

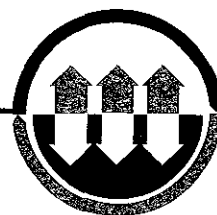
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REMEDIAL WELL INSTALLATION REPORT

ARCO SERVICE STATION 6148

OAKLAND, CALIFORNIA

02/01/96



EMCON





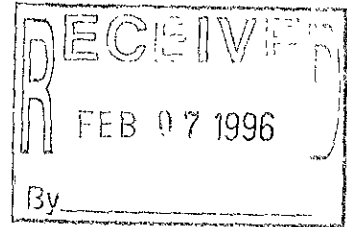
EMCON

1921 Ringwood Avenue • San Jose, California 95131-1721 • (408) 453-7300 • Fax (408) 437-9526

Date February 1, 1996
Project 20805-135.004

To:

Mr. Michael Whelan
ARCO Products Company
P.O. Box 612530
San Jose, CA 95161



We are enclosing:

Copies	Description
<u>1</u>	<u>Remedial Well Installation Report,</u>
	<u>ARCO service station 6148, Oakland, California</u>

For your:	<u> X </u>	Use	Sent by:	<u> X </u>	Regular Mail
		Approval			Standard Air
		Review			Courier
		Information			Other: <u>Cert. Mail</u>

Comments:

Please call if you have questions or comments.

Robert W. Davis
Rob Davis
Staff Geologist

cc: Susan Hugo - ACHCSA
Kevin Graves - RWQCB





Date: February 1, 1996

Re: ARCO Station # 6148 • 5131 Shattuck Avenue, Oakland, CA
Remedial Well Installation Report

" I declare, that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached proposal or report are true and correct."

Submitted by:

A handwritten signature in cursive script that reads "Michael R. Whelan". The signature is written in black ink and is positioned above the printed name and title.

Michael R. Whelan
Environmental Engineer



February 1, 1996
Project 20805-135.004

Mr. Michael Whelan
ARCO Products Company
2155 South Bascom, Suite 202
Campbell, California 95008

Re: Remedial well installation report, ARCO service station 6148, Oakland, California

Dear Mr. Whelan:

This report documents the destruction of one combination AS/SVE well and the installation of eight soil-vapor-extraction (SVE) wells and four air-sparge (AS) wells by EMCON at ARCO Products Company (ARCO) service station 6148, 5131 Shattuck Avenue, Oakland, California (Figure 1). The installed wells form part of the soil and groundwater remediation system described in *Remedial Action Plan, Interim Soil and Groundwater Remediation* (RAP, EMCON, June 1995), as submitted to the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), and the Alameda County Health Care Services Agency (ACHCSA) on June 8, 1995.

BACKGROUND

The project site is on the southwestern corner of the intersection of 52nd Street and Shattuck Avenue, Oakland, California (Figure 1). The relatively level site is at an elevation of approximately 110 feet above mean sea level (MSL). The site is described by Alameda County Assessor's Parcel Number 14-1216-31-2, with a total area of approximately 1/2 acre. The site is owned by ARCO and is currently an operating retail gasoline station. The current underground storage tank (UST) complex consists of three 12,000-gallon gasoline USTs at the site (one regular unleaded, one mid-grade, and one premium unleaded UST).

On June 1, 1987, Crosby and Oberton, and Erico Construction removed a waste-oil tank from the site. During tank removal, one soil sample was collected from the bottom of the waste-oil tank pit. After characterization of the sample, soil from the tank pit was excavated and transported to a landfill. Crosby and Oberton, and Erico Construction excavated and sampled additional soil from the waste-oil tank pit on June 3 and 10, 1987.

In December 1991, RESNA conducted a Phase I subsurface investigation of the former waste-oil tank area. The investigation included drilling four on-site soil borings (B-1 through B-4) in the immediate vicinity of the tank pit, and subsequently converting three



of the borings to groundwater monitoring wells MW-1, MW-2, and MW-3. Results of the investigation were summarized in an initial subsurface investigation report (RESNA, September 1992).

In October 1992, a Phase II investigation was conducted at the site by RESNA. This investigation included drilling four on-site soil borings, B-5 through B-8, and converting the borings to groundwater monitoring wells, MW-4 through MW-7. The investigation also included a 1/2-mile radius well and record search. Results of the investigation were summarized in an additional subsurface investigation report (RESNA, January 1993).

In April 1993, RESNA conducted a Phase III investigation, which included drilling test borings TB-1 through TB-11, and installing an AS well (AS-1) in test boring TB-6. Results of the investigation were summarized in an additional subsurface investigation report (RESNA, September 1993).

In July 1993, RESNA drilled three additional soil borings, B-9, B-10, and B-11, in the vicinity of the former waste-oil tank. The three borings were completed as combination AS/vapor extraction well, AS-2/VW-2, and vapor extraction wells, VW-1 and VW-3. In February 1994, RESNA conducted AS and SVE pilot tests at the site. Details of the well installations, and results of the AS and SVE pilot tests were summarized in a report (RESNA, June 1994).

Groundwater monitoring and sampling at the site were initiated in December 1991 and March 1992, respectively. Wells MW-1 through MW-7 are measured quarterly for depth to water. Wells MW-1 through MW-6 are sampled quarterly for petroleum hydrocarbons in groundwater. Well MW-7 is sampled semiannually, during the first and third quarters of the year.

Previous investigations have concluded that the extent of petroleum-hydrocarbon-impacted soils at the site were limited to three general areas: (1) in the immediate vicinity of the operating service station islands, (2) along the northern and south- southwestern edges of the USTs, and (3) in the vicinity of monitoring wells MW-1, MW-2, and MW-3 in the southern portion of the site (Figure 2). Generally, hydrocarbon-impacted soils at the site, result from hydrocarbons moving laterally along the top of the water table, and are limited to the capillary-fringe zone. Petroleum-hydrocarbon-impacted groundwater at the site has been delineated vertically and laterally north and east of the site.

In June, 1995 EMCON submitted a remedial action plan (RAP) to the RWQCB and ACHCSA. The RAP detailed the results of a February, 1994 SVE and AS pilot test performed at the site and proposed remedial measures for on-site petroleum-hydrocarbon-

impacted soils and groundwater. The purpose of this investigation is to install the AS and SVE wells required to implement the remedial measures recommended in the RAP.

CURRENT FIELD ACTIVITIES

Between July 31 and August 3, 1995, a total of twelve borings were drilled at the site with hollow-stem auger drilling equipment. Four of the borings were converted to air-sparge wells (AS-2 through AS-5) and eight borings were converted to SVE wells (VW-2 and VW-4 through VW-10). In addition, existing well AS-2/VW-2 was decommissioned because of problems caused by a defective seal. Locations of the new wells are shown in Figure 2. The exploratory borings for the wells were drilled and sampled under the supervision of an EMCON geologist working under the direct supervision of a California-registered geologist. Well construction details are summarized in Table 1. Please see notes on Table 1. Alameda County Flood Control and Water Conservation District, Zone 7 (ACFCWCD) well permits are presented in Appendix A. Procedures employed in drilling the exploratory borings, installing the wells, and sampling and storing drill cuttings and groundwater are described in Appendix B.

In September 1995, EMCON completed the installation of the Soil-Vapor Extraction (SVE) and Air-Sparge (AS) systems at the site. The SVE system consists of 12 on-site wells (VW-1 through VW-10, MW-1, and MW-5) that will be used for remediating petroleum-hydrocarbon-impacted vadose-zone and capillary-fringe soils. The AS system consists of 5 on-site wells (AS-1 through AS-5) that will be used to remediate impacted groundwater and saturated soils beneath the site.

Soil Sampling

Soil samples were collected with a 2-inch-diameter modified California split-spoon sampler. The sampler was equipped with brass liners, then driven into the undisturbed soil beyond the tip of the augers. Borings for the AS and SVE wells were sampled using a combination of sampling intervals that included continuous sampling, sampling every 2.5 feet, and sampling every 5 feet.

Soil samples were screened for volatiles in the field by sealing a discrete amount of soil in a plastic bag, and allowing it to stand for at least 15 minutes. A photoionization detector reading was then taken on the headspace of the bag, and recorded in the exploratory boring log. Selected soil samples within the capillary fringe and well screen intervals of the borings were collected, preserved on ice, and transported with chain-of-custody documentation to a state-certified laboratory for analysis. Drilling and sampling equipment were steam-cleaned before use at each boring location.

The drill cuttings were stockpiled on site and covered with Visqueen[®]. A composite sample of the drill cuttings was collected, preserved and transported as described above, and analyzed for petroleum-hydrocarbon content. After the analyses were completed, the drill cuttings were disposed of at the BFI Vasco Road Sanitary Landfill in Livermore, California. Procedures used in sampling and storing drill cuttings are described in Appendix B. Waste manifests are presented in Appendix C.

Well Installation

Air-sparge wells AS-2 through AS-5 were completed in 8-inch-diameter borings to depths of 22.0 to 28.5 feet BGS. The wells were constructed of flush-threaded, 2-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing, with 1.0 to 2.0 feet of 0.020-inch slotted screen placed at the bottom.

Soil-vapor-extraction wells VW-2 and VW-4 through VW-10 were each completed in 10-inch-diameter borings, to depths of 20.0 to 25.1 feet BGS. The wells were constructed of flush-threaded, 4-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing, with 9.0 to 14.0 feet of 0.020-inch slotted screen placed at the bottom. Well construction details are summarized in Table 1; the exploratory boring logs and well construction details are presented in Appendix D.

Steam-cleaning water used in decontaminating the drilling equipment was temporarily stored onsite in sealed and labeled 55-gallon drums. The steam-cleaning water generated during the field activities was disposed of at Seaport Environmental in Redwood City, California. Waste manifests are presented in Appendix C.

Well Development

Air-sparge wells AS-2 through AS-5 were developed on August 7, 1995 using a surge block and bailer. During development, the wells were checked for floating product and monitored for turbidity, conductivity, color, temperature, odor, and pH. Field data sheets documenting well development activities are presented in Appendix E.

Steam-cleaning water used in decontaminating the well development equipment and water generated during well development was transported by a licensed hauler and disposed of at Seaport Environmental in Redwood City, California.

Groundwater Sampling

On August 11, 1995, groundwater samples were collected from wells AS-2 through AS-5. During the third quarter 1995 groundwater monitoring event, groundwater samples were collected from wells MW-6 and MW-7 on August 24, 1995. The samples were collected with a Teflon[®] bailer and submitted to a state-certified laboratory with chain-of-custody documentation. Wells MW-1 through MW-5 could not be sampled during the event because of remediation system construction activities in the southern part of the site. Groundwater sampling field data sheets are presented in Appendix E.

Topographic Well Survey

EMCON contracted a California licensed land surveyor to survey the elevations and locations of the new wells. The well positions were surveyed to an accuracy of 0.02 foot. The well casing, rim, and ground elevations were surveyed to an accuracy of 0.01 foot. The well elevations were surveyed relative to mean sea level (MSL) using a City of Oakland benchmark. Figure 2 presents the current surveyed well locations.

LOCAL SUBSURFACE CONDITIONS

The site is located west of the East Bay Hills. This area lies within the Berkeley Alluvial Plain, which is a subarea of the East Bay Alluvial Plain. Soils in this area are mapped as older alluvium, which consists of a heterogeneous mixture of poorly consolidated to unconsolidated clay, silt, sand, and gravel units (Helley et al., 1979). The earth materials encountered beneath the site during this and previous subsurface investigations consisted primarily of silty clay to clayey sand and sandy gravel. Graphic interpretations of the soil stratigraphy encountered in the borings from previous investigations are shown in geologic cross sections A-A' and B-B', presented in Figures 3 and 4.

Groundwater in the East Bay Plain tends to flow towards the San Francisco Bay to the west and southwest (Hickenbottom and Muir, 1988). Average historical groundwater levels in site wells have ranged from approximately 11 feet BGS to 18 feet BGS (Table 2). During the third quarter groundwater monitoring event, the groundwater levels were within historical ranges, and the groundwater flow direction and gradient were consistent with previous events. Based on groundwater elevation data collected from wells MW-3, MW-5, and MW-7 groundwater at the site flows southwest at a gradient of 0.014 (Figure 5).

LABORATORY PROCEDURES

Selected soil samples from the AS and SVE well borings, soil samples collected from the soil stockpile, and groundwater samples from wells AS-2 through AS-5, were submitted to a state-certified laboratory and analyzed for total petroleum hydrocarbons as gasoline (TPHG), and benzene, toluene, ethylbenzene, and total xylenes (BTEX). Soil and groundwater samples were prepared for analysis by U.S. Environmental Protection Agency (USEPA) method 5030 (purge and trap). Soil was analyzed for TPHG by the methods accepted by the Department of Toxic Substances Control (DTSC) and referenced in *Leaking Underground Fuel Tank (LUFT) Field Manual* (State Water Resources Control Board, October 1989). Samples were analyzed for BTEX by USEPA method 8020, described in *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA SW-846, November 1986, third edition). These methods are recommended for use at petroleum-hydrocarbon-impacted sites in the *Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Tank Sites* (August 10, 1990). Laboratory procedures are detailed in Appendix B.

LABORATORY RESULTS

Soil analytical data, groundwater analytical data, and historical groundwater analytical data are presented in Tables 2, 3, and 5. Certified analytical reports and chain-of-custody documentation for the soil and groundwater samples are presented in Appendix F.

TPHG and benzene were not detected in the soil samples collected from borings AS-5, VW-2, VW-4, VW-5, VW-8, and VW-10. TPHG and benzene were detected in the soil samples collected from borings AS-3, AS-4, VW-5 through VW-8, and VW-9. The detected TPHG concentrations ranged from 6 mg/kg (VW-9 at 16.5 feet) to 3,100 mg/kg (VW-6 at 6.0 feet). Benzene was detected at concentrations that ranged from 0.009 mg/kg (AS-4 at 14 feet) to 5.9 mg/kg (VW-6 at 16.0 feet).

TPHG and benzene were not detected in the groundwater samples collected from wells AS-4 and AS-5. Groundwater samples collected from wells AS-2 and AS-3 contained TPHG concentrations of 310 µg/L and 10,000 µg/L, respectively. Benzene was detected in the samples from AS-2 and AS-3 at 15 µg/L and 1,700 µg/L, respectively.

CONCLUSIONS

Based on the results of this and previous investigations, hydrocarbon-impacted soils at the site are limited to the capillary-fringe zone. Impacted soils at the site appear to be confined to the area around the operating service station island, along the northern and

Mr. Michael Whelan
February 1, 1996
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southwestern edges of the USTs, and the area behind the service station building in the vicinity of wells MW-1 through MW-3. The four AS and eight SVE wells installed during this investigation were incorporated in an on-site remediation system which will be used to remediate hydrocarbon-impacted soil and groundwater at the site.

Hydrocarbon-impacted groundwater at the site appears to be limited to the capillary-fringe/groundwater interface zone in the south and southwestern portions of the site.

Please call if you have questions.

Sincerely,

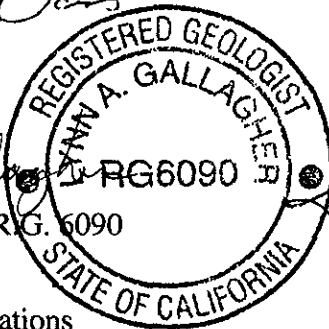
EMCON

Robert R. Davis

Rob Davis
Staff Geologist

Lynn A. Gallagher

Lynn A. Gallagher, R.G. 6090
Project Geologist



John C. Young
John C. Young
Project Manager

Attachments: Limitations
Table 1 - Well Details
Table 2 - Historical Groundwater Elevation Data
Table 3 - Soil Analytical Data
Table 4 - Groundwater Analytical Data
Table 5 - Historical Groundwater Analytical Data
Figure 1 - Site Location
Figure 2 - Site Plan
Figure 3 - Geologic Cross Section A-A'
Figure 4 - Geologic Cross Section B-B'
Figure 5 - Groundwater Data, Third Quarter 1995
Appendix A - Well Permits
Appendix B - Field and Laboratory Procedures
Appendix C - Waste Manifests
Appendix D - Exploratory Boring Logs and Well Construction Details
Appendix E - Field Data Sheets
Appendix F - Certified Analytical Reports and Chain-of-Custody Documentation

cc: Susan Hugo - ACHCSA
Kevin Graves - RWQCB

Table 1
Well Details
ARCO Service Station 6148

Well ID	Installation Date	Total Depth of Well (feet)	Casing Diameter (inches)	Screened Interval (feet)
AS-2	7/31/95	22.0	2.0	20.5 - 21.5
AS-3	8/2/95	22.5	2.0	19.6 - 21.6
AS-4	8/2/95	28.5	2.0	25.6 - 27.6
AS-5	8/2/95	27.4	2.0	24.6 - 26.6
VW-2	7/31/95	24.7	4.0	9.8 - 23.8
VW-4	7/31/95	20.1	4.0	10.2 - 19.2
VW-5	8/1/95	24.9	4.0	10.0 - 24.0
VW-6	8/3/95	20.0	4.0	5.1 - 19.1
VW-7	8/3/95	24.0	4.0	9.1 - 23.1
VW-8	8/1/95	24.7	4.0	9.8 - 23.8
VW-9	8/1/95	24.8	4.0	9.9 - 23.9
VW-10	8/1/95	25.1	4.0	10.2 - 24.2

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-02-95

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-Water Elevation ft-MSL	Floating Product Thickness feet	Ground-Water Flow Direction MWN	Hydraulic Gradient foot/foot
MW-1	12-23-91	108.03	18.26	89.77	Sheen	NR	NR
MW-1	01-07-92	108.03	17.44	90.59	Sheen	NR	NR
MW-1	01-19-92	108.03	17.17	90.86	ND	NR	NR
MW-1	02-19-92	108.03	16.52	91.51	ND	NR	NR
MW-1	03-18-92	108.03	16.81	91.22	ND	NR	NR
MW-1	04-20-92	108.03	17.56	90.47	ND	NR	NR
MW-1	05-15-92	108.03	17.96	90.07	ND	NR	NR
MW-1	06-12-92	108.03	18.16	89.87	ND	NR	NR
MW-1	07-15-92	108.03	18.32	89.71	ND	NR	NR
MW-1	08-07-92	108.03	18.34	89.69	ND	NR	NR
MW-1	09-14-92	108.03	18.46	89.57	ND	NR	NR
MW-1	10-07-92	108.03	18.52	89.51	ND	NR	NR
MW-1	11-12-92	108.03	18.11	89.92	ND	NR	NR
MW-1	12-09-92	108.03	17.10	90.93	ND	NR	NR
MW-1	01-21-93	108.03	15.44	92.59	ND	NR	NR
MW-1	02-22-93	108.03	16.54	91.49	ND	NR	NR
MW-1	03-25-93	108.03	17.05	90.98	ND	NR	NR
MW-1	04-14-93	108.03	17.45	90.58	ND	NR	NR
MW-1	05-22-93	108.03	17.78	90.25	ND	NR	NR
MW-1	06-17-93	108.03	17.90	90.13	ND	NR	NR
MW-1	07-27-93	108.03	18.10	89.93	ND	NR	NR
MW-1	08-29-93	108.03	18.31	89.72	ND	NR	NR
MW-1	09-30-93	108.03	18.24	89.79	ND	NR	NR
MW-1	11-16-93	108.03	18.17	89.86	ND	NR	NR
MW-1	02-02-94	108.03	17.31	90.72	ND	NR	NR
MW-1	04-29-94	108.03	17.31	90.72	ND	NR	NR
MW-1	08-02-94	108.03	17.95	90.08	ND	SW	0.017
MW-1	11-16-94	108.03	17.04	90.99	ND	SW	0.02
MW-1	03-20-95	108.03	15.75	92.28	ND	SW	0.02
MW-1	06-06-95	108.03	17.68	90.35	ND	SW	0.016
MW-1	08-24-95	107.80	17.45	90.35	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-02-95

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground- Water Elevation ft-MSL	Floating Product Thickness feet	Ground- Water Flow Direction MWN	Hydraulic Gradient foot/foot
MW-2	12-23-91	107.43	17.98	89.45	Sheen	NR	NR
MW-2	01-07-92	107.43	17.15	90.28	Sheen	NR	NR
MW-2	01-19-92	107.43	17.47	89.96	ND	NR	NR
MW-2	02-19-92	107.43	16.28	91.15	ND	NR	NR
MW-2	03-18-92	107.43	16.52	90.91	ND	NR	NR
MW-2	04-20-92	107.43	17.27	90.16	ND	NR	NR
MW-2	05-15-92	107.43	17.62	89.81	ND	NR	NR
MW-2	06-12-92	107.43	^17.63	^89.80	0.05	NR	NR
MW-2	07-15-92	107.43	17.65	89.78	ND	NR	NR
MW-2	08-07-92	107.43	17.80	89.63	ND	NR	NR
MW-2	09-14-92	107.43	^18.09	^89.34	0.55	NR	NR
MW-2	10-07-92	107.43	^18.55	^88.88	0.31	NR	NR
MW-2	11-12-92	107.43	17.95	89.48	Sheen	NR	NR
MW-2	12-09-92	107.43	^16.85	^90.58	0.02	NR	NR
MW-2	01-21-93	107.43	^15.08	^92.35	0.01	NR	NR
MW-2	02-22-93	107.43	^16.20	^91.23	0.01	NR	NR
MW-2	03-25-93	107.43	^16.72	^90.71	0.01	NR	NR
MW-2	04-14-93	107.43	^17.15	^90.28	ND	NR	NR
MW-2	05-22-93	107.43	^17.44	^89.99	ND	NR	NR
MW-2	06-17-93	107.43	17.57	89.86	ND	NR	NR
MW-2	07-27-93	107.43	^17.71	^89.72	ND	NR	NR
MW-2	08-29-93	107.43	^18.20	^89.23	ND	NR	NR
MW-2	09-30-93	107.43	^18.14	^89.29	ND	NR	NR
MW-2	11-16-93	107.43	^17.85	^89.58	ND	NR	NR
MW-2	02-02-94	107.43	16.96	90.47	ND	NR	NR
MW-2	04-29-94	107.43	16.95	90.48	ND	NR	NR
MW-2	08-02-94	107.43	17.59	89.84	ND	SW	0.017
MW-2	11-16-94	107.43	16.73	90.70	ND	SW	0.02
MW-2	03-20-95	107.43	15.50	91.93	ND*	SW	0.02
MW-2	06-06-95	107.43	17.43	90.00	ND	SW	0.016
MW-2	08-24-95	107.28	17.22	90.06	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-02-95

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground- Water Elevation ft-MSL	Floating Product Thickness feet	Ground- Water Flow Direction MWN	Hydraulic Gradient foot/foot
MW-3	12-23-91	107.77	18.14	89.63	Sheen	NR	NR
MW-3	01-07-92	107.77	17.26	90.51	Sheen	NR	NR
MW-3	01-19-92	107.77	17.63	90.14	ND	NR	NR
MW-3	02-19-92	107.77	16.34	91.43	ND	NR	NR
MW-3	03-18-92	107.77	16.62	91.15	ND	NR	NR
MW-3	04-20-92	107.77	17.38	90.39	ND	NR	NR
MW-3	05-15-92	107.77	17.80	89.97	ND	NR	NR
MW-3	06-12-92	107.77	18.01	89.76	ND	NR	NR
MW-3	07-15-92	107.77	18.17	89.60	ND	NR	NR
MW-3	08-07-92	107.77	18.23	89.54	ND	NR	NR
MW-3	09-14-92	107.77	18.36	89.41	ND	NR	NR
MW-3	10-07-92	107.77	18.90	88.87	Sheen	NR	NR
MW-3	11-12-92	107.77	18.00	89.77	Sheen	NR	NR
MW-3	12-09-92	107.77	16.85	90.92	Droplets	NR	NR
MW-3	01-21-93	107.77	15.24	92.53	ND	NR	NR
MW-3	02-22-93	107.77	16.36	91.41	ND	NR	NR
MW-3	03-25-93	107.77	16.89	90.88	ND	NR	NR
MW-3	04-14-93	107.77	17.29	90.48	ND	NR	NR
MW-3	05-22-93	107.77	17.64	90.13	ND	NR	NR
MW-3	06-17-93	107.77	17.75	90.02	ND	NR	NR
MW-3	07-27-93	107.77	17.98	89.79	ND	NR	NR
MW-3	08-29-93	107.77	18.14	89.63	ND	NR	NR
MW-3	09-30-93	107.77	18.14	89.63	ND	NR	NR
MW-3	11-16-93	107.77	18.30	89.47	ND	NR	NR
MW-3	02-02-94	107.77	17.16	90.61	ND	NR	NR
MW-3	04-29-94	107.77	17.14	90.63	ND	NR	NR
MW-3	08-02-94	107.77	17.81	89.96	ND	SW	0.017
MW-3	11-16-94	107.77	16.91	90.86	ND	SW	0.02
MW-3	03-20-95	107.77	15.60	92.17	ND	SW	0.02
MW-3	06-06-95	107.77	17.54	90.23	ND	SW	0.016
MW-3	08-24-95	107.61	17.42	90.19	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-02-95

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-Water Elevation ft-MSL	Floating Product Thickness feet	Ground-Water Flow Direction MWN	Hydraulic Gradient foot/foot
MW-4	11-12-92	106.58	16.08	90.50	ND	NR	NR
MW-4	12-09-92	106.58	15.00	91.58	ND	NR	NR
MW-4	01-21-93	106.58	13.35	93.23	ND	NR	NR
MW-4	02-22-93	106.58	14.48	92.10	ND	NR	NR
MW-4	03-25-93	106.58	15.06	91.52	ND	NR	NR
MW-4	04-14-93	106.58	15.50	91.08	ND	NR	NR
MW-4	05-22-93	106.58	15.79	90.79	ND	NR	NR
MW-4	06-17-93	106.58	14.90	91.68	ND	NR	NR
MW-4	07-27-93	106.58	16.11	90.47	ND	NR	NR
MW-4	08-29-93	106.58	16.21	90.37	ND	NR	NR
MW-4	09-30-93	106.58	16.23	90.35	ND	NR	NR
MW-4	11-16-93	106.58	16.30	90.28	ND	NR	NR
MW-4	02-02-94	106.58	15.36	91.22	ND	NR	NR
MW-4	04-29-94	106.58	15.36	91.22	ND	NR	NR
MW-4	08-02-94	106.58	15.94	90.64	ND	SW	0.017
MW-4	11-16-94	106.58	14.99	91.59	ND	SW	0.02
MW-4	03-20-95	106.58	13.85	92.73	ND	SW	0.02
MW-4	06-06-95	106.58	15.70	90.88	ND	SW	0.016
MW-4	08-24-95	106.71	15.86	90.85	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-02-95

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground- Water Elevation ft-MSL	Floating Product Thickness feet	Ground- Water Flow Direction MWN	Hydraulic Gradient foot/foot
MW-5	11-12-92	106.68	16.81	89.87	ND	NR	NR
MW-5	12-09-92	106.68	16.40	90.28	ND	NR	NR
MW-5	01-21-93	106.68	14.58	92.10	ND	NR	NR
MW-5	02-22-93	106.68	15.65	91.03	ND	NR	NR
MW-5	03-25-93	106.68	16.07	90.61	ND	NR	NR
MW-5	04-14-93	106.68	16.34	90.34	ND	NR	NR
MW-5	05-22-93	106.68	16.56	90.12	ND	NR	NR
MW-5	06-17-93	106.68	Not surveyed:				
MW-5	07-27-93	106.68	16.80	89.88	ND	NR	NR
MW-5	08-29-93	106.68	16.93	89.75	ND	NR	NR
MW-5	09-30-93	106.68	16.97	89.71	ND	NR	NR
MW-5	11-16-93	106.68	17.03	89.65	ND	NR	NR
MW-5	02-02-94	106.68	16.38	90.30	ND	NR	NR
MW-5	04-29-94	106.68	16.41	90.27	ND	NR	NR
MW-5	08-02-94	106.68	16.81	89.87	ND	SW	0.017
MW-5	11-16-94	106.68	16.12	90.56	ND	SW	0.02
MW-5	03-20-95	106.68	14.92	91.76	ND	SW	0.02
MW-5	06-06-95	106.68	16.61	90.07	ND	SW	0.016
MW-5	08-24-95	106.60	16.47	90.13	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-02-95

Well Desig- nation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground- Water Elevation ft-MSL	Floating Product Thickness feet	Ground- Water Flow Direction MWN	Hydraulic Gradient foot/foot
MW-6	11-12-92	105.16	14.05	91.11	ND	NR	NR
MW-6	12-09-92	105.16	13.37	91.79	ND	NR	NR
MW-6	01-21-93	105.16	11.76	93.40	ND	NR	NR
MW-6	02-22-93	105.16	12.62	92.54	ND	NR	NR
MW-6	03-25-93	105.16	13.04	92.12	ND	NR	NR
MW-6	04-14-93	105.16	13.47	91.69	ND	NR	NR
MW-6	05-22-93	105.16	13.80	91.36	ND	NR	NR
MW-6	06-17-93	105.16	13.88	91.28	ND	NR	NR
MW-6	07-27-93	105.16	14.13	91.03	ND	NR	NR
MW-6	08-29-93	105.16	14.19	90.97	ND	NR	NR
MW-6	09-30-93	105.16	14.34	90.82	ND	NR	NR
MW-6	11-16-93	105.16	14.41	90.75	ND	NR	NR
MW-6	02-02-94	105.16	13.60	91.56	ND	NR	NR
MW-6	04-29-94	105.16	13.66	91.50	ND	NR	NR
MW-6	08-02-94	105.16	13.99	91.17	ND	SW	0.017
MW-6	11-16-94	105.16	13.11	92.05	ND	SW	0.02
MW-6	03-20-95	105.16	12.13	93.03	ND	SW	0.02
MW-6	06-06-95	105.16	13.95	91.21	ND	SW	0.016
MW-6	08-24-95	105.13	14.07	91.06	ND	SW	0.014

Table 2
Historical Groundwater Elevation Data

ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California

Date: 11-02-95

Well Designation	Water Level Field Date	TOC Elevation ft-MSL	Depth to Water feet	Ground-Water Elevation ft-MSL	Floating Product Thickness feet	Ground-Water Flow Direction MWN	Hydraulic Gradient foot/foot
MW-7	11-12-92	107.08	14.75	92.33	ND	NR	NR
MW-7	12-09-92	107.08	12.55	94.53	ND	NR	NR
MW-7	01-21-93	107.08	11.52	95.56	ND	NR	NR
MW-7	02-22-93	107.08	12.82	94.26	ND	NR	NR
MW-7	03-25-93	107.08	13.43	93.65	ND	NR	NR
MW-7	04-14-93	107.08	13.98	93.10	ND	NR	NR
MW-7	05-22-93	107.08	14.41	92.67	ND	NR	NR
MW-7	06-17-93	107.08	14.50	92.58	ND	NR	NR
MW-7	07-27-93	107.08	14.82	92.26	ND	NR	NR
MW-7	08-29-93	107.08	15.05	92.03	ND	NR	NR
MW-7	09-30-93	107.08	15.04	92.04	ND	NR	NR
MW-7	11-16-93	107.08	15.12	91.96	ND	NR	NR
MW-7	02-02-94	107.08	14.04	93.04	ND	NR	NR
MW-7	04-29-94	107.08	14.10	92.98	ND	NR	NR
MW-7	08-02-94	107.08	14.61	92.47	ND	SW	0.017
MW-7	11-16-94	107.08	13.37	93.71	ND	SW	0.02
MW-7	03-20-95	107.08	12.32	94.76	ND	SW	0.02
MW-7	06-06-95	107.08	14.59	92.49	ND	SW	0.016
MW-7	08-24-95	107.05	14.64	92.41	ND	SW	0.014
AS-1	09-30-93	107.71	18.31	89.40	ND	NR	NR
↓ AS-2	08-11-95	107.38	17.46	89.92	ND	NR	NR
∪ AS-3	08-11-95	107.89	19.30	88.59	ND	NR	NR
∪ AS-4	08-11-95	106.81	16.51	90.30	ND	NR	NR
∪ AS-5	08-11-95	106.24	16.52	89.72	ND	NR	NR

TOC: top of casing

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

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

NR: not reported; data not available

ND: none detected

SW: southwest

∪: groundwater elevation (GWE) and depth to water (DTW) adjusted to include 80 percent of the floating product thickness (FPT):

$$[GWE: (TOC - DTW) + (FPT \times 0.8)]$$

*: floating product entered the well during purging

Table 3

Soil Analytical Data
ARCO Service Station 6148

Sample Identification	Date Sampled	Depth (feet)	TPHG ²	Benzene	Toluene	Ethylbenzene	Xylenes
Soil Data (in mg/kg ¹)							
AS-3	8/2/95	16	<1	0.34	<0.005	<0.005	<0.005
AS-3	8/2/95	26.5	<1	<0.005	<0.005	<0.005	0.007
AS-4	8/2/95	14	<1	0.009	<0.005	<0.005	0.0045
AS-4	8/2/95	26.5	<1	<0.005	<0.005	<0.005	<0.005
AS-5	8/2/95	28.5	<1	<0.005	<0.005	<0.005	<0.005
VW-2	7/31/95	16.5	<1	<0.005	<0.005	<0.005	<0.005
VW-4	7/31/95	16	<1	<0.005	<0.005	<0.005	<0.005
VW-5	8/1/95	21.5	<1	<0.005	<0.005	<0.005	<0.005
VW-5	8/1/95	16	74	0.7	<0.2*	0.9	1.0
VW-6	8/3/95	6	3,100	<5*	86	63	430
VW-6	8/3/95	8	2,300	<5*	51	48	310
VW-6	8/3/95	11.5	2,100	<2*	7.3	16	110
VW-6	8/3/95	16	1,700	5.9	94	44	240
VW-7	8/3/5	17	30	0.3	0.5	0.6	2.8
VW-8	8/1/95	26	<1	<0.005	<0.005	<0.005	<0.005
VW-9	8/1/95	16.5	6	<0.025*	<0.025*	<0.025*	0.026
VW-9	8/1/95	26	<1	<0.005	<0.005	<0.005	<0.005
VW-10	8/1/95	16	<1	<0.005	<0.005	<0.005	<0.005
VW-10	8/1/95	21	<1	<0.005	<0.005	<0.005	<0.005
¹ mg/kg = milligrams per kilogram ² TPHG = total petroleum hydrocarbons as gasoline < indicates laboratory minimum reporting limit * raised MRL due to high analyte concentration requiring sample dilution							

Table 4

Groundwater Analytical Data
ARCO Service Station 6148

Well Identification	Date Sampled	TPGH ¹	Benzene	Toluene	Ethylbenzene	Xylenes
AS-2	8/11/95	310	15	2.6	5.9	44
AS-3	8/11/95	10,000	1,700	380	490	1,600
AS-4	8/11/95	<50	<0.5	<0.5	<0.5	<0.5
AS-5	8/11/95	<50	<0.5	<0.5	<0.5	<0.5

1 TPGH = total petroleum hydrocarbons as gasoline
2 µg/L = micrograms per liter
< indicates laboratory minimum reporting limit

Table 5
 Historical Groundwater Analytical Data
 Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 6148
 5131 Shattuck Avenue, Oakland, California

Date: 11-17-95

Well Designation	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	03-18-92	790	310	26	12	44	--	--	<0.5	1.4	<50
MW-1	06-12-92	1000	290	15	10	30	--	--	<0.5	--	<50
MW-1	09-14-92	1000	370	6.5	6.5	17	--	--	--	0.9	<80
MW-1	10-07-92	590	200	19	6.7	19	--	--	<0.5	--	<50
MW-1	01-22-93	1200	370	57	18	39	--	--	--	--	--
MW-1	04-14-93	140	46	<2.5	<2.5	<2.5	--	--	--	--	--
MW-1	09-30-93	220	64	0.9	2.2	4	--	--	--	--	--
MW-1	11-16-93	180	53	0.7	1.7	4.1	--	--	--	--	--
MW-1	02-02-94	250	93	<0.5	1.9	1	--	--	--	--	--
MW-1	04-29-94	350	99	1.3	3.9	11	--	--	--	--	--
MW-1	08-02-94	210	82	<1	<1	2.5	--	--	--	--	--
MW-1	11-16-94	650	260	38	6.1	15	--	--	--	--	--
MW-1	03-20-95	830	140	5	4.1	110	--	--	--	--	--
MW-1	06-06-95	210	30	<0.5	7.3	16	--	--	--	--	--
MW-1	08-24-95	Not sampled: well was inaccessible due to construction									
MW-2	03-18-92	8400	1400	1000	220	870	--	--	1.2	3	230*
MW-2	06-12-92	Not sampled: well contained floating product									
MW-2	09-14-92	Not sampled: well contained floating product									
MW-2	10-07-92	Not sampled: well contained floating product									
MW-2	01-22-93	Not sampled: well contained floating product									
MW-2	04-14-93	Not sampled: well contained floating product									
MW-2	09-30-93	Not sampled: well contained floating product									
MW-2	11-16-93	Not sampled: well contained floating product									
MW-2	02-02-94	16000	1300	2500	540	2700	--	--	--	--	--
MW-2	04-29-94	11000	1400	1200	360	1400	--	--	--	--	--
MW-2	08-02-94	4900	800	290	120	620	--	--	--	--	--
MW-2	11-16-94	49000	3300	8300	1400	7200	--	--	--	--	--
MW-2	03-20-95	Not sampled: floating product entered well during purging									
MW-2	06-06-95	1200	60	21	35	140	--	--	--	--	--
MW-2	08-24-95	Not sampled: well was inaccessible due to construction									

Table 5
 Historical Groundwater Analytical Data
 Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 6148
 5131 Shattuck Avenue, Oakland, California

Date: 11-17-95

Well Designation	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-3	03-18-92	20000	3200	560	380	1000	--	--	7.8	8.1	2800*
MW-3	06-12-92	46000	3400	4200	1300	5400	--	--	16	--	1600*
MW-3	09-14-92	53000	4300	5700	1300	7300	--	--	--	5.5	40000*
MW-3	10-07-92	Not sampled: well contained floating product									
MW-3	01-22-93	35000	2100	1400	1200	4400	--	--	31	--	13000*
MW-3	04-14-93	13000	1800	390	990	3500	--	--	26	--	<50
MW-3	09-30-93	79000	2400	3400	1900	8100	--	--	23	--	17000*
MW-3	11-16-93	72000	1400	2100	1900	8300	--	--	38	--	--
MW-3	02-02-94	26000	1400	1200	1200	4400	--	--	7.7	7.8	--
MW-3	04-29-94	22000	1400	620	910	3400	--	--	10	--	--
MW-3	08-02-94	17000	530	410	720	2600	--	--	--	6.6	--
MW-3	11-16-94	18000	1400	560	790	2800	--	--	--	2.3	--
MW-3	03-20-95	29000	880	190	760	2000	--	--	--	16	--
MW-3	06-06-95	22000	450	54	380	1300	--	--	--	7.1	--
MW-3	08-24-95	Not sampled: well was inaccessible due to construction									
MW-4	11-12-92	77	32	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	01-22-93	170	66	0.8	<0.5	1.5	--	--	--	--	--
MW-4	04-14-93	<50	4.6	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	09-30-93	52	13	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	11-16-93	230	34	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	02-02-94	<50	3.9	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	04-29-94	<50	4.2	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	08-02-94	<50	3.8	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	11-16-94	110	31	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	03-20-95	88	1	<0.5	<0.5	0.7	--	--	--	--	--
MW-4	06-06-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-4	08-24-95	Not sampled: well was inaccessible due to construction									

Table 5
 Historical Groundwater Analytical Data
 Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 6148
 5131 Shattuck Avenue, Oakland, California

Date: 11-17-95

Well Designation	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-5	11-12-92	2900	1300	12	67	18	--	--	--	--	--
MW-5	01-22-93	17000	5000	780	260	330	--	--	--	--	--
MW-5	04-14-93	12000	4600	<50	180	130	--	--	--	--	--
MW-5	09-30-93	4500	1100	<10	39	16	--	--	--	--	--
MW-5	11-16-93	3300	700	<10	22	<10	--	--	--	--	--
MW-5	02-02-94	10000	3000	65	240	78	--	--	--	--	--
MW-5	04-29-94	7600	2400	27	130	44	--	--	--	--	--
MW-5	08-02-94	1900	680	<10	24	<10	--	--	--	--	--
MW-5	11-16-94	17000	5900	700	440	320	--	--	--	--	--
MW-5	03-20-95	21000	6900	450	800	1300	--	--	--	--	--
MW-5	06-06-95	6500	1700	<20	120	69	--	--	--	--	--
MW-5	08-24-95	Not sampled: well was inaccessible due to construction									
MW-6	11-12-92	51	2.6	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	01-22-93	<50	1.2	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	04-14-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	09-30-93	74	2	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	11-16-93	72	2.6	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	02-02-94	61	2.2	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	04-29-94	<50	0.6	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	08-02-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	11-16-94	<50	1.1	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	06-06-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-6	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--

Table 5
 Historical Groundwater Analytical Data
 Petroleum Hydrocarbons and Their Constituents

ARCO Service Station 6148
 5131 Shattuck Avenue, Oakland, California

Date: 11-17-95

Well Designation	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	11-12-92	<50	1.8	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	01-22-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	04-14-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	09-30-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	11-16-93	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	02-02-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	04-29-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	08-02-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	11-16-94	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	03-20-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
MW-7	06-06-95	Not sampled. not scheduled for chemical analysis									
MW-7	08-24-95	<50	<0.5	<0.5	<0.5	<0.5	<3	--	--	--	--
AS-1	09-30-93	<50	1.2	<0.5	<0.5	<0.5	--	--	--	--	--
AS-2	08-11-95	310	15	2.6	5.9	44	--	--	--	--	--
AS-3	08-11-95	10000	1700	380	490	1600	--	--	--	--	--
AS-4	08-11-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--
AS-5	08-11-95	<50	<0.5	<0.5	<0.5	<0.5	--	--	--	--	--

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

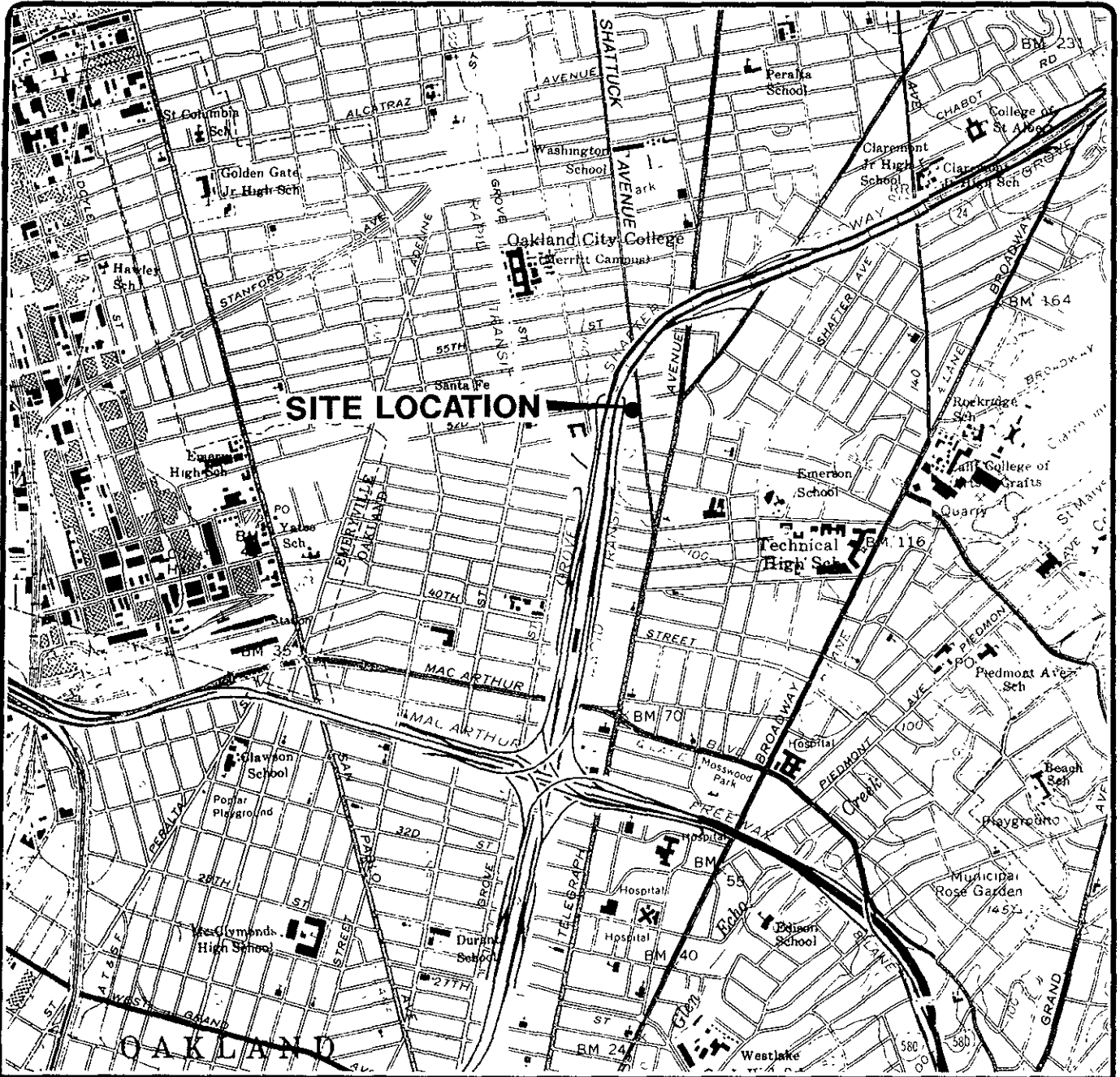
mg/L: milligrams per liter

TRPH: total recoverable petroleum hydrocarbons

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

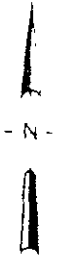
-- : not analyzed

*: chromatogram does not match the typical diesel fingerprint, but appears to be weathered gasoline



Base map from USGS 7.5' Quad. Maps:
Oakland East and Oakland West, California
Photorevised 1980.

Scale 0 2000 4000 Feet



EMCON

ARCO PRODUCTS COMPANY
SERVICE STATION 6148, 5131 SHATTUCK AVENUE
QUARTERLY GROUNDWATER MONITORING
OAKLAND, CALIFORNIA

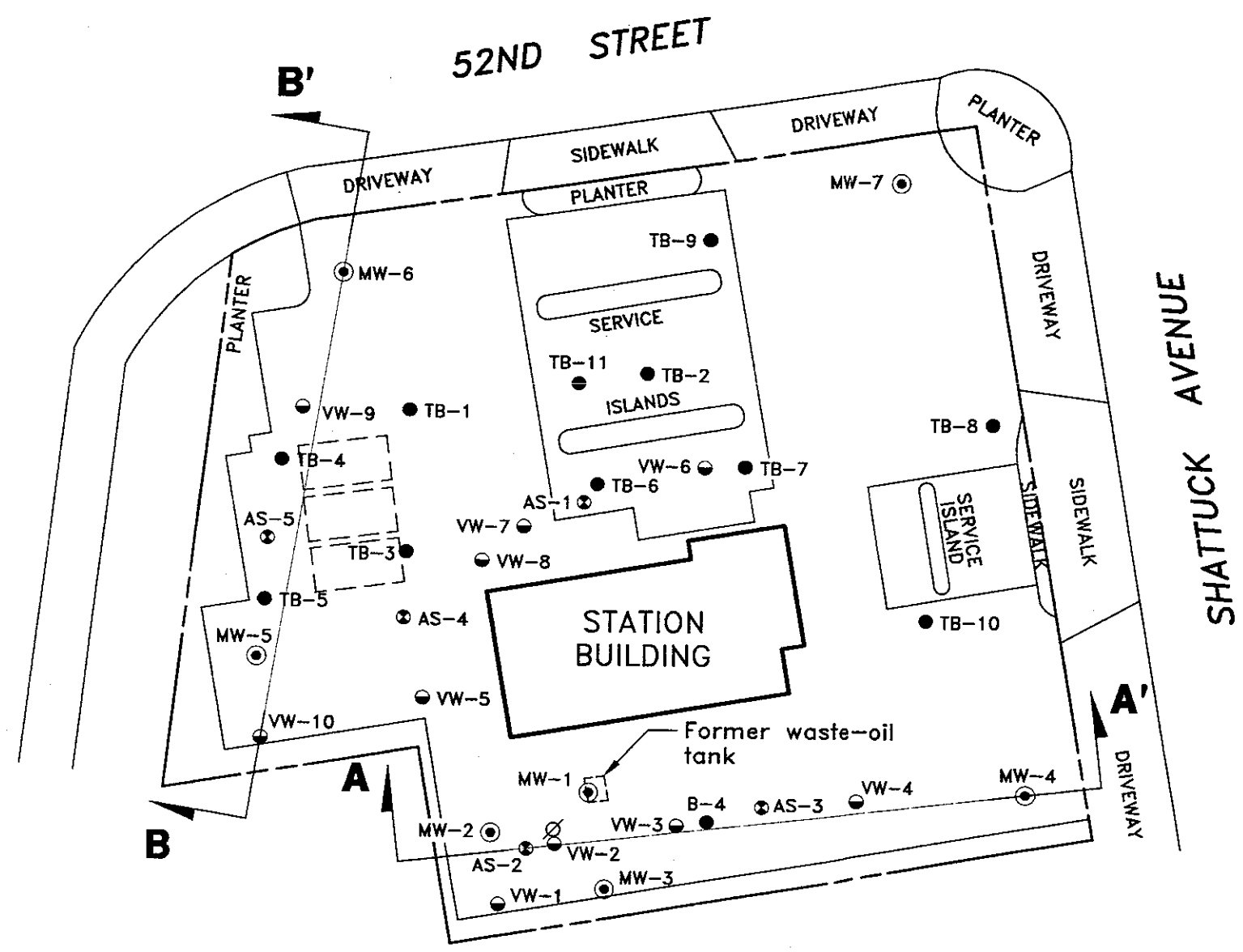
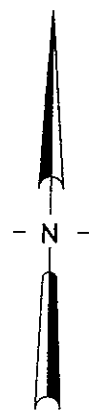
FIGURE

1

PROJECT NO.
805-135.03

SITE LOCATION

G:\805-135\SITEPLAN REV 0 01/26/96 14:26:57 DD DJ



EXPLANATION

- ⊙ Groundwater monitoring well
- Vapor extraction well
- Soil boring
- ⊕ Air-sparge well
- ⊘ Decommissioned well
- ▭ Existing underground gasoline storage tank
- ↑ Line of geologic cross section

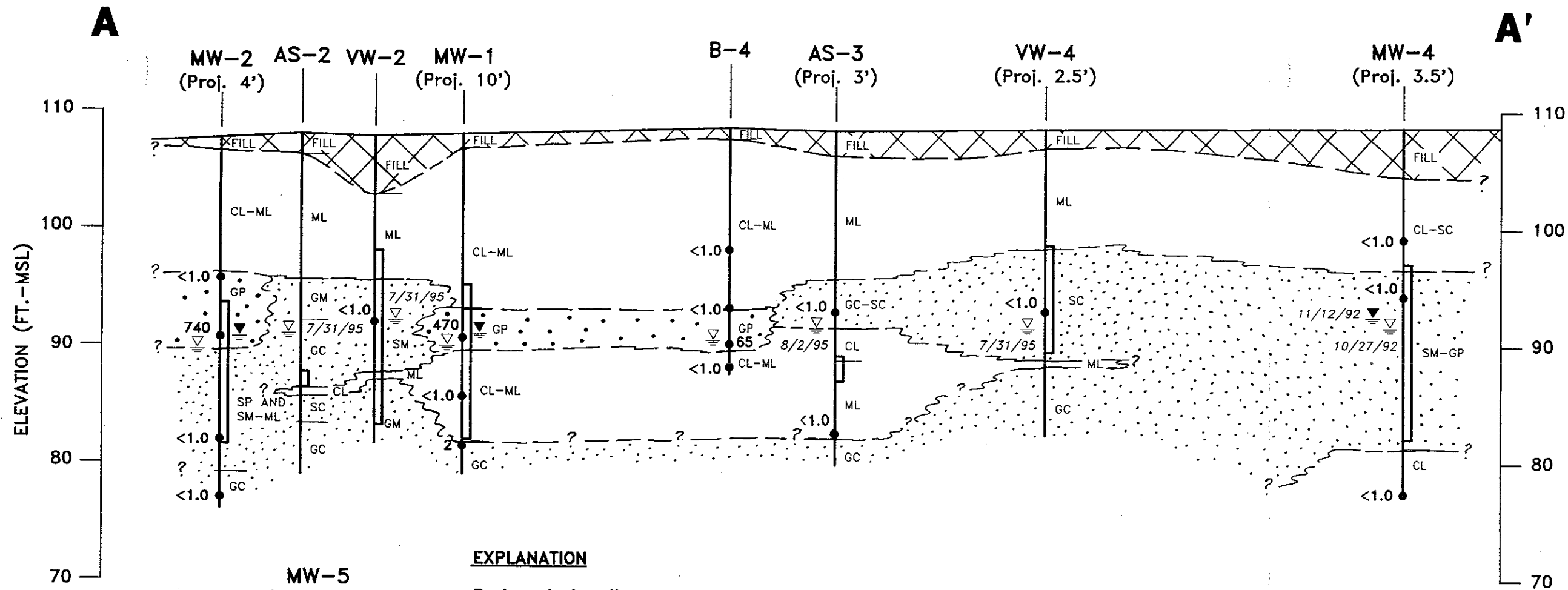


SCALE: 0 30 60 FEET
(Approximate)

ARCO PRODUCTS COMPANY
SERVICE STATION 6148
5131 SHATTUCK AVENUE
OAKLAND, CALIFORNIA

FIGURE NO.
2
PROJECT NO.
805-135.04

SITE PLAN



- MW-5**
(Proj. 3.5')
- Boring designation
(Projected distance to line of section)
 - Borehole
 - FILL — USCS symbol
 - Soil sample location and TPHg*
concentration (mg/kg)
 - Screen interval
 - ▼ 11/12/92 — Piezometric water level
(showing date measured)
 - ▼ 10/28/92 — Piezometric water level
(showing date measured)
 - First encountered water level
(showing date measured)
 - Geologic contact; dashed where
approximate, queried where uncertain

EXPLANATION

- FILL
- SILTS AND CLAYS (ML, CL)
- SILTY AND CLAYEY SANDS AND GRAVELS
(SM, SC, GM, GC)
- SANDS AND GRAVELS (SP, GP)

*TPHg = Total petroleum hydrocarbons as gasoline



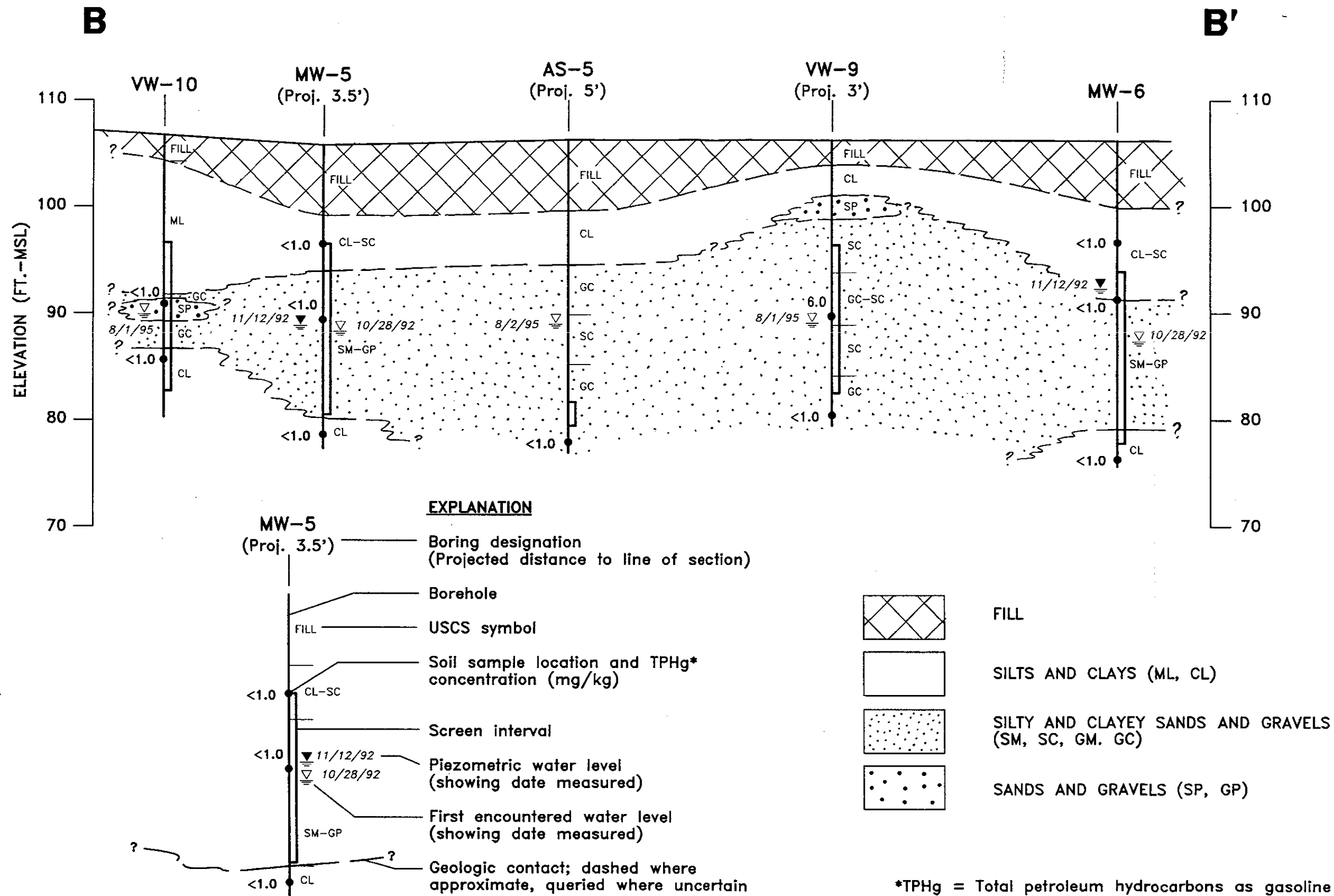
SCALE: 0 10 20 FEET
(Horizontal and Vertical)

ARCO PRODUCTS COMPANY
SERVICE STATION 6148
5131 SHATTUCK AVENUE
OAKLAND, CALIFORNIA

GEOLOGIC CROSS SECTION A-A'

FIGURE NO.
3
PROJECT NO.
805-135.04

J:\805135\SEC8B REV 0 11/01/95 09:48:05 KMM DJ



SCALE: 0 10 20 FEET
(Horizontal and Vertical)

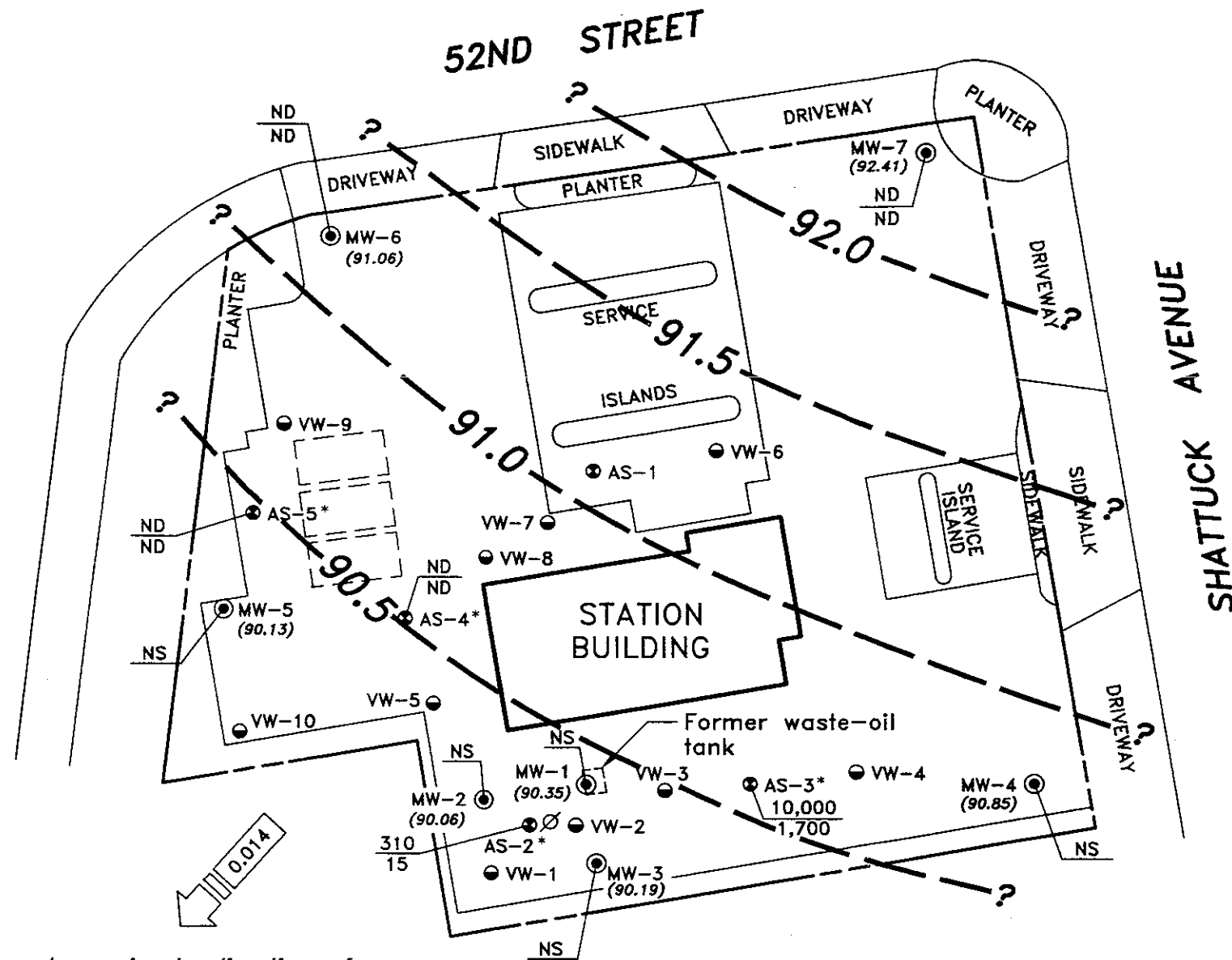
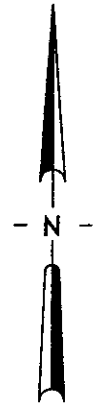
ARCO PRODUCTS COMPANY
SERVICE STATION 6148
5131 SHATTUCK AVENUE
OAKLAND, CALIFORNIA

GEOLOGIC CROSS SECTION B-B'

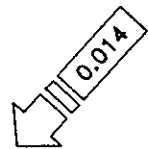
FIGURE NO.

4

PROJECT NO.
805-135.04



Approximate direction of groundwater flow showing gradient (calculated using MW-3, MW-5, and MW-7)



EXPLANATION

- ⊙ Groundwater monitoring well
- Vapor extraction well
- ⊙ Air-sparge well
- ∅ Decommissioned well
- [] Existing underground gasoline storage tank
- (91.06) Groundwater elevation (Ft.-MSL) measured 8/24/95
- ? - - - Groundwater elevation contour (Ft.-MSL)
- ND / ND TPHG concentration in groundwater (µg/L); sampled 8/24/95
- ND / ND Benzene concentration in groundwater (µg/L); sampled 8/24/95
- NS Not sampled due to construction activity
- ND Not detected at or above the method reporting limit for TPHG (50 µg/L) or benzene (0.5 µg/L)
- * Air sparge wells AS-2 through AS-5 were installed on 8/2/95 and sampled on 8/11/95



SCALE: 0 30 60 FEET
(Approximate)

ARCO PRODUCTS COMPANY
SERVICE STATION 6148, 5131 SHATTUCK AVENUE
WELL INSTALLATION REPORT
OAKLAND, CALIFORNIA

GROUNDWATER DATA
THIRD QUARTER 1995

FIGURE NO.

5

PROJECT NO.
805-135.04

APPENDIX A
WELL PERMITS



ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE

PLEASANTON, CALIFORNIA 94588

VOICE (510) 484-2600

FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

FOR OFFICE USE

LOCATION OF PROJECT ARCO SERVICE STATION # 6148
5131 Shattuck Avenue
Oakland, CA

PERMIT NUMBER 95453
LOCATION NUMBER 1S/4W 14R80

CLIENT

Name ARCO PRODUCTS COMPANY
Address 2000 Alameda de las Pulgas Voice (415) 571-2400
City Box 5811 Zip San Mateo, CA 94402

PERMIT CONDITIONS

Circled Permit Requirements Apply

APPLICANT

Name EMCON Fax (408) 437-9526
Address 1921 Ringwood Ave. Voice (408) 453-7300
City San Jose, CA Zip 95131

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection <input type="checkbox"/>	General <input type="checkbox"/>
Water Supply <input type="checkbox"/>	Contamination <input type="checkbox"/>
Monitoring <input type="checkbox"/>	Well Destruction <input checked="" type="checkbox"/>

PROPOSED WATER SUPPLY WELL USE

Domestic <input type="checkbox"/>	Industrial <input type="checkbox"/>	Other <input type="checkbox"/>
Municipal <input type="checkbox"/>	Irrigation <input type="checkbox"/>	

DRILLING METHOD:

Mud Rotary <input type="checkbox"/>	Air Rotary <input type="checkbox"/>	Auger <input checked="" type="checkbox"/>
Cable <input type="checkbox"/>	Other <input type="checkbox"/>	

DRILLER'S LICENSE NO. C-57 # 554979

WELL PROJECTS

Drill Hole Diameter	<u> </u> in.	Maximum	
Casing Diameter	<u>2</u> in.	Depth	<u>25</u> ft.
Surface Seal Depth	<u>4</u> ft.	Number	<u>1</u>

GEOTECHNICAL PROJECTS

Number of Borings	<u> </u>	Maximum	
Hole Diameter	<u> </u> in.	Depth	<u> </u> ft.

ESTIMATED STARTING DATE 7/30/95
ESTIMATED COMPLETION DATE 8/11/95

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE Robert K. Davis
EMCON Date 7/18/95

A. GENERAL

1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

B. WATER WELLS, INCLUDING PIEZOMETERS

1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 25 Jul 95
Wyman Hong



ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE

PLEASANTON, CALIFORNIA 94588

VOICE (510) 484-2600

FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

FOR OFFICE USE

LOCATION OF PROJECT ARCO SERVICE STATION # 6148
5131 Shattuck Avenue
Oakland, CA

PERMIT NUMBER 95452

LOCATION NUMBER _____

CLIENT

Name ARCO PRODUCTS COMPANY
Address 2000 Alameda de Las Pulgas Voice (415) 571-2400
City Box 5811 Zip 94402
San Mateo, CA

PERMIT CONDITIONS

Circled Permit Requirements Apply

APPLICANT

Name EMCON Fax (408) 437-9526
Address 1921 Ringwood Ave. Voice (408) 453-7300
City San Jose, CA Zip 95131

A. GENERAL

1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
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B. WATER WELLS, INCLUDING PIEZOMETERS

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C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

TYPE OF PROJECT

Well Construction	Geotechnical Investigation
Cathodic Protection _____	General _____
Water Supply _____	Contamination _____
Monitoring/Remediation <u>X</u>	Well Destruction _____

PROPOSED WATER SUPPLY WELL USE

Domestic _____	Industrial _____	Other _____
Municipal _____	Irrigation _____	

DRILLING METHOD:

Mud Rotary _____	Air Rotary _____	Auger <u>X</u>
Cable _____	Other _____	

DRILLER'S LICENSE NO. C-57 # 554979

WELL PROJECTS

Drill Hole Diameter	<u>8 1/2</u> in.	Maximum	
Casing Diameter	<u>2 1/4</u> in.	Depth	<u>25</u> ft.
Surface Seal Depth	<u>4-20</u> ft.	Number	<u>12</u>

GEOTECHNICAL PROJECTS

Number of Borings	_____	Maximum	
Hole Diameter	_____ in.	Depth	_____ ft.

ESTIMATED STARTING DATE 7/30/95
ESTIMATED COMPLETION DATE 8/11/95

Approved _____ Date 25 Jul 95

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE Robert K. Davis
EMCON Date 7/18/95

Wyman Hong
Wyman Hong

APPENDIX B
FIELD AND LABORATORY PROCEDURES

Exploratory Boring and Soil Sampling

EXPLORATORY BORINGS AND SOIL SAMPLING

General procedures for drilling and sampling exploratory borings are discussed below.

Before a drilling rig is mobilized, access issues with private property owners are resolved and an underground utility locating service contracted to investigate proposed boring sites and arrange for site visits by public and private utility companies. The utility companies locate their installations with the aid of maps and the locating service verifies and marks the locations. Final boring locations are determined after these assessments are made. To confirm that no subsurface utilities will obstruct drilling, field personnel excavate the upper four feet of soil from each boring location with a posthole digger.

For sites characterized by relatively shallow (less than 100-foot-deep) groundwater, exploratory borings are drilled with 8- to 12-inch hollow-stem auger drilling equipment. The augers are steam-cleaned to prevent possible cross-contamination between boreholes. Where chemical analysis of samples is indicated, sampling equipment is also steam-cleaned between each sampling event.

Soil samples are collected at depths no farther apart than 5 feet using a modified California split-spoon sampler which is fitted with stainless-steel liners. As the sampler is driven into undisturbed soil ahead of the auger tip, soil accumulates in the liners. The sampler is retrieved from the ground and the liners are removed, sealed with Teflon tape and polypropylene end-caps, and stored on ice pending selection for analysis and transport to the laboratory. Chain-of-custody documentation accompanies samples to the laboratory.

Field characterization of contamination is based on visual and olfactory observations and on the results of a headspace analysis, in which a soil sample is removed from the liner, sealed in a mason jar, and exposed to direct sunlight for 10 to 15 minutes. The jar is shaken to release volatile hydrocarbons into the headspace between the soil and the jar cover. The headspace is probed by a tube attached to a portable photoionization detector (PID), by which volatile hydrocarbon content is measured. A minimum of one sample, typically that having the highest PID reading from a boring, is submitted for chemical analysis.

A detailed boring log is maintained for each exploratory boring from auger-return material and representative soil samples. Soil is logged in the field according to the Unified Soil Classification System, and the logging supervised by a state-registered geologist. Borings not completed as wells are backfilled with a neat-cement slurry by the tremie method.

Drill cuttings are stockpiled on site and covered with plastic sheeting until the results of chemical analyses are known. The petroleum hydrocarbon content of the stockpile is determined by analysis of a composite formed from samples collected from the subsurface of the stockpile. Recommendations for disposal of the cuttings are made on the basis of the analysis, and the cuttings are disposed of by the client.

Sampling and Analysis Procedures

EMCON's sampling and analysis procedures for soils provide consistent and reproducible results and ensure that the objectives of the sampling program are met.

The following publications were used as guidelines for developing these procedures:

- *Leaking Underground Fuel Tank (LUFT) Field Manual* (State Water Resources Control Board, May 1988, revised October 1989)
- *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (EPA, SW-846, 3rd edition, November 1986)

Sample Handling

Sample containers are labeled immediately after sample collection, and are kept in ice chests with ice which is replaced daily until the containers are received at the laboratory. As a sample is collected, it is logged on the chain-of-custody record that accompanies samples to the laboratory.

Samples are transferred from the site to EMCON's laboratory by EMCON field personnel. Laboratory personnel assign a different number to each sample container and the number is recorded on the chain-of-custody record and used to identify the sample on all subsequent internal chain-of-custody and analytical records. Within 24 hours of sample receipt, samples are routinely shipped from EMCON to laboratories performing the selected analyses. EMCON's laboratory manager ensures that the holding times for requested analyses are not exceeded.

Sample Documentation

The procedures for sample handling provide chain-of-custody control from collection through storage. Sample documentation includes the following:

- Labels for identifying individual samples
- Chain-of-custody records for documenting possession and transfer of samples

- Laboratory analysis requests for documenting analyses to be performed

Labels

Sample labels contain the following information:

- Project number
- Sample number (i.e., boring designation)
- Sampler's initials
- Date and time of collection

Sampling and Analysis Chain-of-Custody Record

The sampling and analysis chain-of-custody record (Figure 1), initiated at the time of sampling, includes the boring number, sample type, analytical request, date of sampling, the name of the sampler, and other information deemed pertinent. The sampler signs his name and records the date and time on the record sheet when transferring the samples to another person. Custody transfers are recorded for every sample; for example, if samples are split and sent to more than one laboratory, a record sheet accompanies each sample. The number of custodians in the chain of possession is kept to a minimum. A copy of the sampling and analysis chain-of-custody record is returned to EMCON with the analytical results.

Soil Analysis Request

The Soil Analysis Request (Figure 2) or the purchase order that accompanies samples to the laboratory serves as official communication of the particular analysis(es) required for each sample and is evidence that the chain of custody is complete.

At a minimum, the soil analysis request includes the following:

- Date submitted
- Specific analytical parameters
- Boring number
- Sample source

Analytical Methods

Samples collected as part of the proposed sampling programs are analyzed by accepted analytical procedures. The same publications cited under "Sampling and Analysis Procedures" are the primary references.

The laboratories performing the analyses are certified by the Department of Health Services (DHS) for hazardous waste testing.

Quality Control

Quality assurance measures confirm the integrity of field and laboratory data generated during the monitoring program. Procedures for assessing data quality are discussed in this section. Field and laboratory quality assurance data are evaluated in the technical reports.

Laboratory Quality Assurance

Laboratory quality assurance includes procedures required under the DHS Hazardous Waste Testing Program. For sites where Columbia Analytical Services conducts the chemical tests, quality assurance procedures include the reporting of surrogate recoveries, matrix spike recoveries, and matrix spike duplicates (or duplicate) results.

Method blanks are analyzed daily for the purpose of assessing the effect of the laboratory environment on analytical results, and are performed for each constituent analyzed.

Samples to be analyzed for organic constituents contain surrogate spike compounds. Surrogate recoveries are used to determine whether analytical instruments are operating within limits. Surrogate recoveries are compared with control limits established and updated by the laboratory on the basis of its historical operation.

Matrix spikes are analyzed at a frequency of approximately 10 percent. Matrix spike results are evaluated to determine whether the sample matrix is interfering with the laboratory analysis, and provide a measure of the accuracy of the analytical data. Matrix spike recoveries are compared with control limits established and updated by the laboratory on the basis of its historical operation.

Laboratory duplicates are analyzed at a frequency of approximately 10 percent. Spike duplicate results are evaluated to determine the reproducibility (precision) of the analytical method. Reproducibility values are compared with control limits established and updated by the laboratory on the basis of its historical operation.

Laboratory QC data included with the analytical results are method blanks, surrogate spike recoveries (for organic parameters only), matrix spike recoveries, and matrix spike duplicates.

When other state-certified laboratories conduct the testing, each laboratory will follow its own internal QA/QC program.

Groundwater Well Installation

GROUNDWATER WELL INSTALLATION PROCEDURES

Well permits are obtained from local and state regulatory agencies preparatory to drilling exploratory borings that will be completed as groundwater wells.

The exploratory borings to be converted to verification monitoring wells or extraction wells are drilled no deeper than 20 feet into saturated soil, or until a layer at least 3 feet thick of relatively impermeable clayey material (aquitar) is encountered, whichever comes first. If the aquitar is sufficiently thick, it is backfilled with bentonite through a tremie pipe. Borings are converted to verification monitoring wells with 2-inch-diameter, flush-threaded, polyvinyl chloride (PVC) casing with a screened section of machine-perforated, 0.020-inch slots. For extraction wells, the boring is reamed with a 12-inch-diameter auger, and 6-inch-diameter casing is installed inside the enlarged borehole.

Boring depths and screen lengths are determined from geologic profiles of the boring. Screened sections of casing extend through the saturated interval as much as 5 feet above first-encountered groundwater. A well is completed by the placement of various materials in the annular space around the casing. The annulus is filled to approximately 2 feet above the screen with a sand pack of a grain size predetermined by sieve analysis of the soil. The sand pack is covered with a bentonite plug at least 1-foot thick, and the remaining annular space is sealed within 1 foot of the surface with a sanitary seal of neat cement in compliance with regulatory guidelines. The wells are completed to ground surface with PVC casing. The well heads are protected with traffic-proof vault boxes set in concrete and capped with water-tight locking devices. Well locations are surveyed and top-of-casing elevations measured to the nearest 0.01 foot. Detailed well completion diagrams are prepared. Water well drillers' reports containing geological data, well locations and construction details are submitted to the California Department of Water Resources.

Groundwater Sampling and Analysis

GROUNDWATER SAMPLING AND ANALYSIS

EMCON's sampling and analysis procedures for water-quality monitoring are designed to provide consistent and reproducible results and ensure that the objectives of the monitoring program are met.

The following publications were used as guidelines for developing these procedures:

- Procedures Manual for Ground-Water Monitoring at Solid Waste Disposal Facilities (EPA-530/SW-611, August 1977)
- RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (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 Wastewater (EPA-600/4-82-057, July 1982)
- Methods for Chemical Analysis of Water and Wastes (EPA-600/4-79-020, revised March 1983)

Sample Collection

Sample collection procedures include equipment cleaning, well purging, and water-level, floating-hydrocarbon thickness, and total well-depth measuring.

Equipment Cleaning

The bottles, caps, and septa used to hold samples for volatile and semivolatile organic analysis are triple-rinsed with high-purity deionized water and dried overnight, the bottles at 200°C, the caps and septa at 60°C. The bottles, caps, and septa are protected from solvent contact between drying and use at the site.

The plastic bottles and caps used to hold samples for metals analysis are soaked overnight in a 1 percent nitric acid solution, triple-rinsed with deionized water, and air-dried.

Equipment for sampling groundwater (i.e., pumps, bailers, etc.) is first disassembled, cleaned thoroughly with diluted detergent, and steam-rinsed with deionized water. Parts such as plastic pump valves and bladders, which may absorb contaminants, are cleaned before each use or replaced. The inside of the positive-displacement (bladder) pump tubing is cleaned overnight with a low-flow, inert air source heated to 120°C.

A pump blank made of organic-free water is pumped through the clean bladder-pump assembly, and the resulting effluent is sampled and analyzed by EPA Method 601 or 602. Analytical results must be below the method reporting limit for each constituent analyzed before the pump is used at the site.

The surfaces of well equipment that comes in contact with groundwater during well purging and sampling are steam-cleaned with deionized water between each use.

Water-Level, Floating Hydrocarbon, and Total Well-Depth Measurements

Water levels, floating-hydrocarbon thickness, and total well-depth are measured before wells are purged and sampled. An electric sounder, a bottom-filling, clear Teflon[®] bailer, or an oil-water interface probe is used to make these measurements. The electric sounder is a transistorized instrument with a reel-mounted, two-conductor, coaxial cable which connects the control panel to the sensor. The cable is stamped in 1-foot increments. The sensor is lowered into the well and as it makes contact with the water, which acts as an electrolyte, a low-current circuit is completed. The current is amplified and fed into an indicator light and an audible buzzer, which produce a signal as the sensor touches the water. A sensitivity control compensates for highly saline or conductive water. The sounder is decontaminated after each use with a deionized-water rinse. The bailer is lowered to a point just below the liquid level, retrieved, and inspected for floating hydrocarbon.

Alternately, an oil-water interface sonic probe can be used to measure floating-hydrocarbon thickness. The probe emits a continuous 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. Fluid levels are recorded relative to which tone is emitted. The sonic probe is decontaminated after each use with a deionized-water rinse.

Fluid measurements are recorded to the nearest 0.01 foot in a field logbook. The groundwater elevation at the monitoring wells is calculated by subtracting the measured depth to water from the surveyed top-of-casing elevation. When possible, depth to water is measured in all wells on the same day. Water levels are converted to elevations above mean sea level (MSL) and contoured on a groundwater map. Total well depth, recorded to the nearest 0.5 foot, is measured by means of an electric sounder which is lowered to the bottom of a well. This measurement is used for calculating purge volumes and determining the degree to which silt may have obstructed the well screen.

Well Purging

Before a monitoring well is sampled, it is purged of standing water in the casing and gravel pack by one of several devices: a bladder pump, a pneumatic displacement pump, a centrifugal pump, or a Teflon bailer. Water will be evacuated from the well until the amount equals the calculate purge volume (as shown in Monitoring Well Purging Protocol, Figure 3), which will allow indicator parameters to stabilize, or until the well is evacuated to practical limits of dryness, if this occurs before the calculated purge volume is removed. These low-yield monitoring wells are allowed to recharge until the volume of water is sufficient for sampling, but not longer than 24 hours. If insufficient water has recharged after 24 hours, a monitoring well is recorded as dry for the sampling event.

The pH, specific conductance, and the temperature meter are calibrated daily before field activities are begun. Meter calibration is checked daily during field activities to verify performance. Field measurements are recorded on a water-sample field-data sheet (Figure 4) and kept in a waterproof logbook. Data sheets are reviewed by the sampling coordinator at the end of the sampling event.

Well Sampling

A Teflon bailer or a bladder pump is the only acceptable equipment for well sampling. When samples are collected for volatile organic compound (VOC) analysis with a bladder pump, the pump flow is regulated to approximately 100 milliliters per minute to minimize pump-effluent turbulence and aeration. Samples for VOC analysis are preserved in 40-milliliter glass bottles (or larger), which are fitted with Teflon-lined septa. The bottles are filled completely to force out air and to aid in forming a positive meniscus. Bottles are capped with convex Teflon septa to seal out air, and are inverted and tapped to verify that no air bubbles remain. Containers of samples to be analyzed for other constituents are filled, filtered as required, and capped.

When required, an appropriate field-filtration technique is used to determine dissolved concentrations of metals. When a Teflon bailer is used, the contents are emptied into a pressure transfer vessel. A disposable 0.45-micron acrylic copolymer filter is threaded onto the transfer vessel at the discharge point and the vessel is sealed. The vessel is pressurized with a hand pump and the filtrate directed into appropriate containers. Each filter is used once and discarded.

When a bladder pump is used to collect samples for dissolved constituents, a sample is filtered through a disposable 0.450-micron acrylic copolymer filter attached directly to the pump effluent line with a pressure fitting. As the pump cycles, the effluent is pressured through the filter and directed into an appropriate container. Each filter is used once and discarded.

Sample Preservation and Handling

Procedures for handling and preserving samples are consistent with the guidelines referenced in the Introduction. Sample containers vary depending on the type of analysis required (e.g., volatile organics, hydrocarbons, or dissolved metals) and are nonreactive with a given chemical.

Sample Handling

Sample containers are labeled immediately after sample collection, and are kept on cold packs which are replaced daily until the containers are received at the laboratory. As a sample is collected, it is logged on the chain-of-custody record that accompanies samples to the laboratory.

Samples are transferred from the site to EMCON's laboratory by the sampling team. Laboratory personnel assign a different number to each sample container and the number is recorded on the chain-of-custody record and used to identify the sample on all subsequent internal chain-of-custody and analytical records. Within 24 hours of sample receipt, samples are routinely shipped from EMCON to laboratories performing the selected analyses. EMCON's laboratory manager ensures that the holding times for requested analyses are not exceeded.

Sample Documentation

The procedures for sample handling provide chain-of-custody control from collection through storage. Sample documentation includes the following:

- Field logbooks for documenting sampling activities in the field
- Labels for identifying individual samples
- Chain-of-custody records for documenting possession and transfer of samples
- Laboratory analysis requests for documenting analyses to be performed

Field Logbook

In the field, the sampler records the following information on the water sample field data sheet (Figure 4) for each sample:

- Project number

- Client name
- Location
- Sampler's name
- 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
- Sampling equipment
- Appearance of each sample (e.g., color, turbidity, sediment)
- Results of field analyses (temperature, pH, specific conductance)
- General comments

The field logbooks are signed by the sampler.

Labels

Sample labels contain the following information:

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

Sampling and Analysis Chain-of-Custody Record

The sampling and analysis chain-of-custody record (Figure 1), initiated at the time of sampling, includes the well number, sample type, analytical request, date of sampling, the

name of the sampler, and other information deemed pertinent. The sampler signs his name and records the date and time on the record sheet when transferring the samples to another person. Custody transfers are recorded for every sample; for example, if samples are split and sent to more than one laboratory, a record sheet accompanies each sample. The number of custodians in the chain of possession is kept to a minimum. A copy of the sampling and analysis chain-of-custody-record is returned to EMCON with the analytical results.

Groundwater Sampling and Analysis Request

The Groundwater Sampling and Analysis Request or the purchase order that accompanies samples to the laboratory serves as official communication of the particular analysis(es) required for each sample and is evidence that the chain of custody is complete (Figure 5).

At a minimum, the groundwater sampling and analysis request includes the following:

- Date submitted
- Specific analytical parameters
- Well number
- Sample source

Analytical Methods

Samples collected as part of the proposed monitoring programs are analyzed by accepted analytical procedures. The following publications are the primary references:

- Methods for Chemical Analysis of Water and Wastes (EPA-600/4-79-020, revised March 1983)
- Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (EPA-600/4-82-057), July 1982)
- Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods (EPA SW-846, 3rd edition, November 1986)
- Leaking Underground Fuel Tank (LUFT) Manual, State Water Resources Control Board, State of California Leaking Underground Fuel Tank Task Force, May 1988

The laboratories performing the analyses are certified by the Department of Health services (DHS) for hazardous waste testing.

Quality Control

Quality assurance measures confirm the integrity of field and laboratory data generated during the monitoring program. Procedures for assessing data quality are discussed in this section. Field and laboratory quality assurance data are evaluated in the technical reports.

Field Quality Assurance

Field quality assurance for each monitoring event includes the documentation of field instrument calibration and collection and analysis of trip blanks, field blanks, and duplicate samples. Split samples may also be included in the monitoring program.

Trip and Field Blanks

Trip and field blanks are used to detect contamination introduced through sampling procedures, external field conditions, sample transportation, container preparation, sample storage, and the analytical process.

Trip blanks are prepared at the same time and location as the sample containers for a given sampling event. Trip blanks accompany the containers to and from that event, but are never opened or exposed to the air. One trip blank for volatile organic parameters is typically included for each sampling event.

Field blanks are prepared in the same manner as trip blanks, but are exposed to the ambient atmosphere at a specific monitoring point during sample collection for the purpose of determining the influence of external field conditions on sample integrity. One field blank for volatile organic parameters is typically included for each day of sampling.

Duplicate Samples

Duplicate samples are collected so that field precision can be documented. For each sampling event, a specified percentage (typically 5 percent) of monitoring well samples is collected in duplicate. Where possible, field duplicates are collected at sampling points known or suspected to contain constituents of interest. Duplicates are packed and shipped blind to the laboratory to be analyzed with the samples from that particular event (i.e., duplicates have no special markings indicating that they are quality control samples).

Laboratory Quality Assurance

Laboratory quality assurance includes procedures required under the DHS Hazardous Waste Testing Program. For sites where Columbia Analytical Services conducts the chemical tests, its quality assurance procedures include the reporting of surrogate recoveries, matrix spike recoveries, and matrix spike duplicates (or duplicate) results.

Method blanks are analyzed daily for the purpose of assessing the effect of the laboratory environment on analytical results, and are performed for each constituent analyzed.

Samples to be analyzed for organic constituents contain surrogate spike compounds. Surrogate recoveries are used to determine whether analytical instruments are operating within limits. Surrogate recoveries are compared with control limits established and updated by the laboratory on the basis of its historical operation.

Matrix spikes are analyzed at a frequency of approximately 10 percent. Matrix spike results are evaluated to determine whether the sample matrix is interfering with the laboratory analysis, and provide a measure of the accuracy of the analytical data. Matrix spike recoveries are compared with control limits established and updated by the laboratory on the basis of its historical operation.

Laboratory duplicates are analyzed at a frequency of approximately 10 percent. Spike duplicate results are evaluated to determine the reproducibility (precision) of the analytical method. Reproducibility values are compared with control limits established and updated by the laboratory on the basis of its historical operation.

Laboratory QC data included with the analytical results are method blanks, surrogate spike recoveries (for organic parameters only), matrix spike recoveries, and matrix spike duplicates.

When other state-certified laboratories conduct the testing, each laboratory will follow its own internal QA/QC program.

APPENDIX C
WASTE MANIFESTS



NON-HAZARDOUS SPECIAL WASTE & ASBESTOS MANIFEST

If waste is asbestos waste, complete Sections I, II, III and IV.
If waste is NOT asbestos waste, complete only Sections I, II and III.

No. 822974

Section I: GENERATOR (Generator completes all of Section I)

a. Generator Name: ARCO Products Company b. Generating Location: Area Station # 6112
 c. Address: 2155 S. Bascom Ave., Ste. #202 d. Address: 2101 Shattuck, Ave # 52nd
Campbell, CA 95008 Oakland, CA
 e. Phone No.: (510) 938-6945 f. Phone No.: NONE

If owner of the generating facility differs from the generator, provide:
 g. Owner's Name: Arco Products h. Owner's Phone No.: 415-438-1100

i. BFI WASTE CODE:

CA	J	O	S	0	8	1	6	9	3
----	---	---	---	---	---	---	---	---	---

 Containers:

--	--	--	--	--	--

j. Description of Waste: Non Hazardous Soil (TPHg) k. Quantity:

--	--	--	--	--	--

 Units:

--	--	--	--	--	--

 No.:

--	--	--	--	--	--

 TYPE:

--	--	--	--	--	--

TYPE	
DM	- METAL DRUM
DP	- PLASTIC DRUM
B	- BAG
BA	- 6 MIL. PLASTIC BAG or WRAP
T	- TRUCK
O	- OTHER

UNITS	
P	- POUNDS
Y	- YARDS
M ³	- CUBIC METERS
Y ³	- CUBIC YARDS
O	- OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations; AND, if the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261. On behalf of ARCO Products:

Jessica Drake
 Generator Authorized Agent Name Signature

--	--	--	--	--	--

 Shipment Date

Section II: TRANSPORTER (Generator completes a-d; Transporter completes e-g)

TRANSPORTER I
 a. Name: Dillard Trucking, Inc.
 b. Address: P.O. Box 218
Byron, CA 94511
 c. Driver Name/Title: JERRY WISE Driver
 d. Phone No.: (510) 634-6850 e. Truck No.: 891
 Vehicle License No./State: SF 28086 CA
 Acknowledgement of Receipt of Materials:
Jerry Wise

--	--	--	--	--	--

 Shipment Date

TRANSPORTER II
 h. Name: _____
 i. Address: _____
 j. Driver Name/Title: _____
 k. Phone No.: _____ l. Truck No.: _____
 m. Vehicle License No./State: _____
 Acknowledgement of Receipt of Materials:

--	--	--	--	--	--

 Shipment Date

Section III: DESTINATION (Generator completes a-c; Destination completes d-f)

a. Site Name: BFI Vasco Rd. Landfill c. Phone No.: (510) 117-0491
 b. Physical Address: 1001 North Vasco Road d. Mailing Address: 1001 North Vasco Road
Livermore CA 94550 Livermore CA 94550

Discrepancy Indication Space: _____
 I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.

Name of Authorized Agent: _____ Signature: _____

--	--	--	--	--	--

 Receipt Date
 JOB# 1006-19
 PO# 00-20314

Section IV: ASBESTOS

Operator's Name: _____ b. Operator's Phone No.: _____
 Operator's Address: _____

Special Handling Instructions and additional information: _____

OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

Operator's Name & Title: _____ Print/Type _____ Operator's Signature _____

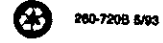
--	--	--	--	--	--

 Date

Name and Address of Responsible Agency: _____
 Friable; Non-friable; Both _____ % friable _____ % nonfriable

Operator refers to the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation, or both.

TRANSPORTER RETAIN





NON-HAZARDOUS SPECIAL WASTE & ASBESTOS MANIFEST

If waste is asbestos waste, complete Sections I, II, III and IV
If waste is NOT asbestos waste, complete only Sections I, II and III

No. 822975

Section I: GENERATOR (Generator completes all of Section I)

a. Generator Name: ARC Products Company b. Generating Location: ARC Station # 6138
 c. Address: 2157 E. Lascom Ave. Ste #202 d. Address: 7131 Shattuck St
Campbell CA 95008 Oakland CA
 e. Phone No.: (510) 939-6945 f. Phone No.: None

If owner of the generating facility differs from the generator, provide.

g. Owner's Name: ARC Products h. Owner's Phone No.: None

i. BFI WASTE CODE:

CA	1	9	3	0	0	1	0	9	7
----	---	---	---	---	---	---	---	---	---

 Containers:

--	--	--	--	--	--

 j. Description of Waste: Non Hazardous Soil (TPHC) k. Quantity:

0	0	1	8
---	---	---	---

 Units:

Y

 No.:

0	1
---	---

 TYPE:

T

TYPE	
DM	- METAL DRUM
DP	- PLASTIC DRUM
B	- BAG
BA	- 6 MIL. PLASTIC BAG or WRAP
T	- TRUCK
O	- OTHER
UNITS	
P	- POUNDS
Y	- YARDS
M ³	- CUBIC METERS
Y ³	- CUBIC YARDS
O	- OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations; AND, if the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261 on Behalf of ARC PRODUCTS

Joselira Drake

Generator Authorized Agent Name: Joselira Drake Signature: [Signature] Shipment Date:

08	22	95
----	----	----

Section II: TRANSPORTER (Generator completes a-d; Transporter I completes e-g; Transporter II completes h-k)

TRANSPORTER I
 a. Name: Dillard Trucking, Inc.
 b. Address: P.O. Box 218
Byron, CA 94511
 c. Driver Name/Title: JOHN SANCHEZ
 d. Phone No.: (510) 634-6850 e. Truck No.: 991
 f. Vehicle License No./State: SP28085
 Acknowledgement of Receipt of Materials.
 g. Driver Signature: [Signature] Shipment Date:

08	22	95
----	----	----

TRANSPORTER II
 h. Name: _____
 i. Address: _____
 j. Driver Name/Title: _____
 k. Phone No.: _____ l. Truck No.: _____
 m. Vehicle License No./State: _____
 Acknowledgement of Receipt of Materials.
 n. Driver Signature: _____ Shipment Date:

--	--	--	--	--

Section III: DESTINATION (Generator completes a-d; destination site completes e-f)

a. Site Name: BFI Vasco Rd. Landfill c. Phone No.: (510) 417-0191
 b. Physical Address: 4001 North Vasco Road d. Mailing Address: 4001 North Vasco Road
Livermore, CA 94550 Livermore CA 94550
 e. Discrepancy Indication Space: _____
 I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.
 f. Name of Authorized Agent: _____ Signature: [Signature] Receipt Date:

08	22	95
----	----	----

 JOB# 1006-19
PO# 09-20314

Section IV: ASBESTOS (Generator completes a-d; Operator completes e-f)

a. Operator's* Name: _____ b. Operator's* Phone No.: _____
 c. Operator's* Address: _____
 d. Special Handling Instructions and additional information: _____
 OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.
 e. Operator's* Name & Title: _____ Print/Type: _____ Operator's* Signature: _____ Date:

--	--	--	--	--

 f. Name and Address of Responsible Agency: _____
 g. Friable; Non-friable; Both _____ % friable _____ % nonfriable

* Operator refers to the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation, or both.

TRANSPORTER RETAIN





NON-HAZARDOUS SPECIAL WASTE & ASBESTOS MANIFEST

If waste is asbestos waste, complete Sections I, II, III and IV.
If waste is **NOT** asbestos waste, complete only Sections I, II and III.

No. 822983

Section I: GENERATOR (Generator completes all of Section I)

a. Generator Name: AWCO Products Company b. Generating Location: AWCO STATION # 6118
 c. Address: 2155 S. Bascom Ave. Ste #202 d. Address: 7311 Shattuck Ave. Oakland CA 94621
 e. Phone No.: (510) 339-6915 f. Phone No.: NONE

If owner of the generating facility differs from the generator, provide:
 g. Owner's Name: AWCO Products h. Owner's Phone No.: NONE

i. BFI WASTE CODE:

CA	4	0	3	0	8	1	6	9	5
----	---	---	---	---	---	---	---	---	---

 Containers:

1	3	1	6
---	---	---	---

 j. Description of Waste: Non Hazardous Solid (TPH): k. Quantity:

0	0	1	8
---	---	---	---

 Units:

Y

 No.:

1

 TYPE:

T

- TYPE**
 DM - METAL DRUM
 DP - PLASTIC DRUM
 B - BAG
 BA - 6 MIL. PLASTIC BAG or WRAP
 T - TRUCK
 O - OTHER
- UNITS**
 P - POUNDS
 Y - YARDS
 M³ - CUBIC METERS
 Y³ - CUBIC YARDS
 O - OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations; AND, If the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261 on behalf of AWCO Products Company.
 Jessica Drake
 Generator Authorized Agent Name Signature [Signature] Shipment Date

0	8	2	2	9	5
---	---	---	---	---	---

Section II: TRANSPORTER (Generator complete a-d; Transporter I complete e-g; Transporter II complete h-j)

TRANSPORTER I
 a. Name: Dillard Trucking, Inc
 b. Address: P.O. Box 218
Byron, CA 94511
 c. Driver Name/Title: Driver Dan Kell
 d. Phone No.: (510) 631-6850 e. Truck No.: 389
 f. Vehicle License No./State: SP14080
 Acknowledgement of Receipt of Materials.
 g. [Signature]

0	8	2	2	9	5
---	---	---	---	---	---

 Driver Signature Shipment Date

TRANSPORTER II
 h. Name: _____
 i. Address: _____
 j. Driver Name/Title: _____
 k. Phone No.: _____ l. Truck No.: _____
 m. Vehicle License No./State: _____
 Acknowledgement of Receipt of Materials.
 n. _____
 Driver Signature Shipment Date

Section III: DESTINATION (Generator completes a-d; Destination site completes e-f)

a. Site Name: BFI Vasco Rd. Landfill c. Phone No.: (510) 417-0491
 b. Physical Address: 4001 North Vasco Road d. Mailing Address: 1001 North Vasco Road
Livermore CA 94550 Livermore CA 94550
 e. Discrepancy Indication Space: _____

I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.

f. [Signature]

0	8	2	2	9	5
---	---	---	---	---	---

 JOB# 1006-19
 Name of Authorized Agent Signature Receipt Date PO# 09-20311

Section IV: ASBESTOS (Generator completes a-c; Operator completes d-f)

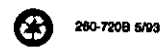
a. Operator's* Name: _____ b. Operator's* Phone No.: _____
 c. Operator's* Address: _____
 d. Special Handling Instructions and additional information: _____

OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked/labelled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

e. Operator's* Name & Title: _____ Operator's* Signature _____ Date _____
 Name and Address of Responsible Agency: _____
 f. Friable; Non-friable; Both _____ % friable _____ % nonfriable

* Operator refers to the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation, or both.

TRANSPORTER RETAIN





NON-HAZARDOUS SPECIAL WASTE & ASBESTOS MANIFEST

If waste is asbestos waste, complete Sections I, II, III and IV.
If waste is NOT asbestos waste, complete only Sections I, II and III.

No. 822984

Section I. GENERATOR (Generator completes all of Section I)

a. Generator Name: ARCO Products Company b. Generating Location: 2155 Bascom Ave. Ste #202
 c. Address: 2155 Bascom Ave. Ste #202 d. Address: Campton, CA 95008
 e. Phone No.: (510) 939-6945 f. Phone No.: None

If owner of the generating facility differs from the generator, provide:

g. Owner's Name: ARCO Products h. Owner's Phone No.: Same as generator

i. BFI WASTE CODE:

C	A	1	U	S	0	6	1	6	7
---	---	---	---	---	---	---	---	---	---

5	1	3	1	6
---	---	---	---	---

 Containers:

DM	DP	B	BA	T	O
----	----	---	----	---	---

 j. Description of Waste: Non Hazardous Soil (TPH) k. Quantity:

0	9	0	1	2
---	---	---	---	---

 Units:

Y

 No.:

3	1
---	---

 TYPE:

T

- TYPE**
 DM - METAL DRUM
 DP - PLASTIC DRUM
 B - BAG
 BA - 6 MIL. PLASTIC BAG or WRAP
 T - TRUCK
 O - OTHER
- UNITS**
 P - POUNDS
 Y - YARDS
 M³ - CUBIC METERS
 Y³ - CUBIC YARDS
 O - OTHER

GENERATOR'S CERTIFICATION: I hereby certify that the above named material is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, has been properly described, classified and packaged, and is in proper condition for transportation according to applicable regulations; AND, if the waste is a treatment residue of a previously restricted hazardous waste subject to the Land Disposal Restrictions, I certify and warrant that the waste has been treated in accordance with the requirements of 40 CFR Part 268 and is no longer a hazardous waste as defined by 40 CFR Part 261 On Behalf of ARCO Products

Jessica Drake

0	5	2	2	9	5
---	---	---	---	---	---

 Generator Authorized Agent Name Signature Shipment Date

Section II. TRANSPORTER (Generator completes a-d; Transporter I completes e-g; Transporter II completes h-n)

<p>a. Name: <u>Dillard Trucking Inc.</u> b. Address: <u>P.O. Box 218</u> <u>Byron, CA 94511</u> c. Driver Name/Title: <u>John Saichuk</u> d. Phone No.: <u>(510) 631-6850</u> e. Truck No.: <u>(K)</u> f. Vehicle License No./State: <u>SP23085</u> Acknowledgement of Receipt of Materials. g. <table border="1"><tr><td>0</td><td>8</td><td>2</td><td>0</td><td>9</td><td>5</td></tr></table> Driver Signature Shipment Date</p>	0	8	2	0	9	5	<p>h. Name: _____ i. Address: _____ j. Driver Name/Title: _____ k. Phone No.: _____ l. Truck No.: _____ m. Vehicle License No./State: _____ Acknowledgement of Receipt of Materials. n. _____ Driver Signature Shipment Date</p>
0	8	2	0	9	5		

Section III. DESTINATION (Generator completes a-c; Destination completes d-f)

a. Site Name: BFI Vasco Rd. Landfill c. Phone No.: (510) 447-0151
 b. Physical Address: 4001 North Vasco Road d. Mailing Address: 1001 North Vasco Road
Livermore CA 94550 Livermore CA 94550
 e. Discrepancy Indication Space: _____
 I hereby certify that the above named material has been accepted and to the best of my knowledge the foregoing is true and accurate.
 f.

0	8	2	0	9	5
---	---	---	---	---	---

 JOB# 1006-19
 Name of Authorized Agent Signature Receipt Date PO# 09-20314

Section IV. ASBESTOS (Generator completes a-c; Operator completes d-f)

a. Operator's Name: _____ b. Operator's Phone No.: _____
 c. Operator's Address: _____
 d. Special Handling Instructions and additional information: _____
 OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.
 e. Operator's Name & Title: _____ Operator's Signature _____ Date _____
 f. Name and Address of Responsible Agency: _____
 g. Friable; Non-friable; Both _____ % friable _____ % nonfriable

* Operator refers to the company which owns, leases, operates, controls, or supervises the facility being demolished or renovated, or the demolition or renovation operation, or both.

TRANSPORTER RETAIN



260-7208 5/93

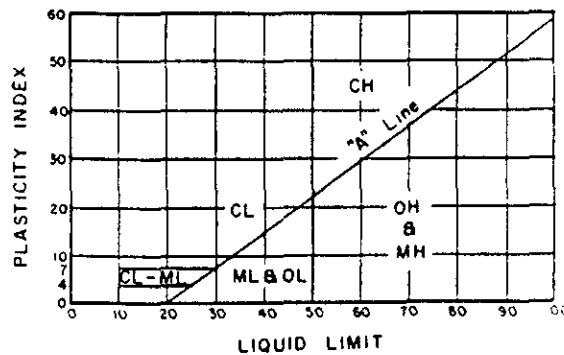
APPENDIX D

**EXPLORATORY BORING LOGS AND WELL CONSTRUCTION
DETAILS**

MAJOR DIVISIONS	SYMBOLS	TYPICAL SOIL DESCRIPTIONS
COARSE GRAINED SOILS (More than 1/2 of soil > no. 200 sieve size)	GRAVELS	
	GW	Well graded gravels or gravel-sand mixtures, little or no fines
	GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
	GM	Silty gravels, gravel-sand-silt mixtures
	GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS	
	SW	Well graded sands or gravelly sands, little or no fines
	SP	Poorly graded sands or gravelly sands, little or no fines
FINE GRAINED SOILS (More than 1/2 of soil < no. 200 sieve size)	SILTS & CLAYS	
	LL < 50	
	SM	Silly sands, sand-silt mixtures
	SC	Clayey sands, sand-clay mixtures
	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS	
	LL > 50	
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
CH	Inorganic clays of high plasticity, fat clays	
OH	Organic clays of medium to high plasticity, organic silty clays, organic silts	
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils

CLASSIFICATION CHART
(Unified Soil Classification System)

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U S Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL	3" to No 4	76.2 to 4.76
	coarse 3" to 3/4"	76.2 to 19.1
	fine 3/4" to No. 4	19.1 to 4.76
SAND	No 4 to No. 200	4.76 to 0.074
	coarse No 4 to No 10	4.76 to 2.00
	medium No 10 to No 40	2.00 to 0.420
	fine No. 40 to No. 200	0.420 to 0.074
SILT & CLAY	Below No 200	Below 0.074



PLASTICITY CHART

GRAIN SIZE CHART

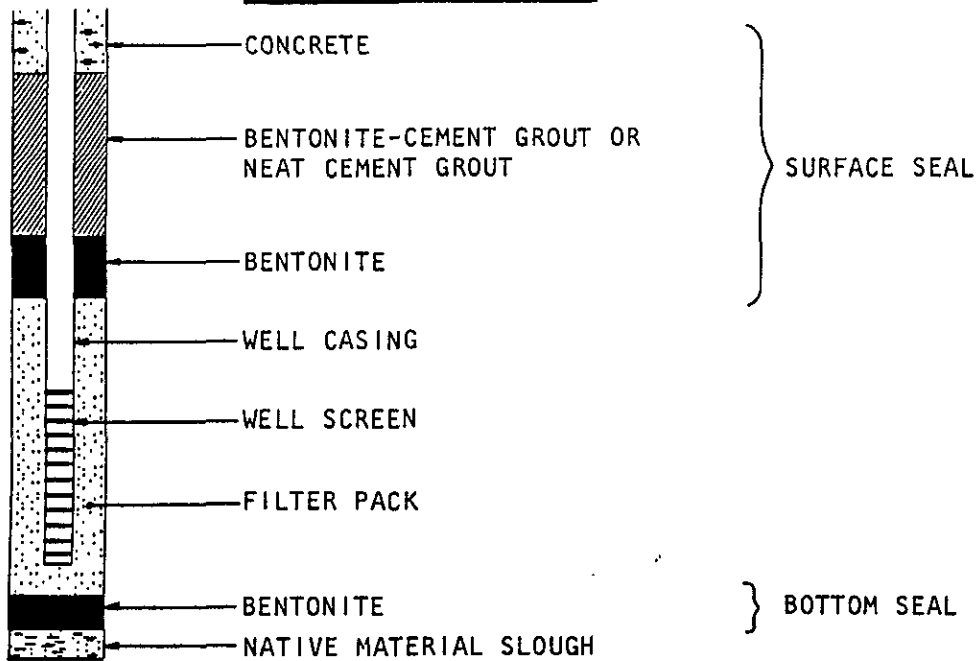
METHOD OF SOIL CLASSIFICATION





EXPLANATION OF SYMBOLS ON EXPLORATORY BORING LOGS

Well Details Column



Sample Column



BAG/BULK SAMPLES

FIVE-FOOT SPLIT BARREL SAMPLER (CONTINUOUS SAMPLER)

MODIFIED CALIFORNIA SPLIT SPOON

OTHER SAMPLERS (SEE REMARKS FOR TYPE AND SIZE)

PITCHER BARREL

ROCK CORE (SEE REMARKS FOR TYPE AND SIZE)

SHELBY TUBE SAMPLER

STANDARD PENETRATION TEST SPLIT SPOON SAMPLER (2" OD)

EXPLANATION OF SYMBOLS ON
EXPLORATORY BORING LOGS
(CONTINUED)

Ground-Water Level Column



DEPTH TO FIRST OBSERVED GROUND WATER

DEPTH TO STABILIZED GROUND WATER

Miscellaneous

2.5 YR 6/2

Color as field checked to Munsell Soil Color Chart
(1975 Edition)

PENETRATION

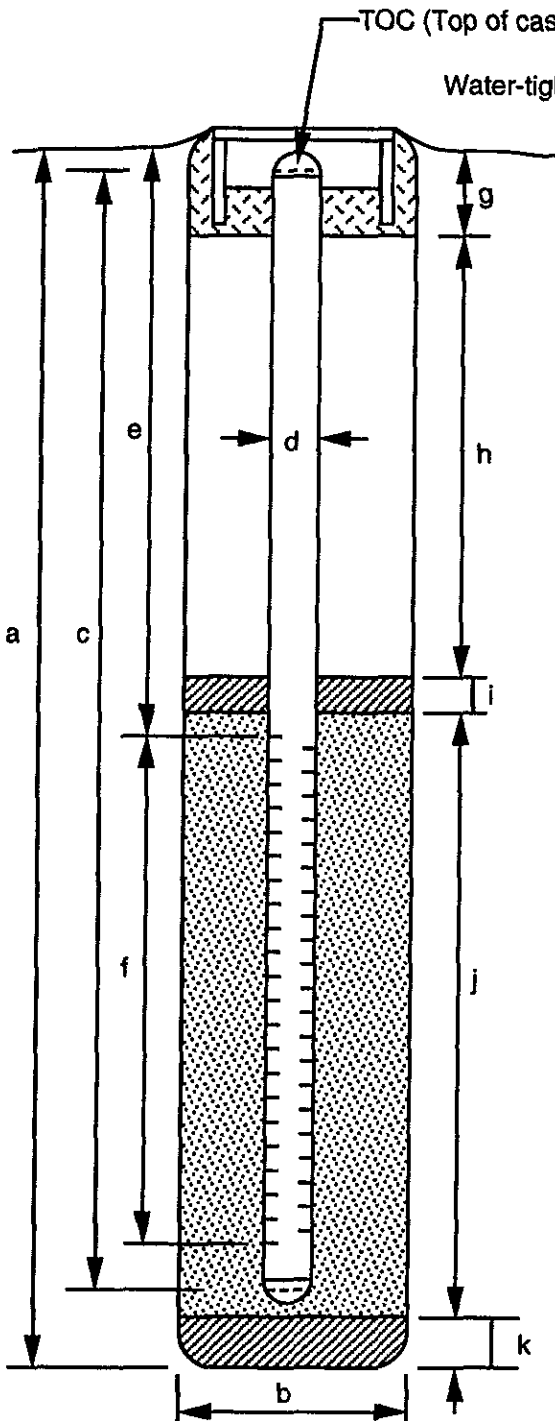
Blows required to drive sampler 1 foot into soil.
Standard drive hammer weight: 140 pounds.
Standard drop: 30 inches.

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. AS-3
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. 107.89
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. 108.34
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/2/95



EXPLORATORY BORING

a. Total depth 29.0 ft.
 b. Diameter 8.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

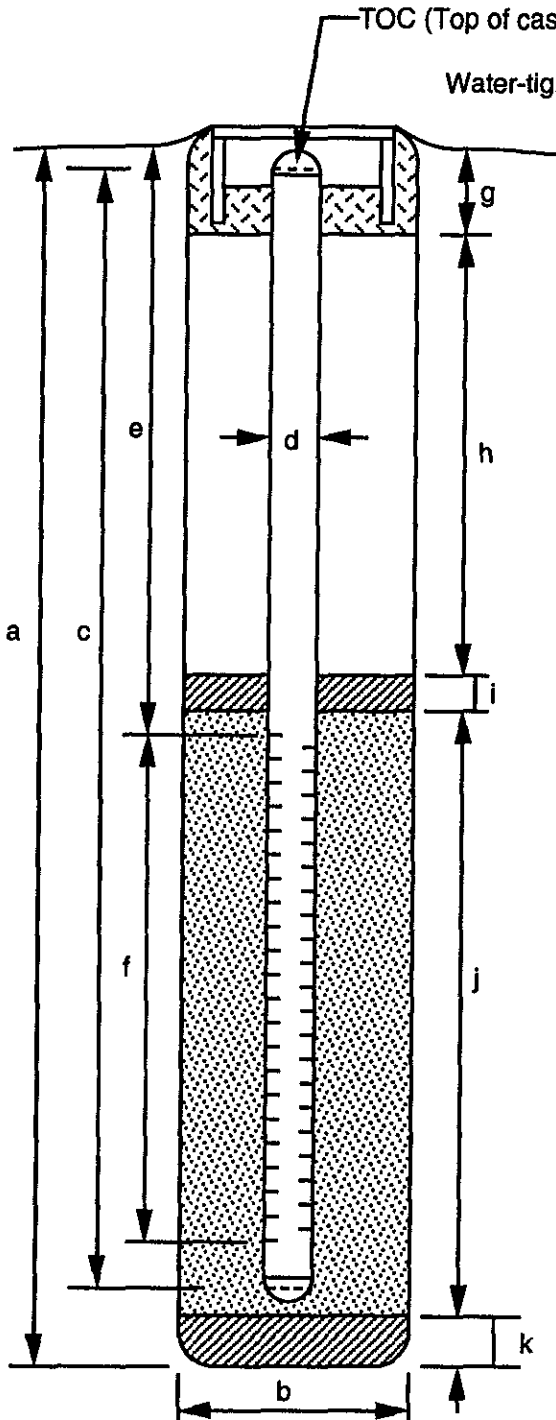
c. Total casing length 22.0 ft.
 Material Schedule 40 PVC
 d. Diameter 2.0 in.
 e. Depth to top perforations 19.6 ft.
 f. Perforated length 2.0 ft.
 Perforated interval from 19.6 to 21.6 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 16.0 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 3.5 ft.
 Gravel pack interval from 19.0 to 22.5 ft.
 Material #3 Sand
 k. Bottom seal/fill 6.5 ft.
 Material Bentonite

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. AS-4
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. 106.81
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. 107.26
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/2/95



EXPLORATORY BORING

a. Total depth 29.0 ft.
 b. Diameter 8.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

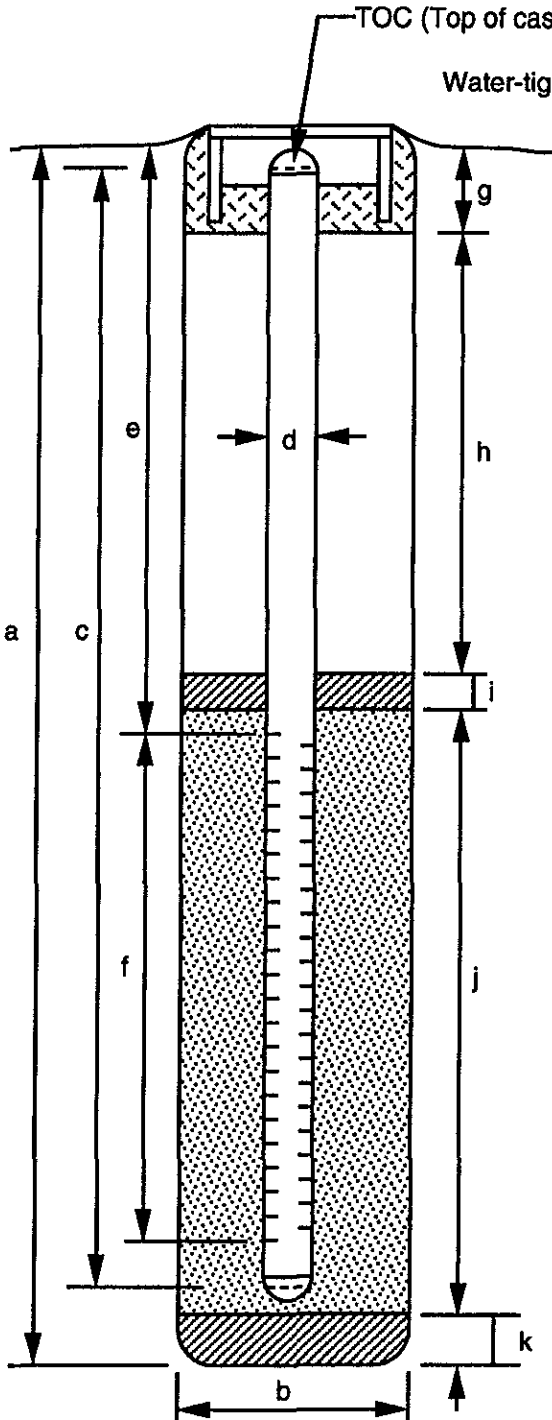
c. Total casing length 28.2 ft.
 Material Schedule 40 PVC
 d. Diameter 2.0 in.
 e. Depth to top perforations 25.6 ft.
 f. Perforated length 2.0 ft.
 Perforated interval from 25.6 to 27.6 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 22.0 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 4.0 ft.
 Gravel pack interval from 25.0 to 29.0 ft.
 Material #3 Sand
 k. Bottom seal/fill na ft.
 Material _____

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. AS-5
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. 106.24
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. 106.69
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/2/95



EXPLORATORY BORING

a. Total depth 29.0 ft.
 b. Diameter 8.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

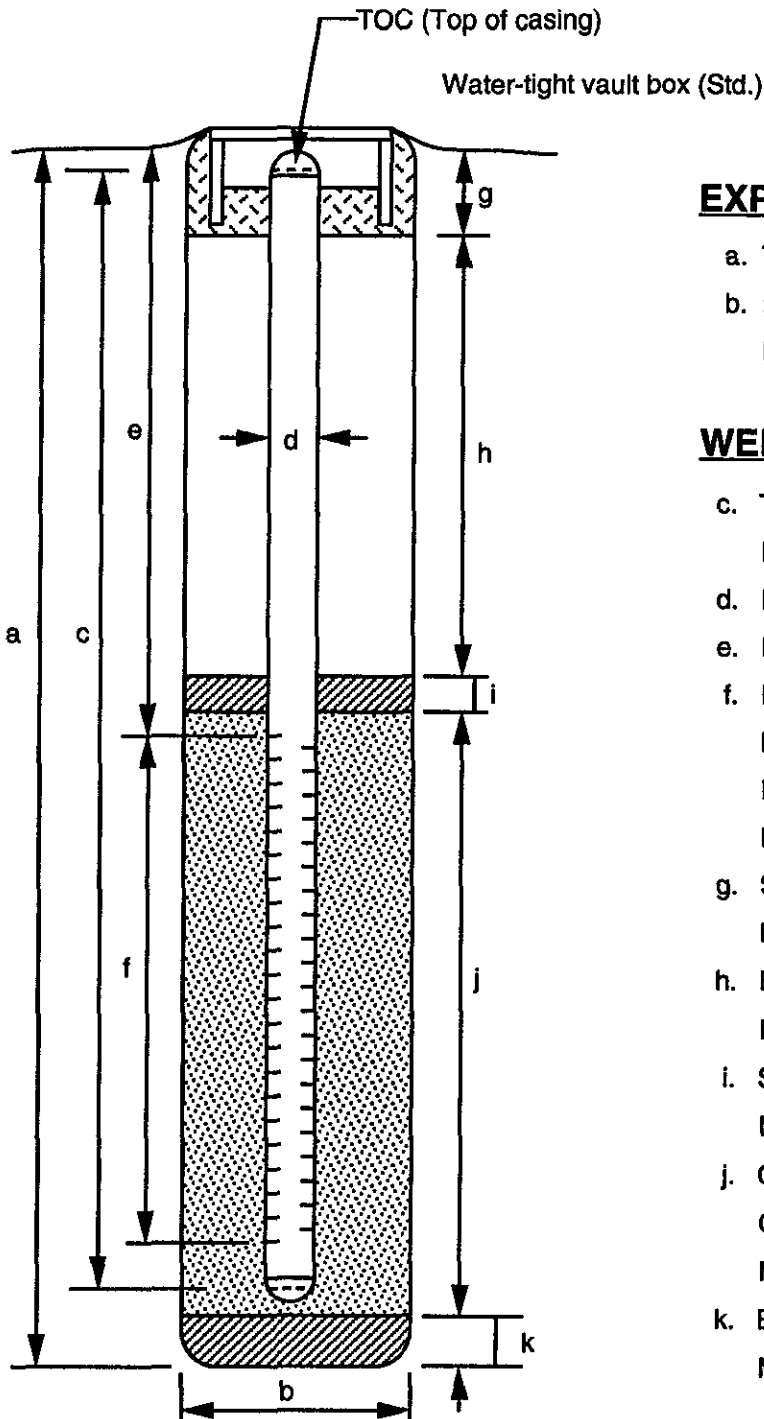
c. Total casing length 27.0 ft.
 Material Schedule 40 PVC
 d. Diameter 2.0 in.
 e. Depth to top perforations 24.6 ft.
 f. Perforated length 2.0 ft.
 Perforated interval from 24.6 to 26.6 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 21.0 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 4.0 ft.
 Gravel pack interval from 24.0 to 28.0 ft.
 Material #3 Sand
 k. Bottom seal/fill 1.0 ft.
 Material Native Slough

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. VW-2
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. na
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. na
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 7/31/95



EXPLORATORY BORING

a. Total depth 26.5 ft.
 b. Diameter 10.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

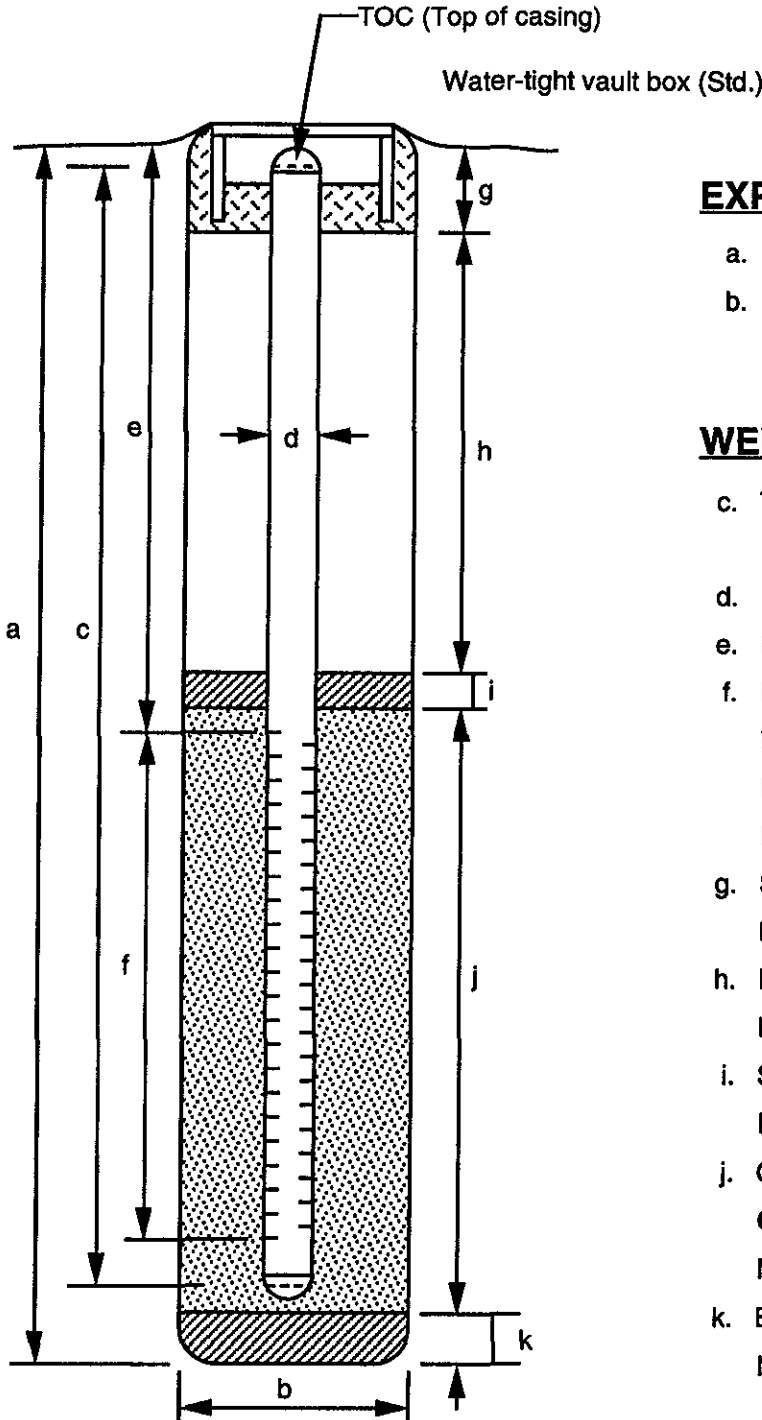
c. Total casing length 24.8 ft.
 Material Schedule 40 PVC
 d. Diameter 4.0 in.
 e. Depth to top perforations 9.8 ft.
 f. Perforated length 14.0 ft.
 Perforated interval from 9.8 to 23.8 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 4.0 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 17.0 ft.
 Gravel pack interval from 8.0 to 25.0 ft.
 Material #3 Sand
 k. Bottom seal/fill 1.5 ft.
 Material Native Slough

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. VW-4
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. na
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. na
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/1/95



EXPLORATORY BORING

a. Total depth 26.5 ft.
 b. Diameter 10.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

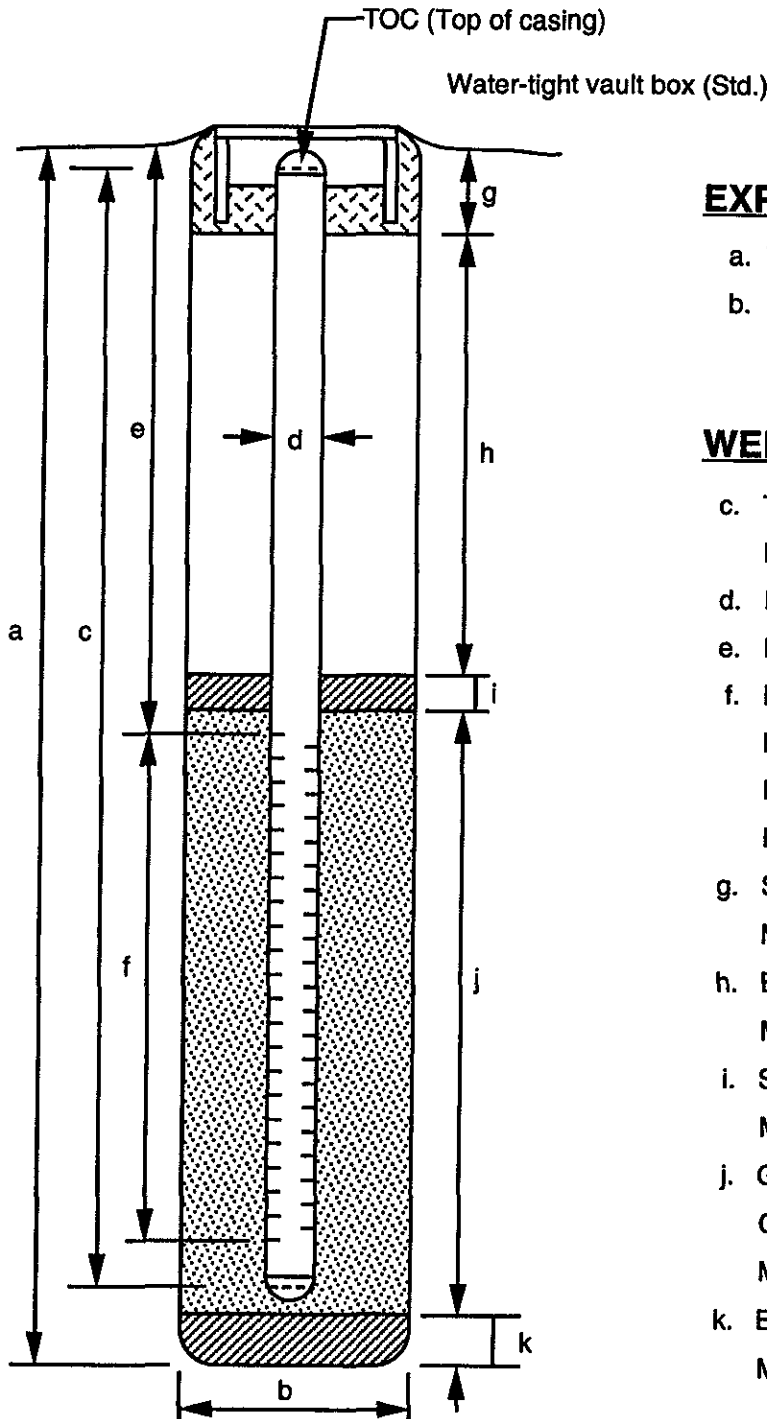
c. Total casing length 20.2 ft.
 Material Schedule 40 PVC
 d. Diameter 4.0 in.
 e. Depth to top perforations 10.0 ft.
 f. Perforated length 9.2 ft.
 Perforated interval from 10.0 to 19.2 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 5.5 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 12.5 ft.
 Gravel pack interval from 9.0 to 21.5 ft.
 Material #3 Sand
 k. Bottom seal/fill 5.0 ft.
 Material Native Slough

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. VW-5
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. na
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. na
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/1/95



EXPLORATORY BORING

a. Total depth 26.5 ft.
 b. Diameter 10.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

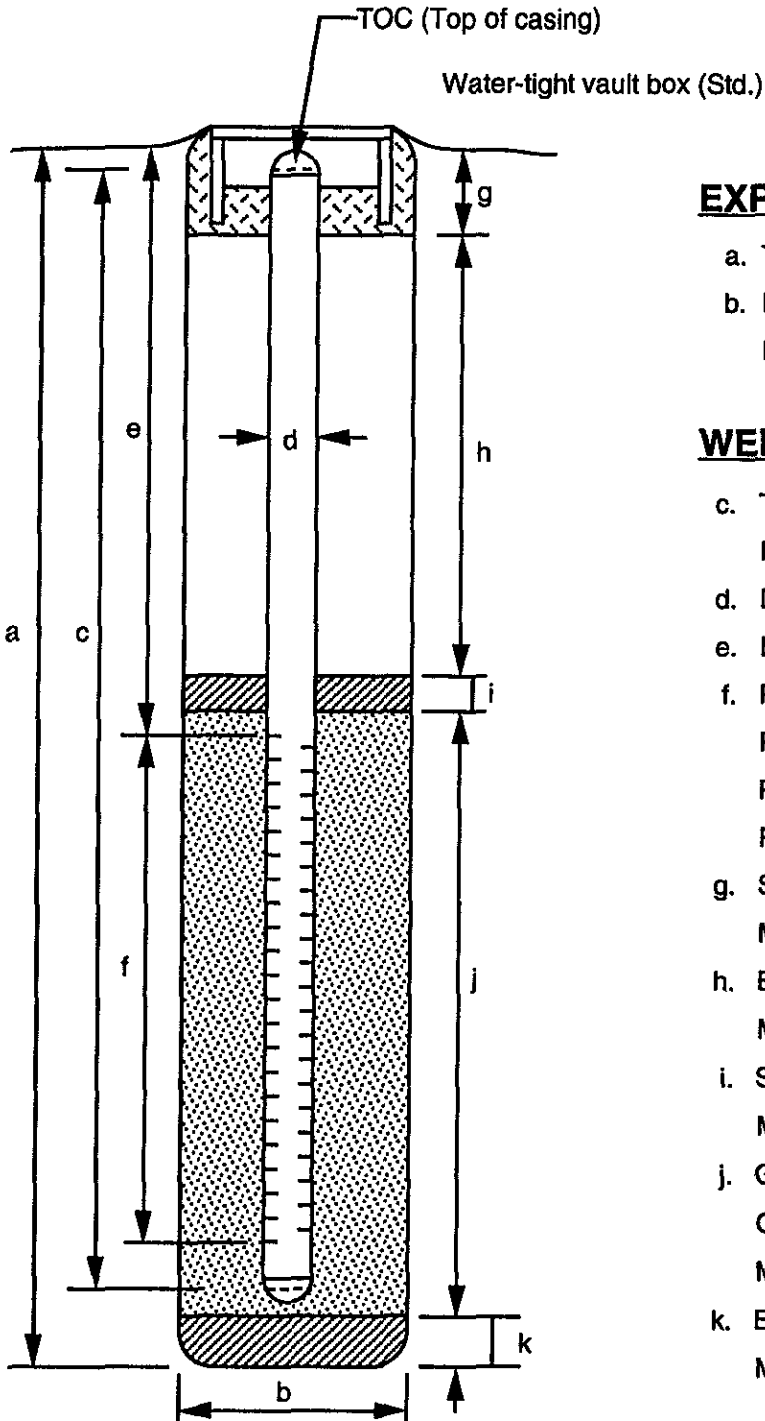
c. Total casing length 24.5 ft.
 Material Schedule 40 PVC
 d. Diameter 4.0 in.
 e. Depth to top perforations 10.0 ft.
 f. Perforated length 14.0 ft.
 Perforated interval from 10.0 to 24.0 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 5.5 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 16.5 ft.
 Gravel pack interval from 8.5 to 25.0 ft.
 Material #3 Sand
 k. Bottom seal/fill 1.5 ft.
 Material Native Slough

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. VW-6
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. 107.76
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. 108.16
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/3/95



EXPLORATORY BORING

a. Total depth 20.0 ft.
 b. Diameter 10.0 in.
 Drilling method Hollow Stem Auger

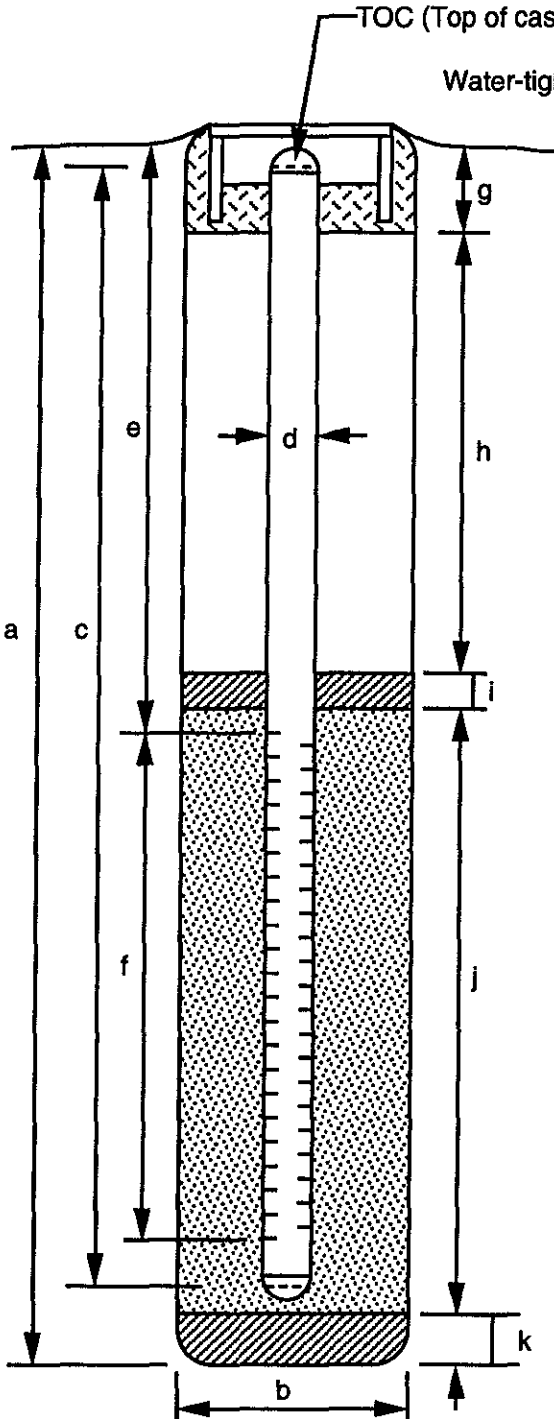
WELL CONSTRUCTION

c. Total casing length 19.5 ft.
 Material Schedule 40 PVC
 d. Diameter 4.0 in.
 e. Depth to top perforations 5.1 ft.
 f. Perforated length 14.0 ft.
 Perforated interval from 5.1 to 19.1 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 0.5 ft.
 Material Concrete
 h. Backfill 2.0 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 4.5 ft.
 Gravel pack interval from 4.5 to 20.0 ft.
 Material #3 Sand
 k. Bottom seal/fill na ft.
 Material _____

WELL DETAILS



PROJECT NUMBER 0805-135.04 BORING / WELL NO. VW-7
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. 107.52
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. 107.96
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/3/95



EXPLORATORY BORING

a. Total depth 25.0 ft.
 b. Diameter 10.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

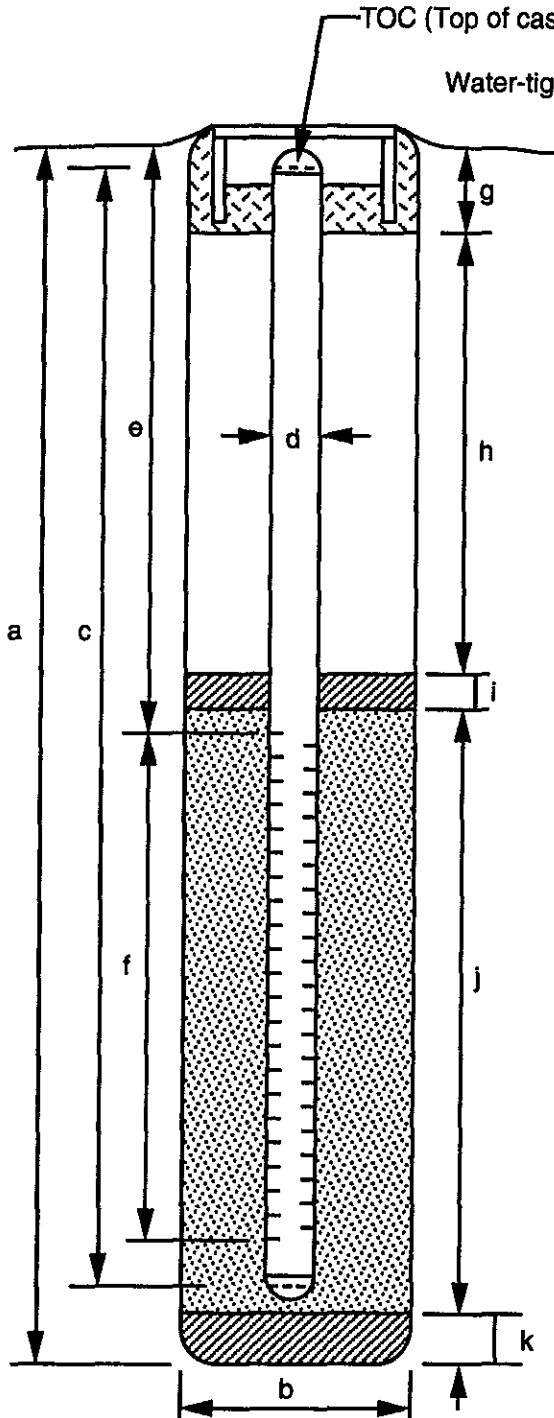
c. Total casing length 23.9 ft.
 Material Schedule 40 PVC
 d. Diameter 4.0 in.
 e. Depth to top perforations 9.1 ft.
 f. Perforated length 14.0 ft.
 Perforated interval from 9.1 to 23.1 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 4.5 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 17.5 ft.
 Gravel pack interval from 7.5 to 25.0 ft.
 Material #3 Sand
 k. Bottom seal/fill 1.5 ft.
 Material Native Slough

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. VW-8
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. 107.43
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. 107.91
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/3/95



EXPLORATORY BORING

a. Total depth 25.0 ft.
 b. Diameter 10.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

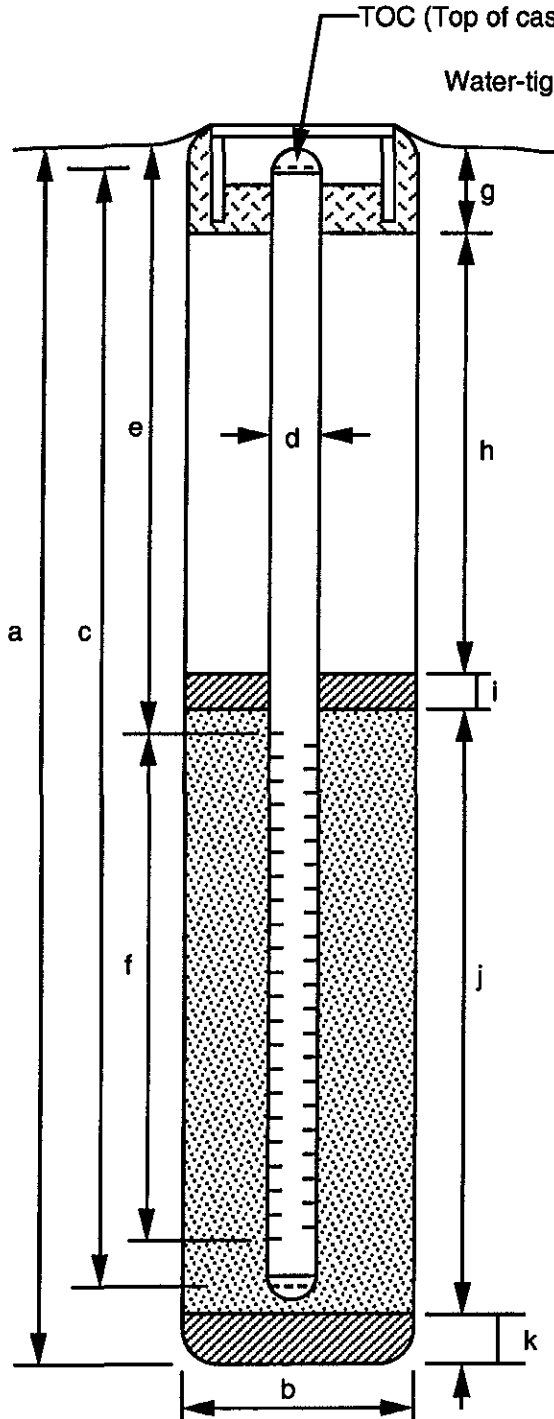
c. Total casing length 24.7 ft.
 Material Schedule 40 PVC
 d. Diameter 4.0 in.
 e. Depth to top perforations 9.8 ft.
 f. Perforated length 14.0 ft.
 Perforated interval from 9.8 to 23.8 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 6.0 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 14.0 ft.
 Gravel pack interval from 9.0 to 25.0 ft.
 Material #3 Sand
 k. Bottom seal/fill 1.5 ft.
 Material Native Slough

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. VW-9
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. 106.18
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. 106.54
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/1/95



EXPLORATORY BORING

a. Total depth 25.0 ft.
 b. Diameter 10.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

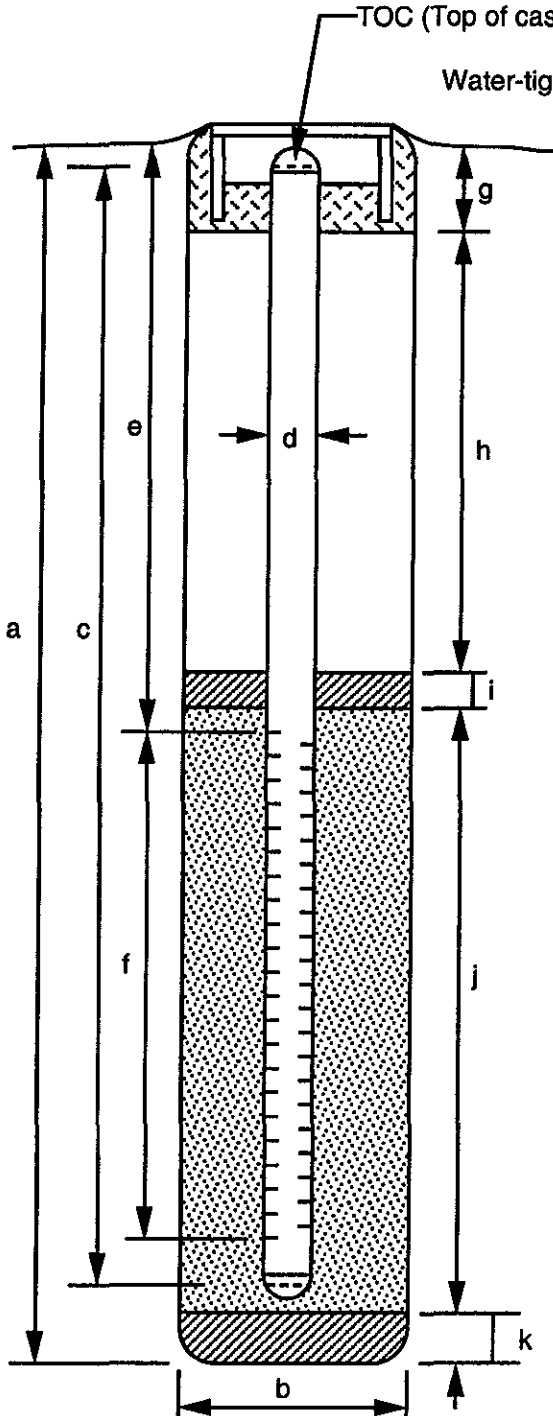
c. Total casing length 24.4 ft.
 Material Schedule 40 PVC
 d. Diameter 4.0 in.
 e. Depth to top perforations 9.9 ft.
 f. Perforated length 14.0 ft.
 Perforated interval from 9.9 to 23.9 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 5.5 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 17.0 ft.
 Gravel pack interval from 8.0 to 25.0 ft.
 Material #3 Sand
 k. Bottom seal/fill 1.5 ft.
 Material Native Slough

WELL DETAILS



EMCON
ASSOCIATES

PROJECT NUMBER 0805-135.04 BORING / WELL NO. VW-10
 PROJECT NAME ARCO 6148 TOP OF CASING ELEV. 106.73
 LOCATION 5131 Shattuck Ave., Oakland GROUND SURFACE ELEV. 107.18
 WELL PERMIT NO. 95453 DATUM M.S.L.
 INSTALLATION DATE 8/1/95



EXPLORATORY BORING

a. Total depth 25.0 ft.
 b. Diameter 10.0 in.
 Drilling method Hollow Stem Auger

WELL CONSTRUCTION

c. Total casing length 24.6 ft.
 Material Schedule 40 PVC
 d. Diameter 4.0 in.
 e. Depth to top perforations 10.2 ft.
 f. Perforated length 14.0 ft.
 Perforated interval from 10.2 to 24.2 ft.
 Perforation type Machine Slotted
 Perforation size 0.020 inch
 g. Surface seal 1.0 ft.
 Material Concrete
 h. Backfill 6.0 ft.
 Material Cement
 i. Seal 2.0 ft.
 Material Bentonite
 j. Gravel pack 16.0 ft.
 Gravel pack interval from 9.0 to 25.0 ft.
 Material #3 Sand
 k. Bottom seal/fill 1.5 ft.
 Material Native Slough

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **7/31/95**

BORING NO. **AS-2**
 PAGE **1 OF 2**
 SURFACE ELEV. **107.89 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						ASPHALT.		
						SANDY GRAVEL (GP), Aggregate roadbase.		
0.0	9/18	16 23 29		5	■	SANDY SILT (ML), mottled light olive brown (2.5Y, 5/4) and dark grayish brown (2.5Y, 3/2); 80-85% low-plasticity fines; 15-20% fine-grained sand; hard; damp; no hydrocarbon odor.		
0.0	14/18	21 27 33		10	■	@10 to 11.5': As above; 65% low-plasticity fines; 20-25% fine-grained sand; 10-15% fine to coarse gravel.		
12.0	16/18	16 16 19		15	■	SILTY GRAVEL (GM), dark brown (10YR, 3/3); 30% low-plasticity fines; 50% fine to coarse-grained sand; 20% fine to coarse gravel (to 2" dia.); dense; moist (wet in fractures); hydrocarbon odor.		
45.0	16/18	26 30 40	7/31/95 ▽	20	■	CLAYEY GRAVEL (GC), as above; 30-35% medium-plasticity fines; hydrocarbon odor.		

REMARKS

Boring drilled to a depth of 29 feet below grade surface (bgs) by West Hazmat using 8" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 2" dia. PVC air sparge well screened from 20.5 to 21.5 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0805-135.04
 PROJECT NAME Arco Station #6148
 BY R.K.D. DATE 7/31/95

BORING NO. AS-2
 PAGE 2 OF 2
 SURFACE ELEV. 107.89 ft.

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
--	0/18	23 27 33 18					CLAYEY GRAVEL (GC), continued.	
--	18/18	14 20 30					SILTY CLAY (CL), yellowish brown (10YR, 5/4); 90-95% low to medium-plasticity fines; 5-10% fine to coarse-grained sand; trace fine gravel; stiff; moist; no hydrocarbon odor.	
--	14/18	35 50/5"		25			CLAYEY SAND (SC), light olive brown (2.5Y, 5/4); 30% medium-plasticity fines; 40% fine to coarse-grained sand; 30% fine to coarse gravel (to 1" dia.); coarse sand and gravel clasts are subangular to angular; medium dense; wet; no hydrocarbon odor.	
--	10/18	6 20 20					CLAYEY GRAVEL (GC), light olive brown (2.5Y, 5/4); 10-30% medium-plasticity fines; 30% fine to coarse-grained sand; 40% fine to coarse gravel; dense; wet; no hydrocarbon odor.	
				30			BORING TERMINATED AT 29 FEET BGS.	
				35				
				40				



REMARKS

Boring drilled to a depth of 29 feet below grade surface (bgs) by West Hazmat using 8" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 2" dia. PVC air sparge well screened from 20.5 to 21.5 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0805-135.04

BORING NO. AS-3

PROJECT NAME Arco Station #6148

PAGE 1 OF 2

BY R.K.D. DATE 8/2/95

SURFACE ELEV. 108.34 ft.

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						ASPHALT.		
						SANDY GRAVEL (GP), Aggregate roadbase.		
0.0	18/18	7 10 13		5	█	CLAYEY SILT (ML), very dark grayish brown (10YR, 3/2); 85-90% low to medium-plasticity fines; 10-15% fine to coarse-grained sand; very stiff; damp; no hydrocarbon odor.		
0.0	17/18	7 9 14		10	█	@10': As above.		
53.0	18/18	11 23 27	8/2/95	15	█	CLAYEY GRAVEL to CLAYEY SAND (GC-SC), 30% medium-plasticity fines; 30-40% fine to coarse-grained sand; 30-40% fine to coarse gravel (to 1.5" dia.); very dense; damp; hydrocarbon odor.		
65.0	18/18	6 10 10			█	SILTY CLAY (CL), mottled dark gray (2.5Y, 4/0) and light olive brown (2.5Y, 5/0); 90-95% low to medium-plasticity fines; 5-10% fine-grained sand; very stiff; moist (wet at 18'); hydrocarbon odor.		
71.0	18/18	6 6		20	█			

REMARKS

Boring drilled to a depth of 29 feet below grade surface (bgs) by West Hazmat using 8" dia. hollow-stem augers. Samples collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 2" dia. PVC air sparge well screened from 19.6 to 21.6 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/2/95**

BORING NO. **AS-3**
 PAGE **2 OF 2**
 SURFACE ELEV. **108.34 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
--	18/18	5 10 11 12				[Hatched Pattern]	CLAYEY SAND (SC) , yellowish brown (10YR, 5/4); 30% medium-plasticity fines; 70% fine to coarse-grained sand; medium dense; wet; no hydrocarbon odor.	
--	24/24	4 4 9 6				[Vertical Lines Pattern]	SANDY CLAY (CL) , yellowish brown (10YR, 5/4); 65% low to medium-plasticity fines; 35% fine to coarse-grained sand; medium dense; moist to wet; no hydrocarbon odor.	
0.0	18/18	8 13 17		25		[Vertical Lines Pattern]	SILT to SANDY SILT (ML) , light yellowish brown (10YR, 5/4); 80-90% low to medium-plasticity fines; 10-20% fine to coarse-grained sand; very stiff; moist; no hydrocarbon odor.	
--	18/18	12 12 23				[Hatched Pattern]	CLAYEY GRAVEL (GC) , yellowish brown (10YR, 5/4); 20-30% medium-plasticity fines; 20-30% fine to coarse-grained sand; 50% fine to coarse gravel (to 2" dia.), subangular; dense; wet; no hydrocarbon odor.	
							BORING TERMINATED AT 29 FEET BGS.	
							30	
							35	
							40	



REMARKS
 Boring drilled to a depth of 29 feet below grade surface (bgs) by West Hazmat using 8" dia. hollow-stem augers. Samples collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 2" dia. PVC air sparge well screened from 19.6 to 21.6 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/2/95**

BORING NO. **AS-4**
 PAGE **1 OF 2**
 SURFACE ELEV. **107.26 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0	13/18	5 6 7		5			SANDY CLAY (CL) , dark grayish brown (10YR, 3/2); 60% medium-plasticity fines; 15-30% fine to coarse-grained sand.	
0.0	13/18	5 4 7		10			SILTY SAND (SM) , dark brown (10YR, 3/3); 20-25% low-plasticity fines; 75-80% fine to coarse-grained sand; medium dense; damp; no hydrocarbon odor. @10 to 10.8': As above; 10% fine to coarse gravel.	
85.0	16/18	12 14 19		15			CLAYEY SAND (SC) , dark brown (10YR, 3/3); 30-40% medium-plasticity fines; 55-60% fine to coarse-grained sand; 5% fine gravel; firm; damp; no hydrocarbon odor. @12.5': mottled dark gray (2.5Y, 4/0) and light olive brown (2.5Y, 5/4); 25-30% medium-plasticity fines; 50% fine to coarse-grained sand; 20-25% fine to coarse gravel, subangular to angular; medium dense to dense; moist; no hydrocarbon odor.	
56.0	5/18	7 9 13		15				
11.0	8/18	10 20 20	8/2/95 ▽	20			CLAYEY SAND TO CLAYEY GRAVEL (SC-GC) , light olive brown (2.5Y, 5/4) to dark grayish brown (10YR, 3/2); 25% medium-plasticity fines; 35-40% fine to coarse-grained sand; 35-40% fine to coarse gravel; dense; moist to wet (water visible in pockets and fractures beginning at 16.5'); hydrocarbon odor.	

REMARKS

Boring drilled to a depth of 29 feet below grade surface (bgs) by West Hazmat using 8" dia. hollow-stem augers. Samples collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 2" dia. PVC air sparge well screened from 25.6 to 27.6 feet bgs. Groundwater was encountered at 17.5 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0805-135.04
 PROJECT NAME Arco Station #6148
 BY R.K.D. DATE 8/2/95

BORING NO. AS-4
 PAGE 2 OF 2
 SURFACE ELEV. 107.26 ft.

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0	17/18	11 13 17					From 20 to 23.5': Interbedded, 30% SANDY SILT (ML) and 70% SILTY SAND (SM).	
0.0	16/18	7 7 9					SANDY SILT (ML), light yellowish brown (10YR, 5/4); 75-85% low to medium-plasticity fines; 15-25% fine-grained sand; trace fine gravel; stiff; wet; no hydrocarbon odor.	
--	14/18	9 11 12		25			SILTY SAND (SM), yellowish brown (10YR, 5/4); 15-30% low-plasticity fines; 70-80% fine to coarse-grained sand; medium dense to dense; wet; no hydrocarbon odor.	
--	12/18	12 14 18					CLAYEY SAND (SC), light olive brown (2.5Y, 5/4); 30% medium-plasticity fines; 40% fine to coarse-grained sand; 30% fine to coarse gravel (to 1" dia.), subangular to angular clasts; medium dense; wet; no hydrocarbon odor.	
							CLAYEY GRAVEL (GC), light olive brown (2.5Y, 5/4); 30% medium-plasticity fines; 30% fine to coarse-grained sand; 40% fine to coarse gravel; dense; wet; no hydrocarbon odor.	
BORING TERMINATED AT 29 FEET BGS.								



REMARKS
 Boring drilled to a depth of 29 feet below grade surface (bgs) by West Hazmat using 8" dia. hollow-stem augers. Samples collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 2" dia. PVC air sparge well screened from 25.6 to 27.6 feet bgs. Groundwater was encountered at 17.5 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/2/95**

BORING NO. **AS-5**
 PAGE **1 OF 2**
 SURFACE ELEV. **106.69 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						ASPHALT.		
						SANDY GRAVEL (GP), Aggregate roadbase.		
0.0	8/18	13 6 8		5		FILL: Wood, brick and concrete fragments.		
0.0	15/18	8 8 15		10		SANDY CLAY (CL), dark brown (10YR, 3/3); 60% medium-plasticity fines; 30-35% fine to coarse-grained sand; 5-10% fine to coarse gravel (to 1.5" dia.); very stiff; damp; no hydrocarbon odor.		
125.0	5/18	10 20 22				CLAYEY GRAVEL (GC), dark olive gray (5Y, 3/2); 25% medium-plasticity fines; 35-40% fine to coarse-grained sand; 35-40% fine to coarse gravel; medium dense; moist; hydrocarbon odor.		
58.0	6/18	12 15 15		15		@15': As above.		
			8/2/95			@17': Wet.		
0.0	14/18	6 9 13				CLAYEY SAND (SC), yellowish brown (10YR, 5/4); 15-25% medium-plasticity fines; 60% fine to coarse-grained sand; 15-25% fine to coarse gravel; medium dense; moist; no hydrocarbon odor.		
				20				

REMARKS

Boring drilled to a depth of 29 feet below grade surface (bgs) by West Hazmat using 8" dia. hollow-stem augers. Samples collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 2" dia. PVC air sparge well screened from 24.6 to 26.6 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/2/95**

BORING NO. **AS-5**
 PAGE **2 OF 2**
 SURFACE ELEV. **106.69 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0	12/18	6 11					CLAYEY SAND (SC), continued.	
--	18/18	7 12 11					CLAYEY GRAVEL (GC), yellowish brown (10YR, 5/4); 20-30% medium-plasticity fines; 20-30% fine to coarse-grained sand; 50% fine to coarse gravel; dense; wet; no hydrocarbon odor.	
--	18/18	20 20 23		25			@25': As above.	
--	18/18	6 12 21					@28': As above.	
				30			BORING TERMINATED AT 29 FEET BGS.	
				35				
				40				



REMARKS
 Boring drilled to a depth of 29 feet below grade surface (bgs) by West Hazmat using 8" dia. hollow-stem augers. Samples collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 2" dia. PVC air sparge well screened from 24.6 to 26.6 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.DAVIS** DATE **7/31/95**

BORING NO. **AS/VW-2**
 PAGE **2 OF 2**
 SURFACE ELEV. **NA ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				25				
				30			BORING TERMINATED AT 28 FEET BGS.	
				35				
				40				



REMARKS

Boring/well drilled out to 28 feet below grade surface (bgs) by West Hazmat using 12" dia. hollow-stem augers. No samples were collected for this boring. Backfilled to surface with neat cement through augers and capped with concrete. No groundwater was encountered. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **7/31/95**

BORING NO. **VW-2**
 PAGE **1 OF 2**
 SURFACE ELEV. **NA ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
							ASPHALT.	
0.0	14/18	7 11 29		5			FILL: SANDY GRAVEL (GP) to SANDY SILT (ML), occassional brick fragments; damp; no hydrocarbon odor.	
0.0	16/18	15 20 27		10			SANDY SILT (ML), dark olive gray (5Y, 3/2); 50% non to low-plasticity fines; 30% fine to coarse-grained sand; 20% fine to coarse gravel (to 1" dia.); damp; no hydrocarbon odor.	
							@10': As above.	
21.0	17/18	18 20 25	7/31/95	15			SILTY SAND (SM), dark brown (10YR, 3/3); 30% low-plasticity fines; 50% fine to coarse-grained sand; 20% fine to coarse gravel (to 2" dia.); dense; moist (wet in fractures); hydrocarbon odor. @15.5 to 16.5': mottled dark gray (2.5Y, 4/0) and light olive brown (2.5Y, 5/4).	
				20				



REMARKS
 Boring drilled to 26.5 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples were collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 9.8 to 23.8 feet bgs. Groundwater was encountered at 16 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **7/31/95**

BORING NO. **VW-2**
 PAGE **2 OF 2**
 SURFACE ELEV. **NA ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0	17/18	12					SILTY SAND (SM), continued.	
35.0		23					SILT (ML), light yellowish brown (10YR, 6/4); non to low-plasticity fines; trace fine-grained sand; very stiff; wet; no hydrocarbon odor.	
		32					SILTY GRAVEL (GM), yellowish brown (10YR, 5/4); 25-30% low-plasticity fines; 20% fine to coarse-grained sand; 50-55% fine to coarse gravel (to 1.5" dia.); very dense; wet; hydrocarbon odor.	
--	16/18	7		25			@25': As above; medium dense; hydrocarbon odor.	
		11						
		15						
							BORING TERMINATED AT 26.5 FEET BGS.	
				30				
				35				
				40				



REMARKS
 Boring drilled to 26.5 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples were collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 9.8 to 23.8 feet bgs. Groundwater was encountered at 16 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **7/31/95**

BORING NO. **VW-4**
 PAGE **1 OF 2**
 SURFACE ELEV. **NA ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						ASPHALT. FILL: Aggregate roadbase.		
0.0	18/18	17 19 24		5			CLAYEY SILT (ML), very dark grayish brown (10YR, 3/2); 85-90% low to medium-plasticity fines; very stiff; damp; no hydrocarbon odor.	
0.0	17/18	12 15 23		10			@10': As above. CLAYEY SAND (SC), yellowish brown (10YR, 5/6); 20-30% low to medium-plasticity fines; 60-70% fine to coarse-grained sand; 10% fine gravel; dense; damp; no hydrocarbon odor.	
0.0	10/12	26 50/4"		15			@15': As above; mottled dark gray (2.5Y, 4/0) and light olive brown (2.5Y, 5/4); moist; no hydrocarbon odor.	
0.0	14/18	21 19 25					@17': Wet.	
			7/31/95 ▽					

REMARKS

Boring drilled to 26.5 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 10 to 19.2 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER 0805-135.04
 PROJECT NAME Arco Station #6148
 BY R.K.D. DATE 7/31/95

BORING NO. VW-4
 PAGE 2 OF 2
 SURFACE ELEV. NA ft.

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT. SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0	16/18	10 15 15				<p>CLAYEY SAND (SC), continued.</p> <p>CLAYEY SILT (ML), light yellowish brown (10YR, 6/4); 90-95% low to medium-plasticity fines; 5-10% fine-grained sand; stiff; wet; no hydrocarbon odor.</p> <p>CLAYEY GRAVEL (GC), yellowish brown (10YR, 5/4); 20-30% medium-plasticity fines; 30-35% fine to coarse-grained sand; 35-40% fine to coarse gravel; medium dense; wet; no hydrocarbon odor. @25': As above.</p>	
--	12/18	12 21 25		25		<p>BORING TERMINATED AT 26.5 FEET BGS.</p>	
				30			
				35			
				40			



REMARKS
 Boring drilled to 26.5 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 10 to 19.2 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/1/95**

BORING NO. **VW-5**
 PAGE **1 OF 2**
 SURFACE ELEV. **NA ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
				5	1		ASPHALT.	
				10	2		FILL: SILTY to SANDY GRAVEL (GM), dark brown; aggregate base material.	
				15	3		SANDY SILT (ML), dark brown (7.5YR, 3/2); 60-65% low to medium-plasticity fines; 30% fine to coarse-grained sand; 5-10% fine to coarse gravel; very stiff; damp; no hydrocarbon odor.	
				16	4		@10': As above.	
				21	5		SANDY CLAY (CL), dark olive gray (5Y, 3/2); 60-65% medium-plasticity fines; 25% fine to coarse-grained sand; 10-15% fine to coarse gravel (to 1" dia.); very stiff; moist; hydrocarbon odor.	
0.5	16/18	10 21 24		20	6		CLAYEY SAND (SC), yellowish brown (10YR, 5/4); 20-30% medium-plasticity fines; 60% fine to coarse-grained sand; 10-20% fine gravel; dense; moist; hydrocarbon odor.	
0.8	14/18	7 11 12		16.9	7			
91.0	18/18	15 16	8/1/95	16.9	8			
54.0		21	▽	16.9	9			

REMARKS

Boring drilled to 26.5 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples were collected using a 2" dia. modified- California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 10 to 24 feet gbs. Groundwater was encountered at 16.9 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**

BORING NO. **VW-5**

PROJECT NAME **Arco Station #6148**

PAGE **2 OF 2**

BY **R.K.D.** DATE **8/1/95**

SURFACE ELEV. **NA ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
38.0		7					<p>SANDY CLAY (CL), dark olive gray (5Y, 3/2); 60-70% medium-plasticity fines; 30-40% fine to coarse-grained sand; stiff; wet; hydrocarbon odor.</p> <p>CLAYEY GRAVEL (GC), yellowish brown (10YR, 5/4); 20% medium-plasticity fines; 30% fine to coarse-grained sand; 50% fine to coarse gravel (to 1.5" dia.); medium dense; wet; no hydrocarbon odor.</p>	
2.1	17/18	11						
		11					<p>CLAYEY SAND (SC), yellowish brown (10YR, 5/4); 20-30% medium-plasticity fines; 60% fine to coarse-grained sand; 10-20% fine gravel; dense; moist; no hydrocarbon odor.</p> <p>SANDY SILT (ML), yellowish brown (10YR, 5/4); 85% low-plasticity fines; 15% fine-grained sand; very stiff; wet; no hydrocarbon odor.</p> <p>CLAYEY GRAVEL (GC), yellowish brown (10YR, 5/4); 20% medium-plasticity fines; 30% fine to coarse-grained sand; 50% fine to coarse gravel (to 1.5: dia.); medium dense; wet; no hydrocarbon odor.</p>	
3.2	9/18	6		25				
		12						
		18						
				30				
				35				
				40				

BORING TERMINATED AT 26.5 FEET BGS.

REMARKS

Boring drilled to 26.5 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples were collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 10 to 24 feet gbs. Groundwater was encountered at 16.9 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/3/95**

BORING NO. **VW-6**
 PAGE **1 OF 1**
 SURFACE ELEV. **108.16 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						CONCRETE.		
						SANDY GRAVEL (GP), aggregate roadbase; very dense.		
540	16/18	7 13 18		5	5	@4.5': Hydrocarbon odors observed during hand augering. SILTY SAND (SM), olive gray (5Y, 4/2); 30-40% low-plasticity fines; 60-70% fine to medium-grained sand; dense; moist; hydrocarbon odor.		
825	14/18	5 8 12			8	@7.5': As above; trace fine gravel; medium dense; moist; hydrocarbon odor.		
145	10/18	10 12 18		10	10	GRAVEL (GP), mottled olive gray (5Y, 4/2) and light olive brown (2.5Y, 5/4); 10% low to medium-plasticity fines; 30% fine to coarse-grained sand; 60% fine to coarse gravel, subangular, weathered, fractured; medium dense; damp; hydrocarbon odor.		
300	9/12	29 50/5"		15	15	CLAYEY GRAVEL (GC), mottled olive brown (5Y, 4/4); and light olive brown (2.5Y, 5/4); 20-25% medium-plasticity fines; 30-35% fine to coarse-grained sand; 45% fine to coarse gravel (to 2" dia.); very dense; moist; hydrocarbon odor.		
150	5/18	21 25 33		20	20	@19': As above. BORING TERMINATED AT 20 FEET BGS.		

REMARKS

Boring drilled to 20 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 5.1 to 19.1 feet bgs. No groundwater was encountered. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/3/95**

BORING NO. **VW-7**
 PAGE **1 OF 2**
 SURFACE ELEV. **107.96 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						ASPHALT.		
						FILL: SANDY GRAVEL (GP).		
0.0	17/18	5 13 14		5		SANDY SILT (ML) , dark yellowish brown (10YR, 4/4); 60-70% low-plasticity fines; 30-40% fine-grained sand; stiff; damp; no hydrocarbon odor.		
						SILTY SAND (SM) , dark yellowish brown (10YR, 4/4); 30-35% low-plasticity fines; 65-70% fine-grained sand; medium dense; damp; no hydrocarbon odor.		
0.0	16/18	13 15 17		10		CLAYEY GRAVEL (GC) , dark brown (10YR, 3/3); 15% medium-plasticity fines; 30% fine to coarse-grained sand; 55% fine to coarse gravel (to 2" dia.); dense; damp; no hydrocarbon odor.		
21	16/18	6 10 10				@12.5': As above; mottled dark grayish brown and light olive brown; 25% medium-plasticity fines; 35% fine to coarse-grained sand; 40% fine to coarse gravel; medium dense; moist; hydrocarbon odor.		
15	11/18	7 19 11		15		@17.5': Wet in voids and fractures. @18': No hydrocarbon odor.		
37	11/18	11 16 21						
125	13/18	6 7 13						
			8/3/95			CLAYEY SAND (SC) , described on next page.		



REMARKS
 Boring drilled to 25 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 9.1 to 23.1 feet bgs. Groundwater was encountered at 19 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0805-135.04

BORING NO. VW-7

PROJECT NAME Arco Station #6148

PAGE 2 OF 2

BY R.K.D. DATE 8/3/95

SURFACE ELEV. 107.96 ft.

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0	17/18	5 11 7					CLAYEY SAND (SC), dark yellowish brown (10YR, 4/4); 30-40% low to medium-plasticity fines; 60-70% fine to medium-grained sand; trace coarse sand; trace fine gravel; iron oxide staining; medium dense; wet; no hydrocarbon odor.	
0.0	18/18	5 9 11		25			CLAYEY GRAVEL (GC), dark brown (10YR, 3/3); 15% medium-plasticity fines; 40% fine to coarse-grained sand; 45% fine to coarse gravel; medium dense; wet; no hydrocarbon odor.	
							BORING TERMINATED AT 25 FBG. SAMPLED TO A DEPTH OF 26.5 FEET BGS.	
				30				
				35				
				40				



REMARKS

Boring drilled to 25 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 9.1 to 23.1 feet bgs. Groundwater was encountered at 19 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0805-135.04
 PROJECT NAME Arco Station #6148
 BY R.K.D. DATE 8/1/95

BORING NO. VW-8
 PAGE 1 OF 2
 SURFACE ELEV. 107.91 ft.

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						ASPHALT.		
						FILL: SANDY GRAVEL (GP), aggregate roadbase.		
0.0	15/18	7 11 18		5		CLAYEY SILT (ML), very dark grayish brown (10YR, 3/2); 85% low to medium-plasticity fines; 10% fine to coarse-grained sand; 5% fine gravel; very stiff; damp; no hydrocarbon odor.		
						SILTY SAND (SM), dark yellowish brown (10YR, 3/4); 35% nonplastic fines; 65% fine-grained sand; medium dense; damp; no hydrocarbon odor.		
0.0	16/18	9 12 17		10		CLAYEY GRAVEL (GC), dark brown (10YR, 3/3); 20-30% medium-plasticity fines; 20% fine to coarse-grained sand; 50-60% fine to coarse gravel, subangular; occasionally well weathered; medium dense; moist; no hydrocarbon odor.		
33	15/18	13 17 19	8/1/95 ▽	15		CLAYEY SAND to CLAYEY GRAVEL (SC-GC), mottled light olive brown (2.5Y, 5/4) and dark olive gray (5Y, 3/2); 20-30% medium-plasticity fines; 30-40% fine to coarse-grained sand; 30-40% fine to coarse gravel, subangular to angular; fractured; dense; wet; hydrocarbon odor.		
				20		CLAYEY SAND (SC), described on next page.		



REMARKS
 Boring drilled to 25 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 9.8 to 23.8 feet bgs. Groundwater was encountered at 16.5 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/1/95**

BORING NO. **VW-8**
 PAGE **2 OF 2**
 SURFACE ELEV. **107.91 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
--	14/18	7 6 7		25	1	1	<p>CLAYEY SAND (SC), light olive brown (2.5Y, 5/4); 20-25% medium-plasticity fines; 45-50% fine to coarse-grained sand; 25-30% fine to coarse gravel; medium dense; wet; no hydrocarbon odor.</p>	1
--	11/18	7 7 7		25	1	1	<p>CLAYEY GRAVEL (GC), light olive brown (2.5Y, 5/4); 20% medium-plasticity fines; 25-30% fine to coarse-grained sand; 50-55% fine to coarse gravel; medium dense; wet; no hydrocarbon odor.</p>	1
							<p>BORING TERMINATED AT 25 FBG. SAMPLED TO A DEPTH OF 26.5 FEET BGS.</p>	
				30				
				35				
				40				



REMARKS
 Boring drilled to 25 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 9.8 to 23.8 feet bgs. Groundwater was encountered at 16.5 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER 0805-135.04

BORING NO. VW-9

PROJECT NAME Arco Station #6148

PAGE 1 OF 2

BY R.K.D. DATE 8/1/95

SURFACE ELEV. 106.54 ft.

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						ASPHALT.		
						FILL: SANDY GRAVEL (GP), aggregate roadbase.		
2.8	14/18	6 11 14		5		SANDY CLAY (CL), dark yellowish brown (10YR, 4/4); 60% medium-plasticity fines; 30-35% fine to coarse-grained sand; 5-10% fine to coarse gravel (to 1.5" dia.); very stiff; damp; no hydrocarbon odor.		
						SAND (SP), dark yellowish brown (10YR, 4/4); 5-10% medium-plasticity fines; 90-95% fine to coarse-grained sand; trace fine gravel (to 1" dia.); medium dense; damp; no hydrocarbon odor.		
2.6	16/18	9 9 9		10		CLAYEY SAND (SC), yellowish brown (10YR, 5/4); 15-25% medium-plasticity fines; 60% fine to coarse-grained sand; 15-25% fine to coarse gravel (to 1" dia.); medium dense; moist; no hydrocarbon odor.		
301	12/18	10 12 14		15		CLAYEY GRAVEL to CLAYEY SAND (GC-SC), dark olive gray (5Y, 3/2); 25% medium-plasticity fines; 35-40% fine to coarse-grained sand; 35-40% fine to coarse gravel; medium dense; very moist; hydrocarbon odor.		
			8/1/95			CLAYEY SAND (SC), described on next page.		

REMARKS

Boring drilled to 25 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 9.9 to 23.9 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.



LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/1/95**

BORING NO. **VW-9**
 PAGE **2 OF 2**
 SURFACE ELEV. **106.54 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
2.0	18/18	15 15 21					CLAYEY SAND (SC) , yellowish brown (10YR, 5/4); 20-30% medium-plasticity fines; 60% fine to coarse-grained sand; 10-20% fine gravel; dense; wet; hydrocarbon odor.	
2.1	18/18	14 18 23		25			CLAYEY GRAVEL (GC) , yellowish brown (10YR, 5/4); 20-30% medium-plasticity fines; 20-30% fine to coarse-grained sand; 50% fine to coarse gravel (to 1.5" dia.); dense; wet; no hydrocarbon odor.	
							BORING TERMINATED AT 25 FBG. SAMPLED TO A DEPTH OF 26.5 FEET BGS.	
				30				
				35				
				40				



REMARKS

Boring drilled to 25 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 9.9 to 23.9 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/1/95**

BORING NO. **VW-10**
 PAGE **1 OF 2**
 SURFACE ELEV. **107.18 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
						ASPHALT.		
						FILL: SANDY GRAVEL (GP), aggregate roadbase.		
0.0	10/18	7 7 11		5	█	SANDY SILT (ML), dark yellowish brown (10YR, 4/4); 60-65% non to low-plasticity fines; 35-40% fine-grained sand; stiff; damp; no hydrocarbon odor.		
0.0	12/18	8 10 21		10	█	@10': yellowish brown (10YR, 5/4); hard; slightly damp; no hydrocarbon odor.		
85	14/18	12 14 18		15	█	@15': As above.		
			8/1/95 ▽			CLAYEY GRAVEL (GC), 15% low-plasticity fines; 30% fine to coarse-grained sand; 55% fine gravel; damp; no hydrocarbon odor.		
						SAND (SP), very dark gray (10YR, 3/1); 5-10% nonplastic fines; 90-95% fine to coarse-grained sand; dense; wet; hydrocarbon odor.		
				20		CLAYEY GRAVEL (GC), described on next page.		



REMARKS

Boring drilled to 25 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 10.2 to 24.2 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

LOG OF EXPLORATORY BORING

PROJECT NUMBER **0805-135.04**
 PROJECT NAME **Arco Station #6148**
 BY **R.K.D.** DATE **8/1/95**

BORING NO. **VW-10**
 PAGE **2 OF 2**
 SURFACE ELEV. **107.18 ft.**

PID Reading (ppm)	Sample Recovery (in./in.)	Penetration (Blows per 6")	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-GRAPHIC COLUMN	DESCRIPTION	WELL DETAIL
0.0	14/18	6 9 11					<p>CLAYEY GRAVEL (GC), 20-25% low-plasticity fines; 20% fine to coarse-grained sand; 55-60% fine to coarse gravel (to 2" dia.); medium dense; wet; no hydrocarbon odor.</p> <p>SANDY CLAY (CL).</p>	
--	14/18	7 8 10		25			@25': As above.	
<p>BORING TERMINATED AT 25 FBG. SAMPLED TO A DEPTH OF 26.5 FEET BGS.</p>								
				30				
				35				
				40				



REMARKS

Boring drilled to 25 feet below grade surface (bgs) by West Hazmat using 10" dia. hollow-stem augers. Samples collected using a 2" dia. modified-California split-spoon sampler. Boring completed as a 4" dia. PVC vapor extraction well screened from 10.2 to 24.2 feet bgs. Groundwater was encountered at 17 feet bgs. See explanation sheet for definition of symbols used in well detail and sample columns of this log.

APPENDIX E
FIELD DATA SHEETS

EMCON - Groundwater Sampling and Analysis Request Form

PROJECT NAME : **ARCO 6148**
5131 Shattuck Ave., Oakland

EMCON Project #: 0805-135.0#
4 (002)

DATE REQUESTED : **07-Aug-95**

Project Manager: John Young

Groundwater Monitoring Instructions	Treatment System Instructions
<p>Special Request- Well Development and Sampling Develop wells as usual using a surge block, bailer, and centrifugal pump if desired. Continue development until settleable solids and turbidity are at a minimum and the last three readings are stable. Wells are to be sampled Friday, August 11th. You will need to bring the water trailer for purge water transport.</p> <p>Sample ID's on the C-O-C and the sample bottles must include the depth at which the sample was collected [i.e. MW-1 (30)]</p>	<p>No treatment system at this site.</p> <p>Mark Adler Pager # (408) 932-6574</p>

Site Contact: Balaji Angle

Site Phone: (510) 654-3461

Well Locks: Dolphin

Well ID or Source	Casing Diameter (inches)	Casing Length (feet)	Floating Product (feet)	Analyses Requested
AS-2	2.0	22.0	ND	<p>Depth To Water Develop TPH-Gas/BTEX</p>
AS-3	2.0	22.5	ND	
AS-4	2.0	28.5	ND	
AS-5	2.0	27.0	ND	

Laboratory Instructions:
Provide lowest detection limits possible.

ND = None Detected IP = Intermittent Product

WELL DEVELOPMENT FIELD DATA SHEET

Project Number: 0805-135.04(002)

Performed By: DG/MG

Client: ARCO 6148

Date: 8/7/95

Location: Oakland, CA

Well ID: A5-2

Casing Diameter: 2 inch 3 inch 4 inch 4.5 inch 6 inch Other _____

Depth to Water (feet): Start 17.47 End 18.60

Well Total Depth (feet): Start 22.15 End 22.15

One Casing Volume at Start (gal): 276 Total Volume Purged (gal): 14.0

DEVELOPMENT METHOD

Centrifugal Pump Bailer (Teflon ®) Surge Block (Swab)
 Submersible Pump Bailer (PVC) Other _____

FIELD INSTRUMENTS

pH, EC, Temp. Meter NTU Meter Imhoff Cone Colorimeter Other _____

Purge Water Disposal Method: ARCO Tanks

Date	Time	Cumulative Discharge (gal)	Temp. (°F)	E.C. @ 25°C (µmho/cm)	pH (Std)	Turbidity		Color		Odor	Settleable Solids (%)
						Visual Heavy Moderate Light Trace	NTU Scale = 0-200 or 0-1000	Visual Clear Cloudy Yellow Brown...	Cobalt Scale = 0 to 500		
8/7/95	1326	2.0	76.5	737	6.99	Heavy	7200	Brown	7500	None	40%
8/7	1336	5.0	76.0	760	6.48	↓		↓		↓	10%
8/7	1348	10.0	74.8	482	6.46	↓		↓		↓	2%
8/7	1353	12.0	74.4	480	6.46	↓		↓		↓	2%
8/7	1357	14.0	74.5	481	6.51	↓		↓		↓	2%

WELL INTEGRITY: Good LOCK #: Dolphin

REMARKS: Swabbed for 20 min prior to purging

SIGNATURE: [Signature] REVIEWED BY: [Signature] Page 1 of 4

WELL DEVELOPMENT FIELD DATA SHEET

Project Number: 0805-135-04

Performed By: M.G.

Client: ARCO# 6148

Date: 8-7-85

Location: DAKLAND, CA

Well ID: AS-3

Casing Diameter: 2 inch 3 inch 4 inch 4.5 inch 6 inch Other _____

Depth to Water (feet): Start 18.18 End 21.90

Well Total Depth (feet): Start 22.3 End 22.3

One Casing Volume at Start (gal): 0.67 Total Volume Purged (gal): 7.0

DEVELOPMENT METHOD

Centrifugal Pump Bailer (Teflon®) Surge Block (Swab)
 Submersible Pump Bailer (PVC) Other _____

FIELD INSTRUMENTS

pH, EC, Temp. Meter NTU Meter Imhoff Cone Colorimeter Other _____

Purge Water Disposal Method: Trailer

Date	Time	Cumulative Discharge (gal)	Temp. (° F)	E.C. @ 25° C (µmho/cm)	pH (Std)	Turbidity		Color		Odor	Settleable Solids (%)
						Visual Heavy Moderate Light Trace	NTU Scale = 0-200 or 0-1000	Visual Clear Cloudy Yellow Brown ..	Cobalt Scale = 0 to 500		
7/7/85	1335	1.0	74.8	1371	6.98	Heavy	7200	BRN	7500	None	90%
↓	1344	2.0	74.3	1176	7.12	"	"	"	"	"	80%
8/8/85	1044	3.0	73.2	1028	6.97	"	"	"	"	"	5%
	1120	4.0	70.7	954	6.79	"	"	"	"	"	3%
	1148	5.0	70.0	827	6.74	"	"	"	"	"	1%
	1208	6.0	70.9	835	6.78	"	"	"	"	"	1%
↓	1230	7.0	71.2	832	6.80	"	"	"	"	"	1%

WELL INTEGRITY: Good LOCK #: Dolphin

REMARKS: well was swabbed 20 min prior to purging

SIGNATURE: [Signature] REVIEWED BY: [Signature] Page 2 of 4

WELL DEVELOPMENT FIELD DATA SHEET

Project Number: 0805-135.04(002)

Performed By: D.L./M.G.

Client: ARCO 6148

Date: 8/7/95

Location: Oakland, CA

Well ID: AS-4

Casing Diameter: 2 inch 3 inch 4 inch 4.5 inch 6 inch Other _____

Depth to Water (feet): Start 16.61 End 16.83

Well Total Depth (feet): Start 28.05 End 28.16

One Casing Volume at Start (gal): 1.87 Total Volume Purged (gal): 25

DEVELOPMENT METHOD

Centrifugal Pump Bailer (Teflon®) Surge Block (Swab)
 Submersible Pump Bailer (PVC) Other _____

FIELD INSTRUMENTS

pH, EC, Temp. Meter NTU Meter Imhoff Cone Colorimeter Other _____

Purge Water Disposal Method: ARCO Tank

Date	Time	Cumulative Discharge (gal)	Temp. (° F)	E.C. @ 25° C (µmho/cm)	pH (Std)	Turbidity		Color		Odor	Settleable Solids (%)
						Visual Heavy Moderate Light Trace	NTU Scale = 0 - 200 or 0 - 1000	Visual Clear Cloudy Yellow Brown...	Cobalt Scale = 0 to 500		
8/7/95	1233	2.5	76.2	607	6.61	Heavy	>200	Brown	>50	None	40%
8/7/95	1243	10.0	76.3	470	6.44	Heavy	>200	Brown	>500	None	10%
8/7/95	1256	20.0	75.8	485	6.39	↓		↓		↓	25%
8/7/95	1302	22.5	74.9	478	6.33	↓		↓		↓	25%
8/7/95	1307	25.0	74.8	475	6.31	↓		↓		↓	25%

WELL INTEGRITY: Good LOCK #: Delphin

REMARKS: Scrubbed for 20 min prior to purging

SIGNATURE: [Signature] REVIEWED BY: [Signature] Page 3 of 4

WELL DEVELOPMENT FIELD DATA SHEET

Project Number: 0805-135.04 (002) Performed By: D. Gonzalez / M.G.
 Client: ARCO 6148 Date: 8/7/95
 Location: Oakland, CA Well ID: AS-5

Casing Diameter: 2 inch 3 inch 4 inch 4.5 inch 6 inch Other _____
 Depth to Water (feet): Start 17.88 End 25.83
 Well Total Depth (feet): Start 26.90 End 26.90
 One Casing Volume at Start (gal): 1.47 Total Volume Purged (gal): 7.5

DEVELOPMENT METHOD

Centrifugal Pump Bailer (Teflon @) Surge Block (Swab)
 Submersible Pump Bailer (PVC) Other _____

FIELD INSTRUMENTS

pH, EC, Temp. Meter NTU Meter Imhoff Cone Colorimeter Other _____

Purge Water Disposal Method: ARCO Tank

Date	Time	Cumulative Discharge (gal)	Temp. (° F)	E.C. @ 25° C (µmho/cm)	pH (Std)	Turbidity		Color		Odor	Settleable Solids (%)
						Visual Heavy Moderate Light Trace	NTU Scale = 0 - 200 or 0 - 1000	Visual Clear Cloudy Yellow Brown...	Cobalt Scale = 0 to 500		
8/7/95	1213	1.5	77.3	1037	7.28	Heavy	7200	Brown	7500	None	40%
8/7	1411	3.0	72.6	773	6.93						40%
8/8/95	1027	4.5	72.6	754	6.97						1%
	1110	6.0	71.9	733	7.01						1%
✓	1139	7.5	71.0	724	6.98						1%

WELL INTEGRITY: Good LOCK #: Dolphin

REMARKS: Well was scrubbed for 20 min prior to purging

SIGNATURE: [Signature] REVIEWED BY: [Signature] Page 4 of 4



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

Rev. 3/2/94

PROJECT NO: 0805-135-04
PURGED BY: J WILLIAMS
SAMPLED BY: J WILLIAMS

SAMPLE ID: AS-2 (22)
CLIENT NAME: APCO 6148
LOCATION: Oakland, Ca

TYPE: Ground Water Surface Water Treatment Effluent Other
CASING DIAMETER (inches): 2 3 4 4.5 6 Other

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): .77
DEPTH TO WATER (feet): 17.46 CALCULATED PURGE (gal.): 2.32
DEPTH OF WELL (feet): 22.2 ACTUAL PURGE VOL (gal.): 3

DATE PURGED: 08-11-95 Start (2400 Hr) 1203 End (2400 Hr) 1212
DATE SAMPLED: 08-11-95 Start (2400 Hr) --- End (2400 Hr) 1216

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1206</u>	<u>1</u>	<u>6.63</u>	<u>511</u>	<u>77.5</u>	<u>BROWN</u>	<u>HEAVY</u>
<u>1209</u>	<u>2</u>	<u>6.62</u>	<u>515</u>	<u>74.3</u>	<u>BROWN</u>	<u>HEAVY</u>
<u>1212</u>	<u>3</u>	<u>6.67</u>	<u>510</u>	<u>74.0</u>	<u>BROWN</u>	<u>HEAVY</u>
---	---	---	---	---	---	---

D. O. (ppm): NR ODOR: WONG NR NR
Field QC samples collected at this well: NR Parameters field filtered at this well: NR
(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

PURGING EQUIPMENT

SAMPLING EQUIPMENT

- | | | | |
|---|---|--|--|
| <input type="checkbox"/> 2" Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input type="checkbox"/> Centrifugal Pump | <input checked="" type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |
- Other: _____ Other: _____

WELL INTEGRITY: OK LOCK #: Dolphin

REMARKS: _____

Meter Calibration: Date: 8-11-95 Time: 1150 Meter Serial #: 9020 Temperature °F: 73.3
(EC 1000 1019/1000) (DI _____) (pH 7 7.05/7.00) (pH 10 10.02/10.00) (pH 4 4.02/---)

Location of previous calibration: _____

Signature: [Signature] Reviewed By: [Signature] Page 1 of 4



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

Rev. 3, 2/94

PROJECT NO: 0805-135-04

SAMPLE ID: AS-3 (22)

PURGED BY: J WILLIAMS

CLIENT NAME: ARCO 6148

SAMPLED BY: J WILLIAMS

LOCATION: Oakland, Ca

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): <u>NR</u>	VOLUME IN CASING (gal.): <u>.49</u>
DEPTH TO WATER (feet): <u>19.30</u>	CALCULATED PURGE (gal.): <u>1.47</u>
DEPTH OF WELL (feet): <u>22.3</u>	ACTUAL PURGE VOL. (gal.): <u>1.5</u>

DATE PURGED: 08-11-95

Start (2400 Hr) 1233

End (2400 Hr) 1246

DATE SAMPLED: 08-11-95

Start (2400 Hr)

End (2400 Hr) 1250

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. ($\mu\text{mhos/cm @ } 25^\circ\text{C}$)	TEMPERATURE ($^\circ\text{F}$)	COLOR (visual)	TURBIDITY (visual)
<u>1236</u>	<u>.5</u>	<u>6.80</u>	<u>837</u>	<u>73.7</u>	<u>BROWN</u>	<u>HEAVY</u>
<u>1241</u>	<u>1</u>	<u>6.97</u>	<u>889</u>	<u>71.2</u>	<u>BROWN</u>	<u>HEAVY</u>
<u>1246</u>	<u>1.5</u>	<u>6.90</u>	<u>833</u>	<u>70.6</u>	<u>BROWN</u>	<u>HEAVY</u>

D. O. (ppm): NR

ODOR: STRONG

NR NR

Field QC samples collected at this well: NR

Parameters field filtered at this well: NR

(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

PURGING EQUIPMENT

SAMPLING EQUIPMENT

- 2" Bladder Pump
- Centrifugal Pump
- Submersible Pump
- Well Wizard™
- Bailer (Teflon®)
- Bailer (PVC)
- Bailer (Stainless Steel)
- Dedicated

- 2" Bladder Pump
- DDL Sampler
- Dipper
- Well Wizard™
- Bailer (Teflon®)
- Bailer (Stainless Steel)
- Submersible Pump
- Dedicated

Other: _____

Other: _____

WELL INTEGRITY: OK

LOCK #: Dolphin

REMARKS: _____

Meter Calibration: Date: 8-11-96 Time: _____ Meter Serial #: _____ Temperature $^\circ\text{F}$: _____
 (EC 1000 _____ / _____) (DI _____) (pH 7 _____ / _____) (pH 10 _____ / _____) (pH 4 _____ / _____)

Location of previous calibration: AS-2

Signature: Joe Williams

Reviewed By: GW

Page 7 of 4



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

PROJECT NO: 0805-135-04
PURGED BY: J WILLIAMS
SAMPLED BY: J WILLIAMS

SAMPLE ID: AS-4 (28)
CLIENT NAME: ARCO 6148
LOCATION: Oakland Ca

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 1.87
DEPTH TO WATER (feet): 16.51 CALCULATED PURGE (gal.): 5.63
DEPTH OF WELL (feet): 28.0 ACTUAL PURGE VOL. (gal.): 6

DATE PURGED: 08-11-95 Start (2400 Hr) 1309 End (2400 Hr) 1323
DATE SAMPLED: 08-11-95 Start (2400 Hr) — End (2400 Hr) 1327

TIME (2400 Hr):	VOLUME (gal.)	pH (units)	E.C. (umhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1313</u>	<u>2</u>	<u>6.66</u>	<u>435</u>	<u>76.4</u>	<u>BROWN</u>	<u>HEAVY</u>
<u>1318</u>	<u>4</u>	<u>6.53</u>	<u>458</u>	<u>71.2</u>	<u>BROWN</u>	<u>HEAVY</u>
<u>1323</u>	<u>6</u>	<u>6.55</u>	<u>459</u>	<u>70.2</u>	<u>BROWN</u>	<u>HEAVY</u>

D. O. (ppm): NR ODOR: None (COBALT 0 - 500) NR (NTU 0 - 200 or 0 - 1000) NR
Field QC samples collected at this well: NR Parameters field filtered at this well: NR

PURGING EQUIPMENT

SAMPLING EQUIPMENT

- | | | | |
|---|---|--|--|
| <input type="checkbox"/> 2" Bladder Pump | <input type="checkbox"/> Bailer (Teflon®) | <input type="checkbox"/> 2" Bladder Pump | <input checked="" type="checkbox"/> Bailer (Teflon®) |
| <input type="checkbox"/> Centrifugal Pump | <input checked="" type="checkbox"/> Bailer (PVC) | <input type="checkbox"/> DDL Sampler | <input type="checkbox"/> Bailer (Stainless Steel) |
| <input type="checkbox"/> Submersible Pump | <input type="checkbox"/> Bailer (Stainless Steel) | <input type="checkbox"/> Dipper | <input type="checkbox"/> Submersible Pump |
| <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated | <input type="checkbox"/> Well Wizard™ | <input type="checkbox"/> Dedicated |
| Other: _____ | | Other: _____ | |

WELL INTEGRITY: OK LOCK #: Dolphin

REMARKS: _____

Meter Calibration: Date: 8-11-95 Time: _____ Meter Serial #: _____ Temperature °F: _____
(EC 1000 _____ / _____) (DI _____) (pH 7 _____ / _____) (pH 10 _____ / _____) (pH 4 _____ / _____)

Location of previous calibration: AS-2

Signature: Joe S. [Signature] Reviewed By: [Signature] Page 3 of 4



EMCON ASSOCIATES

WATER SAMPLE FIELD DATA SHEET

Rev. 3, 2/94

PROJECT NO: 0805-135-04
PURGED BY: J WILLIAMS
SAMPLED BY: J WILLIAMS

SAMPLE ID: AS-5
CLIENT NAME: ARCO 6148
LOCATION: Oakland, Ca

TYPE: Ground Water Surface Water Treatment Effluent Other

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 1.67
DEPTH TO WATER (feet): 16.52 CALCULATED PURGE (gal.): 5.03
DEPTH OF WELL (feet): 26.8 ACTUAL PURGE VOL. (gal.): 2.5

DATE PURGED: 08-11-95 Start (2400 Hr) 1407 End (2400 Hr) 1417
DATE SAMPLED: 08-11-95 Start (2400 Hr) End (2400 Hr) 1426

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
<u>1414</u>	<u>2</u>	<u>6.95</u>	<u>623</u>	<u>74.3</u>	<u>180 Red</u>	<u>HEAVY</u>
	<u>WELL OPEN AFTER 2.5 GALLONS</u>					
<u>1430</u>		<u>7.02</u>	<u>641</u>	<u>74.5</u>	<u>BROWN</u>	<u>HEAVY</u>
D. O. (ppm):	<u>NR</u>	ODOR:	<u>None</u>		<u>NR</u>	<u>NR</u>
Field QC samples collected at this well:			Parameters field filtered at this well:			
<u>NR</u>			<u>NR</u>			(COBALT 0 - 500) (NTU 0 - 200 or 0 - 1000)

PURGING EQUIPMENT

- 2" Bladder Pump
- Centrifugal Pump
- Submersible Pump
- Well Wizard™
- Bailer (Teflon®)
- Bailer (PVC)
- Bailer (Stainless Steel)
- Dedicated

SAMPLING EQUIPMENT

- 2" Bladder Pump
- DDL Sampler
- Dipper
- Well Wizard™
- Bailer (Teflon®)
- Bailer (Stainless Steel)
- Submersible Pump
- Dedicated

WELL INTEGRITY: OK LOCK #: Dolphin

REMARKS: _____

Meter Calibration: Date: _____ Time: _____ Meter Serial #: _____ Temperature °F: _____
(EC 1000 _____ / _____) (DI _____) (pH 7 _____ / _____) (pH 10 _____ / _____) (pH 4 _____ / _____)

Location of previous calibration: _____

Signature: Joe Williams Reviewed By: SA Page 4 of 4

APPENDIX F

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



August 25, 1995

Service Request No: S951001

John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: 0805-135.01 / TO# 17075.00 / 6148 Oakland

Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on August 11, 1995. 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 Service Request No. S951001 - 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 7, 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 black ink, appearing to read "Steven L. Green".

Steven L. Green
Project Chemist

A handwritten signature in black ink, appearing to read "Annelise J. Bazar".

Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

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
Project: 0805-135.01 / TO# 17075.00 / 6148 Oakland
Sample Matrix: Water

Service Request: S951001
Date Collected: 8/11/95
Date Received: 8/11/95
Date Extracted: NA
Date Analyzed: 8/22,23/95

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

Analyte:	TPH as	Benzene	Toluene	Ethyl-	Xylenes,
Units:	Gasoline	ug/L (ppb)	ug/L (ppb)	benzene	Total
Method Reporting Limit:	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)	ug/L (ppb)
	50	0.5	0.5	0.5	0.5

Sample Name	Lab Code	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes, Total
AS-2 (22)	S951001-001	310	15	2.6	5.9	44
AS-3 (22)	S951001-002	10,000	1,700	380	490	1,600
AS-4 (28)	S951001-003	ND	ND	ND	ND	ND
AS-5 (26)	S951001-004	ND	ND	ND	ND	ND
Method Blank	S950822-WB	ND	ND	ND	ND	ND
Method Blank	S950823-WB	ND	ND	ND	ND	ND

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-135.01 / TO# 17075.00 / 6148 Oakland
Sample Matrix: Water

Service Request: S951001
Date Collected: 8/11/95
Date Received: 8/11/95
Date Extracted: NA
Date Analyzed: 8/22,23/95

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

Sample Name	Lab Code	Percent Recovery α,α,α -Trifluorotoluene
AS-2 (22)	S951001-001	101
AS-3 (22)	S951001-002	92
AS-4 (28)	S951001-003	90
AS-5 (26)	S951001-004	92
MS	S950994-003MS	100
DMS	S950994-003DMS	100
Method Blank	S950822-WB	92
Method Blank	S950823-WB	95

CAS Acceptance Limits: 69-116

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-135.01 / TO# 17075.00 / 6148 Oakland

Service Request: S951001
Date Analyzed: 8/22/95

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

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	25	26.3	105	85-115
Toluene	25	25.1	100	85-115
Ethylbenzene	25	25.0	100	85-115
Xylenes, Total	75	72.6	97	85-115
Gasoline	250	233	93	90-110

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-135.01 / TO# 17075.00 / 6148 Oakland
Sample Matrix: Water

Service Request: S951001
Date Collected: 8/11/95
Date Received: 8/11/95
Date Extracted: NA
Date Analyzed: 8/22,23/95

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

Sample Name: Batch QC
Lab Code: S950994-003

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery				Relative Percent Difference
	MS	DMS		MS	DMS	MS	DMS	CAS	Acceptance Limits	
Gasoline	250	250	ND	235	235	94	94	67-121	<1	

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) John Young	Laboratory name CAS
ARCO engineer Whelan	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 453-7300	Contract number
Consultant name EMCON	Address (Consultant) 1971 Ringwood Ave. San Jose, CA 95131		
			Fax no. (Consultant) (408) 453-0452

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 8020	BTEX/TPH EPA 8020/8015	TPH Modified 8015 Gas Diesel	Oil and Grease 413.1 413.2	TPH EPA 418.1/SM503E	EPA 601/6010	EPA 624/6240	EPA 625/6270	TCMP Metals VOA VOA	Semi VOA VOA	CAM Metals EPA 6010/7000 TLIC STLC	Lead Org./DHS Lead EPA 7420/7421	
			Soil	Water	Other	Ice	Acid															
AS-2(22)	1	2	X			X	HCL	8-11-95	1216		X											
AS-3(22)	2	2	X			X	HCL		1250		X											
AS-4(28)	3	2	X			X	HCL		1327		X											
AS-5(26)	4	2	X			X	HCL	✓	1426		X											

Method of shipment
Sampler will deliver

Special detection Limit/reporting
Lowest Possible

Special QA/QC
As Normal

Remarks
2-40ml HCL
VOAs

#0905-135.01
Lab number

Turnaround time

Condition of sample:	Temperature received:	Priority Rush 1 Business Day <input type="checkbox"/>
Relinquished by sampler <i>[Signature]</i>	Date 8-11-95 Time 1640	Rush 2 Business Days <input type="checkbox"/>
Relinquished by	Date	Expedited 5 Business Days <input type="checkbox"/>
Relinquished by	Date	Standard 10 Business Days <input checked="" type="checkbox"/>
	Received by laboratory <i>[Signature]</i>	Date 8-11-95 Time 1640

**Columbia
Analytical
Services^{inc.}**

August 18, 1995

Service Request No: S950977

John Young
EMCON
1921 Ringwood Avenue
San Jose, CA 95131

Re: 0805-135.04 / TO# 18334.00 / 6148 Oakland

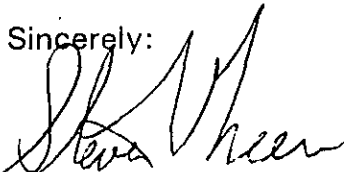
Dear Mr. Young:

The following pages contain analytical results for sample(s) received by the laboratory on August 4, 1995. 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 Service Request No. S950977 - 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:



Steven L. Green
Project Chemist



Annelise J. Bazar
Regional QA Coordinator

SLG/ajb

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
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GC/MS	Gas Chromatography/Mass Spectrometry
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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: 0805-135 04/TO#18334.00/6148 Oakland
Sample Matrix: Soil

Service Request: S950977
Date Collected: 7/31-8/3/95
Date Received: 8/4/95
Date Extracted: NA
Date Analyzed: 8/10-11/95

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

Analyte:	TPH as Gasoline	Benzene	Toluene	Ethyl- benzene	Xylenes, Total
Units:	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)
Method Reporting Limit:	1	0.005	0.005	0.005	0.005

Sample Name	Lab Code	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes, Total
AS-3, 16'	S950977-001	ND	0.34	ND	ND	ND
AS-3, 26.5'	S950977-003	ND	ND	ND	ND	0.007
AS-4, 14'	S950977-006	ND	0.009	ND	ND	0.045
AS-4, 26.5'	S950977-007	ND	ND	ND	ND	ND
AS-5, 28.5'	S950977-008	ND	ND	ND	ND	ND
VW-2, 16.5'	S950977-011	ND	ND	ND	ND	ND
VW-4, 16'	S950977-015	ND	ND	ND	ND	ND
VW-5, 21.5'	S950977-019	ND	ND	ND	ND	ND
VW-8, 26'	S950977-029	ND	ND	ND	ND	ND
VW-9, 16.5'	S950977-032	6	<0.025*	<0.025*	<0.025*	0.026
VW-9, 26'	S950977-033	ND	ND	ND	ND	ND
VW-10, 16'	S950977-034	ND	ND	ND	ND	ND
VW-10, 21'	S950977-035	ND	ND	ND	ND	ND
Method Blank	S950810-SB1	ND	ND	ND	ND	ND
Method Blank	S950811-SB1	ND	ND	ND	ND	ND

* Raised MRL due to high analyte concentration requiring sample dilution.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ARCO Products Company
Project: 0805-135.04/TO#18334.00/6148 Oakland
Sample Matrix: Soil

Service Request: S950977
Date Collected: 7/31-8/3/95
Date Received: 8/4/95
Date Extracted: NA
Date Analyzed: 8/14-17/95

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

Analyte:	TPH as Gasoline	Benzene	Toluene	Ethyl- benzene	Xylenes, Total
Units:	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)
Method Reporting Limit:	5	0.05	0.1	0.1	0.1

Sample Name	Lab Code	TPH as Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes, Total
VW-5, 16'	S950977-018	74	0.7	<0.2*	0.9	1.0
VW-6, 6'	S950977-020	3,100	<5*	86	63	430
VW-6, 8'	S950977-021	2,300	<5*	51	48	310
VW-6, 11.5'	S950977-022	2,100	<2*	7.3	16	110
VW-6 16'	S950977-023	1,700	5.9	94	44	240
VW-7, 17'	S950977-025	30	0.3	0.5	0.6	2.8
Method Blank	S950814-SB1	ND	ND	ND	ND	ND
Method Blank	S950817-SB1	ND	ND	ND	ND	ND

* Raised MRL due to high analyte concentration requiring sample dilution.

APPENDIX A

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-135.04/TO#18334 00/6148 Oakland
Sample Matrix: Soil

Service Request: S950977
Date Collected: 7/31-8/3/95
Date Received: 8/4/95
Date Extracted: NA
Date Analyzed: 8/10-11/95

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

Sample Name	Lab Code	Percent Recovery α,α,α -Trifluorotoluene
AS-3, 16'	S950977-001	112
AS-3, 26.5'	S950977-003	106
AS-4, 14'	S950977-006	98
AS-4, 26.5'	S950977-007	93
AS-5, 28.5'	S950977-008	99
VW-2, 16.5'	S950977-011	90
VW-4, 16'	S950977-015	88
VW-5, 21.5'	S950977-019	79
VW-8, 26'	S950977-029	83
VW-9, 16.5'	S950977-032	113 *
VW-9, 26'	S950977-033	92
VW-10, 16'	S950977-034	91
VW-10, 21'	S950977-035	77
AS-3, 26.5' (MS)	S950977-003MS	98
AS-3, 26.5' (DMS)	S950977-003DMS	102
VW-8, 26' (MS)	S950977-029MS	84
VW-8, 26' (DMS)	S950977-029DMS	92
Method Blank	S950810-SB1	99
Method Blank	S950811-SB1	99

CAS Acceptance Limits: 51-137

* The surrogate used for this sample was 4-bromofluorobenzene.

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-135.04/TO#18334.00/6148 Oakland
Sample Matrix: Soil

Service Request: S950977
Date Collected: 7/31-8/3/95
Date Received: 8/4/95
Date Extracted: NA
Date Analyzed: 8/14-17/95

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

Sample Name	Lab Code	Percent Recovery
		α,α,α -Trifluorotoluene
VW-5, 16'	S950977-018	100
VW-6, 6'	S950977-020	93
VW-6, 8'	S950977-021	88
VW-6, 11.5'	S950977-022	93
VW-6 16'	S950977-023	92
VW-7, 17'	S950977-025	92
Method Blank	S950814-SB1	92
Method Blank	S950817-SB1	92

CAS Acceptance Limits: 59-115

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-135.04/TO#18334.00/6148 Oakland
Sample Matrix: Soil

Service Request: S950977
Date Collected: 7/31-8/3/95
Date Received: 8/4/95
Date Extracted: NA
Date Analyzed: 8/10/95

Matrix Spike/Duplicate Matrix Spike Summary
 BTE
 EPA Methods 5030/8020
 Units: mg/Kg (ppm)
 As Received Basis

Sample Name: AS-3. 26.5'
Lab Code: S950977-003

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery				Relative Percent Difference
	MS	DMS		MS	DMS	CAS		Acceptance Limits		
						MS	DMS			
Benzene	0.050	0.050	ND	0.0559	0.0570	112	114	57-154	2	
Toluene	0.050	0.050	ND	0.0540	0.0565	108	113	60-142	5	
Ethylbenzene	0.050	0.050	ND	0.0577	0.0617	115	123	46-150	7	

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
 Project: 0805-135.04/TO#18334.00/6148 Oakland
 Sample Matrix: Soil

Service Request: S950977
 Date Collected: 7/31-8/3/95
 Date Received: 8/4/95
 Date Extracted: NA
 Date Analyzed: 8/10/95

Matrix Spike/Duplicate Matrix Spike Summary

BTE
 EPA Methods 5030/8020
 Units: mg/Kg (ppm)
 As Received Basis

Sample Name: VW-8, 26'
 Lab Code: S950977-029

Analyte	Spike Level		Sample Result	Spike Result		Percent Recovery				Relative Percent Difference
	MS	DMS		MS	DMS	CAS Acceptance Limits		MS	DMS	
Benzene	0.050	0.050	ND	0.0625	0.0587	125	117	57-154		6
Toluene	0.050	0.050	ND	0.0583	0.0571	117	114	60-142		2
Ethylbenzene	0.050	0.050	ND	0.0614	0.0595	123	119	46-150		3

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-135.04/TO#18334.00/6148 Oakland

Service Request: S950977
Date Analyzed: 8/10/95

Initial Calibration Verification (ICV) Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppm

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	0.050	0.0557	111	85-115
Toluene	0.050	0.0554	111	85-115
Ethylbenzene	0.050	0.0570	114	85-115
Xylenes, Total	0.15	0.159	106	85-115
Gasoline	1.0	0.953	95	90-110

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: ARCO Products Company
Project: 0805-135.04/TO#18334 00/6148 Oakland

Service Request: S950977
Date Analyzed: 8/14/95

Initial Calibration Verification (ICV) Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/California DHS LUFT Method
Units: ppm

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	2.5	2.55	102	85-115
Toluene	2.5	2.45	98	85-115
Ethylbenzene	2.5	1.45	58	85-115
Xylenes, Total	7.5	7.13	95	85-115
Gasoline	25	23.7	95	90-110

ARCO Facility no. **6148** City (Facility) **Oakland** Project manager (Consultant) **John Young**
 ARCO engineer **Mike Whelan** Telephone no. (ARCO) **(408) 377-8697** Telephone no. (Consultant) **(408) 437-9526** Fax no. (Consultant) **(408) 453-7300**
 Consultant name **EMCON** Address (Consultant) **1921 Ringwood Ave.**

Laboratory name
CAS-SJ

Contract number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 802	BTEX/TPH EPA 1632/802/8015 Gas <input checked="" type="checkbox"/> Diesel <input type="checkbox"/>	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals <input type="checkbox"/> VOA <input type="checkbox"/> Semi-Metals <input type="checkbox"/>	CAA Metals EPA 6010/7000 TTL <input type="checkbox"/> STL <input type="checkbox"/>	Lead Org./DHS Lead EPA 7420/7421 <input type="checkbox"/>	HOLD	
			Soil	Water	Other	Ice	Acid															
AS-3, 16'	1	1	/				8/2/95			/												
↓ 19'	2																					
↓ 20.5'	3																					
AS-4, 6.5'	4																					
↓ 11'	5																					
↓ 14'	6																					
↓ 26.5'	7																					
AS-5, 28.5'	8																					
VW-2, 6.5'	9						7/21/95															
↓ 11.5'	10																					
↓ 16.5'	11																					
↓ 21'	12																					
VW-4, 6.5'	13																					
↓ 11'	14																					
↓ 16'	15	↓	↓																			

Method of shipment

Special detection Limit/reporting

Special QA/QC

Remarks
EMCON Project
#0805-155.04

Lab number
89509711

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

Condition of sample: _____ Temperature received: _____

Relinquished by sample **Robert L. Davis** Date **8/4/95** Time **16:35** Received by _____
 Relinquished by _____ Date _____ Time _____ Received by _____
 Relinquished by _____ Date _____ Time _____ Received by laboratory **Joelle Brown** Date **8-1-95** Time **6:35**

ARCO Facility no. **6148** City (Facility) **Oakland** Project manager (Consultant) **John Young**
 ARCO engineer **Mike Whelan** Telephone no. (ARCO) **(408) 337-8697** Telephone no. (Consultant) **(408) 453-7300** Fax no. (Consultant) **(408) 437-9520**
 Consultant name **EMCON** Address (Consultant) **1921 Ringwood Ave.**

Laboratory name **CAS-SJ**
 Contract number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 8020	BTEX/TPH EPA 1602/8020/8015	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM503E	EPA 601/6010	EPA 624/6240	EPA 625/6270	TCLP Metals Sewer Metals <input type="checkbox"/> VOA <input type="checkbox"/>	Sewer Metals EPA 601/7000 TTL <input type="checkbox"/> STL <input type="checkbox"/>	Lead Org./DHS Lead EPA 7420/7421 <input type="checkbox"/>			
			Soil	Water	Other	Ice	Acid																
VW-5, 6.5'	16	1	/				8/1/95																
, 11.5'	17																						
, 16'	18																						
↓, 21.5'	19																						
VW-6, 6'	20						8/3/95																
, 8'	21																						
, 11.5'	22																						
↓, 16'	23																						
VW-7, 11'	24																						
, 17'	25																						
↓, 21'	26																						
VW-8, 6'	27						8/1/95																
, 11.5'	28																						
↓, 26'	29		✓	✓																			

Method of shipment

Special detection Limit/reporting

Special QA/QC

Remarks
EMCON Project # 0805-135.04

Lab number
5900977

Turnaround time

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample: _____ Temperature received: _____

Relinquished by sampler Robert K. Davis	Date 8/4/95	Time 16:35	Received by
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory FOR L23 BLOOM
	Date 8/19/95	Time 16:35	

ARCO Facility no. 6148 City (Facility) Oakland Project manager (Consultant) John Young
 ARCO engineer Mike Whelan Telephone no. (ARCO) Telephone no. (Consultant) (408) 453-7300 Fax no. (Consultant) (408) 437-7526
 Consultant name EMCON Address (Consultant) 1924 Ringwood Ave. San Jose

Laboratory name CAS-55
 Contract number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX/TPH/6AS 60256-0000	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM60E	EPA 801/8010	EPA 824/8240	EPA 825/8270	TCLP Metals Semi Metals <input type="checkbox"/> VOA <input type="checkbox"/>	SEM Metals EPA 601/7000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org./DHS Lead EPA 7420/7421 <input type="checkbox"/>	ASD		
			Soil	Water	Other	Ice	Acid																
VN-9, 6.5'	31	1	/			/	8/1/95																
, 11'	31																						
, 16.5'	32																						
Y, 26'	33																						
VN-10, 16'	34																						
, 21'	35																						
, 6.5'	36																						
↓, 11'	37	↓	↓			↓	↓																

Method of shipment

Special detection Limit/reporting

Special QA/QC

Remarks
 EMCON
 Project #
 0805-135 c.g

Lab number
 9950911

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

Condition of sample: Temperature received:
 Relinquished by sampler Robert L. Davis Date 8/4/95 Time Received by
 Relinquished by Date Time Received by
 Relinquished by Date Time Received by laboratory (Name) Bruce Date 8/7/95 Time 3:30