130	"	"	"	"	





Cambria - Oakland  
1144 65th St, Suite B  
Oakland CA, 94608

Project: Arco 6002  
Project Number: 436-1609  
Project Manager: Ron Scheele

**Reported:**  
11/30/00 20:15

## Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT - Quality Control Sequoia Analytical - Morgan Hill

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Batch 0K22003 - EPA 5030B [P/T]</b>										
<b>Blank (0K22003-BLK1)</b> Prepared & Analyzed: 11/22/00										
Purgeable Hydrocarbons	ND	50.0	ug/l							
Benzene	ND	0.500	"							
Toluene	ND	0.500	"							
Ethylbenzene	ND	0.500	"							
Xylenes (total)	ND	0.500	"							
Methyl tert-butyl ether	ND	2.50	"							
<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.60		"	10.0		96.0	70-130			
<b>LCS (0K22003-BS1)</b> Prepared & Analyzed: 11/22/00										
Benzene	10.0	0.500	ug/l	10.0		100	70-130			
Toluene	9.70	0.500	"	10.0		97.0	70-130			
Ethylbenzene	9.58	0.500	"	10.0		95.8	70-130			
Xylenes (total)	28.7	0.500	"	30.0		95.7	70-130			
<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.88		"	10.0		98.8	70-130			
<b>Matrix Spike (0K22003-MS1)</b> Source: MJK0490-08 Prepared & Analyzed: 11/22/00										
Benzene	10.4	0.500	ug/l	10.0	ND	104	60-140			
Toluene	10.3	0.500	"	10.0	ND	101	60-140			
Ethylbenzene	9.96	0.500	"	10.0	ND	99.6	60-140			
Xylenes (total)	30.0	0.500	"	30.0	ND	100	60-140			
<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.99		"	10.0		99.9	70-130			
<b>Matrix Spike Dup (0K22003-MSD1)</b> Source: MJK0490-08 Prepared & Analyzed: 11/22/00										
Benzene	10.2	0.500	ug/l	10.0	ND	102	60-140	1.94	25	
Toluene	10.1	0.500	"	10.0	ND	99.2	60-140	1.96	25	
Ethylbenzene	9.90	0.500	"	10.0	ND	99.0	60-140	0.604	25	
Xylenes (total)	29.6	0.500	"	30.0	ND	98.7	60-140	1.34	25	
<i>Surrogate: a,a,a-Trifluorotoluene</i>	9.98		"	10.0		99.8	70-130			





Cambria - Oakland  
1144 65th St, Suite B  
Oakland CA, 94608

Project: Arco 6002  
Project Number: 436-1609  
Project Manager: Ron Scheele

Reported:  
11/30/00 20:15

**Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT - Quality Control  
Sequoia Analytical - Morgan Hill**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC %REC	%REC Limits	RPD	RPD Limit	Notes
---------	--------	-----------------	-------	-------------	---------------	-----------	-------------	-----	-----------	-------

**Batch 0K27002 - EPA 5030B [P/T]**

**Blank (0K27002-BLK1)**

Prepared & Analyzed: 11/27/00

Purgeable Hydrocarbons	ND	50.0	ug/l							
Benzene	ND	0.500	"							
Toluene	ND	0.500	"							
Ethylbenzene	ND	0.500	"							
Xylenes (total)	ND	0.500	"							
Methyl tert-butyl ether	ND	2.50	"							
Surrogate: a,a,a-Trifluorotoluene	9.48		"	10.0		94.8	70-130			

**LCS (0K27002-BS1)**

Prepared & Analyzed: 11/27/00

Purgeable Hydrocarbons	223	50.0	ug/l	250		89.2	70-130			
Surrogate: a,a,a-Trifluorotoluene	9.40		"	10.0		94.0	70-130			

**Matrix Spike (0K27002-MS1)**

Source: MJK0596-03

Prepared & Analyzed: 11/27/00

Purgeable Hydrocarbons	231	50.0	ug/l	250	ND	92.4	60-140			
Surrogate: a,a,a-Trifluorotoluene	10.6		"	10.0		106	70-130			

**Matrix Spike Dup (0K27002-MSD1)**

Source: MJK0596-03

Prepared & Analyzed: 11/27/00

Purgeable Hydrocarbons	227	50.0	ug/l	250	ND	90.8	60-140	1.75	25	
Surrogate: a,a,a-Trifluorotoluene	9.85		"	10.0		98.5	70-130			





Cambria - Oakland  
1144 65th St, Suite B  
Oakland CA, 94608

Project: Arco 6002  
Project Number: 436-1609  
Project Manager: Ron Scheele

**Reported:**  
11/30/00 20:15

### Notes and Definitions

H-02 This sample was analyzed outside of EPA recommended hold time.  
M-03 Sample was analyzed at a second dilution per clients request.  
P-01 Chromatogram Pattern: Gasoline C6-C12  
P-03 Chromatogram Pattern: Unidentified Hydrocarbons C6-C12  
DET Analyte DETECTED  
ND Analyte NOT DETECTED at or above the reporting limit  
NR Not Reported  
dry Sample results reported on a dry weight basis  
RPD Relative Percent Difference





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

WELL DEPTH MEASUREMENTS

Well ID	Time	Top of Screen	DTB	DTP	DTW	DOP	Casing Dia	Comments
MW-3	12:20	5'	24.4'		<del>10.80</del> 7.19		4"	<del>DO</del>
MW-4	12:10	4.5'	24'		10.80		4"	DO = 1.55 mg/L
MW-5	12:30	5'	24.4'		12.50		4"	DO 1.27 mg/L
MW-6	12:05	17'	30'		11.79		2"	<del>DO</del>
MW-7	11:54	8.5'	13.3'		9.62		2"	DO = 1.09 mg/L
MW-8	12:00	5.5'	13.9'		6.25		2"	DO = 1.93 mg/L
VW-1	12:15	6'	14'		6.83		4"	DO 1.03 mg/L
VW-4	12:25	6'	15'		9.22		4"	DO 1.25 mg/L

Project Name: ARCO 6002 \_\_\_\_\_

Project Number: 436-1609 \_\_\_\_\_

Measured By: [Signature]

Date: 11-10-00 \_\_\_\_\_



# CAMBRIA

## WELL SAMPLING FORM

Project Name: <u>ASCO 6002</u>	Cambria Mgr: <u>RAS</u>	Well ID: <u>NEW-VW-1</u>
Project Number: <u>436-1609</u>	Date: <u>11-10-00</u>	Well Yield: <u>----</u>
Site Address: <u>6235 Seminary Ave Oakland, Ca</u>	Sampling Method:	Well Diameter: <u>2" pvc</u>
	<u>Disposable bailer</u>	Technician(s):
Initial Depth to Water: <u>6.83</u>	Total Well Depth:	Water Column Height:
Volume/ft:	1 Casing Volume:	3 Casing Volumes:
Purging Device:	Did Well Dewater?:	Total Gallons Purged:
Start Purge Time:	Stop Purge Time:	Total Time:

1 Casing Volume = Water column height x Volume/ft.

Well Diam.	Volume/ft (gallons)
2"	0.16
4"	0.65
6"	1.47

Time	Casing Volume	Temp. C	pH	Cond. uS	Comments
	1				
	2				
	3				
		<u>NO Purge</u>			

Sample ID	Date	Time	Container Type	Preservative	Analytes	Analytic Method
<u>MW-1</u>	<u>11-10-00</u>	<u>12:15</u>	<u>4 VOA</u>	<u>MCI</u>	<u>TPMS DTE X MIBF</u>	<u>8015/2020</u>
<u>MW-</u>						

# CAMBRIA

## WELL SAMPLING FORM

Project Name: <u>Acco 6002</u>	Cambria Mgr: <u>RAS</u>	Well ID: <u>MW- VW- 4</u>
Project Number: <u>436-1609</u>	Date: <u>11-10-00</u>	Well Yield: <u>----</u>
Site Address: <u>6235 Seminary Ave Oakland, Ca</u>	Sampling Method:	Well Diameter: <u>2" pvc</u>
	<u>Disposable bailer</u>	Technician(s):
Initial Depth to Water: <u>9.22</u>	Total Well Depth:	Water Column Height:
Volume/ft:	1 Casing Volume:	3 Casing Volumes:
Purging Device:	Did Well Dewater?:	Total Gallons Purged:
Start Purge Time:	Stop Purge Time:	Total Time:

1 Casing Volume = Water column height x Volume/ft.

Well Diam.	Volume/ft (gallons)
2"	0.16
4"	0.65
6"	1.47

Time	Casing Volume	Temp. C	pH	Cond. uS	Comments
	1				
	2				
	3				
					<u>NO PURGE</u>

Sample ID	Date	Time	Container Type	Preservative	Analytes	Analytic Method
<u>MW- VW-4</u>	<u>11-10-00</u>	<u>19:25</u>	<u>4 VOA</u>	<u>HCl</u>	<u>TPMS DTEx MIRE</u>	<u>8013/8020</u>
<u>MW-</u>						

# CAMBRIA

## WELL SAMPLING FORM

Project Name: <i>ASCO 6002</i>	Cambria Mgr: <i>RAS</i>	Well ID: <i>MW- 4</i>
Project Number: <i>436-1609</i>	Date: <i>11-10-00</i>	Well Yield: -----
Site Address: <i>6235 Seminary Ave Oakland, Ca</i>	Sampling Method:	Well Diameter: <i>2" pvc</i>
	<i>Disposable bailer</i>	Technician(s): <i>SG</i>
Initial Depth to Water: <i>10.80</i>	Total Well Depth:	Water Column Height:
Volume/ft:	1 Casing Volume:	3 Casing Volumes:
Purging Device:	Did Well Dewater?:	Total Gallons Purged:
Start Purge Time:	Stop Purge Time:	Total Time:

1 Casing Volume = Water column height x Volume/ft.

Well Diam.	Volume/ft (gallons)
2"	0.16
4"	0.65
6"	1.47

Time	Casing Volume	Temp. C	pH	Cond. uS	Comments
	1				
	2				
	3				
		<i>NO PWS?</i>			

Sample ID	Date	Time	Container Type	Preservative	Analytes	Analytic Method
<i>MW- 4</i>	<i>11-10-00</i>	<i>13:00</i>	<i>4 VOA</i>	<i>HCl</i>	<i>TPMS BTEX MRE</i>	<i>8015 / 8020</i>
<i>MW-</i>						

# CAMBRIA

## WELL SAMPLING FORM

Project Name: <i>Acco 6002</i>	Cambria Mgr: <i>RAS</i>	Well ID: MW- <i>5</i>
Project Number: <i>436-1609</i>	Date: <i>11-10-00</i>	Well Yield: ----
Site Address: <i>6235 Seminary Ave Oakland, Ca</i>	Sampling Method:	Well Diameter: <i>2" pvc</i>
	<i>Disposable bailer</i>	Technician(s): <i>SG</i>
Initial Depth to Water: <i>12.50</i>	Total Well Depth:	Water Column Height:
Volume/ft:	1 Casing Volume:	3 Casing Volumes:
Purging Device:	Did Well Dewater?:	Total Gallons Purged:
Start Purge Time:	Stop Purge Time:	Total Time:

1 Casing Volume = Water column height x Volume/ft.

Well Diam.	Volume/ft (gallons)
2"	0.16
4"	0.65
6"	1.47

Time	Casing Volume	Temp. C	pH	Cond. uS	Comments
	1				
	2				
	3	<i>AD PURGE</i>			

Sample ID	Date	Time	Container Type	Preservative	Analytes	Analytic Method
MW- <i>5</i>	<i>11-10-00</i>	<i>17:30</i>	<i>4 Voa</i>	<i>MCI</i>	<i>TPMS BTEX MIBE</i>	<i>6015 / 0020</i>
MW-						

# CAMBRIA

## WELL SAMPLING FORM

Project Name: <i>Asco 6002</i>	Cambria Mgr: <i>RAS</i>	Well ID: MW- <i>7</i>
Project Number: <i>436-1609</i>	Date: <i>11-10-00</i>	Well Yield: -----
Site Address: <i>6235 Seminary Ave Oakland, Ca</i>	Sampling Method:	Well Diameter: <i>2" pvc</i>
	<i>Disposable bailer</i>	Technician(s):
Initial Depth to Water: <i>9.62</i>	Total Well Depth:	Water Column Height:
Volume/ft:	1 Casing Volume:	3 Casing Volumes:
Purging Device:	Did Well Dewater?:	Total Gallons Purged:
Start Purge Time:	Stop Purge Time:	Total Time:

1 Casing Volume = Water column height x Volume/ft.

Well Diam.	Volume/ft (gallons)
2"	0.16
4"	0.65
6"	1.47

Time	Casing Volume	Temp. C	pH	Cond. uS	Comments
	1				
	2				
	3				
		<i>NO PURGE</i>			

Sample ID	Date	Time	Container Type	Preservative	Analytes	Analytic Method
MW- <i>7</i>	<i>11-10-00</i>	<i>9 11.54</i>	<i>4 VOA</i>	<i>HCl</i>	<i>TPH<sub>5</sub> DTEx MRE</i>	<i>8013/8020</i>
MW-						

# CAMBRIA

## WELL SAMPLING FORM

Project Name: <i>Asco 6002</i>	Cambria Mgr: <i>RAS</i>	Well ID: <i>MW-8</i>
Project Number: <i>436-1609</i>	Date: <i>11-10-00</i>	Well Yield: <i>----</i>
Site Address: <i>6235 Seminary Ave Oakland, Ca</i>	Sampling Method:	Well Diameter: <i>2" pvc</i>
	<i>Disposable bailer</i>	Technician(s):
Initial Depth to Water: <i>6.25</i>	Total Well Depth:	Water Column Height:
Volume/ft:	1 Casing Volume:	3 Casing Volumes:
Purging Device:	Did Well Dewater?:	Total Gallons Purged:
Start Purge Time:	Stop Purge Time:	Total Time:

1 Casing Volume = Water column height x Volume/ft.

Well Diam.	Volume/ft (gallons)
2"	0.16
4"	0.65
6"	1.47

Time	Casing Volume	Temp. C	pH	Cond. uS	Comments
	1				
	2				
	3	<i>NO PURGE</i>			

Sample ID	Date	Time	Container Type	Preservative	Analytes	Analytic Method
<i>MW-8</i>	<i>11-10-00</i>	<i>12:00</i>	<i>4 VOA</i>	<i>MCI</i>	<i>TPHs BTEX MRE</i>	<i>8015 / 8020</i>
<i>MW-<del>DUP</del></i>						