PACIFIC
ENVIRONMENTAL
GROUP, INC.

585

ST#1259

Quarterly Groundwater Monitoring Report
Fourth Quarter 1997

ARCO Service Station 2162
15135 Hesperian Boulevard at Ruth Court
San Leandro, California

Prepared for

Mr. Paul Supple
ARCO Products Company

March 26, 1998

Prepared by

Pacific Environmental Group, Inc.
2025 Gateway Place, Suite 440
San Jose, California 95110

Project 330-107.2D

REGISTERED GEOLOGIST
JOSEPH J. MUZZIO
No. 1672
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Joseph Muzzio
Project Manager
CEG 1672

Date: March 26, 1998
Quarter: 4Q97

ARCO QUARTERLY GROUNDWATER MONITORING REPORT

Facility No.: 2162 Address:	15135 Hesperian Boulevard at Ruth Court, San Leandro
ARCO Environmental Engineer:	Paul Supple
Consulting Co./Contact Person:	Pacific Environmental Group, Inc./Joseph Muzzio
Consultant Project No.:	330-107.2D
Primary Agency/Regulatory ID No.:	Alameda County Health Care Services Agency
Monitoring Events Performed to Date:	22

WORK PERFORMED THIS QUARTER (Fourth - 1997):

1. Submitted third quarter 1997 groundwater monitoring report.
2. Performed fourth quarter 1997 groundwater monitoring event on December 12.
3. Prepared fourth quarter 1997 groundwater monitoring report.

WORK PROPOSED FOR NEXT QUARTER (First - 1998):

1. Submit fourth quarter 1997 groundwater monitoring report.
2. Perform first quarter 1998 groundwater monitoring event.
3. Prepare first quarter 1998 groundwater monitoring report.

Current Phase of Project:	Monitoring	(Assmnt, Remed., etc.)
Frequency of Groundwater Sampling:	Quarterly	(Quarterly, etc.)
Frequency of Groundwater Monitoring:	Quarterly	(Monthly, etc.)
Is Free Product (FP) Present On-Site:	No	(Yes/No)
FP Recovered this Quarter:	None	(gallons)
Cumulative FP Recovered to Date:	None	(gallons)
Bulk Soil Removed This Quarter:	None	(cubic yards)
Bulk Soil Removed to Date:	None	(cubic yards)
Current Remediation Techniques:	Natural Attenuation	(SVE/Sparge/FP Removal, etc.)
Approximate Depth to Groundwater:	7.10 to 8.45	(Measure Feet)
Groundwater Gradient:	Southwest	(Direction)
	0.01	(Magnitude)

DISCUSSION:

- TPPH-g and BTEX compounds concentrations were below detection limits for all wells, with the exception of TPPH-g of 560 ppb in Well MW-3 and benzene of 2.9 ppb in Well MW-4.
- Please refer to PEG's *Quarterly Groundwater Monitoring Report - Fourth Quarter 1996*, for historical groundwater elevation and analytical data.

MtBE?

ATTACHMENTS:

- Table 1 - Groundwater Sampling Schedule
- Table 2 - Groundwater Elevation and Analytical Data
- Figure 1 - Groundwater Elevation Contour Map
- Figure 2 - TPPH-g/Benzene Concentration Map
- Attachment A - Field and Laboratory Procedures
- Attachment B - Certified Analytical Report, Chain-of-Custody Documentation, and Field Data Sheets

cc: Mr. John Jang, Regional Water Quality Control Board - S.F. Bay Region
Mr. Mike Bakaldin, City of San Leandro Fire Department, Hazardous Materials Division
Mr. Scott Seery, Alameda County Health Care Services Agency

Table 1
Groundwater Sampling Schedule

ARCO Service Station 2162
15135 Hesperian Boulevard at Ruth Court
San Leandro, California

Well Number	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Sampling Frequency
MW-1	a	a	a	a	Quarterly
MW-2	a	a	a	a	Quarterly
MW-3	a	a	a	a	Quarterly
MW-4	a	a	a	a	Quarterly

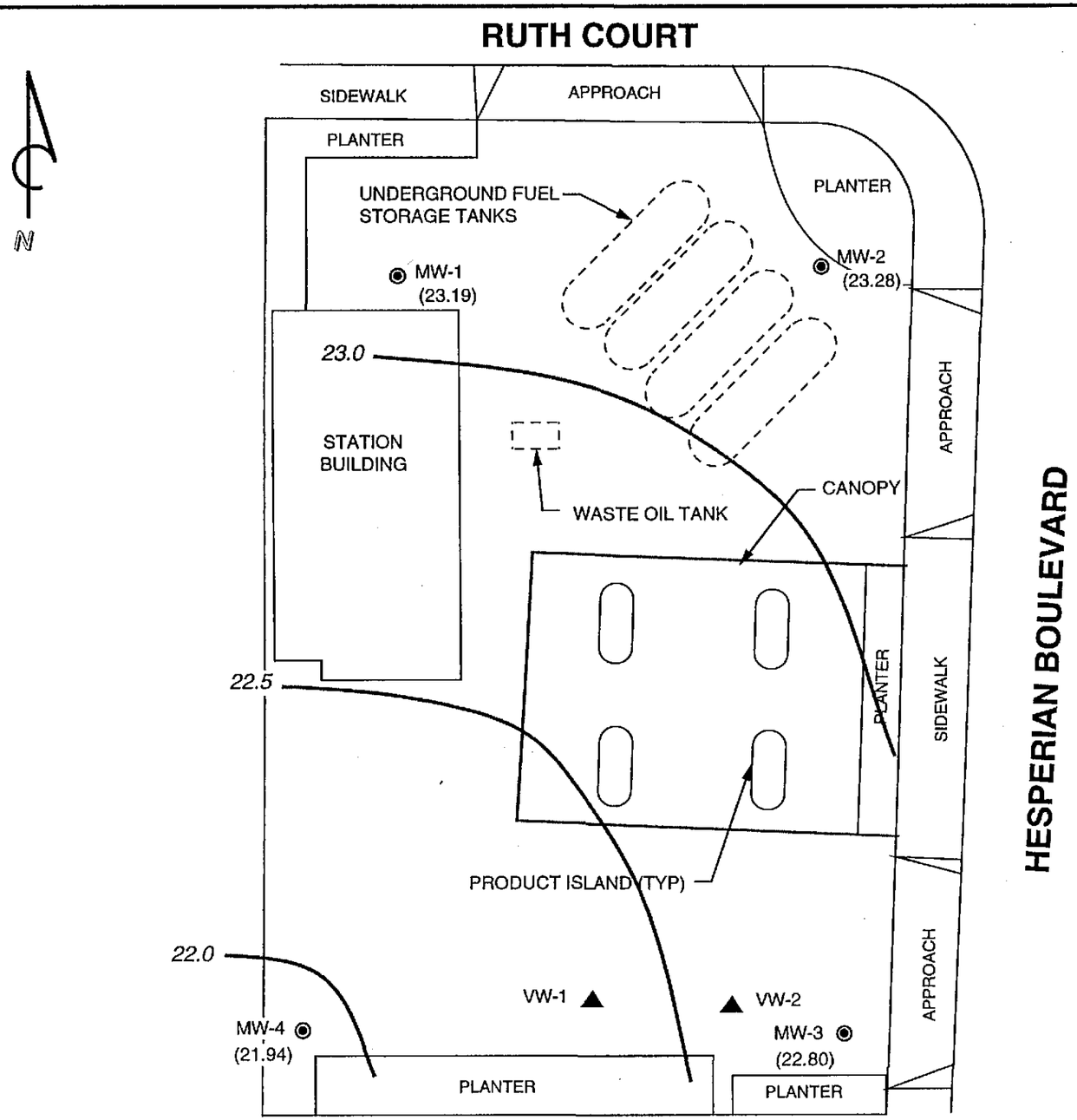
a. Samples analyzed for TPPH-g, BTEX compounds, and MtBE according to EPA Methods 8015 (modified) and 8020.

Table 2
Groundwater Elevation and Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline, BTEX Compounds, and MtBE)

ARCO Service Station 2162
15135 Hesperian Boulevard at Ruth Court
San Leandro, California

Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOC)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)	MtBE (ppb)	Dissolved Oxygen (ppm)
MW-1	02/26/96	31.19	7.14	24.05	<50	<0.50	<0.50	<0.50	<0.50	NA	NA
	05/23/96		7.70	23.49	<50	<0.50	<0.50	<0.50	<0.50	NA	NA
	08/21/96		8.75	22.44	210	<0.50	<0.50	<0.50	<0.50	<2.5	NA
	11/20/96		8.62	22.57	91	<0.50	<0.50	<0.50	<0.50	2.6	NA
	04/01/97 †		8.70	22.49	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA
	06/10/97 †		8.45	22.74	94	<0.50	<0.50	0.68	0.56	6.4	NA
	09/17/97 †		9.20	21.99	<50	<0.50	<0.50	<0.50	<0.50	10	1.0
	12/12/97 †		8.00	23.19	<200	<2.0	<2.0	<2.0	<2.0	[illegible]	2.0
MW-2	02/26/96	30.38	6.41	23.97	770	<0.50	<0.50	45	28	NA	NA
	05/23/96		6.80	23.58	590	0.50	<0.50	35	18	NA	NA
	08/21/96		7.80	22.58	170	<0.50	<0.50	21	6.3	<2.5	NA
	11/20/96		7.73	22.65	88	<0.50	<0.50	7.9	1.1	<2.5	NA
	04/01/97		7.83	22.55	66	<0.50	<0.50	3.6	0.56	33	NA
	06/10/97 †		7.52	22.86	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA
	09/17/97 †		8.24	22.14	<50	<0.50	<0.50	<0.50	<0.50	<3.0	0.6
	12/12/97 †		7.10	23.28	<50	<0.50	<0.50	<0.50	<0.50	<3.0	1.2
MW-3	02/26/96	30.30	6.72	23.58	120	5.0	<0.50	<0.50	<0.50	NA	NA
	05/23/96		7.18	23.12	140	12	<0.50	<0.50	<0.50	NA	NA
	08/21/96		8.17	22.13	<50	1.1	<0.50	<0.50	<0.50	130	NA
	11/20/96		8.03	22.27	55	<0.50	<0.50	<0.50	<0.50	59	NA
	04/01/97 †		8.09	22.21	<50	<0.50	<0.50	<0.50	<0.50	180	NA
	06/10/97 †		7.97	22.33	<50	<0.50	<0.50	<0.50	<0.50	1,900	NA
	09/17/97 †		8.54	21.76	<5,000	<50	<50	<50	<50	1,100	2.2
	09/17/97 *		–	–	–	–	–	–	–	860	–
	12/12/97 †		7.50	22.80	560	<5.0	<5.0	<5.0	5.0	[illegible]	1.4
MW-4	02/26/96	30.39	7.59	22.80	110	9.9	<0.50	<0.50	<0.50	NA	NA
	05/23/96		8.22	22.17	69	8.0	<0.50	<0.50	<0.50	NA	NA
	08/21/96		9.28	21.11	<50	6.8	<0.50	<0.50	<0.50	<2.5	NA
	11/20/96		9.12	21.27	95	10	0.59	<0.50	0.52	3.8	NA
	04/01/97		8.45	21.94	73	5.7	<0.50	<0.50	<0.50	<2.5	NA
	06/10/97 †		9.00	21.39	<50	<0.50	<0.50	<0.50	<0.50	<2.5	NA
	09/17/97 †		9.76	20.63	<50	3.2	<0.50	<0.50	<0.50	8.0	0.2
	12/12/97 †		8.45	21.94	<50	2.9	<0.50	<0.50	<0.50	[illegible]	1.0

MtBE = Methyl tert-butyl ether
MSL = Mean sea level
TOC = Top of casing
ppb = Parts per billion
ppm = Parts per million
NA = Not analyzed
† = Well subject to the no purge protocol. Please refer to Field and Laboratory Procedures (Attachment A) for details.
* = MtBE confirmed by EPA Method 8240.
< = Less than the laboratory detection limit stated to the right.



LEGEND

MW-4 ◉ GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

VW-1 ▲ SOIL VAPOR EXTRACTION WELL LOCATION AND DESIGNATION

(23.28) GROUNDWATER ELEVATION IN FEET - MSL, 12-12-97

22.5 GROUNDWATER ELEVATION CONTOUR IN FEET - MSL, 12-12-97

APPROXIMATE DIRECTION OF GROUNDWATER FLOW

APPROXIMATE GRADIENT = 0.01

SOURCE: MAP BY RESNA

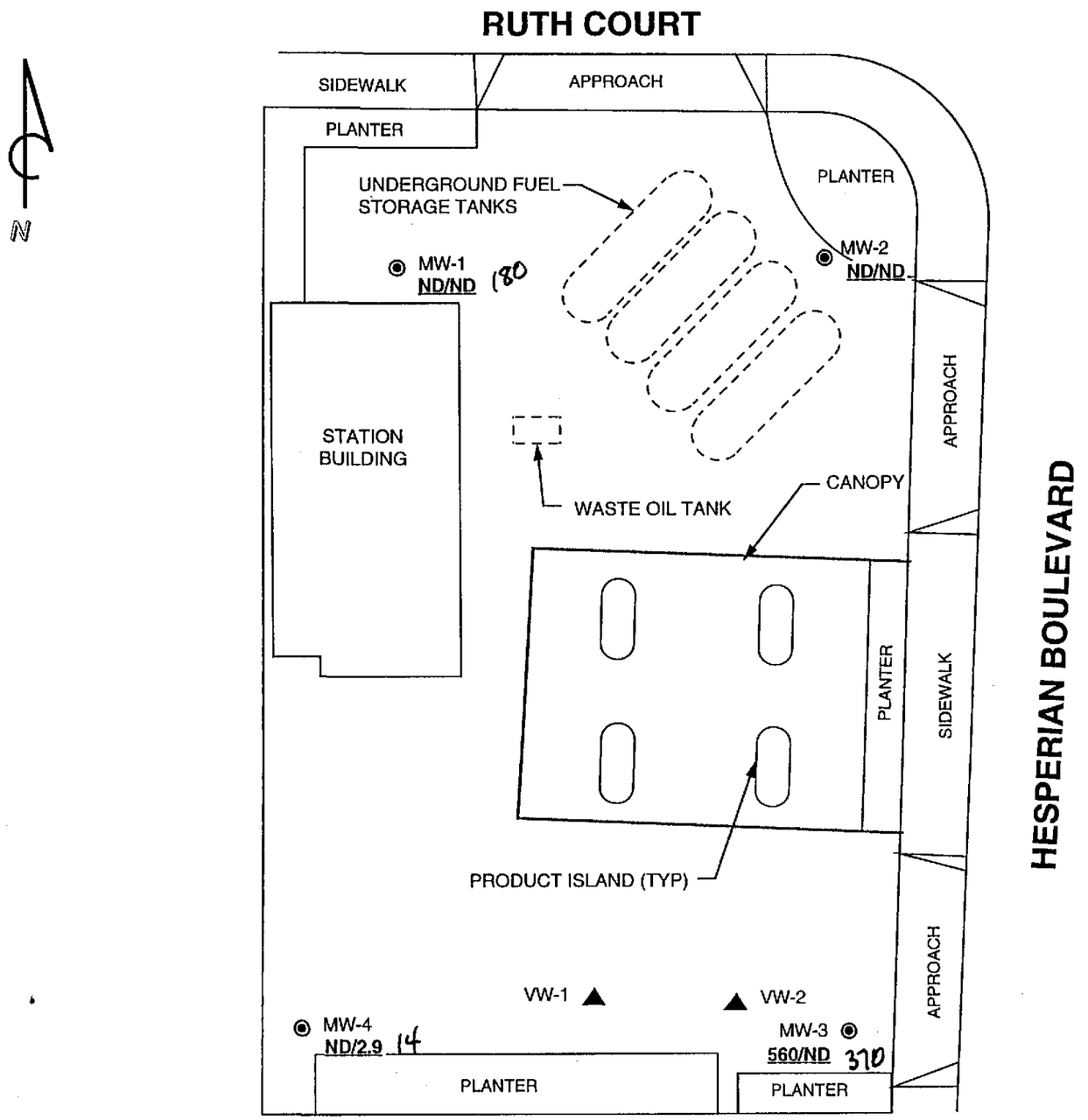
PACIFIC ENVIRONMENTAL GROUP, INC.

SCALE
0 20 40 FEET

ARCO SERVICE STATION 2162
15135 Hesperian Boulevard at Ruth Court
San Leandro, California

GROUNDWATER ELEVATION CONTOUR MAP - FOURTH QUARTER 1997

FIGURE: 1
PROJECT: 330-107.2D



LEGEND

MW-4 ◉ GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

VW-1 ▲ SOIL VAPOR EXTRACTION WELL LOCATION AND DESIGNATION

560/ND TPPH-g/BENZENE CONCENTRATION IN GROUNDWATER, IN PARTS PER BILLION, 12-12-97
MCBE

ND NOT DETECTED

APPROXIMATE DIRECTION OF GROUNDWATER FLOW

SOURCE: MAP BY RESNA

PACIFIC ENVIRONMENTAL GROUP, INC.

SCALE
0 20 40 FEET

ARCO SERVICE STATION 2162
15135 Hesperian Boulevard at Ruth Court
San Leandro, California

TPPH-g/BENZENE CONCENTRATION MAP - FOURTH QUARTER 1997

FIGURE: **2**
PROJECT: 330-107.2D

ATTACHMENT A

FIELD AND LABORATORY PROCEDURES

ATTACHMENT A
FIELD AND LABORATORY PROCEDURES

Sampling Procedures

The sampling procedure for each well consists first of measuring the water level and then checking for the presence of separate-phase hydrocarbons (SPH), using either an electronic indicator and a clear Teflon® bailer or an oil-water interface probe. Wells not containing SPH are then purged of approximately three casing volumes of water (or to dryness) using a centrifugal pump, gas displacement pump, or bailer. Equipment used for the current sampling event is noted on the attached field data sheets. During purging, temperature, pH, and electrical conductivity are monitored in order to document that these parameters are stable prior to collecting samples. After purging, water levels are allowed to partially recover. Groundwater samples are collected using a Teflon® bailer, placed into appropriate EPA-approved containers, labeled, logged onto chain-of-custody documents, and transported on ice to a California State-certified laboratory.

ARCO initiated utilization of a case-by-case approach for the implementation of non-purge sampling of monitoring wells impacted by petroleum hydrocarbons, beginning first quarter 1997. The criteria for implementation of non-purge sampling include:

- The screened interval of the well casing is not fully submerged.
- The well is not located within a confined aquifer.
- The well is not being monitored for the first time.
- The site is not being monitored during the confirmation monitoring period, prior to site closure.

Based on the above criteria, prescreening of monitoring wells are performed for each site. Depth to water data obtained on the sampling date are compared to the well construction data, to decide whether the well may be sampled without purging.

Laboratory Procedures

The groundwater samples were analyzed for the presence of total purgeable petroleum hydrocarbons calculated as gasoline, benzene, toluene, ethylbenzene, xylenes, and methyl tert-butyl ether. The analyses were performed according to EPA Methods 8015 (modified) and 8020 utilizing a purge-and-trap extraction technique. Final detection was by gas chromatography using flame- and photo-ionization detectors. The methods of analysis for the groundwater samples are documented in the certified analytical report. The certified analytical report, chain-of-custody documentation, and field data sheets are presented as Attachment B.

ATTACHMENT B

CERTIFIED ANALYTICAL REPORT, CHAIN-OF-CUSTODY DOCUMENTATION, AND FIELD DATA SHEETS

WELL SAMPLING REQUEST

SAMPLING PROTOCOL								
Project No.	Station #	Project Name	SEQUENCE	Project Manager	Approval	Date/s	Laboratory:	Client Engineer:
330-107.2k	2162	5135 Hesperian San Loren	4Q97	Shaw Garakani	9/12/96		Columbia 21334 00	Paul Supple

Well Number	Ideal Sampling Order	Sample I.D.	Sampling Frequency	Analyses	TOB TOC	Well Depth	Casing Diameter	Top of Screen	Well goes Dry?	Comments
MW-1	3		QLY	MtBE/GAS/BTEX	TOB/TOC	16'	4"	8'		Please note and repair/replace
MW-2	4		QLY	MtBE/GAS/BTEX	TOB/TOC	16'	4"	8'		any damaged J-plugs, locks ect.
MW-3	2		QLY	MtBE/GAS/BTEX	TOB/TOC	15'	4"	8'		
MW-4	1		QLY	MtBE/GAS/BTEX	TOB/TOC	18'	4"	9'		

FIELD REPORT

DEPTH TO WATER/SEPARATE-PHASE HYDROCARBON SURVEY

PROJECT No.: 330-107.2A LOCATION: 15135 HESPERIAN SAN LEANDRO DATE: 12-12-97

CLIENT/STATION NO.: 02162 FIELD TECHNICIAN: RE DAY OF WEEK: THU

PROBE TYPE/ID No.
- ☐ Oil/Water IF/ _____
- ☒ H_2O level indicator _____
- ☐ Other: _____

Dtw Order	Well ID	Time	Surface Seal	Lid Secure	Gasket	Lock	Expanding Cap	Total Depth (feet)	First Depth to Water (feet) TOB/TOC	Second Depth to Water (feet) TOB/TOC	SEPARATE-PHASE HYDROCARBONS (SPH): SPH Depth (feet) TOB/TOC	SPH Thickness (feet)	COLOR: Fresh	Weathered	Gas	Oil	VISCOSITY: Lite	Medium	Heavy	LIQUID REMOVED (gallons): SPH / H_2O
2	MW-1	10:00	-	/	-	-	/		8.00 / 8.00	8.21 / 8.21	8									/
1	MW-2	10:04	-	/	-	-	-		7.10 / 9.10	7.46 / 9.46	8									/
4	MW-3	10:06	-	/	-	-	/		7.50 / 7.50	7.73 / 7.73	8									/
3	MW-4	10:10	-	-	-	-	-		8.45 / 8.45	8.73 / 8.73	9									/
																				/
																				/
																				/
																				/
																				/

Comments: _____

FIELD DATA SHEET

WATER SAMPLE FIELD DATA SHEET

PROJECT No.: 330-10724 LOCATION: 15135 HESPERIAN BLVD SAN LEANDRO WELL ID #: MW-1

CLIENT/STATION No.: ARCO/02162 FIELD TECHNICIAN: PEDRO RUIZ

WELL INFORMATION

Depth to Liquid:_____TOB_____TOC
Depth to water:_____TOB_____TOC
Total depth:_____TOB_____TOC
Date:_____Time (2400):_____

Probe Type and I.D. #
- ☐ Oil/Water interface_____
- ☐ Electronic indicator_____
- ☐ Other;_____

CASING DIAMETER		GAL/ LINEAR FT.
☐	2	0.17
☐	3	0.38
☒	4	0.66
☐	4.5	0.83
☐	5	1.02
☐	6	1.5
☐	8	2.6

SAMPLE TYPE
- ☒ Groundwater
- ☐ Duplicate
- ☐ Extraction well
- ☐ Trip blank
- ☐ Field blank
- ☐ Equipment blank
- ☐ Other;_____

TD_____ - DTW _____ = _____ x Gal/Linear Foot 0.66 = _____ x Number of Casings 3 = Calculated Purge_____

DATE PURGED: 12-12-97 START:_____ END (2400 hr):_____ PURGED BY: PE

DATE SAMPLED: 12-12-97 START: 10:40 END (2400 hr):_____ SAMPLED BY: PE

TIME (2400 hr)	VOLUME (gal.)	pH (units)	E.C. (umhos/cm @ 25°C)	TEMPERATURE (°F)	COLOR	TURBIDITY	ODOR
					Cobalt 0-100 Clear Cloudy Yellow Brown	NTU 0-200 Heavy Moderate Light Trace	Strong Moderate Faint None

Pumped dry Yes / No

FIELD MEASUREMENTS AT TIME OF SAMPLE, AFTER RECHARGE:

DTW: 8.00 TOB/TOC	6.75	1130	630	Clear	Trace	none	

PURGING EQUIPMENT/I.D. #
- ☐ Bailer:_____
- ☐ Airlift Pump:_____
- ☐ Centrifugal Pump:_____
- ☐ Dedicated:_____
- ☐ Other:_____

SAMPLING EQUIPMENT/I.D. #
- ☒ Bailer: 150
- ☐ Dedicated:_____
- ☐ Other:_____

SAMP. CNTRL #	DATE	TIME (2400)	No. of Cont.	SIZE	CONTAINER	PRESERVE	ANALYTICAL PARAMETER
MW-1	12-12-97	10:40	3	40mL	VOA	HCL	TPHg/BTEX/MtBE

REMARKS: DO: 2

SIGNATURE: _____

PACIFIC ENVIRONMENTAL GROUP, INC.

FIELD DATA SHEET

WATER SAMPLE FIELD DATA SHEET

PROJECT No.: 330-1072K LOCATION: 15135 HESPERIAN BLVD SAN LEANDRO WELL ID #: MW-2

CLIENT/STATION No.: ARCO/02162 FIELD TECHNICIAN: PEDRO ROSI

WELL INFORMATION

Depth to Liquid: _____ TOB _____ TOC
Depth to water: _____ TOB _____ TOC
Total depth: _____ TOB _____ TOC
Date: _____ Time (2400): _____

Probe Type and I.D. #
- ☐ Oil/Water interface _____
- ☐ Electronic indicator _____
- ☐ Other; _____

CASING DIAMETER		GAL/ LINEAR FT.
☐	2	0.17
☐	3	0.38
☒	4	0.66
☐	4.5	0.83
☐	5	1.02
☐	6	1.5
☐	8	2.6

SAMPLE TYPE
- ☒ Groundwater
- ☐ Duplicate
- ☐ Extraction well
- ☐ Trip blank
- ☐ Field blank
- ☐ Equipment blank
- ☐ Other; _____

TD _____ - DTW _____ = _____ x Gal/Linear Foot 0.66 = _____ x Number of Casings 3 = Calculated Purge _____

DATE PURGED: 12-12-97 START: _____ END (2400 hr): _____ PURGED BY: PE

DATE SAMPLED: 12-12-97 START: 10:50 END (2400 hr): _____ SAMPLED BY: PE

TIME (2400 hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25°C)	TEMPERATURE (°F)	COLOR	TURBIDITY	ODOR

Cobalt 0-100, Clear, Cloudy, Yellow, Brown | NTU 0-200, Heavy, Moderate, Light, Trace | Strong, Moderate, Faint, None

Pumped dry Yes / No

FIELD MEASUREMENTS AT TIME OF SAMPLE, AFTER RECHARGE:

DTW: 7.10 TOB/TOC 6.90 9.97 638 CLEAR TRACE NONE

PURGING EQUIPMENT/I.D. #
- ☐ Bailer: _____
- ☐ Airlift Pump: _____
- ☐ Centrifugal Pump: _____
- ☐ Dedicated: _____
- ☐ Other: _____

SAMPLING EQUIPMENT/I.D. #
- ☒ Bailer: 15-7
- ☐ Dedicated: _____
- ☐ Other: _____

SAMP. CNTRL #	DATE	TIME (2400)	No. of Cont.	SIZE	CONTAINER	PRESERVE	ANALYTICAL PARAMETER
MW-2	12-12-97	10:50	3	40mL	VOA	HCL	TPHg/BTEX/MtBE

REMARKS: DO: 1.2

SIGNATURE: _____

PACIFIC ENVIRONMENTAL GROUP, INC.

FIELD DATA SHEET

WATER SAMPLE FIELD DATA SHEET

PROJECT No.: 330-10724 LOCATION: 15135 HESPERIAN BLVD SAN LEANDRO WELL ID #: MW-3

CLIENT/STATION No.: ARCO/02162 FIELD TECHNICIAN: PEDRO Ros.

WELL INFORMATION

Depth to Liquid: _____ TOB _____ TOC
Depth to water: _____ TOB _____ TOC
Total depth: _____ TOB _____ TOC
Date: _____ Time (2400): _____

Probe Type and I.D. #
- ☐ Oil/Water interface _____
- ☐ Electronic indicator _____
- ☐ Other: _____

CASING DIAMETER		GAL/ LINEAR FT.
☐	2	0.17
☐	3	0.38
☒	4	0.66
☐	4.5	0.83
☐	5	1.02
☐	6	1.5
☐	8	2.6

SAMPLE TYPE
- ☒ Groundwater
- ☐ Duplicate
- ☐ Extraction well
- ☐ Trip blank
- ☐ Field blank
- ☐ Equipment blank
- ☐ Other: _____

TD _____ - DTW _____ = _____ x Gal/Linear Foot 0.66 = _____ x Number of Casings 3 = Calculated Purge _____

DATE PURGED: 12-12-97 START: _____ END (2400 hr): _____ PURGED BY: JE

DATE SAMPLED: 12-12-97 START: 10:30 END (2400 hr): _____ SAMPLED BY: JE

TIME (2400 hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25°C)	TEMPERATURE (° F)	COLOR	TURBIDITY	ODOR

Pumped dry Yes / No

Cobalt 0-100: Clear, Cloudy, Yellow, Brown
NTU 0-200: Heavy, Moderate, Light, Trace
Strong, Moderate, Faint, None

FIELD MEASUREMENTS AT TIME OF SAMPLE, AFTER RECHARGE:

DTW: 7.50 TOB/TOC 6.80 1030 650 CLEAR TRACE NONE

PURGING EQUIPMENT/I.D. #
- ☐ Bailer: _____
- ☐ Airlift Pump: _____
- ☐ Centrifugal Pump: _____
- ☐ Dedicated: _____
- ☐ Other: _____

SAMPLING EQUIPMENT/I.D. #
- ☒ Bailer: 157
- ☐ Dedicated: _____
- ☐ Other: _____

SAMP. CNTRL #	DATE	TIME (2400)	No. of Cont.	SIZE	CONTAINER	PRESERVE	ANALYTICAL PARAMETER
MW-3	12/12/97	10:30	3	40mL	VOA	HCL	TPHg/BTEX/MTBE

REMARKS: D.O. 1.4

SIGNATURE: _____

PACIFIC ENVIRONMENTAL GROUP, INC.

FIELD DATA SHEET

WATER SAMPLE FIELD DATA SHEET

PROJECT No.: 330-107.2K LOCATION: 15135 HESPERIAN BLVD SAN LEANDRO WELL ID #: MW-4

CLIENT/STATION No.: ARCO/02162 FIELD TECHNICIAN: PEDRO ROSIT

WELL INFORMATION

Depth to Liquid:____ TOB____ TOC
Depth to water:____ TOB____ TOC
Total depth:____ TOB____ TOC
Date:____ Time (2400):____

Probe Type and I.D. #
- ☐ Oil/Water interface____
- ☐ Electronic indicator____
- ☐ Other;____

CASING DIAMETER		GAL/ LINEAR FT.
☐	2	0.17
☐	3	0.38
☒	4	0.66
☐	4.5	0.83
☐	5	1.02
☐	6	1.5
☐	8	2.6

SAMPLE TYPE
- ☒ Groundwater
- ☐ Duplicate
- ☐ Extraction well
- ☐ Trip blank
- ☐ Field blank
- ☐ Equipment blank
- ☐ Other;____

TD____ - DTW____ = ____ x Gal/Linear Foot 0.66 = ____ x Number of Casings 3 = Calculated Purge____

DATE PURGED: 12-12-97 START:____ END (2400 hr):____ PURGED BY: RE

DATE SAMPLED: 12-12-97 START: 10:20 END (2400 hr):____ SAMPLED BY: RE

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

COLOR: Cobalt 0-100, Clear, Cloudy, Yellow, Brown
TURBIDITY: NTU 0-200, Heavy, Moderate, Light, Trace
ODOR: Strong, Moderate, Faint, None

Pumped dry Yes / No

FIELD MEASUREMENTS AT TIME OF SAMPLE, AFTER RECHARGE:

DTW: 8.15 TOB (TOC) 6.90 1130 63.7 Clear Trace None

PURGING EQUIPMENT/I.D. #
- ☐ Bailer:____
- ☐ Airlift Pump:____
- ☐ Centrifugal Pump:____
- ☐ Dedicated:____
- ☐ Other:____

SAMPLING EQUIPMENT/I.D. #
- ☒ Bailer: 153
- ☐ Dedicated:____
- ☐ Other:____

SAMP. CNTRL #	DATE	TIME (2400)	No. of Cont.	SIZE	CONTAINER	PRESERVE	ANALYTICAL PARAMETER
MW-4	12/12/97	10:20	3	40mL	VOA	HCL	TPHg/BTEX/MTBE

REMARKS: DO: 1.9

SIGNATURE:____

PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO Products Company

Division of AtlanticRichfieldCompany

330074N Task Order No. 213400

Chain of Custody

ARCO Facility no. 2100 | City (Facility) 1535 Hesperian Blvd San Lorenzo | Project manager (Consultant) Stacy Garagani

ARCO engineer Paul Supple | Telephone no. (ARCO) | Telephone no. (Consultant) (408) 441-7500 | Fax no. (Consultant) (408) 441-7539

Consultant name Pacific Environmental Group | Address (Consultant) 2025 Gateway Place #440 San Jose CA

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH/MTBE EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
MW1		3		X		4	HCl	12-10-97	10:40		X									
MW2		↓		↓		↓	↓	↓	10:50		↓									
MW3		↓		↓		↓	↓	↓	10:30		↓									
MW4		↓		↓		↓	↓	↓	10:00		↓									

Condition of sample:

Relinquished by sampler — Date 12-12-97 Time 15:30

Relinquished by — Date — Time

Relinquished by — Date — Time

Temperature received:

Received by

Received by

Received by laboratory — Date — Time

Laboratory name Columbia

Contract number

Method of shipment

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

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

Columbia Analytical Services INC.

December 31, 1997

Service Request No.: S9702642

Shaw Garakani
PACIFIC ENVIRONMENTAL GROUP
2025 Gateway Place, Suite 440
San Jose, CA 95110

RE: 330107.2K/TO#21334.00/2162 SAN LEANDRO

Dear Mr. Garakani:

The following pages contain analytical results for sample(s) received by the laboratory on December 15, 1997. 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 12, following, have been thoroughly reviewed and approved for release in accord with CAS Standard Operating Procedure ADM-DatRev3.

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

Sincerely,

Steven L. Green
Project Chemist

Greg Anderson
Regional QA Coordinator

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702642
Project:	330107.2K/TO#21334.00/2162 SAN LEANDRO	**Date Collected:**	12/12/97
Sample Matrix:	Water	**Date Received:**	12/15/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW1	Units:	ug/L (ppb)
Lab Code:	S9702642-001	Basis:	NA
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	50	4	NA	12/24/97	<200	C1
Benzene	EPA 5030	8020	0.5	4	NA	12/24/97	<2	C1
Toluene	EPA 5030	8020	0.5	4	NA	12/24/97	<2	C1
Ethylbenzene	EPA 5030	8020	0.5	4	NA	12/24/97	<2	C1
Xylenes, Total	EPA 5030	8020	0.5	4	NA	12/24/97	<2	C1
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	4	NA	12/24/97	180	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702642
Project:	330107.2K/TO#21334.00/2162 SAN LEANDRO	**Date Collected:**	12/12/97
Sample Matrix:	Water	**Date Received:**	12/15/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW2	Units:	ug/L (ppb)
Lab Code:	S9702642-002	Basis:	NA
Test Notes:			

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	12/23/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	12/23/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702642
Project:	330107.2K/TO#21334.00/2162 SAN LEANDRO	**Date Collected:**	12/12/97
Sample Matrix:	Water	**Date Received:**	12/15/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW3	Units:	ug/L (ppb)
Lab Code:	S9702642-003	Basis:	NA
Test Notes:			

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	12/25/97	560	
Benzene	EPA 5030	8020	0.5	10	NA	12/25/97	<5	C1
Toluene	EPA 5030	8020	0.5	10	NA	12/25/97	<5	C1
Ethylbenzene	EPA 5030	8020	0.5	10	NA	12/25/97	<5	C1
Xylenes, Total	EPA 5030	8020	0.5	10	NA	12/25/97	5	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	10	NA	12/25/97	370	

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

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702642
Project:	330107.2K/TO#21334.00/2162 SAN LEANDRO	**Date Collected:**	12/12/97
Sample Matrix:	Water	**Date Received:**	12/15/97

BTEX, MTBE and TPH as Gasoline

Sample Name:	MW4	Units:	ug/L (ppb)
Lab Code:	S9702642-004	Basis:	NA
Test Notes:			

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	12/23/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	12/23/97	2.9	
Toluene	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	12/23/97	14	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702642
Project:	330107.2K/TO#21334.00/2162 SAN LEANDRO	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX, MTBE and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S971222-WB1	Basis:	NA
Test Notes:			

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	12/22/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	12/22/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	12/22/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	12/22/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	12/22/97	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	12/22/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ARCO Products Company	**Service Request:**	S9702642
Project:	330107.2K/TO#21334.00/2162 SAN LEANDRO	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA

BTEX, MTBE and TPH as Gasoline

Sample Name:	Method Blank	Units:	ug/L (ppb)
Lab Code:	S971223-WB1	Basis:	NA
Test Notes:			

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	12/23/97	ND	
Benzene	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Toluene	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Ethylbenzene	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Xylenes, Total	EPA 5030	8020	0.5	1	NA	12/23/97	ND	
Methyl *tert*-Butyl Ether	EPA 5030	8020	3	1	NA	12/23/97	ND	

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 330107.2K/TO#21334.00/2162 SAN LEANDRO
Sample Matrix: Water

Service Request: S9702642
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
MW1	S9702642-001		109	83
MW2	S9702642-002		101	93
MW3	S9702642-003		114	83
MW4	S9702642-004		98	89
MW2	S9702642-002MS		102	89
MW2	S9702642-002DMS		104	87
Method Blank	S971222-WB1		100	90
Method Blank	S971223-WB1		104	87
CAS Acceptance Limits:			69-116	69-116

SUR2/020397p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 330107.2K/TO#21334.00/2162 SAN LEANDRO
Sample Matrix: Water

Service Request: S9702642
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 12/23/97

Matrix Spike/Duplicate Matrix Spike Summary
BTE

Sample Name: MW2
Lab Code: S9702642-002MS, S9702642-002DMS
Test Notes:

Units: ug/L (ppb)
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Spike Level MS	Spike Level DMS	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Limits	Relative Percent Difference
Benzene	EPA 5030	8020	0.5	25	25	ND	24	24	96	96	75-135	<1
Toluene	EPA 5030	8020	0.5	25	25	ND	24	24	96	96	73-136	<1
Ethylbenzene	EPA 5030	8020	0.5	25	25	ND	24	24	96	96	69-142	<1

DMS/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 330107.2K/TO#21334.00/2162 SAN LEANDRO

Service Request: S9702642
Date Analyzed: 12/22/97

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

Sample Name: ICV
Lab Code: ICV1
Test Notes:

Units: ug/L (ppb)
Basis: NA

ICV Source:

Analyte	Prep Method	Analysis Method	True Value	Result	CAS Percent Recovery Acceptance Limits	Percent Recovery	Result Notes
TPH as Gasoline	EPA 5030	CA/LUFT	250	250	90-110	100	
Benzene	EPA 5030	8020	25	24	85-115	96	
Toluene	EPA 5030	8020	25	24	85-115	96	
Ethylbenzene	EPA 5030	8020	25	24	85-115	96	
Xylenes, Total	EPA 5030	8020	75	73	85-115	97	
Methyl *tert*-Butyl Ether	EPA 5030	8020	25	25	85-115	100	

ICV/032196

ARCO Products Company
Division of AtlanticRichfieldCompany

3300724K **Task Order No.** 213400

Chain of Custody

ARCO Facility no. 2102	City (Facility) 1335 Hesperian Blvd San Lendro	Project manager (Consultant) Shaw Garagani	Laboratory name Columbia
ARCO engineer Paul Supple	Telephone no. (ARCO)	Telephone no. (Consultant) 408) 441-7500	Fax no. (Consultant) 408) 441-7539
Consultant name Pacific Environmental Group	Address (Consultant) 2025 Gateway Place #440 San Jose CA		Contract number

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH MTBE EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
Mw1	1	3		X		4	HCl	12-12-97	10:40		X									
Mw2	2	↓		↓		↓	↓	↓	10:50		↓									
Mw3	3	↓		↓		↓	↓	↓	10:30		↓									
Mw4	4	↓		↓		↓	↓	↓	10:00		↓									

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number 59702642

Turnaround time

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

Condition of sample:

Temperature received:

	Date	Time	
Relinquished by sampler	12-12-97	15:30	Received by Krissy Flesoras
Relinquished by Krissy Flesoras	12/15/97		Received by KF
Relinquished by	Date	Time	Received by laboratory — Date 12-15-97 — Time 15:30

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

APPC-3292 (2-91)

R2