



ENVIRONMENTAL
PROTECTION

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November 30, 1998
Project 20805-135.008

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

Re: Quarterly Groundwater Monitoring Report and Remediation System Performance
Evaluation Report, Second Quarter 1998, for ARCO Service Station No. 6148, located at
5131 Shattuck Avenue, Oakland, California

Dear Mr. Supple:

Pinnacle Environmental Solutions, a division of EMCON (Pinnacle), is submitting the attached report which presents the results of the second quarter 1998 groundwater monitoring program at ARCO Products Company (ARCO) Service Station No. 6148, located at 5131 Shattuck Avenue, Oakland, California. Operation and performance data for the on-site soil-vapor extraction (SVE), air-sparge (AS), and air-bubbling remediation systems are also presented. The quarterly monitoring program complies with Alameda County Health Care Services Agency (ACHCSA) requirements regarding underground tank investigations.

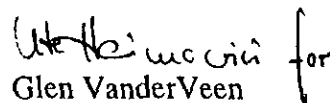
LIMITATIONS


No monitoring event is thorough enough to describe all geologic and hydrogeologic conditions of interest at a given site. If conditions have not been identified during the monitoring event, results should not be construed as a guarantee of the absence of such conditions at the site, but rather as the product of the scope, and limitations, of work performed during the monitoring event.

Please call if you have questions.

Sincerely,

Pinnacle


Glen VanderVeen
Project Manager


Valli Voruganti, P.E.
Project Engineer

Attachment: Quarterly Groundwater Monitoring Report, Second Quarter 1998

cc: Susan Hugo, ACHCSA



Date: November 17, 1998**ARCO QUARTERLY GROUNDWATER MONITORING REPORT**

Station No.: 6148 Address: 5131 Shattuck Avenue, Oakland, California
 Pinnacle Project No. 20805-135.008
 ARCO Environmental Engineer/Phone No.: Paul Supple /(510) 299-8891
 Pinnacle Project Manager/Phone No.: Glen VanderVeen /(925) 977-9020
 Primary Agency/Regulatory ID No.: ACHCSA /Susan Hugo

WORK PERFORMED THIS QUARTER (SECOND - 1998):

1. Prepared and submitted quarterly groundwater monitoring report for first quarter 1998.
2. Performed quarterly groundwater monitoring and sampling for second quarter 1998.
3. Operated air bubbling system to promote any natural biodegradation of petroleum hydrocarbons occurring in groundwater in the vicinity of the well.

WORK PROPOSED FOR NEXT QUARTER (THIRD - 1998):

1. Prepare and submit quarterly groundwater monitoring report for second quarter 1998.
2. Perform quarterly groundwater monitoring and sampling for third quarter 1998.
3. Restart soil-vapor extraction (SVE) and air-sparge systems if hydrocarbon concentrations in extracted soil vapor warrant or water levels decrease at the site.
4. Continue to operate air bubbling system.

QUARTERLY MONITORING:

Current Phase of Project: Quarterly Groundwater Monitoring and Operation and Maintenance of Remediation Systems
Due to a control fault process blower failure, the SVE system did not operate during the second quarter 1998. The air-bubbling system operated during the quarter.

Frequency of Sampling: Annual (1st Quarter): MW-6, MW-7
Semi-Annual (1st/3rd Quarter): MW-4
Quarterly: MW-1, MW-2, MW-3, MW-5

Frequency of Monitoring: Quarterly (groundwater),
Monthly (SVE, air-sparge, and air-bubbling)

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

Bulk Soil Removed to Date : 560 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, Air-Sparge, and Air-Bubbling Systems

Average Depth to Groundwater: 15.0 feet

Groundwater Flow Direction and Gradient (Average): 0.02 ft/ft toward southwest

SVE QUARTERLY OPERATION AND PERFORMANCE:

Equipment Inventory:	Therm Tech Model CATVAC-10E, Electric/Catalytic Oxidizer
Operating Mode:	Catalytic Oxidation
BAAQMD Permit #:	25126
TPH Conc. End of Period (lab):	NA (Not Available)
Benzene Conc. End of Period (lab):	NA
Flowrate End of Period:	NA
HC Destroyed This Period:	0.0 pounds
HC Destroyed to Date:	1885.6 pounds
Utility Usage	
Electric (KWH):	1178 KWH
Operating Hours This Period:	0.0 hours
Percent Operational:	0.0%
Operating Hours to Date:	2697.5 hours
Unit Maintenance:	Routine monthly maintenance
Number of Auto Shut Downs:	0
Destruction Efficiency Permit Requirement:	95% or <1 lb./day TPH and <0.02 lb./day Benzene
Percent TPH Conversion:	NA
Average Stack Temperature:	NA
Average Source Flow:	0.0 scfm
Average Process Flow:	0.0 scfm
Average Source Vacuum:	0 inches of water

DISCUSSION:

Due to high water levels and process blower failure, the SVE system did not operate and no system influent/effluent samples were taken during the second quarter 1998.

ATTACHMENTS:

- Table 1 - Historical Groundwater Elevation and Analytical Data, Petroleum Hydrocarbons and Their Constituents
- 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

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

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	Oil & Grease SM 5520C mg/L	TRPH EPA 418.1 mg/L	TPHD LUFT Method µg/L
MW-1	03-20-95	108.03	15.75	92.28	ND	SW	0.02	03-20-95	830	140	5	41	110	--	--	--	--	--
MW-1	06-06-95	108.03	17.68	90.35	ND	SW	0.016	06-06-95	210	30	<0.5	7.3	16	--	--	--	--	--
MW-1	08-24-95	107.80	17.45	90.35	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									
MW-1	11-16-95	107.80	17.64	90.16	ND	SW	0.012	11-16-95	<50	5.6	<0.5	1.4	1.2	55	--	--	--	--
MW-1	02-27-96	107.80	15.21	92.59	ND	SW	0.016	02-27-96	1400	240	88	44	110	200	--	--	--	--
MW-1	05-15-96	107.80	17.53	90.27	ND	SW	0.015	05-15-96	Not sampled: well sampled semi-annually, during the first and third quarter									
MW-1	08-14-96	107.80	17.15	90.65	ND	SW	0.021	08-14-96	98	18	<0.5	1.9	1	45	--	--	--	--
MW-1	11-11-96	107.80	17.78	90.02	ND	SW	0.015	11-11-96	Not sampled: well sampled semi-annually, during the first and third quarter									
MW-1	03-25-97	107.80	17.68	90.12	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-1	05-15-97	107.80	17.91	89.89	ND	SSW	0.014	05-15-97	Not sampled: well sampled semi-annually, during the first and third quarter									
MW-1	10-26-97	107.80	18.85	88.95	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-1	02-13-98	107.80	13.15	94.65	ND	SSW	0.012	02-13-98	<100	8.4	<1	<1	14	130	--	--	--	--
MW-1	05-12-98	107.80	12.30	95.50	ND	SW	0.02	05-12-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-2	03-20-95	107.43	15.50	91.93	ND#	SW	0.02	03-20-95	Not sampled: floating product entered well during purging									
MW-2	06-06-95	107.43	17.43	90.00	ND	SW	0.016	06-06-95	1200	60	21	35	140	--	--	--	--	--
MW-2	08-24-95	107.28	17.22	90.06	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									
MW-2	11-16-95	107.28	17.36	89.92	ND	SW	0.012	11-16-95	360	45	1.3	7.1	7.5	210	--	--	--	--
MW-2	02-27-96	107.28	14.82	92.46	ND	SW	0.016	02-27-96	8900	1400	980	150	550	940	--	--	--	--
MW-2	05-15-96	107.28	17.40	89.88	ND	SW	0.015	05-15-96	480	82	48	8	48	87	--	--	--	--
MW-2	08-14-96	107.28	17.00	90.28	ND	SW	0.021	08-14-96	130	22	4	2	9	120	--	--	--	--
MW-2	11-11-96	107.28	17.55	89.73	ND	SW	0.015	11-11-96	1200	150	120	21	160	110	--	--	--	--
MW-2	03-25-97	107.28	17.32	89.96	ND	SSW	0.018	03-25-97	670	23	58	13	120	28	--	--	--	--
MW-2	05-15-97	107.28	17.61	89.67	ND	SSW	0.014	05-15-97	<50	<0.5	<0.5	<0.5	<0.5	23	--	--	--	--
MW-2	10-26-97	107.28	18.43	88.85	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-2	02-13-98	107.28	12.75	94.53	ND	SSW	0.012	02-13-98	220	9.5	3.9	3.7	48	84	--	--	--	--
MW-2	05-12-98	107.28	17.02	90.26	ND	SW	0.02	05-12-98	3900	210	280	86	910	35	--	--	--	--

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MW-3	03-20-95	107.77	15.60	92.17	ND	SW	0.02	03-20-95	29000	880	190	760	2000	--	--	--	16	--	
MW-3	06-06-95	107.77	17.54	90.23	ND	SW	0.016	06-06-95	22000	450	54	380	1300	--	--	--	7.1	--	
MW-3	08-24-95	107.61	17.42	90.19	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									--	--
MW-3	11-16-95	107.61	17.58	90.03	ND	SW	0.012	11-16-95	13000	210	<20	320	1000	790	--	--	8.3	--	
MW-3	02-27-96	107.61	15.03	92.58	ND	SW	0.016	02-27-96	9700	94	15	290	720	430	--	--	10	--	
MW-3	05-15-96	107.61	17.35	90.26	ND	SW	0.015	05-15-96	5600	66	12	37	67	230	--	--	--	--	
MW-3	08-14-96	107.61	17.10	90.51	ND	SW	0.021	08-14-96	830	17	<1*	8	7	110	--	--	--	--	
MW-3	11-11-96	107.61	17.73	89.88	ND	SW	0.015	11-11-96	500	28	3	12	13	150	--	--	--	--	
MW-3	03-25-97	107.61	17.99	89.62	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	94	--	--	--	--	
MW-3	05-15-97	107.61	17.84	89.77	ND	SSW	0.014	05-15-97	<50	<0.5	<0.5	<0.5	<0.5	65	--	--	--	--	
MW-3	10-26-97	107.61	18.50	89.11	ND	SW	0.009	10-26-97	220	4	<1	<1	<1	160	--	--	--	--	
MW-3	02-13-98	107.61	13.00	94.61	ND	SSW	0.012	02-13-98	<50	1.3	<0.5	<0.5	1	21	--	--	--	--	
MW-3	05-12-98	107.61	17.20	90.41	ND	SW	0.02	05-12-98	120	<0.5	<0.5	<0.5	<0.9	71	--	--	--	--	
MW-4	03-20-95	106.58	13.85	92.73	ND	SW	0.02	03-20-95	88	1	<0.5	<0.5	0.7	--	--	--	--	--	
MW-4	06-06-95	106.58	15.70	90.88	ND	SW	0.016	06-06-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--	
MW-4	08-24-95	106.71	15.86	90.85	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									--	--
MW-4	11-16-95	106.71	16.10	90.61	ND	SW	0.012	11-16-95	<50	<0.5	<0.5	<0.5	<0.5	6	--	--	--	--	
MW-4	02-27-96	106.71	13.72	92.99	ND	SW	0.016	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	10	--	--	--	--	
MW-4	05-15-96	106.71	15.90	90.81	ND	SW	0.015	05-15-96	Not sampled: well sampled semi-annually, during the first and third quarter									--	--
MW-4	08-14-96	106.71	15.68	91.03	ND	SW	0.021	08-14-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	
MW-4	11-11-96	106.71	16.19	90.52	ND	SW	0.015	11-11-96	Not sampled: well sampled semi-annually, during the first and third quarter									--	--
MW-4	03-25-97	106.71	16.10	90.61	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	
MW-4	05-15-97	106.71	16.38	90.33	ND	SSW	0.014	05-15-97	Not sampled: well sampled semi-annually, during the first and third quarter									--	--
MW-4	10-26-97	106.71	17.78	88.93	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--	
MW-4	02-13-98	106.71	13.05	93.66	ND	SSW	0.012	02-13-98	<50	1.3	0.7	<0.5	2.3	19	--	--	--	--	
MW-4	05-12-98	106.71	15.69	91.02	ND	SW	0.02	05-12-98	Not sampled: well sampled semi-annually, during the first and third quarter									--	--

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MW-5	03-20-95	106.68	14.92	91.76	ND	SW	0.02	03-20-95	21000	6900	450	800	1300	--	--	--	--	--
MW-5	06-06-95	106.68	16.61	90.07	ND	SW	0.016	06-06-95	6500	1700	<20	120	69	--	--	--	--	--
MW-5	08-24-95	106.60	16.47	90.13	ND	SW	0.014	08-24-95	Not sampled: well was inaccessible due to construction									
MW-5	11-16-95	106.60	16.69	89.91	ND	SW	0.012	11-16-95	1800	470	<5	17	5	1000	--	--	--	--
MW-5	02-27-96	106.60	14.35	92.25	ND	SW	0.016	02-27-96	10000	1000	71	690	1000	440	450	--	--	--
MW-5	05-15-96	106.60	16.58	90.02	ND	SW	0.015	05-15-96	3400	350	6	72	20	220	--	--	--	--
MW-5	08-14-96	106.60	17.26	89.34	ND	SW	0.021	08-14-96	2100	130	2.7	47	4.7	220	--	--	--	--
MW-5	11-11-96	106.60	16.62	89.98	ND	SW	0.015	11-11-96	1200	31	1	8	2	130	--	--	--	--
MW-5	03-25-97	106.60	16.38	90.22	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	5	--	--	--	--
MW-5	05-15-97	106.60	16.54	90.06	ND	SSW	0.014	05-15-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-5	10-26-97	106.60	17.60	89.00	ND	SW	0.009	10-26-97	<50	<0.5	<0.5	<0.5	<0.5	7	--	--	--	--
MW-5	02-13-98	106.60	12.21	94.39	ND	SSW	0.012	02-13-98	11200	51	<10	<10	<10	2000	--	--	--	--
MW-5	05-12-98	106.60	NR	NR	ND	SW	0.02	05-12-98	Not sampled: well inaccessible									
MW-6	03-20-95	105.16	12.13	93.03	ND	SW	0.02	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	06-06-95	105.16	13.95	91.21	ND	SW	0.016	06-06-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	08-24-95	105.13	14.07	91.06	ND	SW	0.014	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-6	11-16-95	105.13	14.34	90.79	ND	SW	0.012	11-16-95	<60	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	02-27-96	105.13	12.00	93.13	ND	SW	0.016	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-6	05-15-96	105.13	14.10	91.03	ND	SW	0.015	05-15-96	Not sampled: well sampled annually, during the first quarter									
MW-6	08-14-96	105.13	13.70	91.43	ND	SW	0.021	08-14-96	Not sampled: well sampled annually, during the first quarter									
MW-6	11-11-96	105.13	14.11	91.02	ND	SW	0.015	11-11-96	Not sampled: well sampled annually, during the first quarter									
MW-6	03-25-97	105.13	14.15	90.98	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-6	05-15-97	105.13	14.44	90.69	ND	SSW	0.014	05-15-97	Not sampled: well sampled annually, during the first quarter									
MW-6	10-26-97	105.13	16.02	89.11	ND	SW	0.009	10-26-97	Not sampled: well sampled annually, during the first quarter									
MW-6	02-13-98	105.13	10.06	95.07	ND	SSW	0.012	02-13-98	<50	<0.5	<0.5	<0.5	<0.5	8	--	--	--	--
MW-6	05-12-98	105.13	13.75	91.38	ND	SW	0.02	05-12-98	Not sampled: well sampled annually, during the first quarter									

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Well Designation	Water Level Field Date	Top of Casing Elevation ft-MSL	Depth to Water feet	Groundwater Elevation ft-MSL	Floating Product Thickness feet	Groundwater Flow Direction MWN	Hydraulic Gradient ft/ft	Water Sample Field Date	TPHG LUFT Method µg/L	Benzene EPA 8020 µg/L	Toluene EPA 8020 µg/L	Ethylbenzene EPA 8020 µg/L	Total Xylenes EPA 8020 µg/L	MTBE EPA 8020 µg/L	MTBE EPA 8240 µg/L	Oil & Grease SM 5520C mg/L	TRPH EPA 418.1 mg/L	TPHD LUFT Method µg/L
MW-7	03-20-95	107.08	12.32	94.76	ND	SW	0.02	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	06-06-95	107.08	14.59	92.49	ND	SW	0.016	06-06-95	Not sampled: well sampled semi-annually, during the first and third quarters									
MW-7	08-24-95	107.05	14.64	92.41	ND	SW	0.014	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-7	11-16-95	107.05	15.30	91.75	ND	SW	0.012	11-16-95	Not sampled: well sampled semi-annually, during the first and third quarters									
MW-7	02-27-96	107.05	12.24	94.81	ND	SW	0.016	02-27-96	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-7	05-15-96	107.05	14.65	92.40	ND	SW	0.015	05-15-96	Not sampled: well sampled annually, during the first quarter									
MW-7	08-14-96	107.05	14.35	92.70	ND	SW	0.021	08-14-96	Not sampled: well sampled annually, during the first quarter									
MW-7	11-11-96	107.05	14.92	92.13	ND	SW	0.015	11-11-96	Not sampled: well sampled annually, during the first quarter									
MW-7	03-25-97	107.05	14.80	92.25	ND	SSW	0.018	03-25-97	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-7	05-15-97	107.05	15.27	91.78	ND	SSW	0.014	05-15-97	Not sampled: well sampled annually, during the first quarter									
MW-7	10-26-97	107.05	16.68	90.37	ND	SW	0.009	10-26-97	Not sampled: well sampled annually, during the first quarter									
MW-7	02-13-98	107.05	10.80	96.25	ND	SSW	0.012	02-13-98	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
MW-7	05-12-98	107.05	14.32	92.73	ND	SW	0.02	05-12-98	Not sampled: well sampled annually, during the first quarter									

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ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

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

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

MWN: ground-water flow direction and gradient apply to the entire monitoring well network

ft/ft: foot per foot

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

µg/L: micrograms per liter

EPA: United States Environmental Protection Agency

MTBE: Methyl tert-butyl ether

SM: standard method

mg/L: milligrams per liter

TRPH: total recoverable petroleum hydrocarbons

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

NR: not reported; data not available

ND: none detected

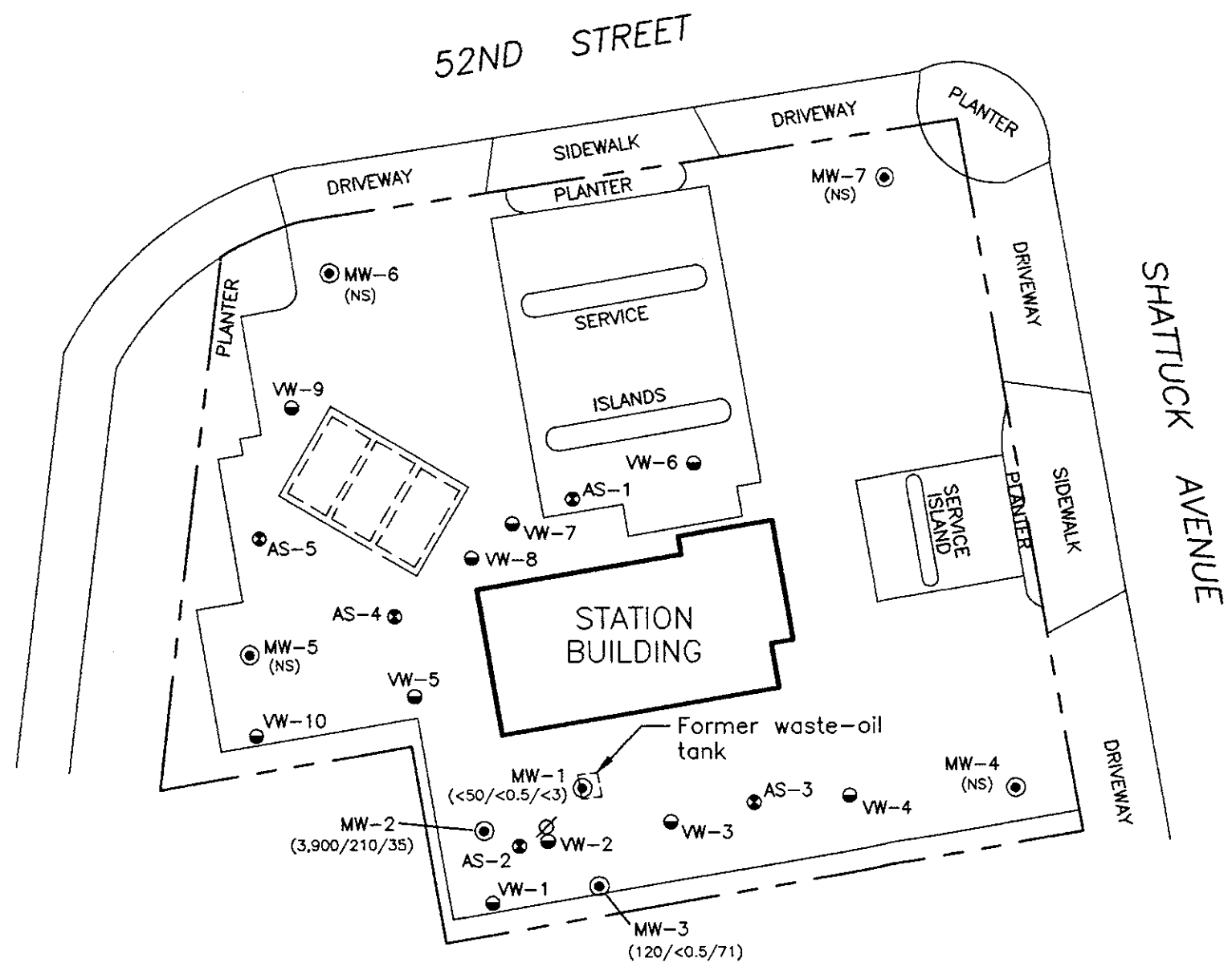
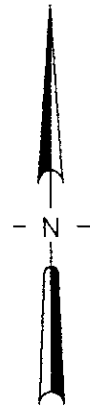
SW: south-west

#: floating product entered the well during purging

- -: not analyzed or not applicable

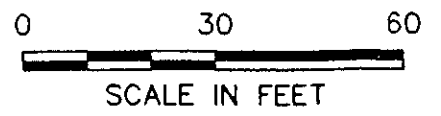
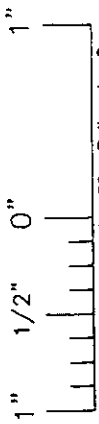
** For previous historical groundwater elevation and analytical data please refer to *Fourth Quarter 1995 Groundwater Monitoring Program Results and Remediation System Performance Evaluation Report*,


ARCO Service Station 6148, Oakland, California, (EMCON, March 4, 1996).



EXPLANATION	
⊙	Groundwater monitoring well
●	Vapor extraction well
⊙	Air-sparge well
∅	Decommissioned well
[---]	Existing underground gasoline storage tanks
(120/<0.5/71)	Concentration of total petroleum hydrocarbons as gasoline (TPHG), benzene, and MTBE in groundwater (ug/L); samples collected 5/12/98
<	Not detected at or above the indicated laboratory detection limit
NS	Not sampled

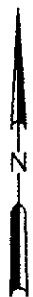
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 SANJOSE/CADD: N:\DWG\PINACL\6148\6148CHEM.DWG Mon, 05/Oct/98 02:00pm kblack




ENVIRONMENTAL SOLUTIONS
 A DIVISION OF EMCON

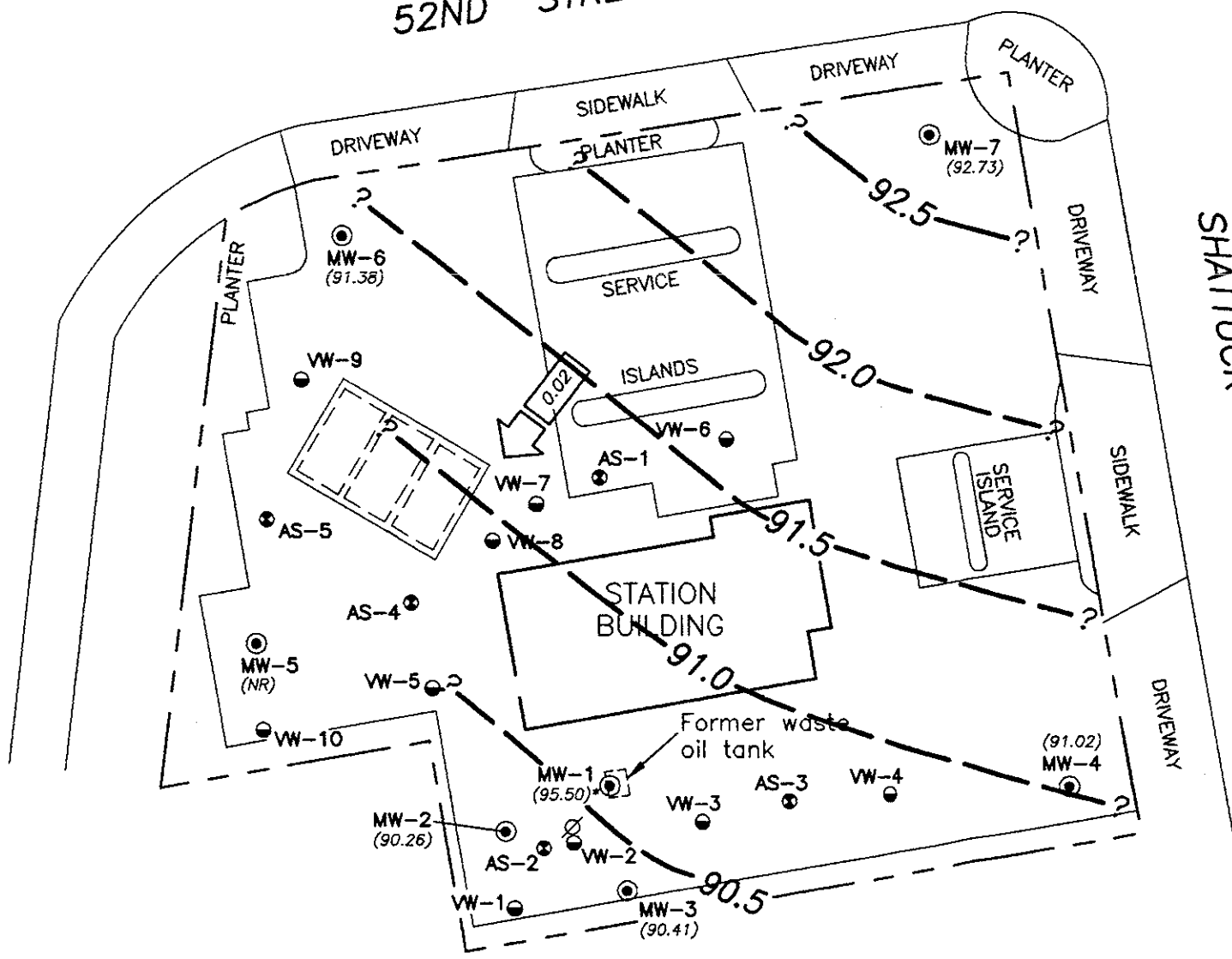
DATE	SEPT. 1998
DWN	KAB
APP	
REV	
PROJECT NO.	20805-135.008

FIGURE 1
 ARCO PRODUCTS COMPANY
 SERVICE STATION 6148, 5131 SHATTUCK AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ANALYTICAL SUMMARY
SECOND QUARTER 1998



52ND STREET

SHATTUCK AVENUE



EXPLANATION

- ⊙ Groundwater monitoring well
- Vapor extraction well
- ⊕ Air-sparge well
- ∅ Decommissioned well
- ⌈ ⌋ Existing underground gasoline storage tank
- (92.73) Groundwater elevation (Ft.-MSL) measured 5/12/98
- ? - - - Groundwater elevation contour (Ft.-MSL)
- ← Approximate direction of groundwater flow showing gradient
- NR Not recorded
- Not used in constructing contours

IMAGE Files: <No Images>
 XREF Files: <No Xrefs>
 Dimscale: 30 Ltscale: 30 Pallscale: 0
 SANJOSE/CADD: N:\DWG\PINACL\6148\6148GWC.DWG Tue, 03/Nov/98 04:21pm kblack

1" 1/2" 0" 1"

Pinnacle
 ENVIRONMENTAL SOLUTIONS
 A DIVISION OF EMCON

0 30 60
 APPROXIMATE SCALE IN FEET

DATE	SEPT. 1998
DWN	KAB
APP	
REV	
PROJECT NO.	20805-135.008

FIGURE 2
 ARCO PRODUCTS COMPANY
 SERVICE STATION 6148, 5131 SHATTUCK AVE.
 OAKLAND, CALIFORNIA
GROUNDWATER ELEVATION CONTOURS
SECOND QUARTER 1998

APPENDIX A
SAMPLING AND ANALYSIS PROCEDURES

APPENDIX A

SAMPLING AND ANALYSIS PROCEDURES

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

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

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

Sample Collection

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

Equipment Cleaning

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

Water Level, Floating Hydrocarbon, and Total Well Depth Measurements

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

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

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

Well Purging

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

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

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

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

Well Sampling

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

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

Sample Preservation and Handling

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

Sample Containers and Preservation

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

Sample Handling

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

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

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

Sample Documentation

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

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

Field Logbook

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

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

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

Labels

Sample labels contained the following information:

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

Sampling and Analysis Chain-of-Custody Record

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

Groundwater Sampling and Analysis Request Form

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

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



OWT

MONITORING WELL PURGING PROTOCOL

MEASURE AND RECORD DEPTH TO WATER AND WELL TOTAL DEPTH

CHECK FOR FLOATING PRODUCT

YES

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

NO

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

where:

P = calculated purge volume (gallons)

$\pi = 3.14$

r = radius of well casing in feet

h = height of water column in feet

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

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

NO

YES

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

pH = ± 0.1 pH units

COND. = $\pm 10\%$

TEMP. = ± 1.0 °F

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

YES

NO

YES

NO

WELL PURGING CRITERIA MET; PROCEED TO WELL SAMPLING.

CONTINUE PURGING; EVACUATE ADDITIONAL CASING VOLUME OF WATER. MONITOR INDICATOR PARAMETERS FOR STABILITY.

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

RECORD WELL AS DRY FOR PURPOSES OF SAMPLING.



EMCON

MONITORING WELL PURGING PROTOCOL

FIGURE

A-1

WATER SAMPLE FIELD DATA SHEET

Rev. 5/96



OWT

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

SAMPLE ID: _____
 CLIENT NAME: _____
 LOCATION: _____

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

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

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

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

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

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

PURGING EQUIPMENT

SAMPLING EQUIPMENT

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

WELL INTEGRITY: _____ LOCK: _____
 REMARKS: _____

pH, E.C., Temp. Meter Calibration Date: _____ Time: _____ Meter Serial No.: _____
 E.C. 1000 _____ / _____ pH 7 _____ / _____ pH 10 _____ / _____ pH 4 _____ / _____
 Temperature °F _____

SIGNATURE: _____ REVIEWED BY: _____ PAGE _____ OF _____



WATER SAMPLE FIELD DATA SHEET

FIGURE
A-2



OWT

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

PROJECT NAME :

SCHEDULED DATE :

SPECIAL INSTRUCTIONS / CONSIDERATIONS :

[Empty box for special instructions]

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

Well Lock Number (s)

CHECK BOX TO AUTHORIZE DATA ENTRY

Site Contact: _____
Name Phone #

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

Laboratory and Lab QC Istructions:

[Empty box for laboratory and lab QC instructions]



EMCON

SAMPLING AND ANALYSIS REQUEST FORM

FIGURE

A-3

APPENDIX B

**CERTIFIED ANALYTICAL REPORT
AND CHAIN OF CUSTODY DOCUMENTATION**



May 28, 1998

Service Request No.: S9801206

Glen Vanderveen
PINNACLE
144 A Mayhew Wy.
Walnut Creek, CA 94596

RE: 20805-135.007/22312.00/RAT8/6148 OAKLAND

Dear Mr. Vanderveen:

The following pages contain analytical results for sample(s) received by the laboratory on May 13, 1998. Results of sample analyses are followed by Appendix A which contains sample custody documentation and quality assurance deliverables requested for this project. The work requested has been assigned the Service Request No. listed above. To help expedite our service, please refer to this number when contacting the laboratory.

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

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

Sincerely,

A handwritten signature in cursive script that reads "Bernadette J Cox for".

Steven L. Green
Project Chemist

A handwritten signature in cursive script that reads "Cristina V. Reyes for".

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

A2LA	American Association for Laboratory Accreditation
ASTM	American Society for Testing and Materials
BOD	Biochemical Oxygen Demand
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAM	California Assessment Metals
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
COD	Chemical Oxygen Demand
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DLC8	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank sample
ICP	Inductively Coupled Plasma atomic emission spectrometry
ICV	Initial Calibration Verification sample
J	Estimated concentration. The value is less than the MRL, but greater than or equal to the MDL. If the value is equal to the MRL, the result is actually <MRL before rounding.
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified
MBAS	Methylene Blue Active Substances
MCL	Maximum Contaminant Level. The highest permissible concentration of a substance allowed in drinking water as established by the U. S. EPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl tert-Butyl Ether
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the paper industry for Air and Stream Improvement
ND	Not Detected at or above the method reporting/detection limit (MRL/MDL)
NIOSH	National Institute for Occupational Safety and Health
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	Standard Methods for the Examination of Water and Wastewater, 18th Ed., 1992
STLC	Solubility Threshold Limit Concentration
SW	Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Ed., 1986 and as amended by Updates I, II, IIA, and IIB.
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
tr	Trace level. The concentration of an analyte that is less than the PQL but greater than or equal to the MDL. If the value is equal to the PQL, the result is actually <PQL before rounding.
TRPH	Total Recoverable Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/22312.00/RAT8/6148 OAKLAND
Sample Matrix: Water

Service Request: S9801206
Date Collected: 5/12/98
Date Received: 5/13/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-1(13)
Lab Code: S9801206-001
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	5/20/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/20/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/20/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/20/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/20/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	5/20/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/22312.00/RAT8/6148 OAKLAND
Sample Matrix: Water

Service Request: S9801206
Date Collected: 5/12/98
Date Received: 5/13/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-3(18)
Lab Code: S9801206-002
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	5/17/98	120	
Benzene	EPA 5030	8020	0.5	1	NA	5/17/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/17/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/17/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/17/98	0.9	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	5/17/98	71	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/22312.00/RAT8/6148 OAKLAND
Sample Matrix: Water

Service Request: S9801206
Date Collected: 5/12/98
Date Received: 5/13/98

BTEX, MTBE and TPH as Gasoline

Sample Name: MW-2(18)
Lab Code: S9801206-003
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	10	NA	5/16/98	3900	
Benzene	EPA 5030	8020	0.5	10	NA	5/16/98	210	
Toluene	EPA 5030	8020	0.5	10	NA	5/16/98	280	
Ethylbenzene	EPA 5030	8020	0.5	10	NA	5/16/98	86	
Xylenes, Total	EPA 5030	8020	0.5	10	NA	5/16/98	910	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	10	NA	5/16/98	35	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/22312.00/RAT8/6148 OAKLAND
Sample Matrix: Water

Service Request: S9801206
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980516-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	5/16/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/16/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/16/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/16/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/16/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	5/16/98	ND	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 20805-135.007/22312.00/RAT8/6148 OAKLAND
Sample Matrix: Water

Service Request: S9801206
Date Collected: NA
Date Received: NA

BTEX, MTBE and TPH as Gasoline

Sample Name: Method Blank
Lab Code: S980520-WB1
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	1	NA	5/20/98	ND	
Benzene	EPA 5030	8020	0.5	1	NA	5/20/98	ND	
Toluene	EPA 5030	8020	0.5	1	NA	5/20/98	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	5/20/98	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	5/20/98	ND	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	3	1	NA	5/20/98	ND	

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-135.007/22312.00/RAT8/6148 OAKLAND
Sample Matrix: Water

Service Request: S9801206
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: NA

Surrogate Recovery Summary
BTEX, MTBE and TPH as Gasoline

Prep Method: EPA 5030
Analysis Method: 8020 CA/LUFT

Units: PERCENT
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			4-Bromofluorobenzene	a,a,a-Trifluorotoluene
MW-1(13')	S9801206-001		98	94
MW-3(18')	S9801206-002		97	99
MW-2(18')	S9801206-003		112	86
BATCH QC	S9801205-005MS		95	100
BATCH QC	S9801205-005DMS		98	104
Method Blank	S980516-WB1		105	89
Method Blank	S980520-WB1		106	92

CAS Acceptance Limits: 69-116 69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-135.007/22312.00/RAT8/6148 OAKLAND
Sample Matrix: Water

Service Request: S9801206
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 5/16/98

Matrix Spike/Duplicate Matrix Spike Summary
 TPH as Gasoline

Sample Name: BATCH QC Units: ug/L (ppb)
Lab Code: S9801205-005MS, S9801205-005DMS Basis: NA
Test Notes:

Analyte	Prep Method	Analysis Method	Spike Level		Sample Result	Percent Recovery				CAS Acceptance Limits	Relative Percent Difference	Result Notes
			MRL	DMS		MS	DMS	MS	DMS			
Gasoline	EPA 5030	CA/LUFT	50	250	ND	250	260	100	104	75-135	4	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 20805-135.007/22312.00/RAT8/6148 OAKLAND

Service Request: S9801206
Date Analyzed: 5/16/98

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		Result Notes
					Percent Recovery	Percent Recovery	
					Acceptance Limits		
TPH as Gasoline	EPA 5030	CA/LUFT	250	260	90-110	104	
Benzene	EPA 5030	8020	25	23	85-115	92	
Toluene	EPA 5030	8020	25	23	85-115	92	
Ethylbenzene	EPA 5030	8020	25	23	85-115	92	
Xylenes, Total	EPA 5030	8020	75	67	85-115	89	
Methyl <i>tert</i> -Butyl Ether	EPA 5030	8020	25	28	85-115	112	

APPENDIX C
FIELD DATA SHEETS

EMCON - Groundwater Sampling and Analysis Request Form

PROJECT NAME : **ARCO STATION 6148**
 5131 Shattuck Avenue, Oakland

Sampling Project #: **21775-250.003**
 Reporting Project #: **20805-135.007**

DATE REQUESTED : **12-May-98**

Project Manager: **Glen Vanderveen**

Groundwater Monitoring Instructions	Treatment System Instructions
<p><i>Quarterly Monitoring- Second Month Of The Quarter</i> You will need a water trailer for purge water transport, and a 15/16" socket to access wells. Get the key from the station manager to open the gate. Perform a water level survey prior to sampling (See ARCO SOP). The survey points are tops of the well casings. Purge three (3) casing volumes. Well MW-2 may contain a skimmer, please note this on your field sheet. Sample all wells regardless of product per John Young's request. Please use the Reporting Project Number (20805-135.007) on the chain-of-custody, sample containers, and analytical results. Sample ID's on the Chain-Of-Custody and sample containers must include the depth at which the sample was collected [i.e. MW-1 (30)].</p>	<p>Active System</p> <p align="right">Lisle Rath Pager# (408) 798-2928</p>

Site Contact: ? Site Phone: **(510) 654-3461** Well Locks: **ARCO Key**

Well ID or Source	Casing Diameter (inches)	Casing Length (feet)	Top Of Screen (feet)	Analyses Requested
MW-7	4.0	27.0	14.0	Depth To Water Total Depth Well Integrity
MW-6	4.0	26.6	14.0	
MW-4	4.0	26.0	13.0	
MW-1	4.0	25.7	11.5	
MW-3	4.0	25.9	10.0	
MW-2	4.0	25.8	12.0	
MW-5	4.0	25.0	12.0	
Above wells in indicated order				Add: Dissolved Oxygen TPHG BTEX MTBE by EPA 8020 (Fill 2- 40ml HCL VOAs)
MW-1				
MW-3		(See Above)		
MW-2				
MW-5				
Above wells in indicated order				
Laboratory Instructions:				
Provide ARCO standard detection limits.				
Please use the Reporting Project Number (#20805-135.007) on the CARs.				
ND = None Detected IP = Intermittent Product				

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

PROJECT # : 21775-250.003 STATION ADDRESS : 5131 Shattuck Avenue, Oakland

DATE : 5/12/98

ARCO STATION # : 6148

FIELD TECHNICIAN : Mike Ross

DAY : Tuesday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket Present	Lock Number	Type Of Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-7	OK	OK	OK	ARCO	LWC	14.32	14.32	N/A	N/A	27.0	
2	MW-6	↓	↓	↓	ARCO	LWC	13.75	13.75	↓	↓	26.6	
3	MW-4	↓	↓	↓	ARCO	TCC	15.69	15.69	↓	↓	26.0	
4	MW-1	↓	↓	↓	None	TCC	12.30	12.30	↓	↓	25.5	
5	MW-5	-	-	-	-	TCC	No samples		of water levels taken gate locked. no key			
6	MW-2	OK	OK	OK	↓	TCC	17.02	17.02	↓	↓	25.4	
7	MW-3	↓	OK	OK	↓	TCC	17.20	17.20	↓	↓	25.6	

SURVEY POINTS ARE TOP OF WELL CASINGS

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-250-003

SAMPLE ID MW-3(18')

PURGED BY M. Gallagos

CLIENT NAME ARCO # 6148

SAMPLED BY ↓

LOCATION OAKLAND, CA

TYPE Groundwater Surface Water Leachate Other
CASING DIAMETER (inches) 2 3 4 5 6 Other

CASING ELEVATION (feetVMSL) NR VOLUME IN CASING (gal) NR
DEPTH OF WELL (feet) 25.6 CALCULATED PURGE (gal) ↓
DEPTH OF WATER (feet) 17.20 ACTUAL PURGE VOL (gal) ↓

DATE PURGED 5-12-98 END PURGE —
DATE SAMPLED ↓ SAMPLING TIME 1045

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C. (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1045</u>	<u>6.00</u>	<u>6.13</u>	<u>582</u>	<u>66.1</u>	<u>Clear</u>	<u>Clear</u>

OTHER: DO = 1.99 ODOR Strong NR NR
(COBALT 0-100) (NTU 0-200)

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

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

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

WELL INTEGRITY OK

LOCK ARCO-1004

REMARKS All samples taken

pH, E.C., Temp Meter Calibration Date 5/12/98 Time Meter Serial No 87M
E.C. 1000 pH 7 pH 10 pH 4

Temperature °F SIGNATURE [Signature] REVIEWED BY [Signature] PAGE 3 OF 4

WATER SAMPLE FIELD DATA SHEET

Rev 1/97



OWT

PROJECT NO 21775-250-003
 PURGED BY M. Gallegos
 SAMPLED BY [Signature]

SAMPLE ID MW-5
 CLIENT NAME ARLO # 6148
 LOCATION OAKLAND, CA

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) N/A
 DEPTH OF WEL (feet) [downward arrow] CALCULATED PURGE (gal) [downward arrow]
 DEPTH OF WATER (feet) [downward arrow] ACTUAL PURGE VOL (gal) [downward arrow]

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

TIME (2400 HR)	VOLUME (gal)	pH (units)	E.C (µmhos/cm@25°C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>N/A</u>	<u>Samples</u>	<u>ten</u>	<u>gate</u>	<u>locked</u>	<u>N/A</u>	<u>key</u>

OTHER: N/A ODOR: N/A (COBALT 0-100) N/A (NTU 0-200) N/A

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"/> Bailor (Teflon)	<input type="checkbox"/> 2" Bladder Pump	<input type="checkbox"/> Bailor (Teflon)
<input type="checkbox"/> Centrifugal Pump	<input type="checkbox"/> Bailor (PVC)	<input type="checkbox"/> Bomb Sampler	<input type="checkbox"/> Bailor (Stainless Steel)
<input type="checkbox"/> Submersible Pump	<input type="checkbox"/> Bailor (Stainless Steel)	<input type="checkbox"/> Dipper	<input type="checkbox"/> Submersible Pump
<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dedicated	<input type="checkbox"/> Well Wizard™	<input type="checkbox"/> Dedicated
<input type="checkbox"/> Other _____		<input type="checkbox"/> Other _____	

WELL INTEGRITY: N/A LOCK: _____

REMARKS: _____

pH, E.C., Temp Meter Calibration Date 5/12/98 Time _____ Meter Serial No 8727
 E.C 1000 1 pH 7 1 pH 10 1 pH 4 1

Temperature °F _____
 SIGNATURE [Signature] REVIEWED BY [Signature] PAGE 4 OF 4

ARCO Products Company

Chain of Custody

Division of Atlantic/Richfield Company

Task Order # **1312-00**

ARCO Facility no. **6148**

City (Facility) **Oakland**

Project manager (Consultant) **Glen Vanderveen**

Laboratory Name **CA**

ARCO engineer **Paul Supple**

Telephone no. (ARCO)

Telephone no. (Consultant) **(408) 453-1900**

Fax no. (Consultant) **(408) 453-0452**

Contract Number

Consultant name **EMCON**

Address (Consultant) **1000 Ave San Jose CA 95131**

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling volume	BTEX (Total)	EPA 9200A	EPA 9200B	EPA 9200C	EPA 9200D	EPA 9200E	EPA 9200F	EPA 9200G	EPA 9200H	EPA 9200I	EPA 9200J	EPA 9200K	EPA 9200L	EPA 9200M	EPA 9200N	EPA 9200O	EPA 9200P	EPA 9200Q	EPA 9200R	EPA 9200S	EPA 9200T	EPA 9200U	EPA 9200V	EPA 9200W	EPA 9200X	EPA 9200Y	EPA 9200Z	
			Soil	Water	Other	Ice	Acid																														
MW-1(18)		2		X		X	HCl	5/2/88	100	X																											
MW-3(18)		2		X		X	HCl	10/88	100	X																											
MW-7(18)		2		X		X	HCl	4/88	100	X																											
MW-5()		2		X		X	HCl	-	-	X																											

Method of shipment
**Sampler
will
deliver**

Special Detection Limit Reporting
**Lowest
possible**

Special QACC
**As
Normal**

Remarks
**RAT 8
2-40ml HCl
VOCs**

#20005-135.007

Condition of sample: **Cool**

Temperature received

Relinquished by sampler
Paul Supple

Date **5/1/88** Time

Received by
Glen Vanderveen

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