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TRANSMITTAL

TO: Ms. Susan Hugo
Alameda County Health Care Agency
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

DATE: April 22, 1994
PROJECT #: 7927.01
SUBJECT: Quarterly Monitoring Report - 1st Quarter 1994 for ARCO Station 2169

FROM:
Barbara Sieminski
Project Geologist
GeoStrategies, Inc.
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1	04/19/94	Quarterly Monitoring Report - First Quarter 1994, ARCO Station 2169, 889 West Grand Avenue, Oakland, California.

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cc: **Mr. Joel Coffman**, GSI
Mr. Michael Whelan, ARCO Products Company
Mr. Richard Hiett, Regional Water Quality Control Board (certified mail)

ALCO HAZMAT
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GeoStrategies Inc.

LETTER REPORT
QUARTERLY GROUNDWATER MONITORING
FIRST QUARTER 1994

at

ARCO Station 2169
889 West Grand Avenue
Oakland, California

792701-18

Prepared for

ARCO Products Company
P.O. Box 5811
San Mateo, California 94402

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April 19, 1994

GeoStrategies Inc.

Mr. Michael Whelan
ARCO Products Company
Post Office Box 5811
San Mateo, California

April 19, 1994

Subject: QUARTERLY MONITORING REPORT - First Quarter 1994 for ARCO Station 2169, 899 West Grand Avenue, Oakland, California.

Mr. Whelan:

As requested by ARCO Products Company (ARCO), GeoStrategies Inc. (GSI) has prepared this letter report summarizing the results of the first quarter 1994 groundwater monitoring at the above-referenced site. The objectives of this quarterly groundwater monitoring are to evaluate changes in the groundwater levels, and changes in concentrations of petroleum hydrocarbons in the local groundwater associated with the former gasoline-storage tanks at the site. The field work was performed by ARCO's contractor, Integrated Wastestream Management (IWM) of Milpitas, California, and included measuring depths to groundwater, subjectively analyzing groundwater for the presence of petroleum product, collecting groundwater samples from the wells for laboratory analyses, and directing a State-certified laboratory to analyze the groundwater samples.

SITE BACKGROUND

The subject ARCO Station is located at the intesections of West Grand Avenue, Market Street and 22nd Street in Oakland, California, as shown on the Vicinity Map, Figure 1. In 1991, GSI conducted a limited site assessment which included drilling five exploratory soil borings (A-A

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through A-E) at the site. Four onsite (A-1 through A-4) and two offsite (A-5 and A-6) groundwater monitoring wells, two groundwater recovery wells (AR-1 and AR-2), and three vapor extraction wells (AV-1 through AV-3) were installed at the site by GSI between 1992 and 1993. These wells and borings were drilled to evaluate the horizontal and vertical extent of petroleum hydrocarbons in soil and groundwater beneath the site, and to provide extraction points for future soil and groundwater remediation systems. The former underground storage tanks (USTs) containing gasoline and diesel fuel were replaced in April 1992. The locations of the wells, former and existing tanks and other pertinent site features are shown on Figure 2.

In June 1992, GSI performed a vapor extraction test to determine the feasibility of vapor extraction as a remedial option for the site. In July 1992, GSI performed an aquifer pumping and recovery test to evaluate the feasibility of groundwater extraction as a groundwater remediation method for the site.

In September 1993, GSI installed air sparging wells AS-1 through AS-3 and additional vapor extraction wells AV-4 and AV-5 at the site and conducted air sparging/vapor extraction tests to evaluate the feasibility of vapor extraction/air sparging as a method for remediation of soil and groundwater at the site. In December 1993 and January 1994, an interim remediation system was constructed at the site, and GSI installed two additional air sparging wells (AS-4 and AS-5), two vapor extraction wells (AV-6 and AV-7), and two dual groundwater recovery/vapor extraction wells (ADR-1 and ADR-2). The results of these investigations will be presented in a forthcoming report. The operation of the interim remediation system will be initiated in the second quarter 1994, pending PG&E installation of gas service.

Quarterly groundwater monitoring and sampling of the site wells began in April 1992. Groundwater samples are currently analyzed for Total Petroleum Hydrocarbons calculated as Gasoline (TPH-G) and gasoline constituents benzene, toluene, ethylbenzene and xylenes (BTEX) using EPA Methods 5030/8020/California DHS LUFT Method; and total petroleum hydrocarbons calculated as diesel (TPH-D) using EPA Methods 3510/California DHS LUFT Method.

FIRST QUARTER 1994 ACTIVITIES

A summary of activities performed at the site during the first quarter 1994 is presented below.

- Depth-to-water (DTW) measurements were obtained by IWM in wells A-1 through A-6, AR-1, AR-2, ADR-1 and ADR-2; each well was inspected for the presence of floating product; and groundwater samples were collected from the wells on February 9, 1994. Groundwater samples were analyzed for TPH-G, BTEX and TPH-D.

- Continued installation of the interim soil and groundwater remediation system.

FIRST QUARTER 1994 SAMPLING RESULTS

Groundwater Level Measurements and Gradient Evaluation

Depth to water-level measurements were obtained from monitoring wells A-1 through A-6 and recovery wells AR-1, AR-2, ADR-1 and ADR-2 on February 9, 1994, by IWM. Static groundwater levels were measured from the surveyed top of the well casing and recorded to the nearest $\pm$0.01 foot. Water-level data were referenced to Mean Sea Level (MSL) datum and were used to construct potentiometric maps (Figure 3). Shallow groundwater beneath the site is interpreted to flow to the northwest at an average hydraulic gradient of 0.007.

Each well was inspected for the presence of floating product. Floating product has not been observed in any well since quarterly monitoring began in April 1992. Depth to groundwater data for the current quarter are presented in Table 1, Current Groundwater Monitoring Data, and in the IWM sampling report (Appendix A). Current and historical water-level data and floating product measurements are summarized in Table 2, Historical Water-Level Data.

Laboratory Analytical Results of Groundwater Samples

Groundwater samples were collected from wells A-1 through A-6, AR-1, AR-2, ADR-1 and ADR-2 on February 9, 1994, by IWM. Samples were analyzed for TPH-G and BTEX using EPA Methods 5030/8020/California DHS LUFT Method. In addition, groundwater samples collected from wells A-1, AR-1, AR-2, ADR-1 and ADR-2 were analyzed for TPH-D using EPA Method 3510/California DHS LUFT Method. Groundwater samples were analyzed by Columbia Analytical Services, Inc. of San Jose, California (Columbia), a California State-certified laboratory (Hazardous Waste Testing Laboratory #1426).

Current quarter chemical analytical data are presented in Table 1 and have also been added to the Historical Groundwater Quality Database presented in Table 3. Laboratory analyses reported nondetectable concentrations of TPH-G (less than 50 parts per billion [ppb]) and BTEX (less than 0.5 ppb) in groundwater samples collected from wells A-3 and A-4, and nondetectable BTEX in samples collected from wells A-2 and AR-2. However, samples collected from wells A-2 and AR-2, located in the vicinity of the existing USTs, contained a single non-fuel component eluting in the gasoline range, which has been quantified as gasoline (TPH-G). The highest concentrations of TPH-G (83,000 ppb), TPH-D (12,000 ppb) and benzene (6,300 ppb) were detected in groundwater samples collected from well ADR-2, located downgradient of the westernmost (diesel) service island. The groundwater samples collected from wells AR-1, ADR-1 and A-1, located in the western portion of the site (within or downgradient of the former UST pit), contained up to 26,000 ppb of TPH-G, up to 4,200 ppb of non-diesel mixture quantified as diesel (TPH-D), and up to 2,900 ppb of benzene. Laboratory analyses of groundwater samples collected from offsite wells A-5 and A-6 indicated concentrations of TPH-G at 2,200 ppb and 640 ppb, respectively. Benzene was detected at 190 ppb in well A-5 and was nondetectable (detection limit raised to 2.9 ppb due to matrix interference) in well A-6.

The IWM groundwater sampling report, laboratory analytical reports and the Chain-of-Custody form are presented in Appendix A. Chemical isoconcentration maps for TPH-G and benzene are presented on Figures 4 and 5, respectively.

CONCLUSIONS

Groundwater elevations in the site wells have increased an average of 1 ½ feet since the fourth quarter 1993. The groundwater gradient and flow direction for this quarter is generally consistent with previously interpreted gradients and flow directions for this site.

Concentrations of TPH-G and benzene have remained nondetectable in wells A-3 and A-4; have not changed significantly in wells A-1, A-5 and A-6; and have increased in well AR-1 since the last quarter. Concentrations of benzene have remained nondetectable in wells A-2 and AR-2, however, samples collected from wells A-2 and AR-2 contained a single non-fuel component eluting in the gasoline range, which has been quantified as gasoline (TPH-G). A comparison could not be made for wells ADR-1 and ADR-2 because these wells were sampled for the first time during this quarter. Offsite well A-5 is located crossgradient from the ARCO site. Concentrations of gasoline hydrocarbons detected in well A-5 may reflect an offsite source of gasoline hydrocarbons.

ACTIVITIES PLANNED FOR THE SECOND QUARTER 1994

- Perform quarterly monitoring and sampling of site wells.
- Initiate operation of the interim soil and groundwater remediation system.

If you have any questions, please call us at (510) 551 - 8777.

Attachments:

Table 1. Current Groundwater Monitoring Data
Table 2. Historical Water-level Data
Table 3. Historical Groundwater Quality Database

Figure 1. Vicinity Map
Figure 2. Site Plan
Figure 3. Potentiometric Map
Figure 4. TPH-G Concentration Map

Figure 5. Benzene Concentration Map

Appendix A: IWM Groundwater Sampling Report

TABLES

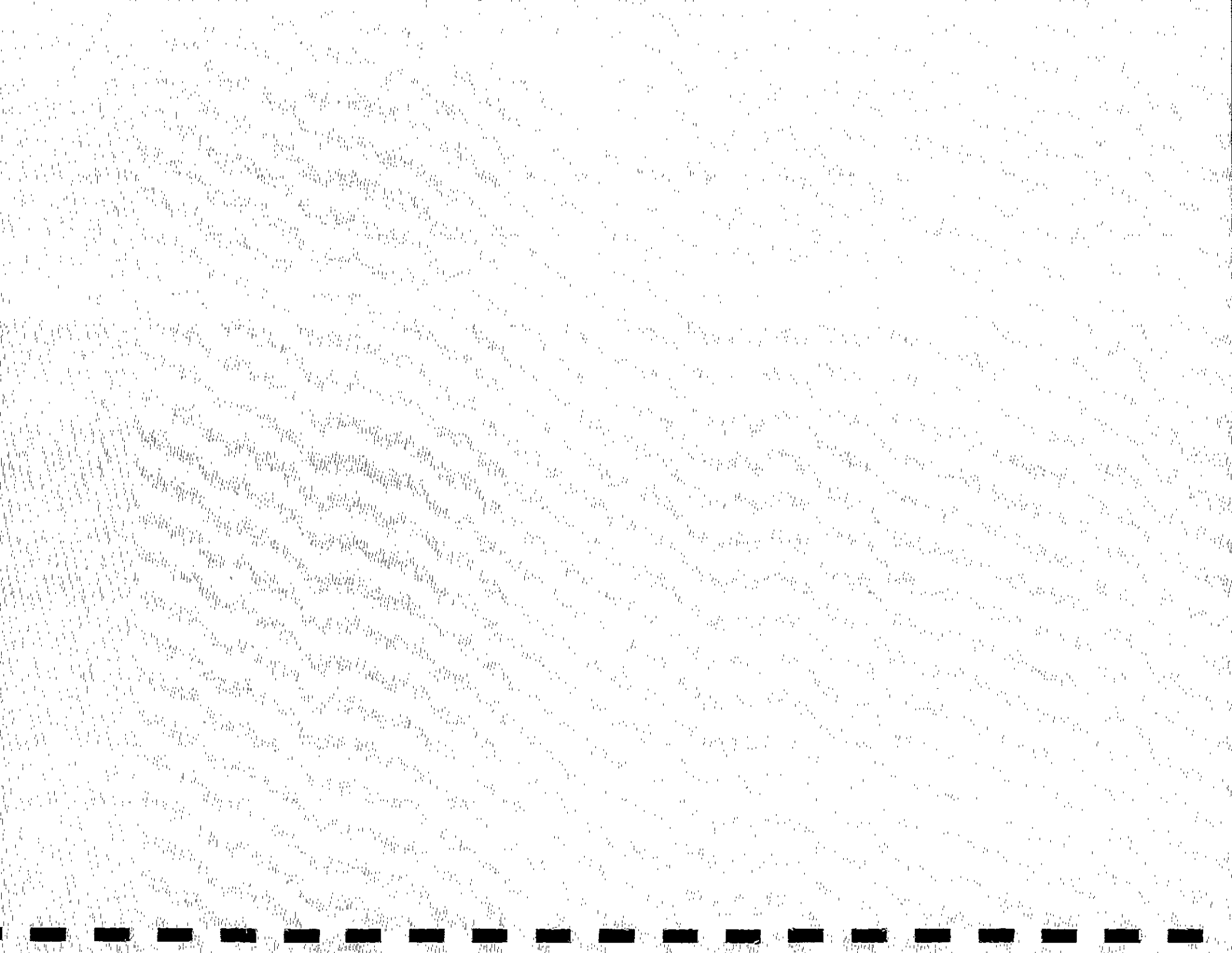


TABLE 1

CURRENT GROUNDWATER MONITORING DATA
ARCO Station 2169
Oakland, California

WELL NO.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	TPH-D (PPB)	WELL ELEV. (FT)	STATIC WATER ELEV. (FT)	PRODUCT THICKNESS (FT)	DEPTH TO WATER (FT)
A-1	09-Feb-94	18-Feb-94	3000	560	150	66	190	650*	14.16	4.07	0.00	10.09
A-2	09-Feb-94	18-Feb-94	260**	<0.6	<0.5	<0.5	<0.5	N/A	14.55	3.88	0.00	10.67
A-3	09-Feb-94	18-Feb-94	<50	<0.5	<0.5	<0.5	<0.5	N/A	15.75	4.43	0.00	11.32
A-4	09-Feb-94	18-Feb-94	<50	<0.5	<0.5	<0.5	<0.5	N/A	15.25	5.24	0.00	10.01
A-5	09-Feb-94	18-Feb-94	2200	190	130	130	310	N/A	13.51	4.07	0.00	9.44
A-6	09-Feb-94	18-Feb-94	640	<2.9	<3.7	<2.4	<8.2	N/A	13.51	4.03	0.00	9.48
AR-1	09-Feb-94	18-Feb 94	26000	2900	450	920	3000	4200*	15.61	4.53	0.00	11.08
AR-2	09-Feb-94	18-Feb-94	82**	<0.5	<0.5	<0.5	<0.5	<50	15.28	3.95	0.00	11.33
ADR-1	09-Feb-94	18-Feb-94	3000	380	140	59	240	110*	13.95	4.05	0.00	9.90
ADR-2	09-Feb-94	18-Feb-94	83000	6300	6100	2000	11000	12000	14.64	3.91	0.00	10.73

Current Regional Water Quality Control Board Maximum Contaminant Levels:
Benzene 1.0 ppb Xylenes 1750. ppb Ethylbenzene 680. ppb

Current Cal EPA Action Levels: Toluene 100.0 ppb

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline.
TPH-D = Total Petroleum Hydrocarbons calculated as Diesel.
PPB = Parts Per Billion.

* = Reported as a non-diesel mix.
** = Sample contains a single non-fuel component eluting in the gasoline range, and quantified as gasoline.

Notes: 1. All data shown as <x are reported as ND (none detected).
2. Water level elevations referenced to Mean Sea Level (MSL).

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 2169
Oakland, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (ft)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
03-Apr-92	A-1	10.35	14.75	4.40	0.00
20-May-92	A-1	11.66	14.75	3.09	0.00
16-Jun-92	A-1	11.95	14.75	2.80	0.00
17-Jul-92	A-1	12.23	14.75	2.52	0.00
07-Aug-92	A-1	12.16	14.75	2.59	0.00
22-Sep-92	A-1	12.42	14.75	2.33	0.00
13-Oct-92	A-1	12.47	14.75	2.28	0.00
23-Nov-92	A-1	11.83	14.75	2.92	0.00
16-Dec-92	A-1	11.03	14.75	3.72	0.00
28-Jan-93	A-1	9.08	14.75	5.67	0.00
22-Feb-93	A-1	9.46	14.75	5.29	0.00
25-Mar-93	A-1	10.02	14.75	4.73	0.00
15-Apr-93	A-1	10.50	14.75	4.25	0.00
22-May-93	A-1	11.33	14.75	3.42	0.00
16-Jun-93	A-1	11.51	14.75	3.24	0.00
27-Jul-93	A-1	11.91	14.75	2.84	0.00
26-Aug-93	A-1	12.11	14.75	2.64	0.00
27-Sep-93	A-1	12.21	14.75	2.54	0.00
08-Oct-93	A-1	12.21	14.75	2.54	0.00
09-Feb-94	A-1	10.09	14.16	4.07	0.00
03-Apr-92	A-2	10.97	15.16	4.19	0.00
20-May-92	A-2	12.17	15.16	2.99	0.00
16-Jun-92	A-2	12.43	15.16	2.73	0.00
17-Jul-92	A-2	12.64	15.16	2.52	0.00
07-Aug-92	A-2	12.75	15.16	2.41	0.00
22-Sep-92	A-2	12.88	15.16	2.28	0.00
13-Oct-92	A-2	12.92	15.16	2.24	0.00
23-Nov-92	A-2	12.18	15.16	2.98	0.00
16-Dec-92	A-2	11.52	15.16	3.64	0.00
28-Jan-93	A-2	9.73	15.16	5.43	0.00
22-Feb-93	A-2	9.28	15.16	5.88	0.00
25-Mar-93	A-2	10.57	15.16	4.59	0.00
15-Apr-93	A-2	11.20	15.16	3.96	0.00

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 2169
Oakland, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (ft)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
22-May-93	A-2	11.91	15.16	3.25	0.00
16-Jun-93	A-2	12.04	15.16	3.12	0.00
27-Jul-93	A-2	12.41	15.16	2.75	0.00
25-Aug-93	A-2	12.54	15.16	2.62	0.00
27-Sep-93	A-2	12.66	15.16	2.50	0.00
08-Oct-93	A-2	12.65	15.16	2.51	0.00
09-Feb-94	A-2	10.67	14.55	3.88	0.00
03-Apr-92	A-3	11.70	16.38	4.68	0.00
20-May-92	A-3	13.00	16.38	3.38	0.00
16-Jun-92	A-3	13.46	16.38	2.92	0.00
17-Jul-92	A-3	13.45	16.38	2.93	0.00
07-Aug-92	A-3	12.37	16.38	4.01	0.00
22-Sep-92	A-3	13.71	16.38	2.67	0.00
13-Oct-92	A-3	13.76	16.38	2.62	0.00
23-Nov-92	A-3	13.60	16.38	2.78	0.00
16-Dec-92	A-3	12.31	16.38	4.07	0.00
28-Jan-93	A-3	10.33	16.38	6.05	0.00
22-Feb-93	A-3	10.44	16.38	5.94	0.00
25-Mar-93	A-3	11.27	16.38	5.11	0.00
15-Apr-93	A-3	11.98	16.38	4.40	0.00
22-May-93	A-3	12.70	16.38	3.68	0.00
16-Jun-93	A-3	12.84	16.38	3.54	0.00
27-Jul-93	A-3	13.22	16.38	3.16	0.00
25-Aug-93	A-3	13.35	16.38	3.03	0.00
27-Sep-93	A-3	13.50	16.38	2.88	0.00
08-Oct-93	A-3	13.48	16.38	2.90	0.00
09-Feb-94	A-3	11.32	15.75	4.43	0.00
03-Apr-92	A-4	10.84	15.89	5.05	0.00
20-May-92	A-4	12.13	15.89	3.76	0.00
16-Jun-92	A-4	12.33	15.89	3.56	0.00
17-Jul-92	A-4	12.60	15.89	3.29	0.00
07-Aug-92	A-4	12.56	15.89	3.33	0.00
22-Sep-92	A-4	12.87	15.89	3.02	0.00
13-Oct-92	A-4	12.87	15.89	3.02	0.00

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 2169
Oakland, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (ft)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
23-Nov-92	A-4	12.63	15.89	3.26	0.00
16-Dec-92	A-4	11.34	15.89	4.55	0.00
28-Jan-93	A-4	9.40	15.89	6.49	0.00
22-Feb-93	A-4	9.35	15.89	6.54	0.00
25-Mar-93	A-4	10.32	15.89	5.57	0.00
15-Apr-93	A-4	11.15	15.89	4.74	0.00
22-May-93	A-4	11.84	15.89	4.05	0.00
16-Jun-93	A-4	12.01	15.89	3.88	0.00
27-Jul-93	A-4	12.33	15.89	3.56	0.00
25-Aug-93	A-4	12.48	15.89	3.41	0.00
27-Sep-93	A-4	12.60	15.89	3.29	0.00
08-Oct-93	A-4	12.57	15.89	3.32	0.00
09-Feb-94	A-4	10.01	15.25	5.24	0.00
11-Feb-93	A-5	9.15	14.14	4.99	0.00
25-Mar-93	A-5	9.33	14.14	4.81	0.00
15-Apr-93	A-5	10.11	14.14	4.03	0.00
22-May-93	A-5	10.71	14.14	3.43	0.00
16-Jun-93	A-5	10.84	14.14	3.30	0.00
27-Jul-93	A-5	11.22	14.14	2.92	0.00
26-Aug-93	A-5	11.44	14.14	2.70	0.00
27-Sep-93	A-5	11.51	14.14	2.63	0.00
08-Oct-93	A-5	11.68	14.14	2.46	0.00
09-Feb-94	A-5	9.44	13.51	4.07	0.00
11-Feb-93	A-6	9.35	14.17	4.82	0.00
25-Mar-93	A-6	Not measured			
16-Apr-93	A-6	9.36	14.17	4.81	0.00
22-May-93	A-6	10.86	14.17	3.31	0.00
16-Jun-93	A-6	10.98	14.17	3.19	0.00
27-Jul-93	A-6	Not measured			
25-Aug-93	A-6	Not measured			
27-Sep-93	A-6	11.65	14.17	2.52	0.00
08-Oct-93	A-6	11.80	14.17	2.37	0.00
09-Feb-94	A-6	9.48	13.51	4.03	0.00
03-Apr-92	AR-1	11.07	15.71	4.64	0.00

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 2169
Oakland, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (ft)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
20-May-92	AR-1	12.37	15.71	3.34	0.00
16-Jun-92	AR-1	12.47	15.71	3.24	0.00
17-Jul-92	AR-1	13.00	15.71	2.71	0.00
07-Aug-92	AR-1	12.87	15.71	2.84	0.00
22-Sep-92	AR-1	12.99	15.71	2.72	0.00
13-Oct-92	AR-1	13.05	15.71	2.66	0.00
23-Nov-92	AR-1	12.80	15.71	2.91	0.00
16-Dec-92	AR-1	11.49	15.71	4.22	0.00
28-Jan-93	AR-1	9.46	15.71	6.25	0.00
22-Feb-93	AR-1	10.05	15.71	5.66	0.00
25-Mar-93	AR-1	10.75	15.71	4.96	0.00
15-Apr-93	AR-1	11.26	15.71	4.45	0.00
22-May-93	AR-1	12.07	15.71	3.64	0.00
16-Jun-93	AR-1	12.21	15.71	3.50	0.00
27-Jul-93	AR-1	12.60	15.71	3.11	0.00
25-Aug-93	AR-1	12.78	15.71	2.93	0.00
27-Sep-93	AR-1	12.89	15.71	2.82	0.00
08-Oct-93	AR-1	12.84	15.71	2.87	0.00
09-Feb-94	AR-1	11.08	15.61	4.53	0.00
17-Jul-92	AR-2	13.14	15.79	2.65	0.00
07-Aug-92	AR-2	13.25	15.79	2.54	0.00
22-Sep-92	AR-2	13.58	15.79	2.21	0.00
13-Oct-92	AR-2	13.65	15.79	2.14	0.00
23-Nov-92	AR-2	Not measured			
16-Dec-92	AR-2	12.16	15.79	3.63	0.00
28-Jan-93	AR-2	10.26	15.79	5.53	0.00
22-Feb-93	AR-2	10.52	15.79	5.27	0.00
25-Mar-93	AR-2	11.18	15.79	4.61	0.00
15-Apr-93	AR-2	11.81	15.79	3.98	0.00
22-May-93	AR-2	12.46	15.79	3.33	0.00
16-Jun-93	AR-2	12.53	15.79	3.26	0.00
27-Jul-93	AR-2	12.77	15.79	3.02	0.00
26-Aug-93	AR-2	13.23	15.79	2.56	0.00
27-Sep-93	AR-2	13.16	15.79	2.63	0.00

TABLE 2

HISTORICAL WATER-LEVEL DATA
ARCO Station 2169
Oakland, California

MONITORING DATE	WELL NUMBER	DEPTH TO WATER (ft)	WELL ELEVATION (FT)	STATIC WATER ELEVATION (FT)	FLOATING PRODUCT THICKNESS (FT)
08-Oct-93	AR-2	13.32	15.79	2.47	0.00
09-Feb-94	AR-2	11.33	15.28	3.95	0.00
09-Feb-94	ADR-1	9.90	13.95	4.05	0.00
09-Feb-94	ADR-2	10.73	14.64	3.91	0.00

Notes:
1. Static water elevations referenced to Mean Sea Level (MSL).
2. Well elevations and depths-to-water were referenced to the top of the well box in 1992 and 1993. After installation of a remediation system, site wells except offsite well A-6 were resurveyed by Virgil D. Chavez, licensed land surveyor, on February 11, 1994. Starting first quarter 1994, depths-to-water have been referenced to the top of the well box using February 1994 survey data for wells A-1 through A-5, AR-1, AR-2, ADR-1 and ADR-2, and previous survey data for well A-6 (survey performed by Kier & Wright Civil Engineers & Surveyors, Inc., on February 25, 1993).
3. Well AR-2 could not be located on November 23, 1992.
4. Well A-6 was not accessible on March 25, July 27 and August 25, 1993.

TABLE 3

HISTORICAL GROUNDWATER QUALITY DATABASE
ARCO Station 2169
Oakland, California

SAMPLE DATE	WELL NO.	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	TPH-D (PPB)
03-Apr-92	A-1	34000	6200	3900	410	3100	6100
17-Jul-92	A-1	5600	3000	500	<100	<100	N/A
13-Oct-92	A-1	5600	980	590	85	910	N/A
28-Jan-93	A-1	3700	780	360	130	460	620*
15-Apr-93	A-1	210	34	11	7.1	20	420*
26-Aug-93	A-1	2000	370	35	50	220	1500*
08-Oct-93	A-1	2600	430	65	64	99	1200*
09-Feb-94	A-1	3000	560	150	66	190	650*
03-Apr-92	A-2	<30	<0.3	<0.3	<0.3	<0.3	<50
17-Jul-92	A-2	<50	<0.5	<0.5	<0.5	<0.5	N/A
13-Oct-92	A-2	<50	0.57	<0.5	<0.5	<0.5	N/A
28-Jan-93	A-2	<50	<0.5	<0.5	<0.5	<0.5	N/A
15-Apr-93	A-2	<50	<0.5	<0.5	<0.5	<0.5	N/A
25-Aug-93	A-2	<50	<0.5	<0.5	<0.5	<0.5	N/A
08-Oct-93	A-2	<50	<0.5	<0.5	<0.5	<0.5	N/A
09-Feb-94	A-2	260**	<0.6	<0.5	<0.5	<0.5	N/A
03-Apr-92	A-3	200	0.79	0.65	4.4	<0.3	130
17-Jul-92	A-3	<50	<0.5	<0.5	1.3	2.3	N/A
13-Oct-92	A-3	<50	<0.5	<0.5	<0.5	<0.5	N/A
28-Jan-93	A-3	<50	<0.5	<0.5	<0.5	<0.5	N/A
15-Apr-93	A-3	<50	<0.5	<0.5	<0.5	<0.5	N/A
25-Aug-93	A-3	<50	<0.5	<0.5	<0.5	<0.5	N/A
08-Oct-93	A-3	<50	<0.5	<0.5	<0.5	<0.5	N/A
09-Feb-94	A-3	<50	<0.5	<0.5	<0.5	<0.5	N/A
03-Apr-92	A-4	35	<0.3	<0.3	<0.3	<0.3	85
17-Jul-92	A-4	<50	<0.5	<0.5	<0.5	<0.5	N/A
13-Oct-92	A-4	<50	<0.5	<0.5	<0.5	<0.5	N/A
28-Jan-93	A-4	<50	<0.5	<0.5	<0.5	<0.5	N/A
15-Apr-93	A-4	<50	<0.5	<0.5	<0.5	<0.5	N/A
25-Aug-93	A-4	<50	<0.5	<0.5	<0.5	<0.5	N/A
08-Oct-93	A-4	<50	<0.5	<0.5	<0.5	<0.5	N/A
09-Feb-94	A-4	<50	<0.5	<0.5	<0.5	<0.5	N/A
11-Feb-93	A-5	4900	380	640	140	970	N/A
15-Apr-93	A-5	27000	3100	4000	1100	4600	N/A

TABLE 3

HISTORICAL GROUNDWATER QUALITY DATABASE
ARCO Station 2169
Oakland, California

SAMPLE DATE	WELL NO.	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	TPH-D (PPB)
26-Aug-93	A-5	13000	1100	1400	480	1800	N/A
08-Oct-93	A-5	6800	490	620	280	980	N/A
09-Feb-93	A-5	2200	190	130	130	310	N/A
11-Feb-93	A-6	990	1:8	5.1	17	7.2	N/A
16-Apr-93	A-6	390	1.3	1.6	1.7	7.7	N/A
25-Aug-93	A-6	Not	Sampled				
08-Oct-93	A-6	220	0.73	<0.5	0.82	0.65	N/A
09-Feb-94	A-6	640	<2.9	<3.7	<2.4	<8.2	N/A
03-Apr-92	AR-1	17000	310	1400	320	3000	12000
17-Jul-92	AR-1	44000	4300	1800	1800	10000	N/A
13-Oct-92	AR-1	32000	310	730	570	3100	22000*
28-Jan-93	AR-1	15000	1200	510	510	2600	5300*
15-Apr-93	AR-1	17000	1800	360	520	1600	5400*
25-Aug-93	AR-1	2900	260	54	80	160	2800*
08-Oct-93	AR-1	3500	200	85	120	290	4100*
09-Feb-94	AR-1	26000	2900	450	920	3000	4200*
17-Jul-92	AR-2	150	6.6	24	6.6	39	N/A
13-Oct-92	AR-2	<50	2.0	0.86	0.51	3.8	58*
28-Jan-93	AR-2	2000	570	13	<10	380	290*
15-Apr-93	AR-2	85	15	<0.5	<0.5	2.4	<50
26-Aug-93	AR-2	<50	<0.5	<0.5	<0.5	<0.5	<50
08-Oct-93	AR-2	<50	<0.5	<0.5	<0.5	<0.5	<50
09-Feb-94	AR-2	82**	<0.5	<0.5	<0.5	<0.5	<50
09-Feb-94	ADR-1	3000	380	140	59	240	110*
09-Feb-94	ADR-2	83000	6300	6100	2000	11000	12000

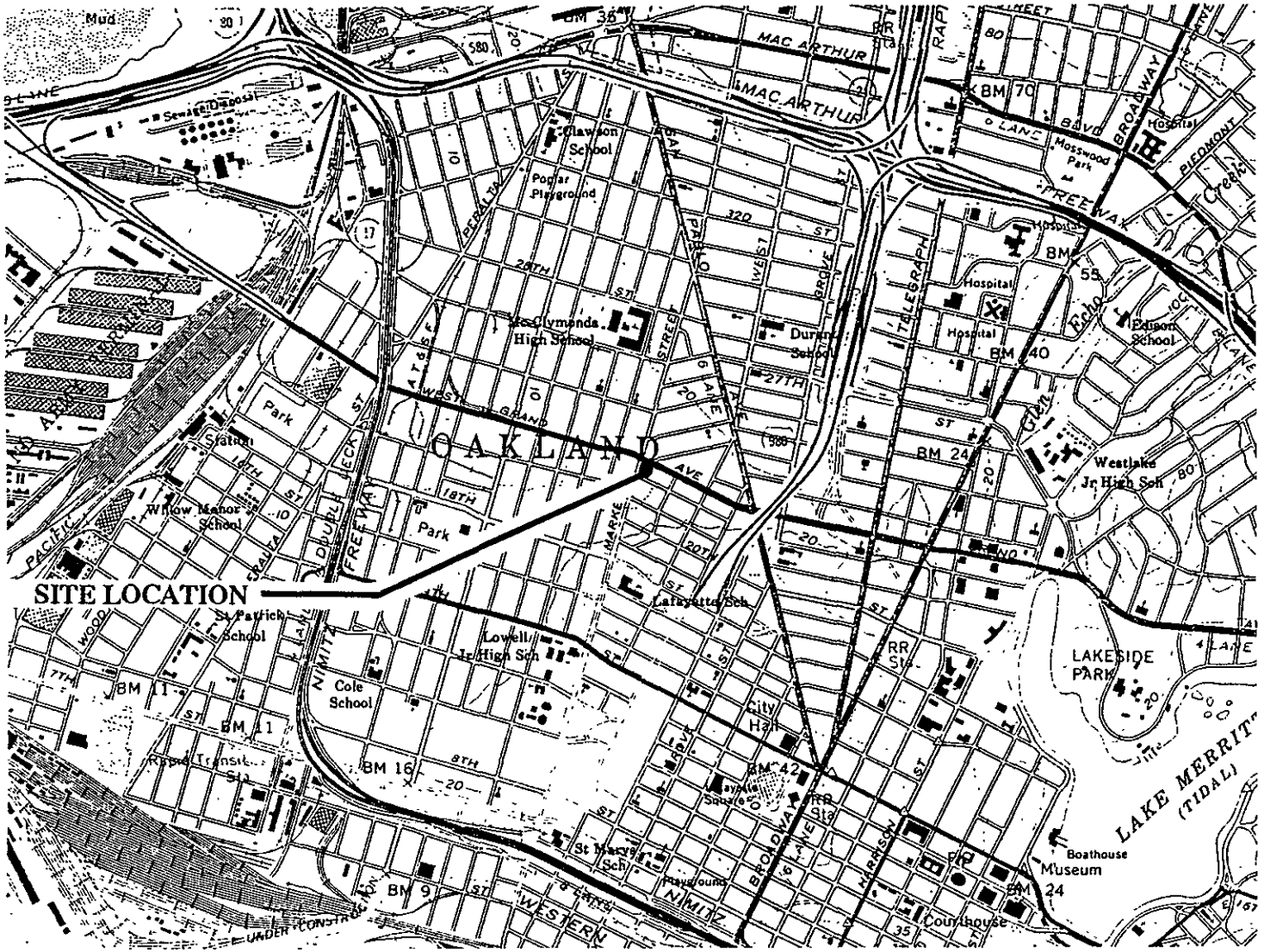
CURRENT REGIONAL WATER QUALITY CONTROL BOARD MAXIMUM CONTAMINANT LEVELS:
Benzene 1. ppb Xylenes 1750. ppb Ethylbenzene 680 ppb

CURRENT CAL EPA ACTION LEVELS: Toluene 100

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline.
TPH-D = Total Petroleum Hydrocarbons calculated as Diesel.
PPB = Parts Per Billion.
N/A = Not Analyzed.
* = Reported as a non-diesel mix.
** = Sample contains a single non-fuel component eluting in the gasoline range, and quantified as gasoline.

Notes: 1. All data shown as <x are reported as ND (not detected above the reporting limit).

ILLUSTRATIONS



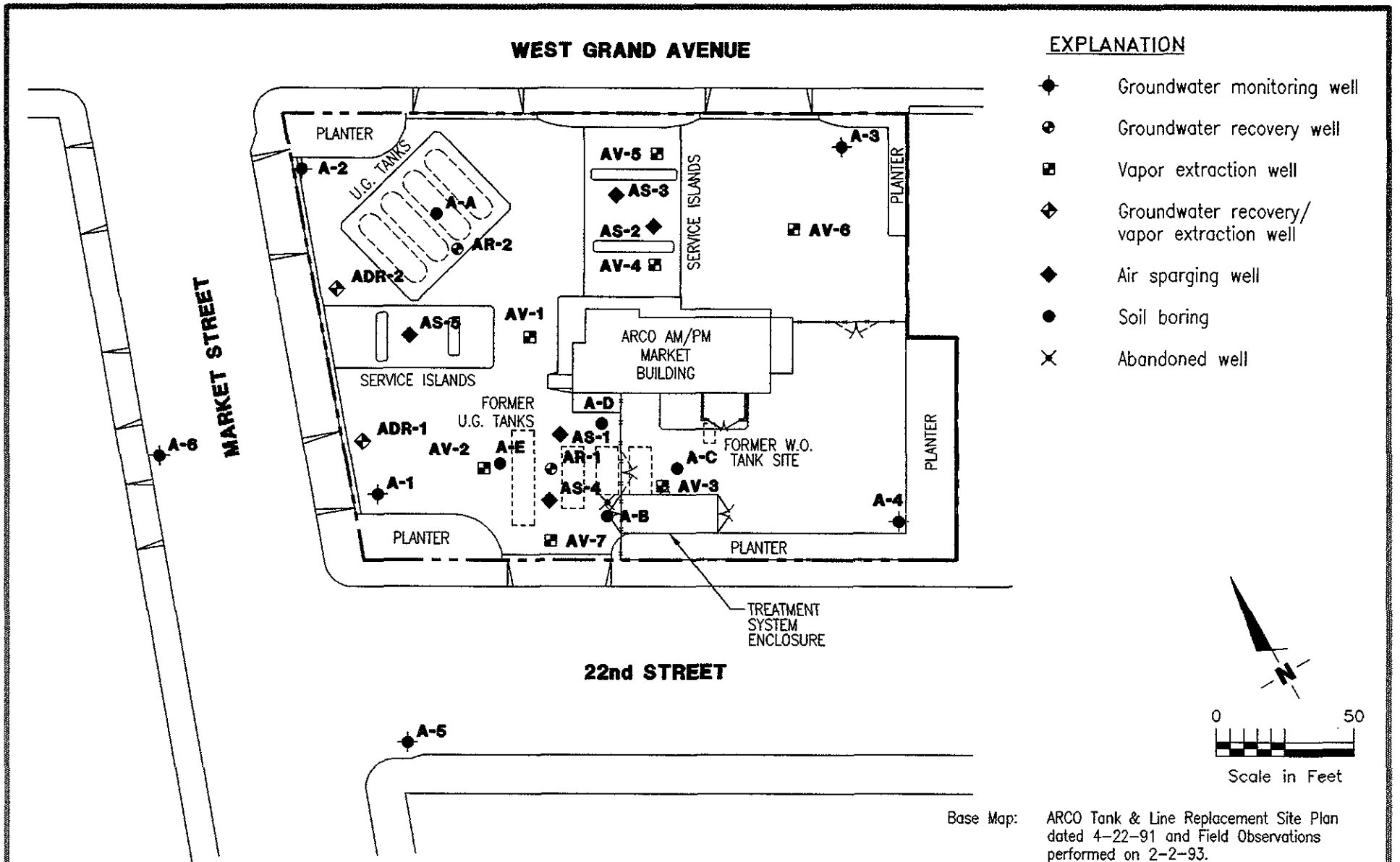
Base Map: USGS Topographic Map

GeoStrategies Inc.

VICINITY MAP
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

FIGURE 1

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7927		5/91	



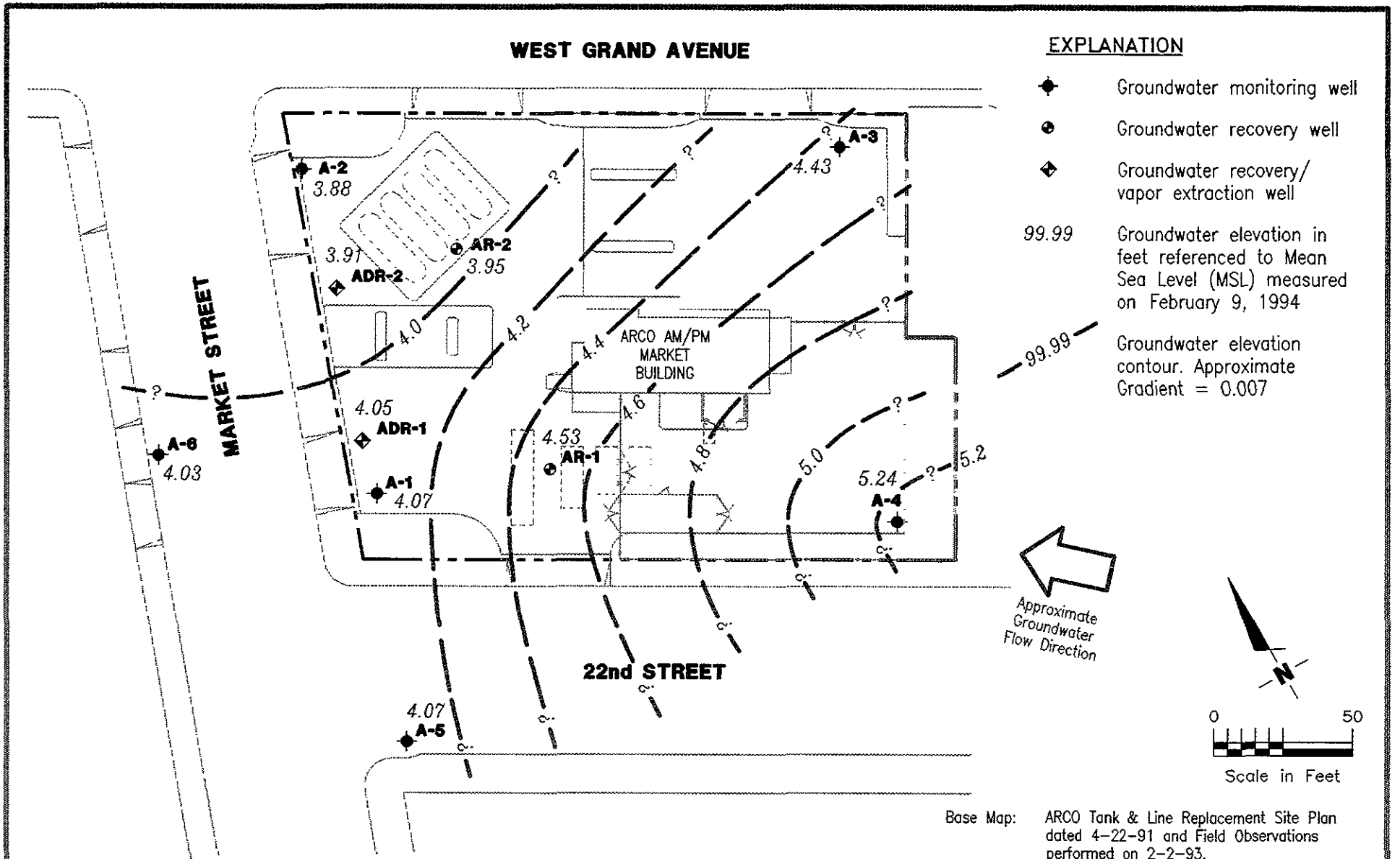
Base Map: ARCO Tank & Line Replacement Site Plan dated 4-22-91 and Field Observations performed on 2-2-93.

GeoStrategies Inc.

SITE PLAN
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

FIGURE
2

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7927	BS	4/94	

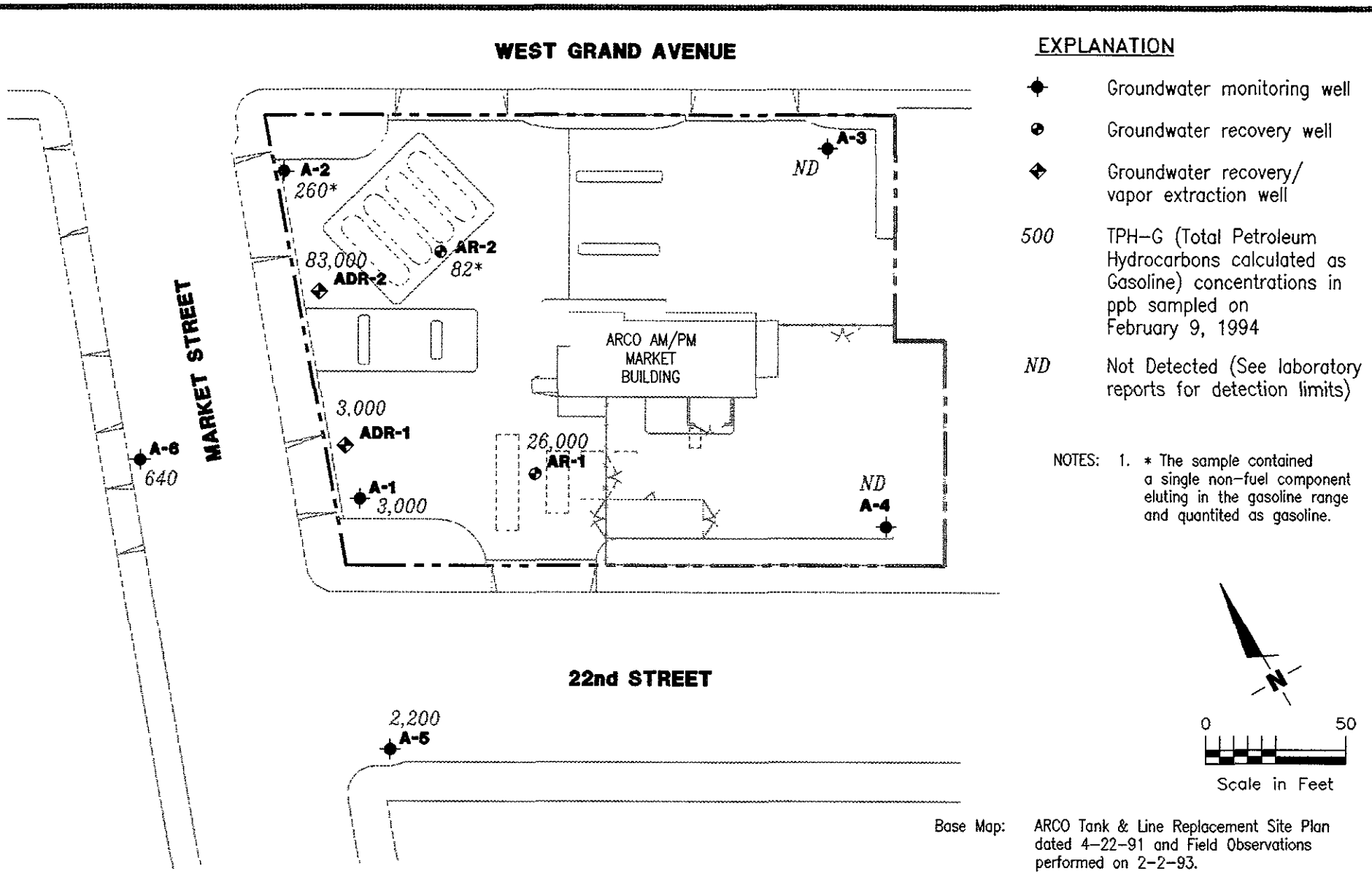


GeoStrategies Inc.

POTENTIOMETRIC MAP (February 9, 1994)
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

FIGURE **3**

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792701-18	BS	4/94	

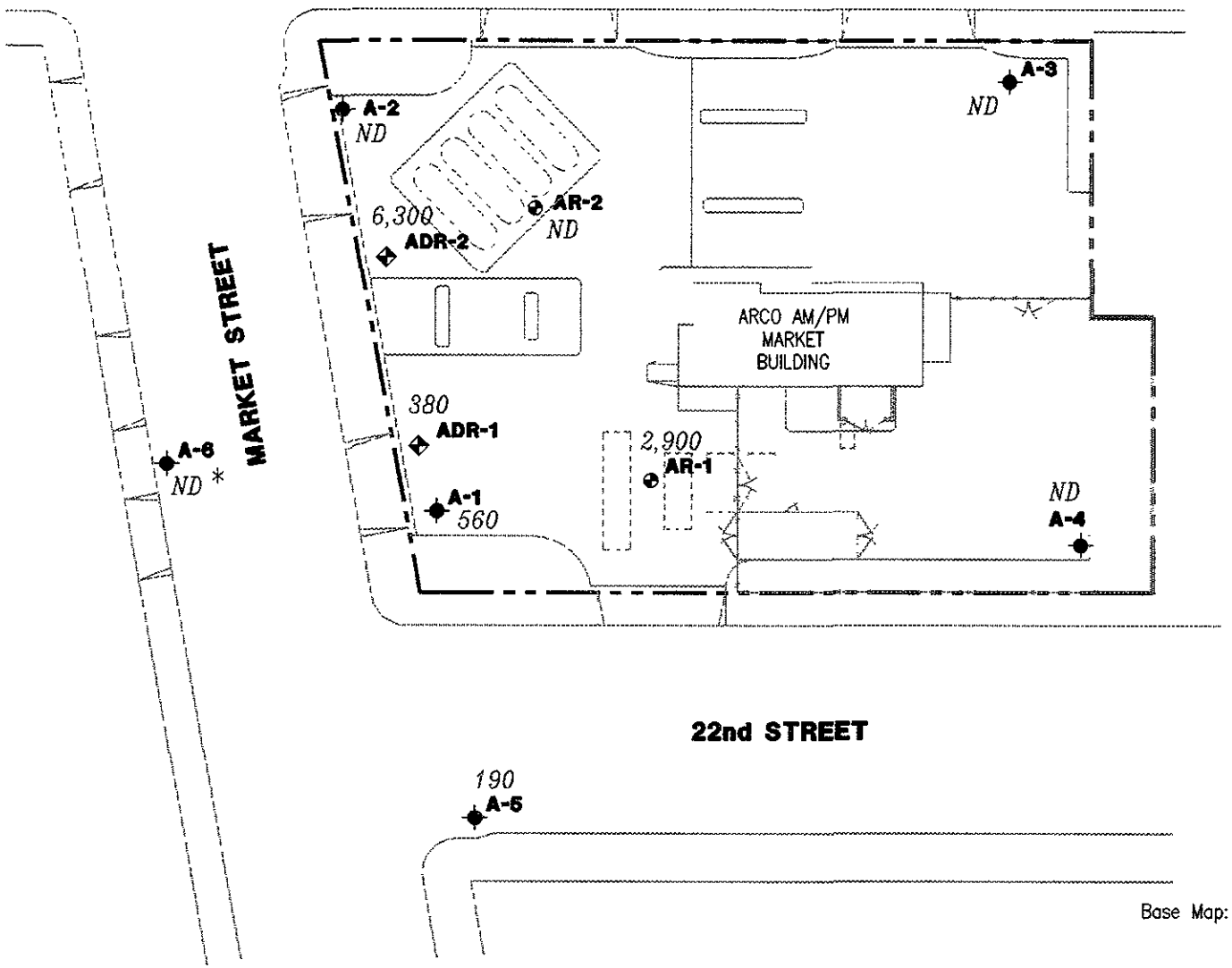


GeoStrategies Inc.

TPH-G CONCENTRATION MAP
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

FIGURE
4

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792701-18		4/94	



EXPLANATION

- Groundwater monitoring well
- Groundwater recovery well
- Groundwater recovery/ vapor extraction well
- *5.00* — Benzene concentration in ppb sampled on February 9, 1994
- *ND* — Not Detected (See laboratory reports for detection limits)
- * — Matrix interference

N

0 50

Scale in Feet

Base Map: ARCO Tank & Line Replacement Site Plan dated 4-22-91 and Field Observations performed on 2-2-93.

GeoStrategies Inc.

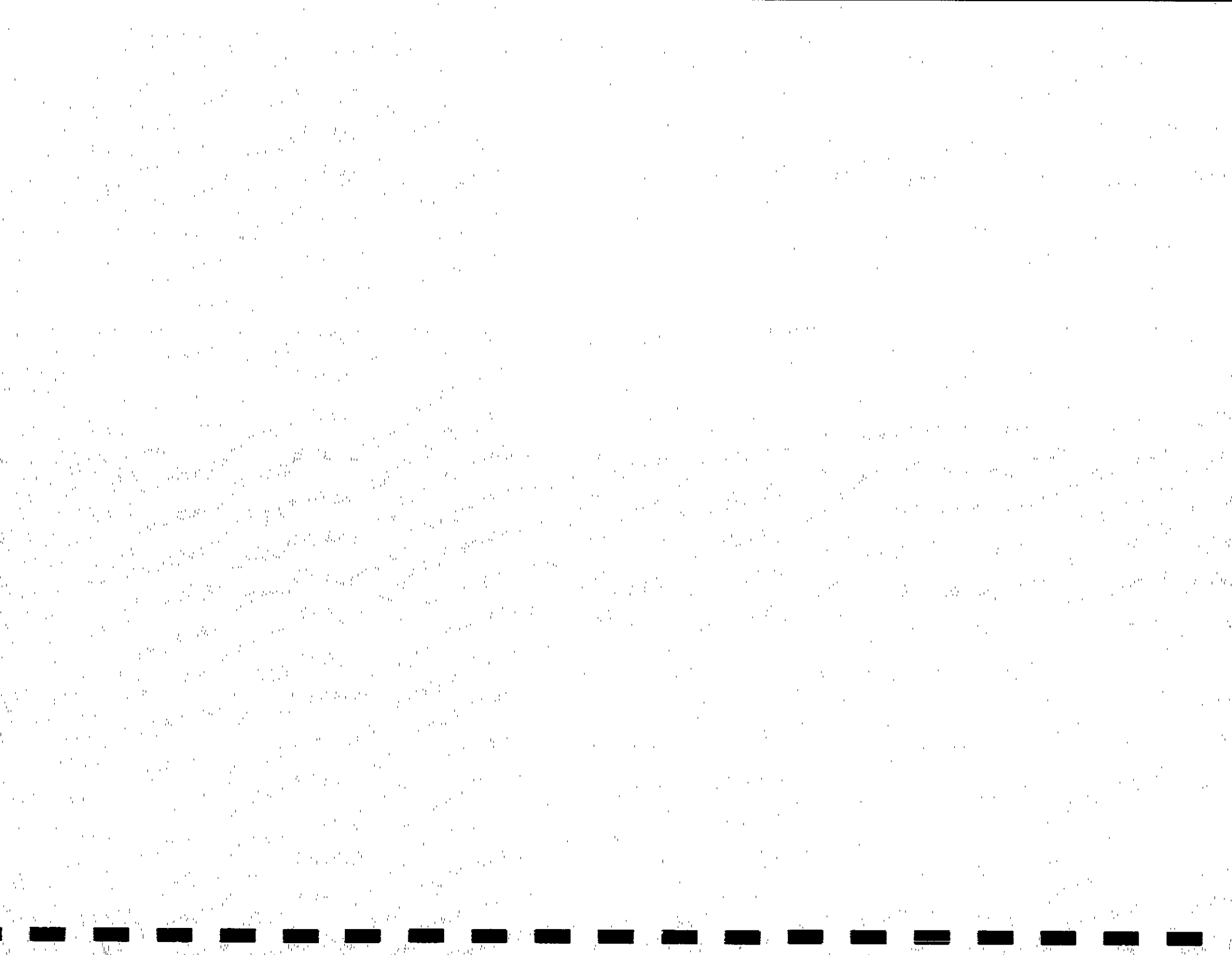
BENZENE CONCENTRATION MAP
ARCO Service Station #2169
889 West Grand Avenue
Oakland, California

FIGURE
5

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
792701-18		4/94	

APPENDIX A

IWM GROUNDWATER SAMPLING REPORT



I NTEGRATED
W ASTESTREAM
M ANAGEMENT, INC.

March 4, 1994

Ms. Barbara Sieminski
Geostrategies
6747 Sierra Court
Suite G
Dublin, CA. 94568

Dear Ms. Sieminski:

Attached are the field data sheets and analytical results for quarterly ground water sampling at ARCO Facility No. A-2169 in Oakland, California. Integrated Wastestream Management measured the depth to water and collected samples from wells at this site on February 9, 1994.

Sampling was carried out in accordance with the protocols described in the "Request for Bid for Quarterly Sampling at ARCO Facilities in Northern California".

Please call us if you have any questions.

Sincerely,
Integrated Wastestream Management

Tom DeLon
Project Manager

Walter H. Howe
Registered Geologist

950 AMES AVENUE MILPITAS, CA. 95035 (408) 942-8955

I NTEGRATED
W ASTESTREAM
M ANAGEMENT

A2169QA4.XLS

Summary of Ground Water Sample Analyses ARCO Facility No. A-2169, Oakland, California

WELL NUMBER	A-1	A-2	A-3	A-4	A-5	A-6	AR-1	AR-2	ADR-1	ADR-2
DATE SAMPLED	2/9/94	2/9/94	2/9/94	2/9/94	2/9/94	2/9/94	2/9/94	2/9/94	2/9/94	2/9/94
DEPTH TO WATER	10.09	10.67	11.32	10.01	9.44	9.48	11.08	11.33	9.90	10.73
SHEEN	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE
PRODUCT THICKNESS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TPHg	3,000	260	ND	ND	2,200	640	26,000	82	3,000	83,000
BTEX										
BENZENE	560	<0.6	ND	ND	190	<2.9	2,900	ND	380	6,300
TOLUENE	150	ND	ND	ND	130	<3.7	450	ND	140	6,100
ETHLYBENZENE	66	ND	ND	ND	130	<2.4	920	ND	59	2,000
XYLENES	190	ND	ND	ND	310	<8.2	3,000	ND	240	11,000
EPA 3510										
DIESEL	650	NA	NA	NA	NA	NA	4,200	ND	110	12,000

FOOTNOTES:

Concentrations reported in ug/L (ppb).

TPHg = Total Purgeable Petroleum Hydrocarbons (USEPA Method 8015 Modified)

BTEX Distinction (USEPA Method 8020)

PCE = Tetrachloroethene (USEPA Method 8010)

DCE = cis-1, 2-Dichloroethene (USEPA Method 8010)

TCE = Trichloroethene (USEAP Method 8010)

N.D. = Not Detected.

950 AMES AVENUE MILPITAS, CA 95035 (408) 942-8955

FIELD REPORT

DEPTH TO WATER / FLOATING PRODUCT SURVEY

SITE ARRIVAL TIME: 1245

SITE DEPARTURE TIME:

WEATHER CONDITIONS: Cloudy/cool

PROJECT NO.: _____ LOCATION: 889 West grandav. OAKDATE: Feb 9, 1994

CLIENT/STATION #: arco 2169 FIELD TECHNICIAN: Vince/Francisco DAY OF WEEK: Wednesday

DTW ORDER	WELL ID	SURFACE SEAL	LID SECURE	GASKET	LOCK	EXPANDING CAP	TOTAL DEPTH (Feet)	FIRST DEPTH TO WATER (Feet)	SECOND DEPTH TO WATER (Feet)	DEPTH TO FLOATING PRODUCT (Feet)	FLOATING PRODUCT THICKNESS (Feet)	SHEEN (Y = YES, N = NO)	COMMENTS	MATERIALS
8	A-1	OK	yes	OK	OK	OK	25.0	10.09	10.09	N/A	N/A	N	3" square grading	
3	A-2						25.0	10.67	10.67				3" square grading	
1	A-3						29.5	11.32	11.32				3" square grading	
2	A-4						28.0	10.01	10.01				3" square grading	
10	A-5						30.0	9.44	9.44				2" Well box is filled w/ #3 ABOVE SURFACE DTW 10.13	Busy Street Well
5	A-6						28.5	9.48	9.48				2" Street Well	
6	ADR-2						26.5	10.73	10.73				4" square grading	
7	ADR-1						22.0	9.90	9.90				4" square grading	
9	AR-1						28.0	11.08	11.08				6" square grading	
4	AR-2						28.5	11.33	11.33				4" circular grading missing bolts	

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: A-3

CLIENT/STATION #: Arco 2169 ADDRESS: 889 W 3rd Ave Oak.

CASING DIAMETER (inches): 2 | 3 | 4 | 6 | 8 | 12 | Other _____

GALLON/LINEAR FOOT: 0.17 | 0.38 | 0.66 | 1.5 | 2.6 | 5.8 | Other _____

TD 29.5 - DTW 11.32 x GALLON/LINEAR FT. 0.38 x CASING VOLUME 3 = CALCULATED PURGE 20.72 ACTUAL PURGE 21 C

DATE PURGED: 2-9-94 START (2400 Hr) 1430 END (2400 Hr) 1436

DATE SAMPLED: 2-9-94 START (2400 Hr) 1443 END (2400 Hr) 1443

DTW 11.5

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1431	13	7.62	0.72	65.8	clear	
1433	9	7.74	0.81	65.6	clear	
1435	15	7.70	0.84	65.3	clear	
1436	21	7.69	0.82	64.9	clear	

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

PURGING EQUIPMENT

- ___ 2" Bladder Pump
- ✓ Centrifugal Pump
- ___ Submersible Pump
- ___ Dedicated
- ___ Bailer (Teflon®)
- ___ Bailer (PVC)
- ___ Bailer (Stainless Steel)

Other: _____

SAMPLING EQUIPMENT

- ___ 2" Bladder Pump
- ___ DDL Sampler
- ___ Dipper
- ✓ Bailer Disposable
- ___ Bailer (Teflon®)
- ___ Bailer (Stainless Steel)
- ___ Submersible Pump
- ___ Dedicated

Other: _____

REMARKS: _____

PRINT NAME: Vince Walden

SIGNATURE: Vince Walden

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: A-4

CLIENT/STATION #: ARCO 2169 ADDRESS: 889 WEST GRAND AVE. OAK

CASING DIAMETER (inches): 2 | 3 | 4 | 6 | 8 | 12 | Other _____

GALLON/LINEAR FOOT: 0.17 | 0.38 | 0.66 | 1.5 | 2.6 | 5.8 | Other _____

TD 28.0 - DTW 10.01 x GALLON/LINEAR FT. .038 x CASING VOLUME 3 = CALCULATED PURGE 20.50 ACTUAL PURGE 21 L

DATE PURGED: 2-9-94 START (2400 Hr) 1447 END (2400 Hr) 1452

DATE SAMPLED: 2-9-94 START (2400 Hr) 1459 END (2400 Hr) 1459

DTW 10.2

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1448	4	6.76	0.99	65.8	clear	
1449	11	6.89	1.08	66.1	clear	
1451	16	6.93	0.96	65.7	clear	
1452	21	6.96	0.97	65.4	clear	

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

PURGING EQUIPMENT

___ 2" Bladder Pump
✓ Centrifugal Pump
___ Submersible Pump
___ Dedicated
___ Bailer (Teflon®)
___ Bailer (PVC)
___ Bailer (Stainless Steel)
Other: _____

SAMPLING EQUIPMENT

___ 2" Bladder Pump
___ DDL Sampler
___ Dipper
✓ Bailer Disposable
___ Bailer (Teflon®)
___ Bailer (Stainless Steel)
___ Submersible Pump
___ Dedicated
Other: _____

REMARKS: _____

PRINT NAME: Vince Valdez

SIGNATURE: Vince Valdez

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: A-2

CLIENT/STATION #: ARCO 2169 ADDRESS: 889 WEST GRAND AVE OAK

CASING DIAMETER (inches): 2 | 3 | 4 | 6 | 8 | 12 | Other _____

GALLON/LINEAR FOOT: 0.17 | 0.38 | 0.66 | 1.5 | 2.6 | 5.8 | Other _____

TD 25.0 - DTW 10.67 X GALLON/LINEAR FT. 0.38 X CASING VOLUME 3 = CALCULATED PURGE 16.33 ACTUAL PURGE 17.0

DATE PURGED: 2-9-94 START (2400 Hr) 1512 END (2400 Hr) 1518

DATE SAMPLED: 2-9-94 START (2400 Hr) 1525 END (2400 Hr) 1525

DTW 11.0

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1514	4	7.09	1.12	68.5	clear	
1515	9	7.07	0.96	68.8	clear	
1516	14	7.08	0.94	68.4	clear	
1518	17	7.06	0.93	68.0	clear	

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

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ✓ Centrifugal Pump
- ____ Submersible Pump
- ____ Dedicated
- ____ Bailer (Teflon®)
- ____ Bailer (PVC)
- ____ Bailer (Stainless Steel)

Other: _____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ DDL Sampler
- ____ Dipper
- ✓ Bailer Disposable
- ____ Bailer (Teflon®)
- ____ Bailer (Stainless Steel)
- ____ Submersible Pump
- ____ Dedicated

Other: _____

REMARKS: _____

PRINT NAME: Vince Valdez

SIGNATURE: Vince Valdez

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: AR-2

CLIENT/STATION #: ARCO 2169 ADDRESS: 889 WEST GRAND AVE. OAK

CASING DIAMETER (inches):	2	3	4	6	8	12	Other
GALLON/LINEAR FOOT:	0.17	0.38	0.66	1.5	2.6	5.8	Other

TD 285 - DTW 11.33 X GALLON/LINEAR FT. 0.66 X CASING VOLUME 3 = CALCULATED PURGE 33.99 ACTUAL PURGE 34.0

DATE PURGED: 2-9-94 START (2400 Hr) 1537 END (2400 Hr) 1546

DATE SAMPLED: 2-9-94 START (2400 Hr) 1559 END (2400 Hr) 1559

DTW 11.3

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1539	3	7.19	0.88	67.4	clear	
1543	12	7.26	1.03	68.3	clear	
1552	22	7.17	0.97	68.0	clear	
1554	26	7.08	0.95	67.8	clear	
1546	31	7.08	0.94	67.6	clear	

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

PURGING EQUIPMENT

- ___ 2" Bladder Pump
- ___ Bailer (Teflon®)
- ✓ Centrifugal Pump
- ___ Bailer (PVC)
- ___ Submersible Pump
- ___ Bailer (Stainless Steel)
- ___ Dedicated

Other: _____

SAMPLING EQUIPMENT

- ___ 2" Bladder Pump
- ___ Bailer (Teflon®)
- ___ DDL Sampler
- ___ Bailer (Stainless Steel)
- ___ Dipper
- ___ Submersible Pump
- ✓ Bailer Disposable
- ___ Dedicated

Other: _____

REMARKS: _____

PRINT NAME: _____

PAGE 5 OF 11 SIGNATURE: _____

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: A-6

CLIENT/STATION #: ARCO 2109 ADDRESS: 889 WEST GRAND AVE. OAK

CASING DIAMETER (inches): 2 | 3 | 4 | 6 | 8 | 12 | Other _____

GALLON/LINEAR FOOT: 0.17 | 0.38 | 0.66 | 1.5 | 2.6 | 5.8 | Other _____

TD 28.5 - DTW 9.48 X GALLON/LINEAR FT. 0.17 X CASING VOLUME 3 = CALCULATED PURGE 9.70 ACTUAL PURGE 8.0

DATE PURGED: 2-9-94 START (2400 Hr) 1609 END (2400 Hr) 1614

DATE SAMPLED: 2-9-94 START (2400 Hr) 1621 END (2400 Hr) 1621

DTW 15.0

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1610	2	7.15	0.84	66.9	clear	
1612	4	7.09	0.89	66.5	clear	
1614	8	7.03	0.94	66.4	clear	

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

PURGING EQUIPMENT

- ___ 2" Bladder Pump
- ✓ Centrifugal Pump
- ___ Submersible Pump
- ___ Dedicated
- ___ Bailer (Teflon®)
- ___ Bailer (PVC)
- ___ Bailer (Stainless Steel)

Other: _____

SAMPLING EQUIPMENT

- ___ 2" Bladder Pump
- ___ DDL Sampler
- ___ Dipper
- ✓ Bailer Disposable
- ___ Bailer (Teflon®)
- ___ Bailer (Stainless Steel)
- ___ Submersible Pump
- ___ Dedicated

Other: _____

REMARKS: Well purged dry at 8 gallons.

PRINT NAME: VINCE VALDES

SIGNATURE: Vince Valdes

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: ADR - 2

CLIENT/STATION #: ARCO 2169 ADDRESS: 889 WEST GRAND AVE OAK

CASING DIAMETER (inches): 2 | 3 | 4 | 6 | 8 | 12 | Other _____

GALLON/LINEAR FOOT: 0.17 | 0.38 | 0.66 | 1.5 | 2.6 | 5.8 | Other _____

TD 26.5 - DTW 10.73 X GALLON/LINEAR FT. 0.66 X CASING VOLUME 3 = CALCULATED PURGE 31.22

ACTUAL PURGE 25.0

DATE PURGED: 2-9-94 START (2400 Hr) 1625 END (2400 Hr) 1647

DATE SAMPLED: 2-9-94 START (2400 Hr) 1655 END (2400 Hr) 1658

DTW 23.0

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1641	4	6.93	1.23	67.5	cloudy	
1643	12	6.98	1.35	67.3	cloudy	
1644	18	6.99	1.39	67.0	cloudy	
1647	25	7.01	1.41	66.9	clear	

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

PURGING EQUIPMENT

- ___ 2" Bladder Pump
- ✓ Centrifugal Pump
- ___ Submersible Pump
- ___ Dedicated
- ___ Bailer (Teflon®)
- ___ Bailer (PVC)
- ___ Bailer (Stainless Steel)

Other: _____

SAMPLING EQUIPMENT

- ___ 2" Bladder Pump
- ___ DDL Sampler
- ___ Dipper
- ✓ Bailer Disposable
- ___ Bailer (Teflon®)
- ___ Bailer (Stainless Steel)
- ___ Submersible Pump
- ___ Dedicated

Other: _____

REMARKS: Well pumped dry at 25 gallons

PRINT NAME: Vince Vallejos

SIGNATURE: Vince Vallejos

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: A-1

CLIENT/STATION #: ARCO 2169 ADDRESS: 889 WEST GRAND AVE OAK

CASING DIAMETER (inches):	2	3	4	6	8	12	Other _____
GALLON/LINEAR FOOT:	0.17	0.38	0.66	1.5	2.6	5.8	Other _____

TD 25.0 - DTW 10.09 X GALLON/LINEAR FT. .038 X CASING VOLUME 3 = CALCULATED PURGE 16.99 ACTUAL PURGE 17.0

DATE PURGED: 2-9-94 START (2400 Hr) 1736 END (2400 Hr) 1741

DATE SAMPLED: 2-9-94 START (2400 Hr) 1748 END (2400 Hr) 1748

DTW 17.0

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1737	5	6.83	1.01	66.0	clear	
1739	11	6.92	1.15	65.8	clear	
1741	17	7.02	1.20	65.4	clear	

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)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Dedicated		✓ Bailer Disposable	___ Dedicated
Other: _____		Other: _____	

REMARKS: _____

PRINT NAME: FRANCISCO ABUNGAN

SIGNATURE: Francisco Abungan

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: AR-1

CLIENT/STATION #: ARCO 2169 ADDRESS: 889 WEST GRAND AVE. OAK

CASING DIAMETER (inches): 2 | 3 | 4 | 6 | 8 | 12 | Other _____

GALLON/LINEAR FOOT: 0.17 | 0.38 | 0.66 | 1.5 | 2.6 | 5.8 | Other _____

TD 28.0 - DTW 11.08 X GALLON/LINEAR FT. 1.5 X CASING VOLUME 3 = CALCULATED PURGE 76.14 ACTUAL PURGE 77.0

DATE PURGED: 2-9-94 START (2400 Hr) 1801 END (2400 Hr) 1812

DATE SAMPLED: 2-9-94 START (2400 Hr) 1825 END (2400 Hr) 1825

DTW 11.1

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1802	4	7.35	1.73	65.9	cloudy	
1804	21	7.49	1.56	66.3	clear	
1807	47	7.48	1.66	65.8	clear	
1809	58	7.49	1.58	65.0	clear	
1812	77	7.52	1.54	64.9	clear	

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

PURGING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Bailer (Teflon®)
- ✓ Centrifugal Pump
- ____ Bailer (PVC)
- ____ Submersible Pump
- ____ Bailer (Stainless Steel)
- ____ Dedicated

Other: _____

SAMPLING EQUIPMENT

- ____ 2" Bladder Pump
- ____ Bailer (Teflon®)
- ____ DDL Sampler
- ____ Bailer (Stainless Steel)
- ____ Dipper
- ____ Submersible Pump
- ✓ Bailer Disposable
- ____ Dedicated

Other: _____

REMARKS: _____

PRINT NAME: Vince Vallejos

SIGNATURE: Vince Vallejos

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: A-5

CLIENT/STATION #: ARCO 2169 ADDRESS: 899 WEST 6TH ST. AF. OR

CASING DIAMETER (inches):	2	3	4	6	8	12	Other _____
GALLON/LINEAR FOOT:	0.17	0.38	0.66	1.5	2.6	5.8	Other _____

TD 30.0 - DTW 9.42 X (GALLON/LINEAR FT.) 0.17 X (CASING VOLUME) 3 = (CALCULATED PURGE) 10.48 ACTUAL PURGE 11.0

DATE PURGED: 2-9-94 START (2400 Hr) 1814 END (2400 Hr) 1817

DATE SAMPLED: 2-9-94 START (2400 Hr) 1840 END (2400 Hr) 1840

PTW 10.0

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1815	3	7.58	0.90	64.0	CLOUDY	
1816	7	7.46	0.84	65.4	CLEAR	
1817	11	7.47	0.86	65.4	CLEAR	

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)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Dedicated		✓ Bailer Disposable	___ Dedicated
Other: _____		Other: _____	

REMARKS: _____

PRINT NAME: FRANCISCO ABUNIAN

PAGE 10 OF 11 SIGNATURE: Francisco Abunian

GROUND WATER SAMPLE FIELD DATA SHEET

PROJECT NO: _____ WELL ID: ADR - 1

CLIENT/STATION #: ARCO 2169 ADDRESS: 859 WEST GRAND AVE. OAK

CASING DIAMETER (inches):	2	3	4	6	8	12	Other
GALLON/LINEAR FOOT:	0.17	0.38	0.66	1.5	2.6	5.8	Other

TD 22.0 - DTW 9.90 X GALLON/LINEAR FT. 0.66 X CASING VOLUME 3 = CALCULATED PURGE 23.95 ACTUAL PURGE 24.0

DATE PURGED: 2-9-94 START (2400 Hr) 1707 END (2400 Hr) 1715

DATE SAMPLED: 2-9-94 START (2400 Hr) 1721 END (2400 Hr) 1721

DTW E.C

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1710	4	6.97	1.17	66.7	cloudy	
1711	12	6.99	1.21	66.8	cloudy	
1712	16	6.95	1.26	66.4	clear	
1715	24	6.95	1.18	66.0	clear	

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

PURGING EQUIPMENT

- ___ 2" Bladder Pump
- ___ Bailer (Teflon®)
- ✓ Centrifugal Pump
- ___ Bailer (PVC)
- ___ Submersible Pump
- ___ Bailer (Stainless Steel)
- ___ Dedicated

Other: _____

SAMPLING EQUIPMENT

- ___ 2" Bladder Pump
- ___ Bailer (Teflon®)
- ___ DDL Sampler
- ___ Bailer (Stainless Steel)
- ___ Dipper
- ___ Submersible Pump
- ✓ Bailer Disposable
- ___ Dedicated

Other: _____

REMARKS: _____

PRINT NAME: Mike Wilcox

PAGE 11 OF 11

SIGNATURE: Mike Wilcox

Columbia Analytical Services INC.

February 25, 1994

Service Request No. SJ94-0195

Gina Austin
Tom DeLon
IWM
950 Ames Avenue
Milpitas, CA 95035

Re: **ARCO Facility No. A2169**

Dear Ms. Austin/Mr. DeLon:

Attached are the results of the water samples submitted to our lab on February 11, 1994. For your reference, these analyses have been assigned our service request number SJ94-0195.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Keoni A. Murphy
Laboratory Manager

Annelise J. Bazar
Regional QA Coordinator

KAM/kmh

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-9356

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MRL	Method Reporting Limit
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 MRL
NR	Not Requested
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
VPH	Volatile Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: IWM
Project: ARCO Facility No. A2169
Sample Matrix: Water

Dates Collected: 02/09/94
Date Received: 02/11/94
Date Extracted: 02/15/94
Date Analyzed: 02/17/94
Service Request: SJ94-0195

Total Petroleum Hydrocarbons as Diesel
EPA Method 3510/California DHS LUFT Method
Units: µg/L (ppb)

Sample Name	TPH as Deisel	
A-1 (17.0)	650.	(a)
AR-1 (11.1)	4,200.	(b)
AR-2 (11.3)	ND	
ADR-1 (15.0)	110.	(b)
ADR-2 (23.0)	12,000.	(c)
Method Blank	ND	
MRL	50	

(a) Sample contains lower and higher boiling point hydrocarbon mixtures quantitated as diesel. The chromatogram does not match the typical diesel fingerprint.
(b) The sample contains a lower boiling point hydrocarbon mixture quantitated as diesel. The chromatogram does not match the typical diesel fingerprint
(c) The sample contains a lower boiling point hydrocarbon and diesel mixture quantitated as diesel The chromatogram does not match the typical diesel fingerprint.

Approved By: Kevin A Murphy Date: February 11, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: JWM
Project: ARCO Facility No. A2169
Sample Matrix: Water

Dates Collected: 02/09/94
Date Received: 02/11/94
Date Extracted: N/A
Date Analyzed: 02/18, 22/94
Service Request: SJ94-0195

BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Analyte:		Benzene	Toluene	Ethyl-benzene	Total Xylenes	TPH as Gasoline
Units:		µg/L (ppb)	µg/L (ppb)	µg/L (ppb)	µg/L (ppb)	µg/L (ppb)
Method Reporting Limit:		0.5	0.5	0.5	0.5	50
Sample Name	**Date Analyzed**					
A-1 (17.0)	02/18/94	560.	150.	66.	190.	3,000.
A-2 (11.0)	02/18/94	<0.6 (a)	ND	ND	ND	260. (b)
A-3 (11.5)	02/18/94	ND	ND	ND	ND	ND
A-4 (10.2)	02/18/94	ND	ND	ND	ND	ND
A-5 (10.0)	02/18/94	190.	130.	130.	310.	2,200.
A-6 (10.0)	02/22/94	<2.9 (a)	<3.7 (a)	<2.4 (a)	<8.2 (a)	640.
AR-1 (11.1)	02/18/94	2,900.	450.	920.	3,000.	26,000.
AR-2 (11.3)	02/18/94	ND	ND	ND	ND	82 . (b)
ADR-1 (15.0)	02/18/94	380.	140.	59.	240.	3,000.
ADR-2 (23.0)	02/18/94	6,300.	6,100.	2,000.	11,000.	83,000.
Method Blank	02/18/94	ND	ND	ND	ND	ND
Method Blank	02/22/94	ND	ND	ND	ND	ND

(a) Raised MRL due to matrix interference.
(b) The sample contains a single non-fuel component eluting in the gasoline range, and quantitated as gasoline. The chromatogram does not match the typical gasoline fingerprint.

Approved By: Edward Murphy Date: February 25, 1994

[940195.SLW]8020wt/2/25/94

APPENDIX A

LABORATORY QC RESULTS

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM
Project: ARCO Facility No A2169
Sample Matrix: Water

Dates Collected: 02/09/94
Date Received: 02/11/94
Date Extracted: N/A
Date Analyzed: 02/18, 22/94
Service Request: SJ94-0195

Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery a.a.a-Trifluorotoluene
A-1 (17.0)	02/18/94	81.
A-2 (11.0)	02/18/94	84.
A-3 (11.5)	02/18/94	94.
A-4 (10.2)	02/18/94	78.
A-5 (10.0)	02/18/94	82.
A-6 (10.0)	02/22/94	101.
AR-1 (11.1)	02/18/94	78.
AR-2 (11.3)	02/18/94	79.
ADR-1 (15.0)	02/18/94	86.
ADR-2 (23.0)	02/18/94	82.
A-3 (11.5) MS	02/18/94	87.
A-3 (11.5) DMS	02/18/94	96.
Method Blank	02/18/94	87.
Method Blank	02/22/94	89

CAS Acceptance Limits: 62-112

Approved By: Kenneth Murphy Date: February 25, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	IWM	**Dates Collected:**	02/09/94
Project:	ARCO Facility No A2169	**Date Received:**	02/11/94
Sample Matrix:	Water	**Date Extracted:**	N/A
		Date Analyzed:	02/18/94
		Service Request:	SJ94-0195

Initial Calibration Verification
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: µg/L (ppb)

Analyte	True Value	Result	Percent Recovery	CAS Acceptance Criteria
Benzene	25.	25.5	102.	85-115
Toluene	25.	25.6	102.	85-115
Ethylbenzene	25.	22.5	90.	85-115
Total Xylenes	75.	64.9	86.	85-115
TPH as Gasoline	250.	235.	94.	90-110

Approved By: Robert Murphy Date: February 25, 1994

[940195 XLW]8020ccs/2/25/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	IWM		**Dates Collected:**	02/09/94
Project:	ARCO Facility No	A2169	**Date Received:**	02/11/94
Sample Matrix:	Water		**Date Extracted:**	N/A
			Date Analyzed:	02/18/94
			Service Request:	SJ94-0195

Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline
EPA Methods 5030/California DHS LUFT Method
Units: µg/L (ppb)

Sample Name: A-3 (11.5)

					Percent Recovery		
		Sample	Spike Result				CAS Acceptance
Analyte	Spike Level	Result	MS	DMS	MS	DMS	Criteria
TPH as Gasoline	250.	ND	282.	289.	113.	116	67-121

Approved By: Kathleen Murphy Date February 25, 1994

[940195 XLW]8020tphms/2/25/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM
Project: ARCO Facility No. A2169
Sample Matrix: Water

Dates Collected: 02/09/94
Date Received: 02/11/94
Date Extracted: 02/15/94
Date Analyzed: 02/17/94
Service Request: SJ94-0195

Surrogate Recovery Summary
Total Petroleum Hydrocarbons as Diesel
EPA Method 3510/California DHS LUFT Method

Sample Name	Percent Recovery p-Terphenyl
A-1 (17.0)	95.
AR-1 (11.1)	90.
AR-2 (11.3)	90.
ADR-1 (15.0)	90.
ADR-2 (23.0)	89.
MS	99.
DMS	100.
Method Blank	100.

CAS Acceptance Limits: 66-123

Approved By: Edward A Murphy Date: February 25, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	IWM		**Dates Collected:**	02/09/94
Project:	ARCO Facility No	A2169	**Date Received:**	02/11/94
Sample Matrix:	Water		**Date Extracted:**	N/A
			Date Analyzed:	02/17/94
			Service Request:	SJ94-0195

Initial Calibration Verification
Total Petroleum Hydrocarbons as Diesel
EPA Method 3510/California DHS LUFT Method
Units: mg/L (ppm)

Analyte	True Value	Result	Percent Recovery	CAS Acceptance Criteria
TPH as Diesel	500.	509.	102.	90-110

Approved By: Keon M. Murphy Date February 25, 1994

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: IWM
Project: ARCO Facility No. A2169
Sample Matrix: Water

Dates Collected: 02/09/94
Date Received: 02/11/94
Date Extracted: 02/15/94
Date Analyzed: 02/17/94
Service Request: SJ94-0195

Matrix Spike/Duplicate Matrix Spike Summary
Total Petroleum Hydrocarbons as Diesel
EPA Method 3510/California DHS LUFT Method
Units: µg/L (ppb)

Analyte	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	CAS Acceptance Criteria
Diesel	4,000.	ND	4,360.	4,550.	109.	114.	61-141

Approved By: Kevin A Murphy Date February 25, 1994

APPENDIX B

CHAIN OF CUSTODY

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. IWM-94-SCC

Chain of Custody

ARCO Facility no. A 2169	City (Facility) OAKLAND	Project manager (Consultant) TOM DeFan	Laboratory name Columbia
ARCO engineer Kyle Christie	Telephone no. (ARCO)	Telephone no. (Consultant) 408/942 8955	Fax no. (Consultant) 408/942 1499
Consultant name I.W.M.	Address (Consultant) 950 Amer av. Milp. Ca 95035		Contract number 07077

	Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid HCl	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH 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 ☐	TPH d/HOD 5015
W	FB	1-2	2		✓		✓	✓	2-9-94	1250		✓	✓									
1.0	A-1	3-5	3		✓		✓	✓		1748		✓	✓									✓
1.0	A-2	6-7	2		✓		✓	✓		1525		✓	✓									
1.5	A-3	8-9	2		✓		✓	✓		1443		✓	✓									
0.2	A-4	10-11	2		✓		✓	✓		1459		✓	✓									
0.0	A-5	12-13	2		✓		✓	✓		1840		✓	✓									
2.0	A-6	14-15	2		✓		✓	✓		1621		✓	✓									
0.1	AR-1	16-18	3		✓		✓	✓		1825		✓	✓									✓
1.3	AR-2	19-21	3		✓		✓	✓		1559		✓	✓									✓
5.0	ADR-1	22-24	3		✓		✓	✓		1721		✓	✓									✓
3.0	ADR-2	25-27	3		✓		✓	✓		1658		✓	✓									✓

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number 5594-0195

Turnaround time

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

Condition of sample: good / cold

Temperature received: cool

Relinquished by sampler: Vince Salcido	Date 2-11-94	Time	Received by: CAS/SS 2/11/94
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory / Date / Time

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

APPC 3292 (2-91)