RESNA
Working To Restore Nature

INITIAL SUBSURFACE INVESTIGATION RELATED TO FORMER WASTE-OIL TANK

at

ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

61035.02
9/29/92
Report prepared for

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

by
RESNA Industries Inc.

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Assistant Project Geologist

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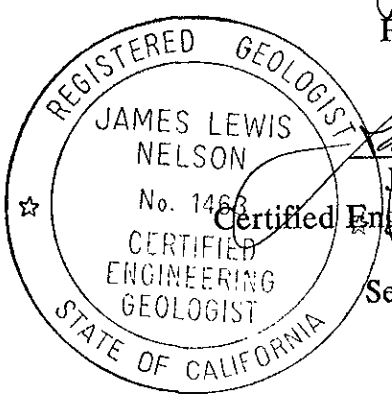
Project Geologist



James L. Nelson
Certified Engineering Geologist No. 1463

September 29, 1992

Applied GeoSystems, Inc.
A RESNA Company

RESNA
Working To Restore Nature

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TRANSMITTAL

TO: Ms. Susan Hugo
ACHCSA
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

DATE: September 29, 1992
PROJECT NUMBER: 61035.02
SUBJECT: ARCO Station 6148 at
5131 Shattuck Avenue, Oakland, CA

FROM: Joel Coffman
TITLE: Project Geologist

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REMARKS: This Work Plan has been forwarded to you at the request of Mr. Mike Whelan at ARCO Products Company.

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Prepared for ARCO Products Company

INTRODUCTION

ARCO Products Company (ARCO) contracted with RESNA Industries Inc. (RESNA) to conduct an initial subsurface investigation related to the former waste-oil tank at ARCO Station 6148 located at 5131 Shattuck Avenue in Oakland, California. In June 1987, a waste-oil tank was removed from the southwestern portion of the site. Soil recovered from beneath the tank at a depth of 20 feet was reported by Crosby & Overton (C&O) to contain 210 parts per million (ppm) motor oil. The objectives of this work were to: 1) evaluate whether hydrocarbon constituents, volatile organic compounds (VOCs), or metals associated with the former waste-oil tank are present in the soil, 2) evaluate whether waste-oil related hydrocarbons have impacted the local groundwater, and 3) evaluate the gradient of the first-water bearing unit beneath the vicinity of the former waste-oil tank.

Work performed for this investigation included drilling four soil borings (B-1 through B-4); collecting and describing soil samples from the borings; installing and developing three 4-inch-diameter groundwater monitoring wells (MW-1 through MW-3) in the borings B-1 through B-3, respectively; sampling groundwater from the monitoring wells; measuring groundwater levels; surveying wellhead elevations; performing laboratory analyses on selected soil and groundwater samples; and preparing this report that presents field procedures, results, and conclusions. This work was performed as outlined in our Work Plan for Initial Subsurface Investigation Related to the Former Waste-Oil Tank (RESNA, August 30, 1991), and Addendum to Work Plan (RESNA, November 7, 1991). These documents were approved by the Alameda County Health Care Services Agency (ACHCSA) prior to commencement of this investigation.

SITE DESCRIPTION AND BACKGROUND

General

The site is an operating gasoline station located on the southwestern corner of the intersection of 52nd Street and Shattuck Avenue in Oakland, California. The site location is shown on the Site Vicinity Map (Plate 1). The site is on a relatively flat lot at an elevation of approximately 110 feet above mean sea level.

Presently, according to information provided by ARCO, there are three 12,000 gallon underground gasoline-storage tanks (USTs) located in the western portion of the site. The locations of the USTs and pertinent site features are shown on the Generalized Site Plan (Plate 2).

Regional and Local Hydrogeology

ARCO Station 6148 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 consist of a heterogeneous mixture of poorly consolidated to unconsolidated clay, silt, sand, and gravel units (Helley and others, 1979). The sediments were derived mainly from bedrock underlying the hills and represent successive coalescing alluvial fans deposited during the Pleistocene epoch.

The sediments found beneath the East Bay Alluvial Plain are believed to be about 200 feet thick in the Berkeley area and are the major groundwater source in the region. Water-yielding capabilities are highly variable. Generally, high yields come only from wells that are screened through several water-bearing sand and gravel beds. Groundwater in the East Bay Plain occurs predominantly under confined conditions and tends to flow toward the San Francisco Bay to the west and southwest (Hickenbottom and Muir, 1988).

PREVIOUS WORK

Previous work performed by C&O and Erico Construction at the site included removal of a waste-oil tank and laboratory analyses of a soil sample from the bottom of the waste-oil tank pit on June 1, 1987, additional excavation and laboratory analyses of soil from the waste-oil tank pit on June 3, 1987, and June 10, 1987. Soil excavated from the waste-oil tank pit was transported to the Class I landfill in Casmalia, California on June 10, 1987, by Erico Construction and C&O.

FIELD WORK

Drilling

Field work at the site was conducted in accordance with RESNA's field protocol in the Work Plan for Initial Subsurface Investigation Related to Former Waste-Oil Tank (RESNA, August 30, 1992) and Site Safety Plan (RESNA, October 10, 1991). A description of the field methods and Site Safety Plan is included in Appendix A, Field Protocol. A well construction permit was acquired from the Alameda County Flood Control and Water Conservation District (ACFCWCD) prior to drilling. A copy of this permit is included in Appendix B. On December 19 and 20, 1991, four soil borings (B-1 through B-4) were drilled at the site and three groundwater monitoring wells (MW-1 through MW-3) were constructed in borings B-1 through B-3, respectively.

To investigate the presence of waste-oil related chemical constituents in the soil and groundwater beneath the former waste-oil tank, boring B-1 was drilled in the former waste-oil tank pit, and groundwater monitoring well MW-1 was installed in the boring. To evaluate the presence of hydrocarbons in the soil and groundwater in the inferred downgradient direction of the former tank pit, borings B-2 and B-3 were drilled west and south, respectively, of the waste-oil tank pit, at the borders of the property, and groundwater monitoring wells MW-2 and MW-3 were installed in borings B-2 and B-3, respectively. To investigate the presence and evaluate the extent of hydrocarbons east of the former underground waste-oil tank, boring B-4 was drilled. The soil boring/monitoring well locations are shown on Plate 2.

Soil Sampling and Description

A total of 25 soil samples were collected from soil borings B-1 through B-4 for classification and possible laboratory analyses. A summary of the Unified Soil Classification System used to identify the soil encountered during drilling is presented on Plate 3, and descriptions of the soil encountered in the borings are presented on the Logs of Borings, Plates 4 through 10. Soil samples from borings B-1 through B-4 were collected at a maximum interval of 5 feet. Sampling procedures are described in Appendix A.

The earth materials encountered during this investigation consisted primarily of sandy clay, sandy silt, silty sand and sandy to clayey gravel. In boring B-1, subrounded to rounded, well sorted pea gravel backfill was encountered immediately below ground surface to a depth of 17 feet. In borings B-2 through B-4, a sandy clay underlain by sandy silt was encountered immediately below an approximately 1-foot thick section of baserock to depths of approximately 11-1/2 and 15-1/2 feet below ground surface. A layer of sandy gravel was encountered below the sandy silt in borings B-2 through B-4, and below the pea gravel in boring B-1 and extended to the depths of approximately 18 and 19 feet. Groundwater was encountered in borings B-1 through B-4 in this sandy gravel at a depth of approximately 18 feet below ground surface. The sandy gravel is underlain by a wet, silty sand layer that grades into a sandy silt in the lower portion of the layer. A stratum of clayey gravel with sand was encountered in borings B-1 through B-3 below the silty sand to sandy silt layer at depths between approximately 25-1/2 and 28-1/2 feet below ground surface and extended to the total depths of these borings (between 29 and 31-1/2 feet). Boring B-4 was terminated at a depth of 20-1/2 feet below ground surface. Graphic interpretations of the soil stratigraphy encountered in the borings are shown on Geologic Cross Sections A-A', and B-B' (Plate 11). Locations of the cross sections are depicted on Plate 2.

Product odor was noted in the soil samples collected just above water (capillary fringe section) at depths between approximately 15 and 20 feet from borings B-1 through B-4. Field Organic Vapor Meter (OVM) readings, which yield order of magnitude estimates only, were taken of soil samples from borings B-1 through B-4. OVM readings ranged from nondetectable to 498 ppm. OVM readings of soil samples collected from borings B-1

through B-4 are shown on the boring logs (Plates 4 through 10) in the column labeled P.I.D. (photoionization detector).

Soil cuttings generated from the borings were temporarily stockpiled onsite in the southwestern corner of the property and covered with plastic sheeting pending disposal. After the completion of drilling on December 20, 1991, four soil samples were collected from the stockpile and submitted for compositing and laboratory analyses for total petroleum hydrocarbons as gasoline (TPHg), total petroleum hydrocarbons as diesel (TPHd), total oil and grease (TOG), and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX). The method used to obtain these samples is described in Appendix A.

Monitoring Well Construction and Development

Three groundwater monitoring wells (MW-1 through MW-3) were constructed in borings B-1 through B-3, respectively. The wells were completed with four-inch-diameter schedule 40 polyvinyl chloride (PVC) casing. Well casings were set in the wells to the depths of approximately 26 feet below ground surface. The screened casings for the monitoring wells consisted of 4-inch-diameter, 0.020 machine slotted PVC set from the total depth of the wells to approximately 13 to 14 feet below the ground surface. Blank PVC casing was set from the top of the screened casing to within a few inches below the ground surface.

The wells were developed on December 23, 1991, to remove fine-grained sediments and to allow better communication between the water-bearing zone and the groundwater monitoring well. Details regarding well construction and development are described in Appendix A.

Groundwater Level Measurement and Sampling

Depths-to-water (DTW) were measured in the wells MW-1 through MW-3, and groundwater samples were collected and visually inspected for floating product initially on December 23, 1991, and January 7, 1992, by RESNA field personnel. Water samples collected from the groundwater monitoring wells MW-1 through MW-3 exhibited hydrocarbon sheen during both monitoring events. Groundwater monitoring wells MW-1 through MW-3 were purged

and sampled on January 7, 1992, but due to the presence of hydrocarbon sheen the samples were not submitted for laboratory analyses. Appendix A contains a description of subjective analyses and sampling procedures used by RESNA, and well purge data sheets.

In January 1992, ARCO's contractor, EMCON Associates (EMCON) of San Jose, California, began monthly monitoring and quarterly sampling at the site. DTW measurements were performed by EMCON field personnel on January 19, February 19, March 18, April 20, May 15, and June 12, 1992. Quarterly sampling was performed by EMCON field personnel on March 18, and June 12, 1992; additional samples were collected from MW-1 and MW-3 on July 2, 1992, to be analyzed for diesel because of the presence of diesel in the blank sample. Groundwater monitoring well MW-2 was not sampled during June sampling event due to the presence of floating product. The results of EMCON's field work on the site, including DTW measurements and subjective analyses for the presence of product in the groundwater are presented on EMCON's Field Report sheets and EMCON's Summary of Groundwater Monitoring Data. These data are included in Appendix C. The detailed summary of the results of the first and second quarter 1992 groundwater monitoring performed at the site by EMCON is presented in the Quarterly Groundwater Monitoring Letter Reports prepared by RESNA, which are listed in the References section.

EVALUATION OF GROUNDWATER GRADIENT

On December 27, 1991, the wellheads for the groundwater monitoring wells MW-1 through MW-3 were surveyed to a local National Geodetic Vertical Datum benchmark by a licensed land surveyor, John E. Koch. The results of this wellhead survey are included in Appendix D, Wellhead Survey. Groundwater elevations for each well were calculated by subtracting the measured DTW from the elevation of the wellhead. The measured DTW, wellhead elevations, and groundwater elevations for first and second quarter 1992, are presented in Table 1, Cumulative Groundwater Monitoring Data.

The groundwater gradient evaluated for the first encountered water-bearing zone is approximately 0.01 to the southwest. Plates 12 and 13, Groundwater Gradient Maps, are graphic interpretations of groundwater gradients measured on December 23, 1991, and January 7, 1992, respectively. Additional gradient maps for first and second quarter 1992

are included in the Quarterly Groundwater Monitoring Letter Reports listed in the References section.

LABORATORY METHODS

Soil Samples

Soil samples were preserved as required by the applicable analytical method, and delivered with Chain of Custody Records to Sequoia Analytical Laboratories (Hazardous Waste Testing Laboratory Certification No. 1210) of Redwood City, California for analyses.

Fourteen soil samples collected from borings B-1 through B-4 were analyzed in accordance with ACHCSA requirements for the gasoline constituents BTEX and TPHg using modified Environmental Protection Agency (EPA) Methods 5030/8015/8020, TPHd using EPA Method 3550/8015, TOG using Standard Method 5520 E&F (Gravimetric), for volatile organic compounds (VOCs) using EPA Method 8240, and the metals cadmium (Cd), chromium (Cr), nickel (Ni), and zinc (Zn) using EPA Method 6010, and lead (Pb) using EPA Method 7421. The soil samples were selected for laboratory analyses based on:

- Location above first-encountered groundwater;
- Location in a potential confining or perching layer below first-encountered groundwater;
- Areas where the presence of hydrocarbons were suspected; and
- At 5-foot intervals and/or change in stratigraphic units, as recommended by state Department of Health Services (DHS) guidelines.

Soil samples collected from the soil stockpile were composited in the laboratory and analyzed for TPHg and BTEX by EPA Method 5030/8015/8020, TPHd by EPA 3550/8015, and TOG by Standard Method 5520 E&F (Gravimetric).

Groundwater Samples

As mentioned in the previous chapter, groundwater samples collected by RESNA field personnel from monitoring wells MW-1 through MW-3 on January 7, 1992, were not submitted for laboratory analyses due to the presence of hydrocarbon sheen.

Under the direction of EMCON, groundwater samples collected on March 18, June 12, and July 2, 1992, were analyzed by Columbia Analytical Services, Inc., located in San Jose, California (Hazardous Waste Testing Laboratory Certification No. 1426). The water samples collected from the wells MW-1 through MW-3 on March 18, 1992, and from wells MW-1 and MW-3 on June 12, were analyzed for TPHg and BTEX using modified EPA Methods 5030/8020 DHS LUFT, TPHd using EPA Method 3510, TOG using Method 5520F-IR/5520C, and volatile organic compounds (VOCs) using EPA 5030/8010. Groundwater samples collected from wells MW-1 through MW-3 on March 18, 1992 were also analyzed for the metals: Cd, Cr, Ni, and Zn using EPA Method 6010, and for Pb using EPA Method 7421.

RESULTS OF LABORATORY ANALYSES

Soil Samples

The results of laboratory analyses of soil samples are summarized in Table 2, Results of Laboratory Analyses of Soil Samples - TPHg, TPHd, BTEX and TOG, and Table 3, Results of Laboratory Analyses of Soil Samples - VOCs, and Metals, and are depicted on Plate 14, TPHg Concentrations in Soil at Depths of 17 to 18.5 feet, and Plate 15, TPHd Concentrations in Soil at Depths of 17 to 18.5 feet. Copies of the laboratory reports and Chain-of-Custody records for the soil samples are included in Appendix E.

Analytical results of soil samples collected from borings B-1 through B-4 generally indicate the following:

- Except for soil samples collected from depths between 17 and 18.5 feet (directly above first encountered groundwater), most soil samples from borings contain low

(less than 2 ppm) or nondetectable concentrations TPHg, BTEX and TPHd. The samples from depths between 17 and 18.5 feet contain up to 740 ppm TPHg, up to 41 ppm (360 ppm detected using different method) BTEX, and up to 540 ppm TPHd. We understand ARCO has not stored diesel on this site and according to analytical results the diesel detected in the soil contains hydrocarbons intermediate of gasoline and diesel (between C-10 and C-12). Thus, the detected TPHd appears to be weathered gasoline.

- o TOG was nondetectable in all samples collected from the soil borings.

- o VOCs (37 compounds tested) were nondetectable in all the soil samples collected from the borings, with the exception of BTEX detected in the samples collected just above first-encountered groundwater (between depths of 17 and 18-1/2 feet).

- o Soil samples collected from the borings contain concentrations of metals (up to 0.95 ppm Cd, 48 ppm Cr, 8.3 ppm Pb, 70 ppm Zn, and 66 ppm Ni) within the typical range of natural background levels for soil (Scott, 1991).

Based on analytical results, the composite soil sample collected from the stockpile contained 25 ppm TPHg, low concentrations of BTEX (up to 0.38 ppm), 11 ppm TPHd, and nondetectable (less than 30 ppm) TOG. These results are shown in Table 2. The soil stockpile was removed from the site and transported to BFI Landfill in Livermore by ARCO's contractor, Dillard Trucking Inc. of Byron, California, on January 10, 1992.

Groundwater Samples

The results of laboratory analyses of groundwater samples are summarized in Table 4, Cumulative Results of Laboratory Analyses of Water Samples - TPHg, TPHd, BTEX, TOG and Metals, and Table 5, Cumulative Results of Laboratory Analyses of Water Samples - VOCs. The Chain of Custody Records and Laboratory Analytical Reports are included in Appendix C. Plates 16 and 17 show concentrations of TPHg and benzene, respectively,in the groundwater on March 18, 1992. Plates 18 and 19 show concentrations of TPHg and benzene, respectively, in the groundwater on June 12, 1992.

Laboratory analyses of groundwater samples from wells MW-1 through MW-3 on March 18, and June 16, 1992, indicate the following:

- TPHg was detected at concentrations ranging from 790 parts per billion (ppb) to 46,000 ppb.

- Benzene was detected at concentrations ranging from 290 ppb to 3,400 ppb. During both monitorings (March 18, and June 12, 1992), benzene concentrations in MW-1 through MW-3 exceeded the State Maximum Contaminant Level (MCL) of 1 ppb benzene in drinking water.

- Toluene, ethylbenzene, and total xylenes were detected at concentrations ranging from 10 ppb to 5,400 ppb. The toluene concentrations exceeded the Drinking Water Action Level (DWAL) of 100 ppb in MW-2 on March 18, 1992; and in MW-3 on March 18, and June 12, 1992. The ethylbenzene concentration exceeded the MCL of 680 ppb in MW-3 on June 12, 1992. The total xylenes concentration exceeded the MCL of 1,750 ppb in MW-3 on June 12, 1992.

- A lower boiling point hydrocarbon mixture quantified as TPHd was detected in MW-2 and MW-3 at concentrations ranging from 230 ppb to 2,800 ppb. The mixture was nondetectable (less than 50 ppb) in the groundwater sample from MW-1. Because the chromatograms of the hydrocarbon mixture do not match the typical diesel fingerprint, and ARCO has stated that diesel has not been stored at this site, it appears that the reported TPHd could be degraded gasoline.

- TOG was detected in MW-2 and MW-3 at concentrations ranging from 1.2 ppm to 16 ppm, and was nondetectable (less than 0.5 ppm) in the groundwater sample from MW-1.

- Trichloroethene (TCE) was detected in MW-1 and MW-2 at concentrations ranging from 1.2 ppb to 2.2 ppb; this chemical was nondetectable (less than 0.5 ppb) in the groundwater from MW-3.

- Tetrachloroethene (PCE) was detected in MW-1 through MW-3 at a concentrations ranging from 1.9 ppb to 19 ppb. PCE exceeded the State MCL of 5 ppb in MW-1 and MW-2 on March 18, 1992, and in MW-1 on June 12, 1992.

- Of metals analyzed in groundwater from MW-1 through MW-3, Cd was nondetectable (less than 3 ppb); Cr was detected at concentrations ranging from 5 ppb to 67 ppb; Pb was detected at concentrations ranging from 3 ppb to 27 ppb; Ni was detected in groundwater samples from MW-2 at a concentration of 38 ppb, at 113 ppb in MW-3, and was nondetectable (less than 20 ppb) in MW-1; and, Zn was detected in groundwater samples from MW-1 through MW-3 at concentrations ranging from 31 ppb to 156 ppb. The Cr concentration exceeded the MCL of 50 ppm in MW-3 on March 18, 1992.

DISCUSSION AND CONCLUSIONS

The presently interpreted extent of hydrocarbon impacted soil beneath the site in the vicinity of the former waste-oil tank pit is presented on the Geologic Cross Sections, Plate 11. The majority of hydrocarbons at concentrations greater than 100 ppm in the soil in the vicinity of the former waste-oil tank pit appears to be at depths between approximately 15 and 20 feet, within the sandy gravel and silty sand layers and directly above the local water table. Because the greatest concentrations of hydrocarbons appears to be limited to a zone directly above the water table it appears that hydrocarbons migrated laterally within the capillary fringe along the top of the water table.

We understand that ARCO has not stored diesel at this site, and according to analytical results the diesel detected in the soil contains hydrocarbons intermediate of gasoline and diesel (between C-10 and C-12). Thus, the reported TPHd appears to be weathered gasoline.

The vertical extent of petroleum hydrocarbons in the soil beneath the vicinity of the former waste-oil tank pit appears to be delineated to less than about 10 ppm TPHg, and less than about 1 ppm BTEX to depths between about 20 and 26 feet. The vertical extent of TOG and apparent weathered gasoline (TPHd) in the vicinity of the former waste-oil tank pit appear to be delineated between depths of 20 and 26 feet.

VOCs were nondetectable (with the exception of BTEX) in the soil samples collected from borings B-1 through B-4; and concentrations of metals (Cd, Cr, Pb, Zn and Ni) were within the range typical of natural background levels for soil.

First groundwater at the site was encountered at a depth of approximately 18 feet. The groundwater gradient and flow direction evaluated for the first encountered water-bearing zone is 0.01 to the southwest. Due to the proximity of the three onsite wells in the immediate vicinity of the former waste-oil tank pit the interpreted gradient may not represent conditions across the entire site.

Groundwater beneath the southwestern portion of the site appears to be impacted by hydrocarbons and VOCs as indicated by the occasional presence of floating product sheen on groundwater samples from monitoring wells MW-1 through MW-3, and laboratory analytical results. The lateral and vertical extent of hydrocarbons in groundwater beneath the site have not been delineated.

LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental engineering and geological practice in California at the time this investigation was performed. This investigation was conducted solely for the purpose of evaluating environmental conditions of the soil and groundwater with respect to petroleum hydrocarbons, and chemical constituents related to an underground waste-oil tank that formerly existed in the southwestern portion of the site. Groundwater monitoring field procedures and acquisition of field and laboratory data were performed under direction of EMCON Associates of San Jose, California; evaluation and warrant of their monitoring field data and field protocols is beyond RESNA's scope of work. RESNA's scope of work was limited to interpretation of groundwater monitoring field and laboratory analytical data, which included evaluating trends in reported hydrocarbon concentrations in the local groundwater, the groundwater gradient, and direction of groundwater flow beneath the site. No soil engineering or geotechnical references are implied or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this assessment is made from a limited number of observation points. Subsurface conditions may vary away from the data points available. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of investigation.

DISTRIBUTION

Copies of this report should be sent to the following regulatory agencies:

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San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, California 94612

REFERENCES

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RESNA. September 28, 1992. Letter Report, Quarterly Groundwater Monitoring Second Quarter 1992 at ARCO Station 6148, 5131 Shattuck Avenue, Oakland, California. 61035.03

Base: U.S. Geological Survey
7.5-Minute Quadrangles
Oakland East/West,
California
Photorevised 1980

N

LEGEND

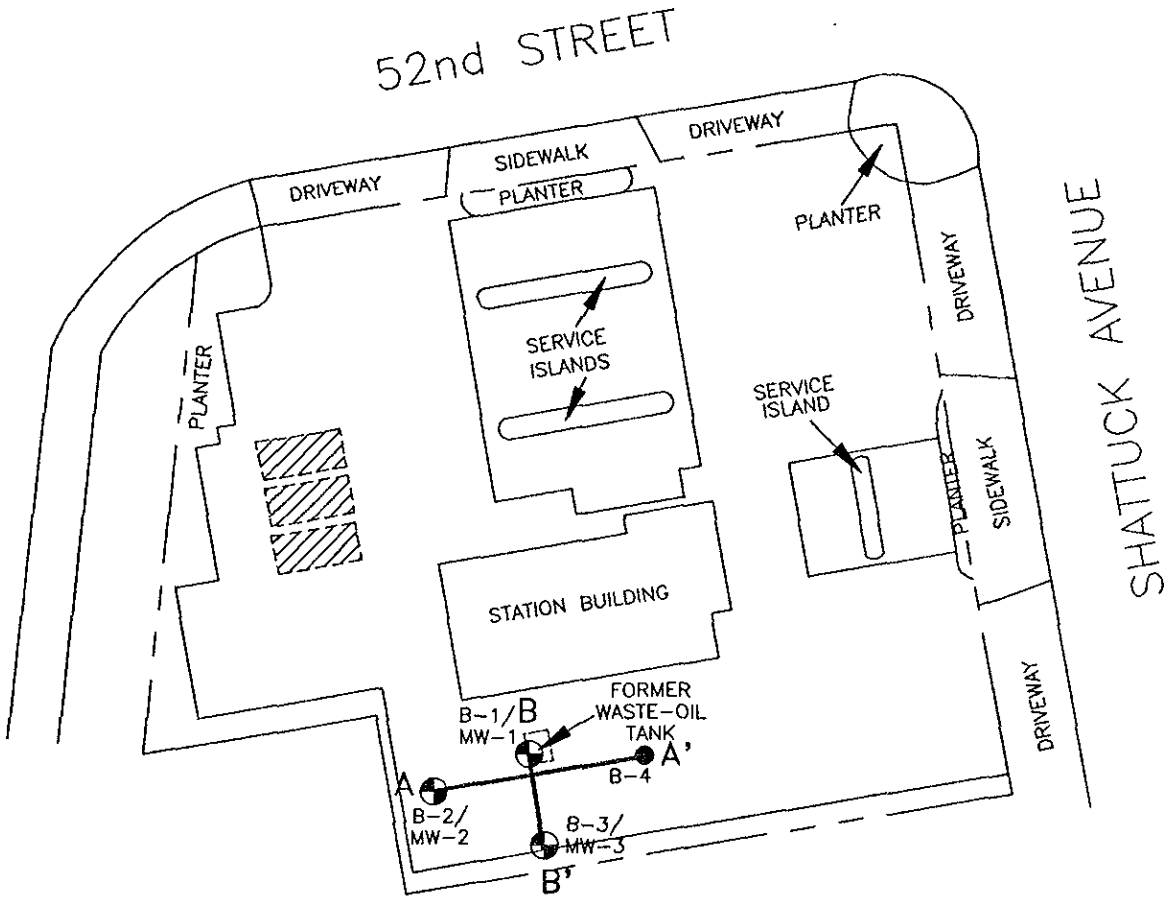
⊙ = Site Location

Approximate Scale

2000 1000 0 2000 4000

feet

RESNA	**SITE VICINITY MAP**	**PLATE**
	ARCO Station 6148 **5131 Shattuck Avenue** **Oakland, California**	**1**
PROJECT 61035.02		



EXPLANATION

B-3/ MW-3 = Monitoring well (RESNA, December 1991)

B-4 = Soil boring (RESNA, December 1991)

= Underground storage tank

B — B' = Geologic cross section

N

Approximate Scale

40 20 0 40 80

feet

Source: Based on ARCO Site Plan dated 1980.

RESNA	**GENERALIZED SITE PLAN** **ARCO Station 6148** **5131 Shattuck Avenue** **Oakland, California**	**PLATE** **2**
PROJECT 61035.02		

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION		LTR	DESCRIPTION
COARSE-GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	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 Gravel, Gravel-Sand-Clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded Sand or Gravelly Sands, little or no fines.
		SP	Poorly-graded Sands or Gravelly Sands, little or no fines.
		SM	Silty Sands, Sand-Silt mixtures.
		SC	Clayey Sands, Sand-Clay mixtures.

MAJOR DIVISION		LTR	DESCRIPTION
FINE-GRAINED SOILS	SILTS AND CLAYS LL<50	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 Silt-Clays of low plasticity.
	SILTS AND 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 Silts.
HIGHLY ORGANIC SOILS		PT	Peat and other highly Organic Soils.


Depth through which sampler is driven


Relatively undisturbed sample


No sample recovered


Static water level observed in well/boring


Initial water level observed in boring

S-10 Sample number


Sand pack


Bentonite


Neat cement


Caved native soil


Blank PVC


Machine-slotted PVC

P.I.D. Photoionization detector

BLOWS REPRESENT THE NUMBER OF BLOWS OF A 140-POUND HAMMER FALLING 30 INCHES TO DRIVE THE SAMPLER THROUGH EACH 6 INCHES OF AN 18-INCH PENETRATION.

DASHED LINES SEPARATING UNITS ON THE LOG REPRESENT APPROXIMATE BOUNDARIES ONLY. ACTUAL BOUNDARIES MAY BE GRADUAL LOGS REPRESENT SUBSURFACE CONDITIONS AT THE BORING LOCATION AT THE TIME OF DRILLING ONLY.

RESNA	**UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY ARCO Station 6148 5131 Shattuck Avenue Oakland, California**	**PLATE 3**
PROJECT 61035.02		

Depth of boring: 29 feet Diameter of boring: 10 inches Date drilled: 12/20/91

Well depth: 26 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 13 to 26 feet Slot size: 0.020-inch

Drilling Company: HEW Drilling Driller: Jasper and Louie

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Paved area – old tank pit.	
0					Asphalt (4 inches).	
				GP	Gravel, brown, damp, loose; subrounded to rounded, well-sorted: pea gravel backfill.	
2						
4						
6					Pea gravel.	
8						
10						
12					Pea gravel.	
14						
16						
18	S-17.5	7 16 22	405	GP	Sandy gravel, with silt, green, moist, dense; obvious product odor.	
				SM	Silty sand, with gravel, light brown, wet, medium dense.	
20					(Section continues downward)	

RESNA

PROJECT: 61035.02

LOG OF BORING B-1/MW-1

ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 4

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22	S-22.5	3 4 7	0	SM	Silty sand, with gravel, light brown, wet, medium dense	
24					More silt, no gravel.	
26	S-26.5	7 2 7	0	GC	Clayey gravel, with sand, light brown, moist to wet, loose to medium dense.	
28		6 8 7				
30					Total depth = 29 feet.	
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

RESNA

PROJECT 61035.02

LOG OF BORING B-1/MW-1

ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 5

Depth of boring: 31-1/2 feet Diameter of boring: 10 inches Date drilled: 12/19/91

Well depth: 26 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 14 to 26 feet Slot size: 0.020-inch

Drilling Company: HEW Drilling Driller: Jasper and Louie

Method Used: Hollow-Stem Auger Field Geologist: Lou Leet

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Paved area.	
0					Asphalt (4 inches).	
				GC	Clayey gravel, dark brown, damp, medium dense; baserock	
				CL	Sandy clay, dark brown, damp, medium plasticity, stiff.	
2						
4						
	S-5.5	5 6 8	0		Color change to brown.	
6						
8						
				ML	Sandy silt, with gravel, brown, damp, low plasticity, stiff; angular gravel.	
10	S-10.5	3 5 10	0			
12	S-12	8 13 16	0	GP	Sandy gravel, light brown, damp, medium dense; angular gravel.	
14					Color change to brown, increasing silt, larger gravel.	
	S-15.5	2 10 16	20	GW	Sandy gravel, with silt, green, moist, medium dense; noticeable product odor, gravel to 1 inch diameter, subrounded.	
16	S-17	12 15 18	359		More sand, very moist, obvious product odor.	
18				SW	Sand, with gravel, light brown, wet, medium dense.	
20	S-20.5	5 6 10	2		(Section continues downward)	

RESNA

PROJECT: 61035.02

LOG OF BORING B-2/MW-2

ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 6

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				SW	Sand, with gravel, light brown, wet, medium dense.	
24						
26	S-25.5	3 3 3	0			
28				ML	Sandy silt, with clay, light brown, moist, medium plasticity, firm.	
30	S-30.5	19 12 20	0	GC	Clayey gravel, with sand, light brown, moist to damp, dense; gravel up to 1-1/2 inches diameter.	
32					Total depth = 31-1/2 feet.	
34						
36						
38						
40						
42						
44						
46						
48						
50						

RESNA

PROJECT 61035.02

LOG OF BORING B-2/MW-2

ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 7

Depth of boring: 29 feet Diameter of boring: 10 inches Date drilled: 12/20/91

Well depth: 26 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 14 to 26 feet Slot size: 0.020-inch

Drilling Company: HEW Drilling Driller: Jasper and Louie

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Paved area.	
0					Asphalt (4 inches).	
				SP	Sandy gravel, brown, damp, loose; baserock.	
				CL	Sandy clay, dark brown, damp, medium plasticity, stiff.	
2						
4				GC	Clayey gravel, with sand, dark brown, damp, medium dense; subangular gravel up to 1 inch diameter	
	S-5.5	4 6 10	0			
6				CL	Sandy clay, with small gravel, dark brown, damp, medium plasticity, stiff; with roots.	
8						
					More gravel.	
10	S-10.5	2 4 6	0	ML	Sandy silt, with gravel, brown, damp, low plasticity, stiff; subangular gravel.	
12						
14					Gravel up to 1 inch diameter.	
	S-15.5	4 8 10	25	GP	Sandy gravel, with silt, green, moist, medium dense; noticeable product odor.	
16	S-17.5	10 14	268		More sand; obvious product odor.	
18	S-19	24 8 13	3	SM	Silty sand, with gravel, green, wet, dense.	
20		18			Color change to light brown, more gravel.	
					(Section continues downward)	

RESNA

PROJECT: 61035.02

LOG OF BORING B-3/MW-3

ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 8

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22				SM	Silty sand, with gravel, light brown, wet, dense.	
24	S-24.5	4 8 12	0		Less gravel.	
				ML	Sandy silt, light brown, wet, low plasticity, very stiff.	
26	S-26.5	10 15 20	0	GC	Clayey gravel, with sand, light brown, moist, dense.	
28		12 16 20	0			
30					Total depth = 29 feet.	
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

RESNA

PROJECT 61035.02

LOG OF BORING B-3/MW-3

ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 9

Depth of boring: 21 feet Diameter of boring: 6 inches Date drilled: 12/19/91

Well depth: N/A Material type: N/A Casing diameter: N/A

Screen interval: N/A Slot size: N/A

Drilling Company: HEW Drilling Driller: Jasper and Louie

Method Used: Hollow-Stem Auger Field Geologist: Barbara Sieminski

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Paved area.	
0					Asphalt (4 inches).	
				GP	Sandy gravel, brown, damp, loose; baserock.	
				CL	Sandy clay, with small gravel, dark brown, damp, medium plasticity, stiff.	
2						
4						
	S-5.5	4 5 6	0		With silt.	
6						
8						
10	S-10.5	2 5 9	0			
				ML	Sandy silt, with gravel, brown, damp, low plasticity, stiff.	
12						
14						
	S-15.5	7 17 16	13			
16				GP	Sandy gravel, with silt, green, damp, dense; noticeable product odor.	
18	S-18.5	4 6 9	76		More sand; obvious product odor.	
		8		SM	Silty sand, with gravel, mottled green-brown, wet, medium dense.	
20	S-20	10 11	9			
					Total depth = 21 feet.	

RESNA

PROJECT: 61035.02

LOG OF BORING B-4

ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 10

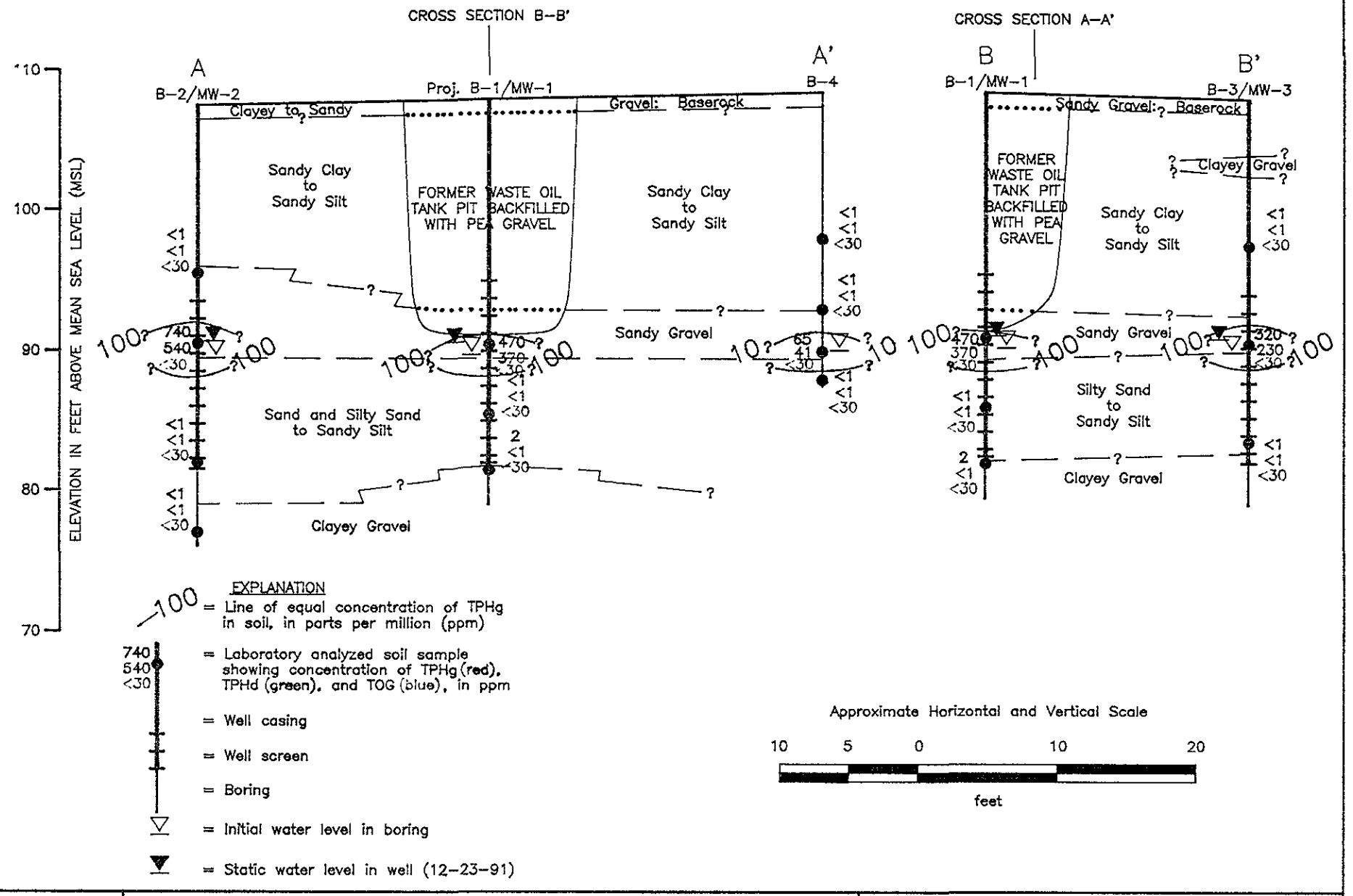
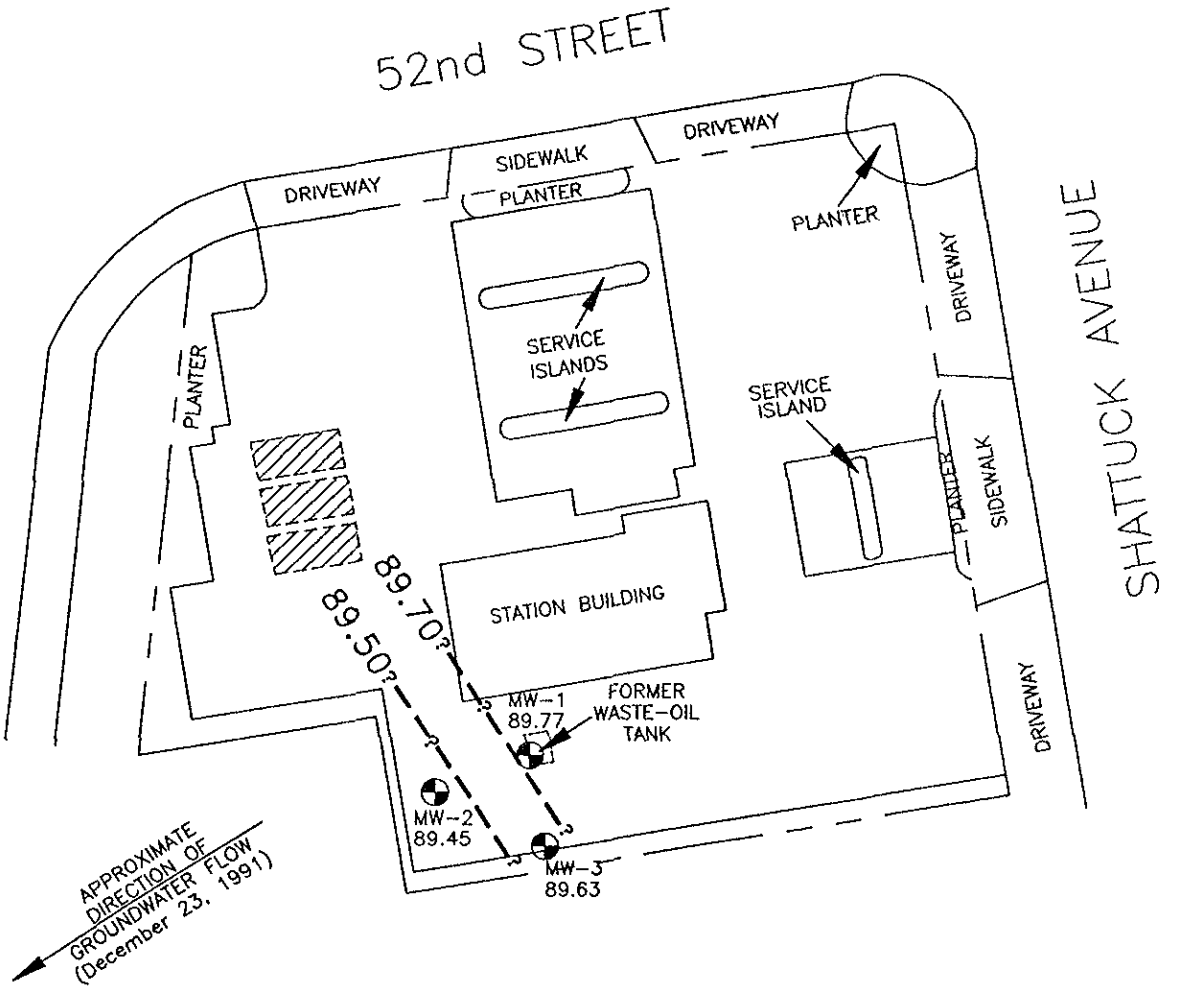


PLATE 11	GEOLOGIC CROSS SECTIONS A-A' AND B-B' ARCO Station 6148 5131 Shattuck Avenue Oakland, California	RESNA PROJECT 61035.02



EXPLANATION

89.70 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

89.77 = Elevation of groundwater in feet above MSL, December 23, 1991

MW-3 = Monitoring well (RESNA, December 1991)

= Underground storage tanks

N

Approximate Scale

40 20 0 40 80

feet

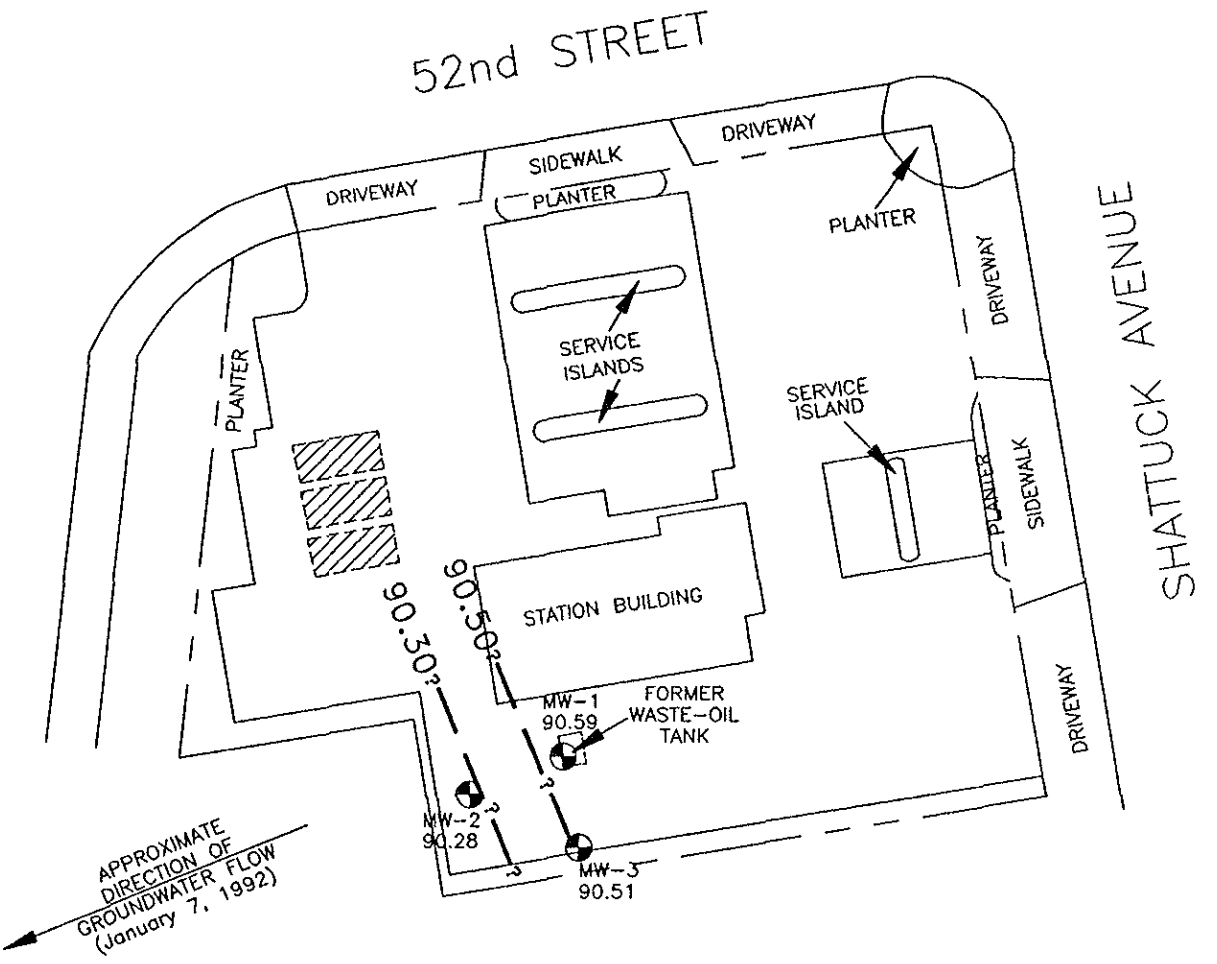
Source: Based on ARCO Site Plan dated 1980.

RESNA

PROJECT 61035.02

GROUNDWATER GRADIENT MAP
ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE
12



EXPLANATION

90.50 = Line of equal elevation of groundwater in feet above mean sea level (MSL)

90.59 = Elevation of groundwater in feet above MSL, January 7, 1992

MW-3 = Monitoring well (RESNA, December 1991)

= Underground storage tanks

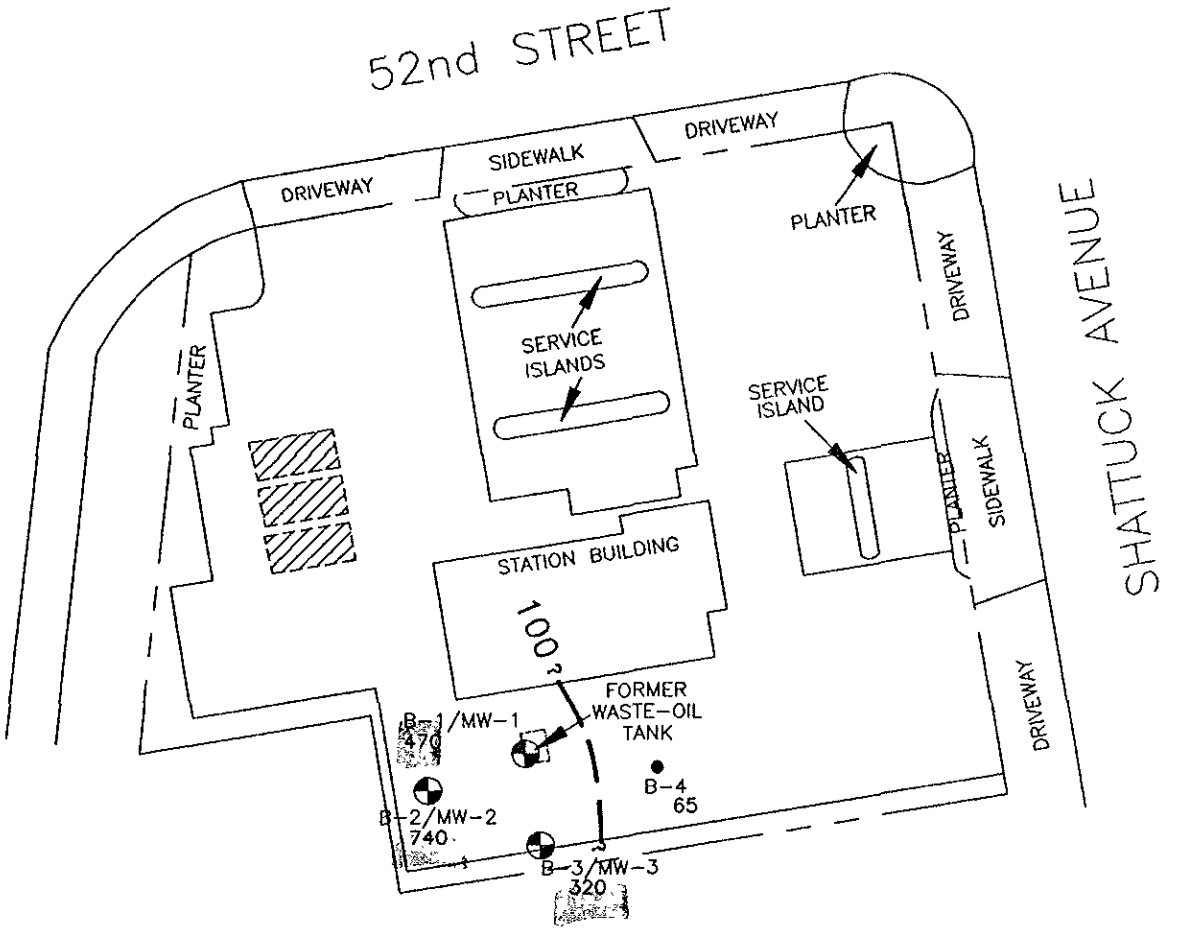
Approximate Scale

40 20 0 40 80

feet

Source: Based on ARCO Site Plan dated 1980.

RESNA	**GROUNDWATER GRADIENT MAP** **ARCO Station 6148** **5131 Shattuck Avenue** **Oakland, California**	**PLATE** **13**
PROJECT 61035.02		



EXPLANATION

100 = Line of equal concentration of TPHg in soil in parts per million (ppm)

740 = Concentration of TPHg in soil in ppm at depths of 17 to 18.5 feet

B-3/MW-3 = Monitoring well (RESNA, December 1991)

B-4 = Soil boring (RESNA, December 1991)

= Underground storage tanks

Approximate Scale

40 20 0 40 80

feet

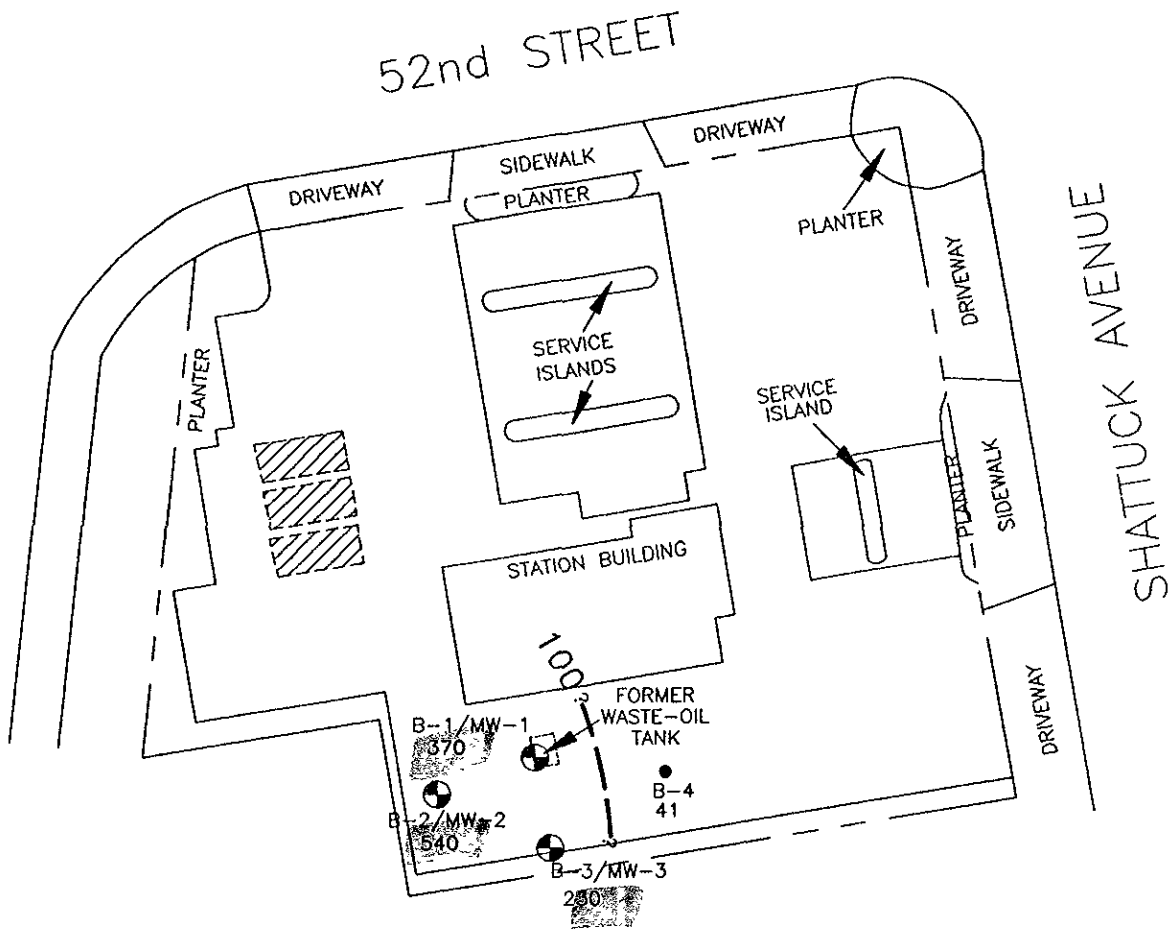
Source: Based on ARCO Site Plan dated 1980.

RESNA

PROJECT 61035.02

TPHg CONCENTRATIONS IN SOIL AT DEPTHS OF 17 TO 18.5 FEET
ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 14



EXPLANATION

100 — = Line of equal concentration of TPHd in soil in parts per million (ppm)

540 = Concentration of TPHd in soil in ppm at depths of 17 to 18.5 feet

B-3/MW-3 = Monitoring well (RESNA, December 1991)

B-4 = Soil boring (RESNA, December 1991)

= Underground storage tanks

N

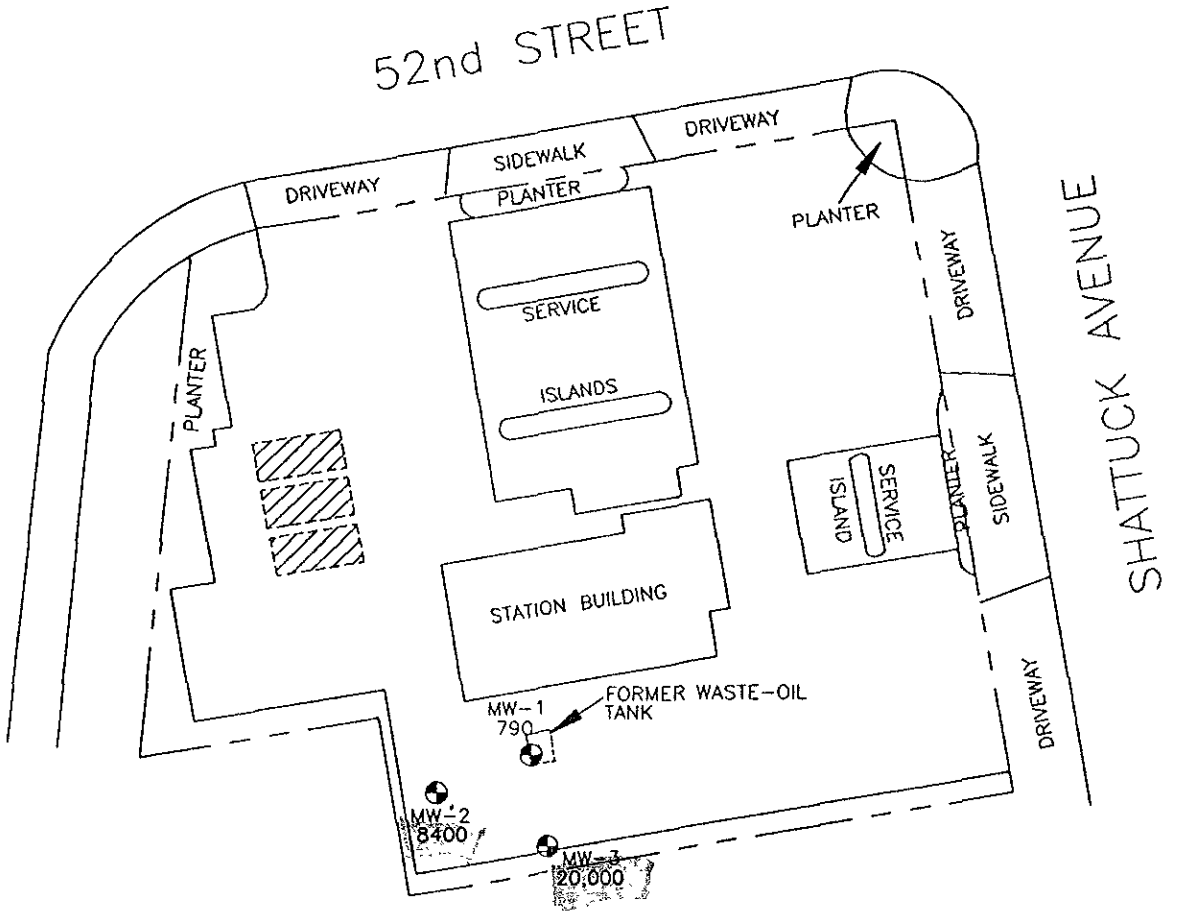
Approximate Scale

40 20 0 40 80

feet

Source: Based on ARCO Site Plan dated 1980.

RESNA	**TPHd CONCENTRATIONS IN SOIL AT DEPTHS OF 17 TO 18.5 FEET ARCO Station 6148 5131 Shattuck Avenue Oakland, California**	**PLATE 15**
PROJECT 61035.02		



EXPLANATION

20,000 = Concentration of TPHg in groundwater in parts per billion, March 18, 1992

MW-3 = Monitoring well (RESNA, December 1991)

= Underground storage tanks

N

Approximate Scale

40 20 0 40 80

feet

Source: Based on ARCO Site Plan dated 1980.

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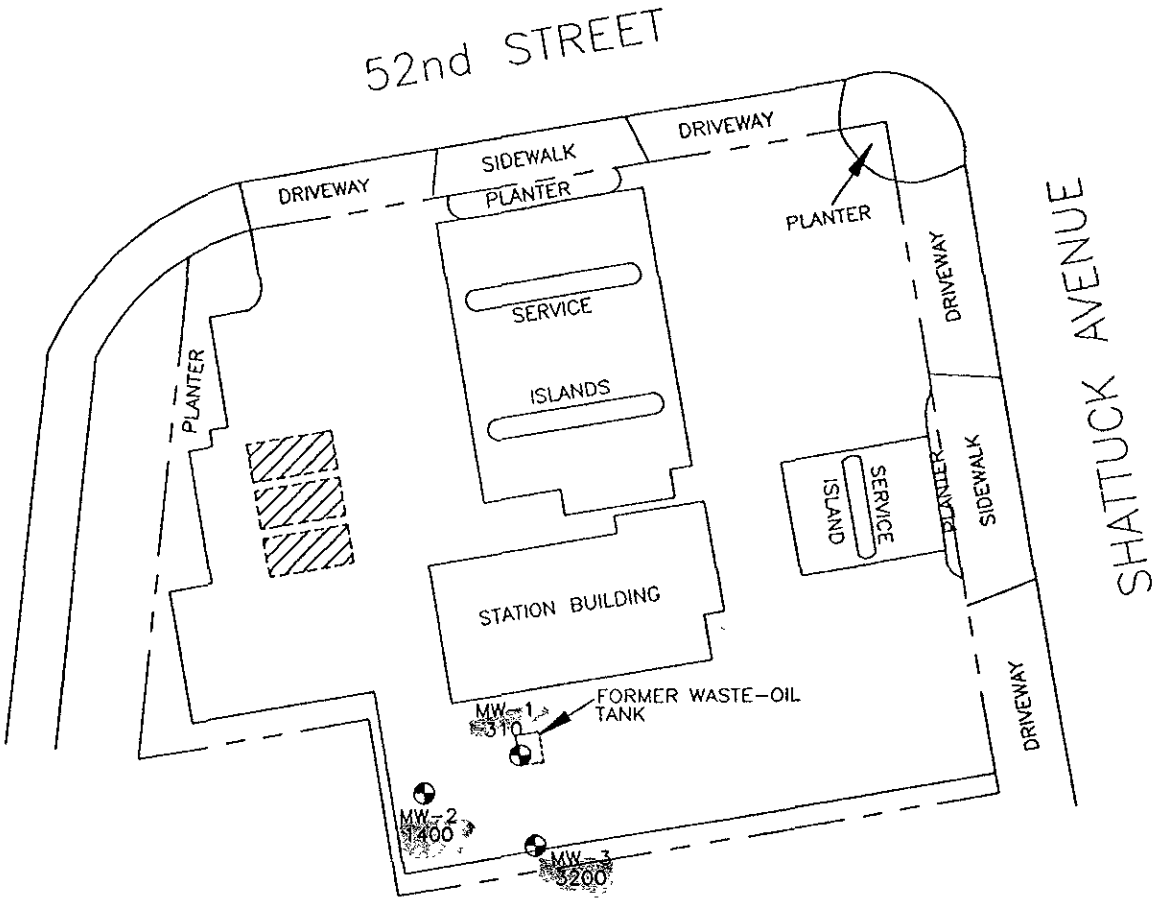
PROJECT 61035.02

TPHg CONCENTRATIONS IN GROUNDWATER
ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 16



EXPLANATION

3200 = Concentration of benzene in groundwater in parts per billion, March 18, 1992

MW-3 = Monitoring well (RESNA, December 1991)

= Underground storage tanks

N

Approximate Scale

40 20 0 40 80

feet

Source: Based on ARCO Site Plan dated 1980.

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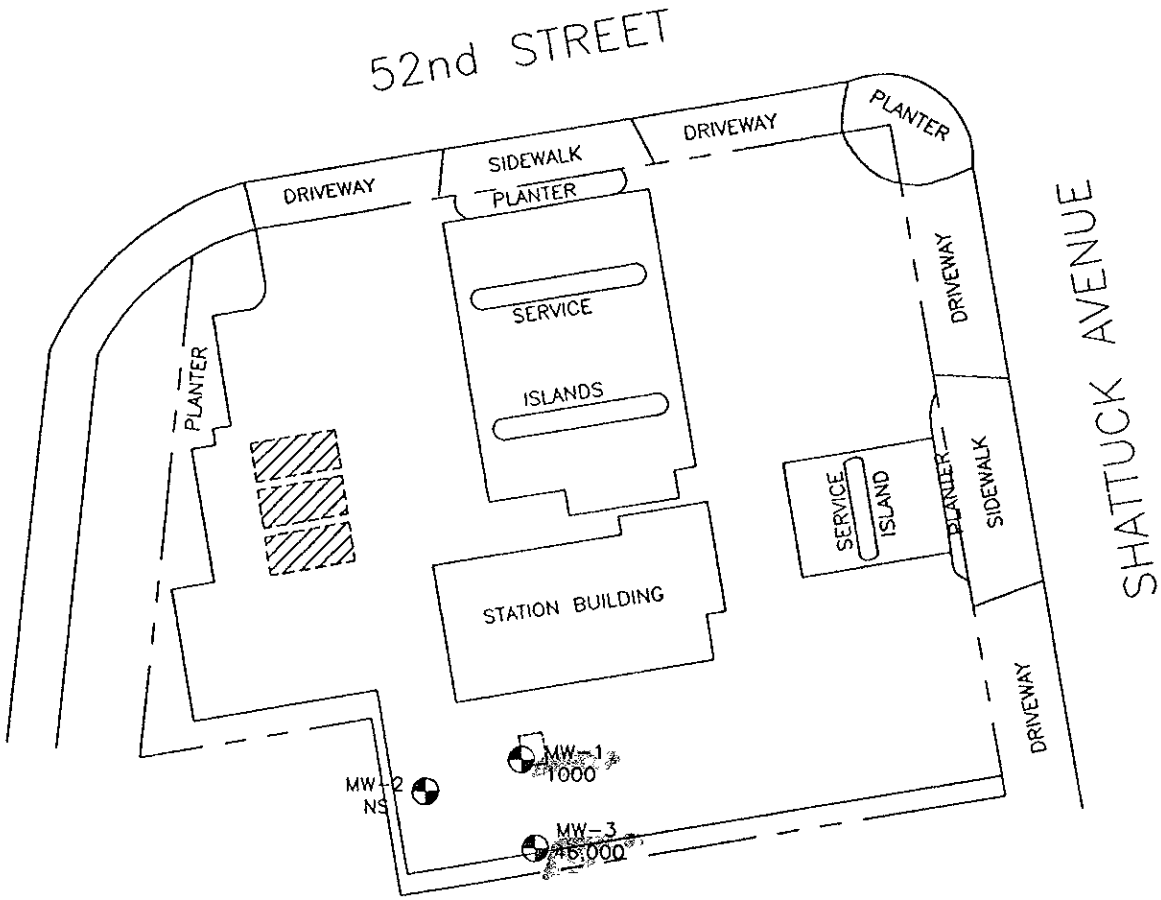
BENZENE CONCENTRATIONS IN GROUNDWATER
ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 17



EXPLANATION

46,000 = Concentration of TPHg in groundwater in parts per billion, June 12, 1992

NS = Not sampled due to floating product

MW-3 = Monitoring well (RESNA, December 1991)

= Underground storage tanks

Approximate Scale

40 20 0 40 80

feet

Source: Based on ARCO Site Plan dated 1980

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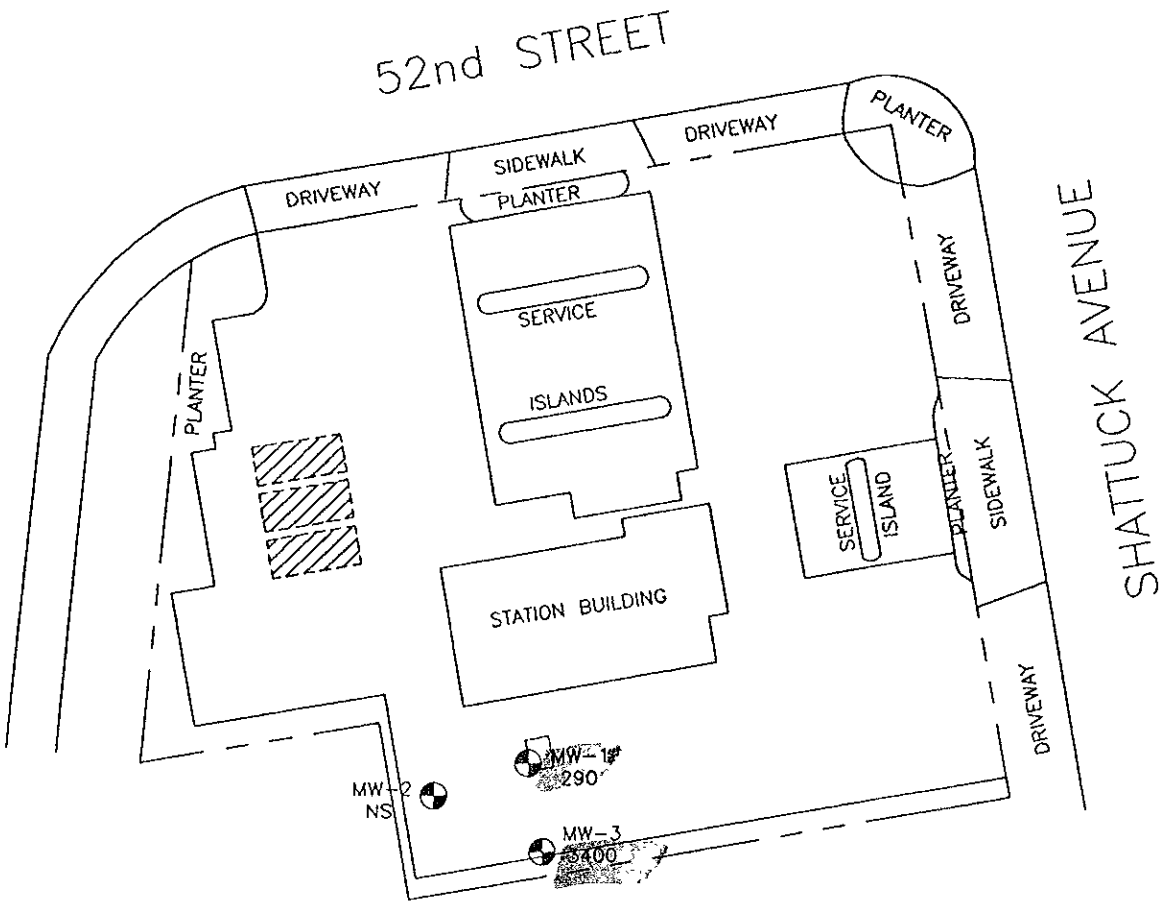
PROJECT 61035.02

TPHg CONCENTRATIONS IN GROUNDWATER
ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE
18



EXPLANATION

3400 = Concentration of benzene in groundwater in parts per billion, June 12, 1992

NS = Not sampled due to floating product

MW-3 = Monitoring well (RESNA, December 1991)

= Underground storage tanks

Approximate Scale

40 20 0 40 80

feet

Source: Based on ARCO Site Plan dated 1980.

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BENZENE CONCENTRATIONS IN GROUNDWATER
ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

PLATE 19

TABLE 1
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 6148
Oakland, California

Date Well Measured	Well Elevation	Depth to Water	Water Elevation	Floating Product
MW-1				
12-23-91		18.26	89.77	Sheen
01-07-92	108.03	17.44	90.59	Sheen
01-19-92		17.17	90.86	None
02-19-92		16.52	91.51	None
03-18-92		16.81	91.22	None
04-20-92		17.56	90.47	None
05-15-92		17.96	90.07	None
06-12-92		18.16	89.87	None
MW-2				
12-23-91		17.98	89.45	Sheen
01-07-92	107.43	17.15	90.28	Sheen
01-19-92		17.47	89.96	None
02-19-92		16.28	91.15	None
03-18-92		16.52	90.91	None
04-20-92		17.27	90.16	None
05-15-92		17.62	89.81	None
06-12-92		17.63*	89.80*	0.05
MW-3				
12-23-91		18.14	89.63	Sheen
01-07-92	107.77	17.26	90.51	Sheen
01-19-92		17.63	90.14	None
02-19-92		16.34	91.43	None
03-18-92		16.62	91.15	None
04-20-92		17.38	90.39	None
05-15-92		17.80	89.97	None
06-12-92		18.01	89.76	None

Measurements in feet.
Wells surveyed on December 27, 1991. Datum is City of Oakland = (USGS) + 3.00
Elevations in feet above mean sea level.
* indicates that the depth to water (DTW) and water elevation were corrected for the presence of floating product by the following method. Measured product thickness (PT) is multiplied by a correction factor of 0.8 and subtracted from DTW. (Adjusted DTW = DTW - [PT X 0.8]).

TABLE 2
RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES - TPHg, TPHd, BTEX, and TOG
ARCO Station 6148
Oakland, California
December 19-20, 1991

Sample Identification	TPHg	TPHd	B	T	E	X	TOG
S-17-1/2-B1	470	370	2.3 [1.3]	5.1 [1.8]	5.1 [1.8]	24 [8.8]	<30
S-22-1/2-B1	<1.0	<1.0	0.010	<0.0050	<0.0050	<0.0050	<30
S-26-1/2-B1	2.0	<1.0	0.026	0.014	0.011	0.049	<30
S-12-B2	<1.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<30
S-17-B2	740	540	2.3 [4.3]	13 [92]	7.7 [57]	41 [360]	<30
S-25-1/2-B2	<1.0	<1.0	0.015	0.016	<0.0050	0.019	<30
S-30-1/2-B2	<1.0	<1.0	0.015	0.0080	<0.0050	<0.0050	<30
S-10-1/2-B3	<1.0	<1.0	0.0070	<0.0050	<0.0050	<0.0050	<30
S-17-1/2-B3	320	230	0.65	0.65	2.3	5.9	<30
S-26-1/2-B3	<1.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<30
S-10-1/2-B4	<1.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050	<30
S-15-1/2-B4	<1.0	<1.0	0.010	<0.0050	<0.0050	<0.0050	<30
S-18-1/2-B4	65	41	0.42 [0.46]	0.22 [0.24]	0.54 [1.7]	0.77 [3.2]	<30
S-20-B4	<1.0	<1.0	0.0070	<0.0050	<0.0050	<0.0050	<30
S-1220-SP-(A-D)	25	11	0.11	0.14	0.11	0.38	<30

All results shown in parts per million (ppm)
TPHg: Total petroleum hydrocarbons as gasoline by EPA method 5030/8015/8020.
TPHd: Total petroleum hydrocarbons as diesel by EPA method 3550/8015. Laboratory reported samples matrix contained high boiling point fuel mixture calculated as diesel, possibly weathered gasoline.
B: Benzene, T: Toluene, E: Ethylbenzene, T: Total Xylene isomers;
BTEX: Measured by EPA method 8030/8015/8020.
TOG: Total oil and grease by Standard Method 5520 E&F.
[ ]: BTEX detected using EPA Method 8240.
<: Results reported as less than the detection limit.

Sample Identification:

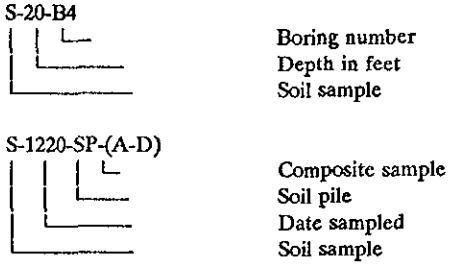

TABLE 3
RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES - VOCs and METALS
ARCO Station 6148
Oakland, California
December 19-20, 1991

Sample Identification	VOCs	Cd	Cr	Pb	Zn	Ni
S-17-1/2-B1	ND*	0.87	31	8.3	62	41
S-22-1/2-B1	ND	0.82	30	4.1	62	34
S-17-B2	ND*	0.87	24	6.7	68	46
S-25-1/2-B2	ND	<0.50	28	2.8	45	26
S-17-1/2-B3	NA	0.95	31	3.9	66	38
S-26-1/2-B3	ND	0.77	48	6.9	70	66
S-18-1/2-B4	ND*	<0.50	27	3.6	57	35
S-20-B4	ND	NA	NA	NA	NA	NA

All results shown in parts per million (ppm)
VOCs: Volatile Organic Compounds by EPA Method 8240.
Cd: Cadmium by EPA Method 6010.
Cr: Chromium by EPA Method 6010.
Pb: Lead by EPA Method 7421.
Zn: Zinc by EPA Method 6010.
Ni: Nickel by EPA Method 6010.
<: Results reported as less than the detection limit.
ND: All 37 compounds tested were not detected.
ND*: All compounds tested were not detected with the exception of BTEX.
NA: Not analyzed.

Sample Identification:

S-20-B4
- Boring number
- Depth in feet
- Soil sample

S-1220-SP-(A-D)
- Composite sample
- Soil pile
- Date sampled
- Soil sample

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Subsurface Environmental Investigation
ARCO Station 6148, Oakland, California

September 29, 1992
61035.02

TABLE 4
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES-
TPHg, TPHd, BTEX, TOG, and Metals
ARCO Station 6148
Oakland, California

WELL DATE	TPHg	TPHd	B	T	E	X	Cd	Cr	Pb	Ni	Zn	TOG
MW-1												
03/18/92	790	<50	310	26	12	44	<3	5	3	<20	31	<0.5 (1.4)
06-12-92	1000	<50**	290	15	10	30	NA	NA	NA	NA	NA	<0.5
MW-2												
03/18/92	8,400	230*	1,400	1,000	220	870	<3	21	9	38	54	1.2 (3.0)
06/12/92	Not sampled--floating product											
MW-3												
03/18/92	20,000	2,800*	3,200	560	380	1,000	<3	67	27	113	156	7.8 (8.1)
06/12/92	46,000	1,600**	3,400	4,200	1,300	5,400	NA	NA	NA	NA	NA	16
MCL:	—	—	1	—	680	1,750	10	50	50	—	—	—
DWAL:	—	—	—	100	—	—	—	—	—	—	—	—

Results in parts per billion (ppb), except TOG which is in parts per million (ppm).
TPHg: Total petroleum hydrocarbons as gasoline by EPA method 5030/8015/8020.
TPHd: Total petroleum hydrocarbons as diesel by EPA method 3510.
B: benzene, T: toluene, E: ethylbenzene, X: total xylenes isomers
BTEX: Analyzed by EPA method 5030/8015/8020.
TOG: Total oil and grease by Standard method 5520F-IR.
( ): Concentrations in parentheses were results of Method 5520C.
*: Laboratory reported sample matrix contained high boiling point fuel mixture calculated as diesel, possibly weathered gasoline.
Metals: By EPA method 6010 and 7421.
<: Results reported below the laboratory detection limit.
**: Samples taken on July 2, 1992. Laboratory reported sample contains a lower boiling point hydrocarbon mixture quantified as diesel. The chromatogram does not match the typical diesel fingerprint, but appears to be weathered gasoline.

TABLE 5
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES-VOCs
ARCO Station 6148
Oakland, California

Date/Well	Compound	VOCs (ppb)
MW-1		
03/18/21	Tetrachloroethene	13
	Trichloroethene	1.2
06/12/92	Tetrachloroethene	18
	Trichloroethene	1.4
MW-2		
03/18/92	Tetrachloroethene	19
	Trichloroethene	2.2
	cis-1,2-Dichloroethene	0.5
06/12/92	Not sampled--floating product	
MW-3		
03/18/92	Tetrachloroethene	2.7
06/12/92	Tetrachloroethene	1.9

MCL:	PCE	TCE	cis-1,2-DCE
	5	5	6*

Results in parts per billion (ppb).
VOCs: Volatile Organic Compounds by EPA method 5030/8010. Compounds not shown were not detected.
Cd: Cadmium by EPA method 6010.
Cr: Chromium by EPA method 6010.
Pb: Lead by EPA method 7421.
Zn: Zinc by EPA method 6010.
Ni: Nickel by EPA method 6010.
MCLs: Maximum Contaminant Levels as reported by the California Department of Health Services 10/24/90.
*: Proposed MCL.

APPENDIX A

FIELD PROTOCOL
WELL PURGE DATA SHEETS

FIELD PROTOCOL

The following presents RESNA's protocol for a typical site investigation involving gasoline hydrocarbon-impacted soil and/or groundwater.

Site Safety Plan

The Site Safety Plan describes the safety requirements for the evaluation of gasoline hydrocarbons in soil, groundwater, and the vadose-zone at the site. The Site Safety Plan is applicable to personnel of RESNA and its subcontractors. RESNA personnel and subcontractors of RESNA scheduled to perform the work at the site are be briefed on the contents of the Site Safety Plan before work begins. A copy of the Site Safety Plan is available for reference by appropriate parties during the work. A site Safety Officer is assigned to the project.

Sampling of Stockpiled Soil

One composite soil sample is collected for each 50 cubic yards of stockpiled soil, and for each individual stockpile composed of less than 50 cubic yards. Composite soil samples are obtained by first evaluating relatively high, average, and low areas of hydrocarbon concentration by digging approximately one to two feet into the stockpile and placing the intake probe of a field calibrated OVM against the surface of the soil; and then collecting one sample from the "high" reading area, and three samples from the "average" areas. Samples are collected by removing the top one to two feet of soil, then driving laboratory-cleaned brass sleeves into the soil. The samples are sealed in the sleeves using aluminum foil, plastic caps, and aluminized duct tape; labeled; and promptly placed in iced storage for transport to the laboratory, where compositing will be performed.

Soil Borings

Prior to the drilling of borings and construction of monitoring wells, permits are acquired from the appropriate regulatory agency. In addition to these permits, encroachment permits from the City or State are acquired if drilling of borings offsite in the City or State streets is necessary. Copies of the permits are included in the appendix of the project report. Prior to drilling, Underground Services Alert is notified of our intent to drill, and known underground utility lines and structures are approximately marked.

The borings are drilled by a truck-mounted drill rig equipped with 8- or 10-inch-diameter, hollow-stem augers. The augers are steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. After drilling the borings, monitoring wells are constructed in the borings, or neat-cement grout with bentonite is used to backfill the borings to the ground surface.

Borings for groundwater monitoring wells are drilled to a depth of no more than 20 feet below the depth at which a saturated zone is first encountered, or a short distance into a stratum beneath the saturated zone which is of sufficient moisture and consistency to be judged as a perching layer by the field geologist, whichever is shallower. Drilling into a deeper aquifer below the shallowest aquifer can begin only after a conductor casing is properly installed and allowed to set, to seal the shallow aquifer.

Drill Cuttings

Drill cuttings subjectively evaluated as having hydrocarbon contamination at levels greater than 100 parts per million (ppm) are separated from those subjectively evaluated as having hydrocarbon contamination levels less than 100 ppm. Evaluation is based either on subjective evidence of soil discoloration, or on measurements made using a field calibrated OVM. Readings are taken by placing a soil sample into a ziplock type plastic bag and allowing volatilization to occur. The intake probe of the OVM is then inserted into the headspace created in the plastic bag immediately after opening it. The drill cuttings from the borings are placed in labeled 55-gallon drums approved by the Department of Transportation; or on plastic at the site, and covered with plastic. The cuttings remain the responsibility of the client.

Soil Sampling in Borings

Soil samples are collected at no greater than 5-foot intervals from the ground surface to the total depth of the borings. The soil samples are collected by advancing the boring to a point immediately above the sampling depth, and then driving a California-modified, split-spoon sampler containing brass sleeves through the hollow center of the auger into the soil. The sampler and brass sleeves are laboratory-cleaned, steam-cleaned, or washed thoroughly with Alconox® and water, prior to each use. The sampler is driven with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive six inches are counted and recorded to evaluate the relative consistency of the soil.

The samples selected for laboratory analysis are removed from the sampler and quickly sealed in their brass sleeves with aluminum soil, plastic caps, and aluminized duct tape. The samples are then labeled, promptly placed in iced storage, and delivered to a laboratory certified by the State of California to perform the analyses requested.

One of the samples in brass sleeves not selected for laboratory analysis at each sampling interval is tested in the field using an OVM that is field calibrated at the beginning of each day it is used. This testing is performed by inserting the intake probe of the OVM into the headspace created in the plastic bag containing the soil sample as described in the Drill Cuttings section above. The OVM readings are presented in Logs of Borings included in the project report.

Logging of Borings

A geologist is present to log the soil cuttings and samples using the Unified Soil Classification System. Samples not selected for chemical analysis, and the soil in the sampler shoe, are extruded in the field for inspection. Logs include texture, color, moisture, plasticity, consistency, blow counts, and any other characteristics noted. Logs also include subjective evidence for the presence of hydrocarbons, such as soil staining, noticeable or obvious product odor, and OVM readings.

Monitoring Well Construction

Monitoring wells are constructed in selected borings using clean 2- or 4-inch-diameter, thread-jointed, Schedule 40 polyvinyl chloride (PVC) casing. No chemical cements, glues, or solvents are used in well construction. Each casing bottom is sealed with a threaded end-plug, and each casing top with a locking plug. The screened portions of the wells are constructed of machine-slotted PVC casing with 0.020-inch-wide (typical) slots for initial site wells. Slot size for subsequent wells may be based on sieve analysis and/or well development data. The screened sections in groundwater monitoring wells are placed to allow monitoring during seasonal fluctuations of groundwater levels.

The annular space of each well is backfilled with No. 2 by 12 sand, or similar sorted sand, to approximately two feet above the top of the screened casing for initial site wells. The sand pack grain size for subsequent wells may be based on sieve analysis and/or well development data. A 1- to 2-foot-thick bentonite plug is placed above the sand as a seal against cement entering the filter pack. The remaining annulus is then backfilled with a slurry of water, neat cement, and bentonite to approximately one foot below the ground surface.

An aluminum utility box with a PVC apron is placed over each wellhead and set in concrete placed flush with the surrounding ground surface. Each wellhead cover has a seal to protect the monitoring well against surface-water infiltration and requires a special wrench to open. The design discourages vandalism and reduces the possibility of accidental disturbance of the well.

Groundwater Monitoring Well Development

The monitoring wells are developed by bailing or over-pumping and surge-block techniques. The wells are either bailed or pumped, allowed to recharge, and bailed or pumped again until the water removed from the wells is determined to be clear. Turbidity measurements (in NTUs) are recorded during well development and are used in evaluating well development. The wells are allowed to equilibrate for at least 48 hours after development prior to sampling. Water generated by well development will be stored in 17E Department of Transportation (DOT) 55-gallon drums on site and will remain the responsibility of the client.

Groundwater Sampling

The static water level in each well is measured to the nearest 0.01-foot using a Solinst® electric water-level sounder or oil/water interface probe (if the wells contain floating product) cleaned with Alconox® and water before use in each well. The liquid in the onsite wells is examined for visual evidence of hydrocarbons by gently lowering approximately half the length of a Teflon® bailer (cleaned with Alconox® and water) past the air/water interface. The sample is then retrieved and inspected for floating product, sheen, emulsion, color, and clarity. The thickness of floating product detected is recorded to the nearest 1/8-inch.

Wells which do not contain floating product are purged using a submersible pump. The pump, cables, and hoses are cleaned with Alconox® and water prior to use in each well. The wells are purged until withdrawal is of sufficient duration to result in stabilized pH, temperature, and electrical conductivity of the water, as measured using portable meters calibrated to a standard buffer and conductivity standard. If the well becomes dewatered, the water level is allowed to recover to at least 80 percent of the initial water level. Prior to the collection of each groundwater sample, the Teflon® bailer is cleaned with Alconox® and rinsed with tap water and deionized water, and the latex gloves worn by the sampler changed. Hydrochloric acid is added to the sample vials as a preservative (when applicable). A sample method blank is collected by pouring distilled water into the bailer and then into sample vials. A sample of the formation water is then collected from the surface of the

water in each of the wells using the Teflon® bailer. The water samples are then gently poured into laboratory-cleaned, 40-milliliter (ml) glass vials, 500 ml plastic bottles or 1-liter glass bottles (as required for specific laboratory analysis) and sealed with Teflon®-lined caps, and inspected for air bubbles to check for headspace, which would allow volatilization to occur. The samples are then labeled and promptly placed in iced storage. A field log of well evacuation procedures and parameter monitoring is maintained. Water generated by the purging of wells is stored in 17E DOT 55-gallon drums onsite and remains the responsibility of the client.

Sample Labeling and Handling

Sample containers are labeled in the field with the job number, sample location and depth, and date, and promptly placed in iced storage for transport to the laboratory. A Chain of Custody Record is initiated by the field geologist and updated throughout handling of the samples, and accompanies the samples to a laboratory certified by the State of California for the analyses requested. Samples are transported to the laboratory promptly to help ensure that recommended sample holding times are not exceeded. Samples are properly disposed of after their useful life has expired.

RESNA
Working To Restore Nature

WELL PURGE DATA SHEET

Project Name: ARCO 6148 Job No. 61035.02

Date: 1/7/92 Page 1 of 1

Well No. MW-1 Time Started 12:45

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromoh)	Turbidity (NTU)
12:45	Begin pumping well MW-1				
12:49	5	60.0	7.54	3.96	NM
12:53	10	62.8	7.40	4.42	NM
12:57	15	64.2	7.48	4.22	NM
1:01	20	63.8	7.43	4.31	NM
1:05	25	64.3	7.38	4.32	NM
1:09	30	63.7	7.43	4.28	NM
1:10	31	Stop pumping MW-1			

Notes:

Well diameter (inches) : 4
Depth to Bottom (feet) : 26.0
Depth to Water - initial (feet) : 17.44
Depth to Water - final (feet) : 17.46
% recovery : 99
Time Sampled :
Gallons per Well Casing Volume : 5.6
Gallons Purged : 31
Well Casing Volumes Purged : 5.5
Approximate Pumping Rate (gpm) : 1.2
Turbidity not measured per ARCO request : NM

RESNA
Working To Restore Nature

WELL PURGE DATA SHEET

Project Name: ARCO 6148 Job No. 61035.02

Date: 1/7/92 Page 1 of 1

Well No. MW-2 Time Started 12:12

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromoh)	Turbidity (NTU)
12:12	Begin pumping well MW-2				
12:16	5	60.2	7.71	4.06	NM
12:20	10	62.7	7.47	4.55	NM
12:24	15	62.0	7.47	4.41	NM
12:28	20	62.1	7.40	4.29	NM
12:32	25	62.7	7.35	4.41	NM
12:36	29	Stop pumping MW-2			

Notes:

Well diameter (inches)	4
Depth to Bottom (feet)	26.0
Depth to Water - initial (feet)	17.15
Depth to Water - final (feet)	17.21
% recovery	99
Time Sampled	
Gallons per Well Casing Volume	5.8
Gallons Purged	29
Well Casing Volumes Purged	5.0
Approximate Pumping Rate (gpm)	1.2
Turbidity not measured per ARCO request	NM

RESNA
Working To Restore Nature

WELL PURGE DATA SHEET

Project Name: ARCO 6148 Job No. 61035.02

Date: 1/7/92 Page 1 of 1

Well No. MW-3 Time Started 11:32

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromoh)	Turbidity (NTU)
11:32	Begin pumping well MW-3				
11:35	5	63.2	8.92	4.75	NM
11:38	10	64.3	8.73	5.10	NM
11:40	15	64.0	7.80	5.40	NM
11:43	20	63.4	7.43	5.53	NM
11:45	25	62.6	7.24	5.53	NM
11:48	30	62.9	7.15	5.43	NM
11:51	25	62.7	7.15	5.54	NM
11:53	33	Stop pumping MW-3			

Notes:

Well diameter (inches)	4
Depth to Bottom (feet)	26.0
Depth to Water - initial (feet)	17.26
Depth to Water - final (feet)	17.31
% recovery	99
Time Sampled	
Gallons per Well Casing Volume	5.8
Gallons Purged	33
Well Casing Volumes Purged	5.7
Approximate Pumping Rate (gpm)	1.6
Turbidity not measured per ARCO request	NM

APPENDIX B

WELL CONSTRUCTION PERMIT

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 • (415) 484-2600

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT Arco Station
5131 Shattuck Avenue
Oakland, CA

CLIENT
Name Arco Products Company
Address P.O. Box 5511 Phone (415) 571-2434
City San Mateo Zip 94402

APPLICANT
Name RESNA / Applied GeoSystems
Address 3315 Almaden Expy. Suite 34 Phone (408) 264-7723
City San Jose Zip 95118

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	___	General	___
Water Supply	___	Contamination	X
Monitoring	___	Well Destruction	___

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other N/A
Municipal ___ Irrigation ___

DRILLING METHOD:
Mud Rotary ___ Air Rotary ___ Auger X
Cable ___ Other ___

DRILLER'S LICENSE NO. 596545

WELL PROJECTS
Drill Hole Diameter ___ in. Maximum
Casing Diameter ___ in. Depth ___ ft. N/A
Surface Seal Depth ___ ft. Number ___

GEOTECHNICAL PROJECTS
Number of Borings 4
Hole Diameter 6 in. Maximum Depth 30 ft.

ESTIMATED STARTING DATE 10/8/91
ESTIMATED COMPLETION DATE 10/8/91

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

APPLICANT'S SIGNATURE [signature] Date 9/27/91

FOR OFFICE USE

PERMIT NUMBER 91553
LOCATION NUMBER

PERMIT CONDITIONS

Circled Permit Requirements Apply

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 log 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 1 Oct 91
Wyman Hong

121989

APPENDIX C

EMCON'S FIELD REPORTS (3), DEPTH TO WATER/FLOATING PRODUCT SURVEY RESULTS, SUMMARY OF GROUNDWATER MONITORING DATA, CERTIFIED ANALYTICAL REPORTS WITH CHAIN-OF-CUSTODY, WATER SAMPLE FIELD DATA SHEETS

EMCON
ASSOCIATES
Consultants in Wastes
Management and
Environmental Control

Date February 25, 1992
Project G70-39.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95118

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Form, February 1992 monthly water level survey, ARCO station 6148, 5131 Shattuck Avenue, Oakland, CA

For your: X Information Sent by: X Mail

Comments:
Monthly water level data for the above mentioned site are attached. Please call if you have any questions: (408) 453-2266.

Reviewed by: Mark Knuttel MK

REGISTERED PROFESSIONAL ENGINEER 6/30/92

Robert Porter, Senior Project Engineer.

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-39.01 STATION ADDRESS : 5131 Shattuck Avenue, Oakland, C/ DATE : 2/19/92

ARCO STATION # : 6148 FIELD TECHNICIAN : VINCE BARLOCK DAY : WEDNESDAY

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	OK	Yes	OK	yes	yes	16.52	16.53	ND	ND	25.73	—
2	MW-2	OK	Yes	OK	yes	yes	16.28	16.29	ND	ND	25.77	—
3	MW-3	OK	Yes	OK	yes	yes	16.34	16.35	ND	ND	25.80	—

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

Date January 29, 1992
Project G70-39.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95118

We are enclosing:

Copies	Description
1	DTW/FP Survey Form, January 1992 monthly water level survey, ARCO station 6148, 5131 Shattuck Avenue, Oakland, CA

For your: X Information Sent by: X Mail

Comments:
Monthly water level data for the above mentioned site are attached. Please call if you have any questions: (408) 453-2266.

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER ROBERT CURTIS PORTER No: 4094 Exp. 6/30/92 INDUSTRIAL STATE OF CALIFORNIA

Mark Knuttel MK

Robert Porter, Senior P.E. #4094

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-39.01 STATION ADDRESS : 5131 Shattuck Avenue, Oakland, C/ DATE : 1-19-92

ARCO STATION # : 6148 FIELD TECHNICIAN : J Williams DAY : Sunday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	ok	ok	ok	ok	ok	17.77	17.17	NA	NA	25.07	—
2	MW-2	"	"	"	"	"	17.47	17.47	NA	NA	25.80	—
3	MW-3	"	"	"	"	"	17.63	17.63	NA	NA	25.82	—

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

APR [illegible]

Date April 2, 1992
Project G70-39.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Alamden Expressway, Suite 34
San Jose, California 95050

We are enclosing:

Copies	Description
1	Depth To Water / Floating Product Survey Results
3	Summary of Groundwater Monitoring Data
1	Certified Analytical Reports with Chain-of-Custody
3	Water Sample Field Data Sheets

For your: X Information Sent by: X Mail

Comments:
Enclosed are the data from the first quarter 1992 monitoring event at ARCO service station 6148, 5131 Shattuck Avenue, Oakland, California. Please call if you have any questions: (408) 453-2266.

Mark Knuttel MK

Reviewed by:

REGISTERED ... No: 4034 Exp. 6/30/92 INDUSTRIAL ... STATE OF CALIFORNIA

Robert Porter, Senior Project Engineer.

1938 Junction Avenue, San Jose, California 95131-2102, (408) 453-0719, Fax (408) 453-0452

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-39.01 STATION ADDRESS : 5131 Shattuck Avenue, Oakland, C/ DATE : 3/18/92

ARCO STATION # : 6148 FIELD TECHNICIAN : L. RATH DAY : WEDNESDAY

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	Good	Yes	Good	3259	Good	16.81	16.82	ND	ND	25.8	—
2	MW-2	Good	Yes	Good	3259	Good	16.52	16.52	ND	ND	25.8	—
3	MW-3	Good	Yes	Good	3259	Good	16.62	16.62	ND	ND	25.8	—

Summary of Groundwater Monitoring Data
First Quarter 1992
ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California
micrograms per liter (µg/l) and milligrams per liter (mg/l)

Well ID and Sample Depth	Sampling Date	Depth To Water (feet)	Floating Product Thickness (feet)	TPH[1] as Gasoline (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethyl-benzene (µg/l)	Total Xylenes (µg/l)	TPH as Diesel (µg/l)	Total Oil and Grease, 5520B (mg/l	Hydrocarbons 5520F-IR (mg/l
MW-1(24)	03/18/92	16.81	ND.[2]	790.	310.	26.	12.	44.	<50	1.4	<0.5
MW-2(24)	03/18/92	16.52	ND.	8,400.	1,400.	1,000.	220.	870.	230.*	3.0	1.2
MW-3(24)	03/18/92	16.62	ND.	20,000.	3,200.	560.	380.	1,000.	2,800.*	8.1	7.8
FB-1.[3]	03/18/92	NA.[4]	NA.	<50	<0.5	<0.5	<0.5	<0.5	NR.[5]	NR.	NR.

1. TPH. = Total petroleum hydrocarbons
2. ND. = Not detected
3. FB. = Field Blank
4. NA. = Not applicable
5. NR. = Not reported; sample was not scheduled for analysis of the selected parameter

*. = Sample matrix contains high boiling point fuel mixture calculated as diesel

Summary of Analytical Results
Halogenated Volatile Organic Compounds by EPA[1] Methods 5030/8010
First Quarter 1992
ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California
micrograms per liter (µg/l) or parts per billion (ppb)

Well ID and Sample Depth	Sampling Date	cis-1,2-DCE[2] (ppb)	TCE[3] (ppb)	PCE[4] (ppb)
MW-1(24)	03/18/92	<0.5	1.2	13.
MW-2(24)	03/18/92	0.5	2.2	19.
MW-3(24)	03/18/92	<0.5	<0.5	2.7

1. EPA = United States Environmental Protection Agency.
2. cis-1,2-DCE = cis-1,2-Dichloroethene
3. TCE = Trichloroethene
4. PCE = Tetrachloroethene

Summary of Analytical Results
Total Metals by EPA[1] Method 6010 and 7421
First Quarter 1992
ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California
micrograms per liter (µg/l) or parts per billion (ppb)

Well ID and Sample Depth	Sampling Date	Cadmium (ppb)	Chromium (ppb)	Lead (ppb)	Nickle (ppb)	Zinc (ppb)
MW-1(24)	03/18/92	<3	5	3	<20	31
MW-2(24)	03/18/92	<3	21	9	38	54
MW-3(24)	03/18/92	<3	67	27	113	156

1. EPA = United States Environmental Protection Agency

Columbia Analytical Services, Inc.

March 31, 1992

Mr. Mark Knuttel
EMCON Associates
1921 Ringwood Avenue
San Jose, CA 95131

Re: EMCON Project No. G70-39.01
Arco Facility No. 6148

Dear Mr. Knuttel:

Enclosed are the results of the water samples submitted to our lab on March 19, 1992. For your reference, our service request number for this work is SJ92-0282.

All analyses were performed in accordance with the laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted:

Keoni A. Murphy
COLUMBIA ANALYTICAL SERVICES, INC.

le/KAM

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 03/19/92
Work Order #: SJ92-0282
Sample Matrix: Water

Inorganic Parameters[1]
mg/L (ppm)

Sample Name	Date Sampled	Total Oil & Grease, 5520C	Hydrocarbons, 5520F-IR
MW-1 (24)	03/18/92	1.4	ND
MW-2 (24)	03/18/92	3.0	1.2
MW-3 (24)	03/18/92	8.1	7.8
Method Blank		ND	ND
Method Reporting Limit		0.5	0.5

ND None Detected at or above the method reporting limit

1 Unless otherwise noted, all analyses were performed within EPA recommended maximum holding times specified in *Test Methods for Evaluating Solid Waste,* (SW-846, 3rd Edition) and *Methods for Chemical Analysis of Water and Waste* (EPA-600/4-79-020, Revised March 1983).

Approved by [signature] Date March 31, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	Date Received:	03/19/92
Project:	EMCON Project No. G70-39.01	Date Extracted:	03/20/92
	Arco Facility No. 6148	Date Analyzed:	03/23/92
Sample Matrix:	Water	Work Order #:	SJ92-0282

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

Sample Name	MRL	TPH as Diesel
MW-1 (24)	50	ND
MW-2 (24)	50	230.*
MW-3 (24)	50	2,800.*
Method Blank	50	ND

MRL Method Reporting Limit
TPH Total Petroleum Hydrocarbons
ND None Detected at or above the method reporting limit
* Sample matrix contains high boiling point fuel mixture calculated as diesel.

Approved by Kevin Murphy Date March 31, 1992

1024 Bigge Road Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-0254

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	Date Received:	03/19/92
Project:	EMCON Project No. G70-39.01	Work Order #:	SJ92-0282
	Arco Facility No. 6148	Sample Matrix:	Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
µg/L (ppb)

Sample Name:		MW-1 (24)	MW-2 (24)	MW-3 (24)
Date Analyzed:		03/20/92	03/20/92	03/20/92
Analyte	MRL			
Benzene	0.5	310.	1,400.	3,200.
Toluene	0.5	26.	1,000.	560.
Ethylbenzene	0.5	12.	220.	380.
Total Xylenes	0.5	44.	870.	1,000.
TPH as Gasoline	50	790.	8,400.	20,000.

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kevin Murphy Date March 31, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	Date Received:	03/19/92
Project:	EMCON Project No. G70-39.01	Work Order #:	SJ92-0282
	Arco Facility No. 6148	Sample Matrix:	Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
µg/L (ppb)

Sample Name:		FB-1	Method Blank
Date Analyzed:		03/20/92	03/20/92
Analyte	**MRL**		
Benzene	0.5	ND	ND
Toluene	0.5	ND	ND
Ethylbenzene	0.5	ND	ND
Total Xylenes	0.5	ND	ND
TPH as Gasoline	50	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kevin A. Murphy Date March 31, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	Date Received:	03/19/92
Project:	EMCON Project No. G70-39.01	Work Order #:	SJ92-0282
	Arco Facility No. 6148	Sample Matrix:	Water

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
μg/L (ppb)

		Sample Name: MW-1 (24)	MW-2 (24)	MW-3 (24)
		Date Analyzed: 03/20/92	03/23/92	03/23/92
Analyte	**MRL**			
Dichlorodifluoromethane (Freon 12)	1	ND	ND	ND
Chloromethane	1	ND	ND	ND
Vinyl Chloride	0.5	ND	ND	ND
Bromomethane	0.5	ND	ND	ND
Chloroethane	0.5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	0.5	ND	ND	ND
1,1-Dichloroethene	0.5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	0.5	ND	ND	ND
Methylene Chloride	0.5	ND	ND	ND
trans-1,2-Dichloroethene	0.5	ND	ND	ND
cis-1,2-Dichloroethene	0.5	ND	0.5	ND
1,1-Dichloroethane	0.5	ND	ND	ND
Chloroform	0.5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	0.5	ND	ND	ND
Carbon Tetrachloride	0.5	ND	ND	ND
1,2-Dichloroethane	0.5	ND	ND	ND
Trichloroethene (TCE)	0.5	1.2	2.2	ND
1,2-Dichloropropane	0.5	ND	ND	ND
Bromodichloromethane	0.5	ND	ND	ND
2-Chloroethyl Vinyl Ether	5	ND	ND	ND
trans-1,3-Dichloropropene	0.5	ND	ND	ND
cis-1,3-Dichloropropene	0.5	ND	ND	ND
1,1,2-Trichloroethane	0.5	ND	ND	ND
Tetrachloroethene (PCE)	0.5	13.	19.	2.7
Dibromochloromethane	0.5	ND	ND	ND
Chlorobenzene	0.5	ND	ND	ND
Bromoform	0.5	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.5	ND	ND	ND
1,3-Dichlorobenzene	1	ND	ND	ND
1,4-Dichlorobenzene	1	ND	ND	ND
1,2-Dichlorobenzene	1	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by __________ Date March 31, 1992

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 03/19/92
Work Order #: SJ92-0282
Sample Matrix: Water

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
µg/L (ppb)

Sample Name:		Method Blank	Method Blank
Date Analyzed:		03/20/92	03/23/92
Analyte	MRL		
Dichlorodifluoromethane (Freon 12)	1	ND	ND
Chloromethane	1	ND	ND
Vinyl Chloride	0.5	ND	ND
Bromomethane	0.5	ND	ND
Chloroethane	0.5	ND	ND
Trichlorofluoromethane (Freon 11)	0.5	ND	ND
1,1-Dichloroethene	0.5	ND	ND
Trichlorotrifluoroethane (Freon 113)	0.5	ND	ND
Methylene Chloride	0.5	ND	ND
trans-1,2-Dichloroethene	0.5	ND	ND
cis-1,2-Dichloroethene	0.5	ND	ND
1,1-Dichloroethane	0.5	ND	ND
Chloroform	0.5	ND	ND
1,1,1-Trichloroethane (TCA)	0.5	ND	ND
Carbon Tetrachloride	0.5	ND	ND
1,2-Dichloroethane	0.5	ND	ND
Trichloroethene (TCE)	0.5	ND	ND
1,2-Dichloropropane	0.5	ND	ND
Bromodichloromethane	0.5	ND	ND
2-Chloroethyl Vinyl Ether	5	ND	ND
trans-1,3-Dichloropropene	0.5	ND	ND
cis-1,3-Dichloropropene	0.5	ND	ND
1,1,2-Trichloroethane	0.5	ND	ND
Tetrachloroethene (PCE)	0.5	ND	ND
Dibromochloromethane	0.5	ND	ND
Chlorobenzene	0.5	ND	ND
Bromoform	0.5	ND	ND
1,1,2,2-Tetrachloroethane	0.5	ND	ND
1,3-Dichlorobenzene	1	ND	ND
1,4-Dichlorobenzene	1	ND	ND
1,2-Dichlorobenzene	1	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kenneth Murphy Date March 31, 1992

1904 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-2400 • Fax 408/437-0256

APPENDIX A

LABORATORY QC RESULTS

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 03/19/92
Work Order #: SJ92-0282
Sample Matrix: Water

QA/QC Report
Surrogate Recovery Summary
TPH as Diesel
EPA Method 3510/DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery P-Terphenyl
MW-1 (24)	03/23/92	80.
MW-2 (24)	03/23/92	89.
MW-3 (24)	03/23/92	81.
Method Blank	03/23/92	86.
	CAS Acceptance Criteria	55-145

TPH Total Petroleum Hydrocarbons

Approved by Kathleen Murphy Date March 31, 1992

1921 Ringwood Avenue • San Jose, California 95131 • Telephone 408/437-9420 • Fax 408/437-9256

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 03/19/92
Work Order #: SJ92-0282
Sample Matrix: Water

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

Sample Name	Date Analyzed	Percent Recovery α,α,α-Trifluorotoluene
MW-1 (24)	03/20/92	88.
MW-2 (24)	03/20/92	92.
MW-3 (24)	03/20/92	103.
FB-1	03/20/92	91.
Method Blank	03/20/92	84.
	CAS Acceptance Criteria	70-130

TPH Total Petroleum Hydrocarbons

Approved by Kevin A Murphy Date March 31, 1992

Client:	EMCON Associates	Date Received:	03/19/92
Project:	EMCON Project No. G70-39.01	Work Order #:	SJ92-0282
	Arco Facility No. 6148	Sample Matrix:	Water

QA/QC Report
Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	Date Analyzed	Percent Recovery 4-Bromofluorobenzene
MW-1 (24)	03/20/92	78.
MW-2 (24)	03/23/92	87.
MW-3 (24)	03/23/92	81.
Method Blank	03/20/92	79.
Method Blank	03/23/92	77.
	CAS Acceptance Criteria	70-130

Approved by [signature] Date March 31, 1992

APPENDIX B

CHAIN OF CUSTODY

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) Mark Kmetzel	Laboratory name CAS
ARCO engineer Kyle Christie	Telephone no. (ARCO) 415-571-2434	Telephone no. (Consultant) 408-453-0719	Fax no. (Consultant) 408-453-0452
Consultant name Emcon Associates	Address (Consultant) 1938 Junction Ave, San Jose, CA		Contract number 07077

Sample I.D.	Lab no	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH gas EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐ 5520 C/E ☐	TPH EPA 418.1/SM5030E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-1(24)	1-2	2		X		X	HCl	3/18/92	1500		X											
MW-2(24)	3-4	2		X		X	HCl		1540		X											
MW-4(24)	5-6	2		X		X	HCl		1600		X											
FB 1	7-8	2		X		X	HCl		1500		X											
MW-1(24)	9-10	2		X		X	HCl		1500						X							
MW-4(24)	11-12	2		X		X	HCl		1540						X							
MW-3(24)	13-14	2		X		X	HCl		1600						X							
MW-1(24)	15-16	2		X		X	NP		1500			X										
MW-2(24)	17-18	2		X		X	NP		1540			X										
MW-3(24)	19-20	2		X		X	NP		1600			X										
MW-1(24)	21-22	2		X		X	HCl		1500				X									
MW-2(24)	23-24	2		X		X	HCl		1540				X									
MW-3(24)	25-26	2		X		X	HCl		1600				X									
MW-1(24)		1		X		X	HNO_3		1500											X		
MW-2(24)		1		X		X	HNO_3		1540											X		
MW-3(24)		1		X		X	HNO_3	↓	1600											X		

Method of shipment: sampler will deliver

Special detection Limit/reporting: Lowest Possible

Special QA/QC: Normal
5520 C
TOG - 5520 F IR
per P Lacey 3-19-92

Remarks: 970-39.01
See attached Bottle List

Lab number: SJ92-0282

Turnaround time

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

Condition of sample: OK		Temperature received Cool	
Relinquished by sampler: Luke Z Rockey	Date 3/19/92	Time 9:18	Received by: [signature] 3-19-92 9:30
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory / Date / Time

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

APPC-3292 (2-91)

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) Mark Knuthal	Laboratory name CAS
ARCO engineer Kyle Christie	Telephone no. (ARCO) 415-571-2434	Telephone no. (Consultant) 408-453-0719	Fax no. (Consultant) 408-453-0452
Consultant name Emcon Associates	Address (Consultant) 1938 Junction Ave, San Jose, CA		Contract number 07077

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Semi Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	Metals Cd, Cr, Ni, Zn	200.7/6010
MW-1(24)		1		X		X	HNO_3	3/18/92	1500												X	
MW-2(24)		1		X		X	HNO_3	✓	1540												X	
MW-3(24)		1		X		X	HNO_3	✓	1600												X	

Special detection Limit/reporting: Lowest Possible

Special QA/QC: Normal

Remarks: G70-39.01 see attached Battle List

Lab number: SJ92-0282

Condition of sample: OK

Temperature received: COOL

Relinquished by sampler: Susan Routh	Date: 3/19/92 0918 Time	Received by:	3-19-92 9:35
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date Time

Turnaround time

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

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

APPC-3292 (2-91)

Columbia Analytical Services, Inc.

March 31, 1992

Mark Knuttel
EMCON Associates
1921 Ringwood Avenue
San Jose, CA 95131

Re: **ARCO #6148 - Oakland/Project #G70-39.01/SJ920282**

Dear Mark:

Enclosed are the results of the samples submitted to our lab on March 19, 1992. For your reference, these analyses have been assigned our work order number K921741C.

All analyses were performed in accordance with our laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin B. Elliott
Senior Project Chemist

CBE/das

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	03/19/92
Project:	ARCO #6148 - Oakland	**Work Order No.:**	K921741C
Sample Matrix:	Water		

Total Metals
µg/L (ppb)

	Sample Name:	MW-1	MW-2	MW-3
	Lab Code:	K1741-1	K1741-2	K1741-3
Analyte	**EPA Method**	**MRL**		
Cadmium	6010	3	ND	ND	ND
Chromium	6010	5	5	21	67
Lead	7421	2	3	9	27
Nickel	6010	20	ND	38	113
Zinc	6010	10	31	54	156

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by John Elliott Date 3/31/92

10001

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Associates
Project: ARCO #6148 - Oakland
Sample Matrix: Water

Work Order No.: K921741C

Total Metals
µg/L (ppb)

	Sample Name:	Method Blank
	Lab Code:	K1741-MB
Analyte	**EPA Method**	**MRL**	
Cadmium	6010	3	ND
Chromium	6010	5	ND
Lead	7421	2	ND
Nickel	6010	20	ND
Zinc	6010	10	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by John Elliott Date 3/31/92

00002

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) Mark K. Mutter	Laboratory name CAS
ARCO engineer Kyle Christie	Telephone no. (ARCO) 415-571-2434	Telephone no. (Consultant) 408-453-0719	Fax no. (Consultant) 408-453-0452
Consultant name Emcon Associates	Address (Consultant) 1938 Junction Ave, San Jose, CA		Contract number 07077

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐ 5520 B&F ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-1(24)		2		X		X	HCl	3/18/92	1500		X											
MW-2(24)		2		X		X	HCl		1540		X											
MW-3(24)		2		X		X	HCl		1600		X											
FB-1		2		X		X	HCl		1500		X											
MW-1(24)		2		X		X	HCl		1500						X							
MW-2(24)		2		X		X	HCl		1540						X							
MW-3(24)		2		X		X	HCl		1600						X							
MW-1(24)		2		X		X	NP		1500			X										
MW-2(24)		2		X		X	NP		1540			X										
MW-3(24)		2		X		X	NP		1600			X										
MW-1(24)		2		X		X	HCl		1500				X									
MW-2(24)		2		X		X	HCl		1540				X									
MW-3(24)		2		X		X	HCl		1600				X									
MW-1(24)		1		X		X	HNO_3		1500											X		
MW-2(24)		1		X		X	HNO_3		1540											X		
MW-3(24)		1		X		X	HNO_3	↓	1600											X		

Method of shipment: sampler will deliver

Special detection Limit/reporting: Lowest Possible

Special QA/QC: Normal
5520 C
TOG - 5520 F IR
per P. Lacey 3-19-92

Remarks: G70-39.01
See attached Bottle List

Lab number: SJ92-0282

Turnaround time
- Priority Rush 1 Business Day [ ]
- Rush 2 Business Days [ ]
- Expedited 5 Business Days [ ]
- Standard 10 Business Days [✓]

Condition of sample: OK		Temperature received: cool	
Relinquished by sampler: Isaac Rocha	Date 3/19/92 Time 9:18	Received by	3-19-92 9:30
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory: Lori K.	Date 3/20/92 Time 0930

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

APPC-3292 (2-91)

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no 6148	City (Facility) Oakland	Project manager (Consultant) Mark Knuttal	Laboratory name ICAS.
ARCO engineer Kyle Christie	Telephone no. (ARCO) 415-571-2434	Telephone no. (Consultant) 408-453-0719	Fax no. (Consultant) 408-453-0452	Contract number 07077
Consultant name Emcon Associates	Address (Consultant) 1938 Junction Ave, San Jose, CA		

Sample I.D.	Lab no	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Semi Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	Metals Cd, Cr, Ni, Zn 200.7/CorD	
MW-1(24)		1		X		X	HNO_3	3/18/92	1500												X	
MW-2(24)		1		X		X	HNO_3	✓	1540												X	
MW-3(24)		1		X		X	HNO_3	✓	1600												X	

Special detection Limit/reporting: Lowest Possible

Special QA/QC: Normal

Remarks: G70-39.01 see attached Bottle List

Lab number: SJ92-0282

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

Method of shipment: Sampler will deliver

Condition of sample: OK		Temperature received: COOL	
Relinquished by sampler: Jesse Z Ruth	Date 3/19/92 Time 0918	Received by	3-19-92 9:30
Relinquished by	Date Time	Received by	
Relinquished by	Date Time	Received by laboratory	Date 3/20/92 Time 0930

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

APPC 3292 (2-91)

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/

EMCON ASSOCIATES

PROJECT NO: 703901 | SAMPLE ID: MW-3

PURGED BY: L. RATH | CLIENT NAME: ARCO 6148

SAMPLED BY: L. RATH | LOCATION: 5131 Shattuck Ave Oakland

TYPE: Ground Water X | Surface Water ___ | Treatment Effluent ___ | Other ___

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

CASING ELEVATION (feet/MSL): NR | VOLUME IN CASING (gal.): 6.0

DEPTH TO WATER (feet): 16.62 | CALCULATED PURGE (gal.): 30.1

DEPTH OF WELL (feet): 25.8 | ACTUAL PURGE VOL. (gal.): 30.5

DATE PURGED: 3/18/92 | Start (2400 Hr) 1540 | End (2400 Hr) 1555

DATE SAMPLED: 3/18/92 | Start (2400 Hr) 1600 | End (2400 Hr) ___

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (Visual)	TURBIDITY (Visual)
1543	6.0	6.53	4.77	68.7	Clear	light
1545	12.0	6.56	545	68.5	"	"
1548	18.0	6.52	583	68.2	"	"
1551	24.0	6.51	596	67.9	"	"
1555	30.5	6.54	601	67.8	"	"

D. O. (ppm): NR | ODOR: slight | NR (COBALT 0 - 100) | NR (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
X Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	2 ___ Dedicated	___ Well Wizard™	___ Dedicated
Other: 2" Grundfos		Other:	

WELL INTEGRITY: Good | LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: ___ Time: ___ Meter Serial #: 911 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-1

Signature: Lance Rath | Reviewed By: MK | Page 3 of 3

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/

EMCON ASSOCIATES

PROJECT NO: G70 39 01 | SAMPLE ID: MW-1

PURGED BY: L. RATH | CLIENT NAME: ARCO 6148

SAMPLED BY: L. RATH | LOCATION: 5131 Shattuck Ave Oakland CA

TYPE: Ground Water X | Surface Water ___ | Treatment Effluent ___ | Other ___

CASING DIAMETER (inches): 2" ___ | 3 ___ | 4 X | 4.5 ___ | 6 ___ | Other ___

CASING ELEVATION (feet/MSL): NR | VOLUME IN CASING (gal.): 5.89

DEPTH TO WATER (feet): 16.81 | CALCULATED PURGE (gal.): 29.48

DEPTH OF WELL (feet): 25.8 (4.99 x 3.25) | ACTUAL PURGE VOL. (gal.): 30.0

DATE PURGED: 3/18/92 | Start (2400 Hr) 1410 | End (2400 Hr) 1432

DATE SAMPLED: 3/18/92 | Start (2400 Hr) 1500 | End (2400 Hr) ___

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (Visual)	TURBIDITY (Visual)
1413	6	6.19	437	70.4	Clear	light
1416	12	6.38	526	70.0	"	"
1420	18	6.41	467	69.9	"	"
1429	24	6.36	451	69.8	"	"
1432	30	6.35	462	69.7	"	"

D. O. (ppm): NR | ODOR: Strong | COLOR (COBALT 0 - 100): NR | TURBIDITY (NTU 0 - 200): NR

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
X Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: 2" grun Ros		Other:	

WELL INTEGRITY: good | LOCK #: 3259

REMARKS:

Meter Calibration: Date: 3/15/92 | Time: 1359 | Meter Serial #: 9111 | Temperature °F: 74.4

(EC 1000 9.81 / 1000) (DI 12.80) (pH 7 7.15 / 7.00) (pH 10 10.09 / 10.00) (pH 4 3.94 / ___)

Location of previous calibration: ___

Signature: [signature] | Reviewed By: MK | Page 1 of 3

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5

EMCON ASSOCIATES

PROJECT NO: G70 3901 | SAMPLE ID: MW-2

PURGED BY: L. RATLIFF | CLIENT NAME: ARCO 6148

SAMPLED BY: L. RATLIFF | LOCATION: 5131 Shattuck Ave

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): NR | VOLUME IN CASING (gal.): 6.0

DEPTH TO WATER (feet): 16.52 | CALCULATED PURGE (gal.): 30.4

DEPTH OF WELL (feet): 25.8 | ACTUAL PURGE VOL. (gal.): 20.5

DATE PURGED: 3/18/92 | Start (2400 Hr) 1518 | End (2400 Hr) 1529

DATE SAMPLED: 3/18/92 | Start (2400 Hr) 1540 | End (2400 Hr) —

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (Visual)	TURBIDITY (Visual)
1520	6.0	6.35	4.59	69.5	Clear	light
1524	12.0	6.51	4.99	69.3	"	"
1526	18.0	6.59	4.76	69.1	"	"
	Well Dried at	20.5 gal	at 1530	HRS		
1540	Recharge	6.52	4.75	68.7	Brown	mod

D. O. (ppm): NR | ODOR: Strong | NR (COBALT 0 - 100) | NR (NTU 0 - 200)

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

PURGING EQUIPMENT

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

Other: 2" Grundfos

SAMPLING EQUIPMENT

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

Other: ___

WELL INTEGRITY: Good | LOCK #: 3259

REMARKS: Well Dried at 20.5 gal at 1530 HRS

Meter Calibration: Date: ___ Time: ___ Meter Serial #: 911 Temperature °F: ___

(EC 1000 ___/___) (DI ___) (pH 7 ___/___) (pH 10 ___/___) (pH 4 ___/___)

Location of previous calibration: MW-1

Signature: [signature] Reviewed By: MK Page 2 of 3

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 703901 | SAMPLE ID: MW-3
PURGED BY: L. RATH | CLIENT NAME: ARCO 6148
SAMPLED BY: L. RATH | LOCATION: 5131 Shattuck, Oakland CA

TYPE: Ground Water X | Surface Water ___ | Treatment Effluent ___ | Other ___

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

CASING ELEVATION (feet/MSL): NR
DEPTH TO WATER (feet): 16.62
DEPTH OF WELL (feet): 25.8

VOLUME IN CASING (gal.): 6.0
CALCULATED PURGE (gal.): 30.1
ACTUAL PURGE VOL. (gal.): 30.5

DATE PURGED: 3/18/92 | Start (2400 Hr) 1540 | End (2400 Hr) 1555
DATE SAMPLED: 3/18/92 | Start (2400 Hr) 1600 | End (2400 Hr) ___

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (Visual)	TURBIDITY (Visual)
1543	6.0	6.53	4.77	68.7	Clear	light
1545	12.0	6.56	545	68.5	"	"
1548	18.0	6.52	583	68.2	"	"
1551	24.0	6.51	596	67.9	"	"
1555	30.5	6.54	601	67.8	"	"

D. O. (ppm): NR | ODOR: Slight | COLOR (COBALT 0 - 100): NR | TURBIDITY (NTU 0 - 200): NA

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

PURGING EQUIPMENT

___ 2" Bladder Pump
___ Centrifugal Pump
X Submersible Pump
___ Well Wizard™
___ Bailer (Teflon®)
___ Bailer (PVC)
___ Bailer (Stainless Steel)
___ Dedicated
Other: 2" Grundfos

SAMPLING EQUIPMENT

___ 2" Bladder Pump
___ DDL Sampler
___ Dipper
___ Well Wizard™
X Bailer (Teflon®)
___ Bailer (Stainless Steel)
___ Submersible Pump
___ Dedicated
Other: ___

WELL INTEGRITY: Good | LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: ___ | Time: ___ | Meter Serial #: 911 | Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-1

Signature: Lee Rath | Reviewed By: MK | Page 3 of 3

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

Date April 27, 1992
Project G70-39.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95118

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	April 1992 monthly water level survey, ARCO
	station 6148, 5131 Shattuck Avenue, Oakland, CA

For your: X Information Sent by: X Mail

Comments:
Monthly water level data for the above mentioned site are attached. Please call if you have any questions: (408) 453-2266.

Reviewed by:

Mark Knuttel MK

Robert Porter, Senior Project Engineer.

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-39.01 STATION ADDRESS : 5131 Shattuck Avenue, Oakland, C/ DATE : [illegible]

ARCO STATION # : 6148 FIELD TECHNICIAN : [illegible] DAY : [illegible]

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	OK	OK	OK	OK	OK	17.56	17.56	ND	ND	25.73	—
2	MW-2	OK	OK	OK	OK	OK	17.21	17.24	ND	ND	25.8	—
3	MW-3	OK	OK	OK	OK	OK	17.38	17.38	ND	ND	25.83	—

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

RECEIVED
MAY
RESNA

Date May 19, 1992
Project G70-39.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95118

We are enclosing:

Copies	Description
1	Depth To Water/Floating Product Survey Results
	May 1992 monthly water level survey, ARCO
	station 6148, 5131 Shattuck Avenue, Oakland, CA

For your: X Information Sent by: X Mail

Comments:
Monthly water level data for the above mentioned site are attached. Please call if you have any questions: (408) 453-2266.

Jim Butera JB

Reviewed by:

6/30/92

Robert Porter, Senior Project Engineer.

1333 [illegible], Suite [illegible], California 95131-2122, (408) 453-[illegible], Fax (408) 453-0452

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-39.01 STATION ADDRESS : 5131 Shattuck Ave., Oakland, CA DATE : 5-15-91

ARCO STATION # : 6148 FIELD TECHNICIAN : BUTCRA DAY : FRIDAY

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	ok	15/16 socket	ok	3259	yes	17.96	17.95	ND	NA	25.7	—
2	MW-2	ok	15/16 socket	ok	3259	yes	17.62	17.62	ND	NA	25.8	—
3	MW-3	ok	15/16 socket	ok	3259	yes	17.80	17.80	ND	NA	25.8	—

Columbia Analytical Services, Inc.

June 26, 1992

Jim Butera
EMCON Associates
1921 Ringwood Avenue
San Jose, CA 95131

Re: EMCON Project No. G70-39.01
Arco Facility No. 6148

Dear Mr. Butera:

Enclosed are the results of the water samples submitted to our lab on June 12, 1992. For your reference, our service request number for this work is SJ92-0731.

During extraction the Method Blank for the Diesel analysis was apparently contaminated with Gasoline from sample MW-3. The chromatograms of both samples and the Method Blank had fingerprints resembling Gasoline and not Diesel. Due to insufficient sample volume, we could not reanalyze the samples for Diesel. We apologize for any inconvenience this may have caused. Except as noted, all analyses were performed in accordance with the laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Keoni A. Murphy
Laboratory Manager

Annelise J. Bazar
Regional QA Coordinator

le/KAM

Summary of Groundwater Monitoring Data
Second Quarter 1992
ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California
micrograms per liter (µg/l) and milligrams per liter (mg/l)

Well ID and Sample Depth	Sampling Date	Depth To Water (feet)	Floating Product Thickness (feet)	TPH[1] as Gasoline (µg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethyl-benzene (µg/l)	Total Xylenes (µg/l)	TPH as Diesel (µg/l)	Total Oil and Grease, 5520B (mg/l
MW-1(25)	06/12/92	18 16	ND.[2]	1,000	290	15.	10	30	<50*	<0 5
MW-2	FP[3]	17.67	0.5	FP	FP	FP	FP	FP	FP	FP
MW-3(25)	06/12/92	18.01	ND.	46,000	3,400	4,200.	1,300	5,400	1,600 *	16.
FB 1 [4]	06/12/92	NA [5]	NA.	<50	< 0 5	<0 5	<0.5	< 0 5	NR [6]	NR

1 TPH = Total petroleum hydrocarbons
2 ND = Not detected
3 FP = Floating product detected in well, no sample was taken
4 FB = Field Blank
5 NA = Not applicable
6 NR = Not reported; sample was not scheduled for analysis of the selected parameter
* = Sample was taken on 7/2/92

Summary of Analytical Results
Halogenated Volatile Organic Compounds by EPA[1] Methods 5030/8010
Second Quarter 1992
ARCO Service Station 6148
5131 Shattuck Avenue, Oakland, California
micrograms per liter (µg/l) or parts per billion (ppb)

Well ID and Sample Depth	Sampling Date	cis-1,2-DCE[2] (ppb)	TCE[3] (ppb)	PCE[4] (ppb)
MW-1(25)	06/12/92	<0.5	1.4	18
MW-2	FP[5]	FP	FP	FP
MW 3(25)	06/12/92	<0.5	<0.5	1.9

1. EPA = United States Environmental Protection Agency
2. cis-1,2-DCE = cis-1,2-Dichloroethene
3. TCE = Trichloroethene
4. PCE = Tetrachloroethene
5. FP = Floating product detected, well not sampled

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-39.01 STATION ADDRESS : 5131 Shattuck Ave., Oakland, CA DATE : 6/12/[illegible]

ARCO STATION # : 6148 FIELD TECHNICIAN : K. Reichelderfer / S. Horton DAY : Friday

DTW Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	Good	Yes	Good	3259	Yes	18.16	18.16	ND	ND	25.73	—
2	MW-2	Good	Yes	Good	3259	Yes	17.67	17.67	ND w/probe	.05 w/bailer ND w/probe	25.78	Strong odor noticed .05 measured with teflon
3	MW-3	Good	Yes	Good	3259	Yes	18.01	18.01	ND	ND	[illegible]	—

FIELD REPORT
DEPTH TO WATER / FLOATING PRODUCT SURVEY

PROJECT # : G70-39.01 STATION ADDRESS : 5131 Shattuck Ave., Oakland, CA DATE : 7 2 92

ARCO STATION # : 6148 FIELD TECHNICIAN : K REICHELDERFER DAY : THURSDAY

Grid Order	WELL ID	Well Box Seal	Well Lid Secure	Gasket	Lock	Locking Well Cap	FIRST DEPTH TO WATER (feet)	SECOND DEPTH TO WATER (feet)	DEPTH TO FLOATING PRODUCT (feet)	FLOATING PRODUCT THICKNESS (feet)	WELL TOTAL DEPTH (feet)	COMMENTS
1	MW-1	OK	OK	OK	OK	BAD	18.25	18.25	-	-	25.80	LIP ON CAP IS CRACKED
2	MW-3	OK	OK	OK	OK	OK	18.29	18.29	-	-	25.80	

Analytical Report

Client:	EMCON Associates	Date Received:	06/12/92
Project:	EMCON Project No. 370-39.01	Work Order #:	SJ92-0731
	Arco Facility No. 6148	Sample Matrix:	Water

Inorganic Parameters[1]
mg/L (ppm)

Sample Name:			MW-1 (25)	MW-3 (25)	Method Blank
Date Sampled:			06/12/92	06/12/92	
Analyte	Method	MRL			
Total Oil and Grease	413.2	0.5	ND	16.	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
[1] Unless otherwise noted, all analyses were performed within EPA recommended maximum holding times specified in *Test Methods for Evaluating Solid Waste*, (SW-846, 3rd Edition) and *Methods for Chemical Analysis of Water and Waste* (EPA-600/4-79-020, Revised March 1983).

Approved by _____ Date June 26, 1992

Analytical Report

Client:	EMCON Associates	Date Received:	06/12/92
Project:	EMCON Project No. G70-39.01	Date Extracted:	06/19/92
	Arco Facility No. 6148	Date Analyzed:	06/22/92
Sample Matrix:	Water	Work Order #:	SJ92-0731

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

Sample Name	MRL	TPH as Diesel
MW-1 (25)	50	400.[1,2]
MW-3 (25)	50	24,000.[1]
Method Blank	50	2,100.[1]

MRL Method Reporting Limit
TPH Total Petroleum Hydrocarbons

1 The sample matrix contains a lower boiling point fuel mixture calculated as diesel. The chromatogram does not match typical diesel fingerprint.

2 Analyte concentration is an estimate because this analyte was found in the Method Blank.

Approved by [signature] Date June 26, 1992

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
µg/L (ppb)

Sample Name:		MW-1 (25)	MW-3 (25)	FB-1
Date Analyzed:		06/17/92	06/19/92	06/17/92
Analyte	MRL			
Benzene	0.5	290.	3,400.	ND
Toluene	0.5	15.	4,200.	ND
Ethylbenzene	0.5	10.	1,300.	ND
Total Xylenes	0.5	30.	5,400.	ND
TPH as Gasoline	50	1,000.	46,000.	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kevin P. Murphy Date June 26, 1992

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. 670-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
µg/L (ppb)

Sample Name:		Method Blank	Method Blank
Date Analyzed:		06/17/92	06/19/92
Analyte	MRL		
Benzene	0.5	ND	ND
Toluene	0.5	ND	ND
Ethylbenzene	0.5	ND	ND
Total Xylenes	0.5	ND	ND
TPH as Gasoline	50	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kenneth Phillips Date June 26, 1992

Analytical Report

Client:	EMCON Associates	Date Received:	06/12/92
Project:	EMCON Project No. G70-39.01	Work Order #:	SJ92-0731
	Arco Facility No. 6148	Sample Matrix:	Water

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
µg/L (ppb)

Sample Name:		MW-1 (25)	MW-3 (25)	Method Blank
Date Analyzed:		06/16/92	06/19/92	06/16/92
Analyte	**MRL**			
Dichlorodifluoromethane (Freon 12)	1	ND	ND	ND
Chloromethane	1	ND	ND	ND
Vinyl Chloride	0.5	ND	ND	ND
Bromomethane	0.5	ND	ND	ND
Chloroethane	0.5	ND	ND	ND
Trichlorofluoromethane (Freon 11)	0.5	ND	ND	ND
1,1-Dichloroethene	0.5	ND	ND	ND
Trichlorotrifluoroethane (Freon 113)	0.5	ND	ND	ND
Methylene Chloride	0.5	ND	ND	ND
trans-1,2-Dichloroethene	0.5	ND	ND	ND
cis-1,2-Dichloroethene	0.5	ND	ND	ND
1,1-Dichloroethane	0.5	ND	ND	ND
Chloroform	0.5	ND	ND	ND
1,1,1-Trichloroethane (TCA)	0.5	ND	ND	ND
Carbon Tetrachloride	0.5	ND	ND	ND
1,2-Dichloroethane	0.5	ND	ND	ND
Trichloroethene (TCE)	0.5	1.4	ND	ND
1,2-Dichloropropane	0.5	ND	ND	ND
Bromodichloromethane	0.5	ND	ND	ND
2-Chloroethyl Vinyl Ether	5	ND	ND	ND
trans-1,3-Dichloropropene	0.5	ND	ND	ND
cis-1,3-Dichloropropene	0.5	ND	ND	ND
1,1,2-Trichloroethane	0.5	ND	ND	ND
Tetrachloroethene (PCE)	0.5	18.	1.9	ND
Dibromochloromethane	0.5	ND	ND	ND
Chlorobenzene	0.5	ND	ND	ND
Bromoform	0.5	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.5	ND	ND	ND
1,3-Dichlorobenzene	1	ND	ND	ND
1,4-Dichlorobenzene	1	ND	ND	ND
1,2-Dichlorobenzene	1	ND	ND	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kevin Murphy Date June 26, 1992

Analytical Report

Client: EMCON Associates
Project: EMCON Project No. 370-39.01
Arco Facility No. 6143

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
µg/L (ppb)

Sample Name: Method Blank
Date Analyzed: 06/19/92

Analyte	MRL	
Dichlorodifluoromethane (Freon 12)	1	ND
Chloromethane	1	ND
Vinyl Chloride	0.5	ND
Bromomethane	0.5	ND
Chloroethane	0.5	ND
Trichlorofluoromethane (Freon 11)	0.5	ND
1,1-Dichloroethene	0.5	ND
Trichlorotrifluoroethane (Freon 113)	0.5	ND
Methylene Chloride	0.5	ND
trans-1,2-Dichloroethene	0.5	ND
cis-1,2-Dichloroethene	0.5	ND
1,1-Dichloroethane	0.5	ND
Chloroform	0.5	ND
1,1,1-Trichloroethane (TCA)	0.5	ND
Carbon Tetrachloride	0.5	ND
1,2-Dichloroethane	0.5	ND
Trichloroethene (TCE)	0.5	ND
1,2-Dichloropropane	0.5	ND
Bromodichloromethane	0.5	ND
2-Chloroethyl Vinyl Ether	5	ND
trans-1,3-Dichloropropene	0.5	ND
cis-1,3-Dichloropropene	0.5	ND
1,1,2-Trichloroethane	0.5	ND
Tetrachloroethene (PCE)	0.5	ND
Dibromochloromethane	0.5	ND
Chlorobenzene	0.5	ND
Bromoform	0.5	ND
1,1,2,2-Tetrachloroethane	0.5	ND
1,3-Dichlorobenzene	1	ND
1,4-Dichlorobenzene	1	ND
1,2-Dichlorobenzene	1	ND

MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Kevin Mansfield Date June 26, 1992

APPENDIX A

LABORATORY QC RESULTS

Client: EMCCN Associates
Project: EMCCN Project No. G70-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

QA/QC Report
Matrix Spike Summary*
Inorganic Parameters
mg/L (ppm)

Parameter	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
Total Oil and Grease	6.3	ND	5.4	4.6	86.	73.	55-145

ND None Detected at or above the method reporting limit

* *The MS and DMS are from the sample run prior to this batch. There were only two (2) samples in this batch and there was insufficient sample volume to perform an MS/DMS.*

Approved by Kenneth Williams Date June 26, 1992

Client:	EMCON Associates	Date Received:	06/12/92
Project:	EMCON Project No. G70-39.01	Work Order #:	SJ92-0731
	Arco Facility No. 6148	Sample Matrix:	Water

QA/QC Report
Continuing Calibration Summary
TPH as Diesel
EPA Methods 3510/DHS LUFT Method
mg/L (ppm)

Date Analyzed: 06/22/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
TPH as Diesel	1,000.	972.	97.	90-110

TPH Total Petroleum Hydrocarbons

Approved by Kevin Murphy Date June 26, 1992

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

QA/QC Report
Surrogate Recovery Summary
TPH as Diesel
EPA Method 3510/DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery P-Terphenyl
MW-1 (25)	06/22/92	85.
MW-3 (25)	06/22/92	*
MS	06/22/92	63.
DMS	06/22/92	88.
Method Blank	06/22/92	103.
	CAS Acceptance Criteria	55-145

TPH Total Petroleum Hydrocarbons
* No surrogate spike recovery was calculated due to high sample concentration requiring a dilution.

Approved by Kevin Murphy Date June 26, 1992

Client:	EMCON Associates	**Date Received:**	06/12/92
Project:	EMCON Project No. G70-39.01	**Work Order #:**	SJ92-0731
	Arco Facility No. 6148	**Sample Matrix:**	Water

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
Total Petroleum Hydrocarbons as Diesel
DHS LUFT Method
µg/L (ppb)

Data Analyzed: 06/22/92

Parameter	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
Diesel	3,640.	1,170.	4,860.	4,460.	101.	90.	55-145

Approved by Kenneth Smith Date June 26, 1992

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

QA/QC Report
Continuing Calibration Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/DHS LUFT Method
Nanograms

Date Analyzed: 06/17/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	251.	100.	85-115
Toluene	250.	273.	109.	85-115
Ethylbenzene	250.	265.	106.	85-115
Total Xylenes	750.	760.	101.	85-115
TPH as Gasoline	2,500.	2,506.	100.	90-110

Date Analyzed: 06/19/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	248.	99.	85-115
Toluene	250.	267.	107.	85-115
Ethylbenzene	250.	258.	103.	85-115
Total Xylenes	750.	744.	99.	85-115
TPH as Gasoline	2,500.	2,482.	99.	90-110

TPH Total Petroleum Hydrocarbons

Approved by Kevin Murphy Date June 26, 1992

Client: EMCON Associates
Project: EMCON Project No. 370-39.01
Arco Facility No. 3148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

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

Sample Name	Date Analyzed	Percent Recovery *a,a,a*-Trifluorotoluene
MW-1 (25)	06/17/92	106.
MW-3 (25)	06/19/92	113.
FB-1	06/17/92	100.
MS	06/17/92	113.
DMS	06/17/92	122.
Method Blank	06/17/92	110.
Method Blank	06/19/92	108.
	CAS Acceptance Criteria	70-130

TPH Total Petroleum Hydrocarbons

Approved by [signature] Date June 26, 1992

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

QA QC Report
Matrix Spike/Duplicate Matrix Spike Summary
TPH as Gasoline
EPA Method 5030/DHS LUFT Method
µg/L (ppb)

Date Analyzed: 06/17/92

Analytes	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
TPH as Gasoline	250.	ND	265.9	273.9	106.	110.	70-140

ND None Detected at or above the method reporting limit
TPH Total Petroleum Hydrocarbons

Approved by _____ Date June 22, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

Continuing Calibration Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Nanograms

Date Analyzed: 06/16/92

Analyte	True Value	Result	Percent Recovery	EPA Percent Recovery Acceptance Criteria
Chloromethane	50	58.	116.	D-193
Vinyl Chloride	50	61.	122.	28-163
Bromomethane	50	62.	124.	D-144
Chloroethane	50	54.	108.	46-137
Trichlorofluoromethane (Freon 11)	50	44.	88.	21-156
1,1-Dichloroethene	50	55.	110.	28-167
Methylene Chloride	50	44.	88.	25-162
trans-1,2-Dichloroethene	50	45.	90.	38-155
1,1-Dichloroethane	50	45.	90.	47-132
Chloroform	50	44.	88.	49-133
1,1,1-Trichloroethane (TCA)	50	46.	92.	41-138
Carbon Tetrachloride	50	49.	98.	43-143
1,2-Dichloroethane	50	48.	96.	51-147
Trichloroethene (TCE)	50	47.	94.	35-146
1,2-Dichloropropane	50	49.	98.	44-156
Bromodichloromethane	50	45.	90.	42-172
trans-1,3-Dichloropropene	50	49.	98.	22-178
cis-1,3-Dichloropropene	50	45.	90.	22-178
1,1,2-Trichloroethane	50	43.	86.	39-136
Tetrachloroethene (PCE)	50	48.	96.	26-162
Dibromochloromethane	50	40.	80.	24-191
Chlorobenzene	50	45.	90.	38-150
Bromoform	50	35.	70.	13-159
1,1,2,2-Tetrachloroethane	50	38.	76.	8-184
1,3-Dichlorobenzene	50	47.	94.	7-187
1,4-Dichlorobenzene	50	49.	98.	42-143
1,2-Dichlorobenzene	50	46.	92.	D-208

D Detected

Approved by [signature] Date JUNE 26, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Associates
Project: EMCON Project No. G70-33.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

Continuing Calibration Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
Nanograms

Date Analyzed: 06/19/92

Analyte	True Value	Result	Percent Recovery	EPA Percent Recovery Acceptance Criteria
Chloromethane	50	58.	116.	D-193
Vinyl Chloride	50	62.	124.	28-163
Bromomethane	50	50.	100.	D-144
Chloroethane	50	52.	104.	46-137
Trichlorofluoromethane (Freon 11)	50	42.	84.	21-156
1,1-Dichloroethene	50	50.	100.	28-167
Methylene Chloride	50	41.	82.	25-162
trans-1,2-Dichloroethene	50	44.	88.	38-155
1,1-Dichloroethane	50	43.	86.	47-132
Chloroform	50	44.	88.	49-133
1,1,1-Trichloroethane (TCA)	50	45.	90.	41-138
Carbon Tetrachloride	50	47.	94.	43-143
1,2-Dichloroethane	50	42.	84.	51-147
Trichloroethene (TCE)	50	46.	92.	35-146
1,2-Dichloropropane	50	46.	92.	44-156
Bromodichloromethane	50	42.	34.	42-172
trans-1,3-Dichloropropene	50	42.	34.	22-178
cis-1,3-Dichloropropene	50	40.	80.	22-178
1,1,2-Trichloroethane	50	37.	74.	39-136
Tetrachloroethene (PCE)	50	47.	94.	26-162
Dibromochloromethane	50	35.	70.	24-191
Chlorobenzene	50	45.	90.	38-150
Bromoform	50	30.	60.	13-159
1,1,2,2-Tetrachloroethane	50	32.	64.	8-184
1,3-Dichlorobenzene	50	44.	88.	7-187
1,4-Dichlorobenzene	50	47.	94.	42-143
1,2-Dichlorobenzene	50	43.	86.	D-208

D Detected

Approved by: _____ Date: June 26, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

QA/QC Report
Surrogate Recovery Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010

Sample Name	Date Analyzed	Percent Recovery 4-Bromofluorobenzene
MW-1 (25)	06/16/92	97.
MW-3 (25)	06/19/92	92.
MW-3 (25) MS	06/19/92	115.
MW-3 (25) DMS	06/19/92	113.
Method Blank	06/16/92	96.
Method Blank	06/19/92	96.
	CAS Acceptance Criteria	70-130

Approved by Kenneth Wyatt Date June 26, 1992

COLUMBIA ANALYTICAL SERVICES, INC.

Client: EMCON Associates
Project: EMCON Project No. 370-39.01
Arco Facility No. 6148

Date Received: 06/12/92
Work Order #: SJ92-0731
Sample Matrix: Water

QA/QC Report
Matrix Spike Summary
Halogenated Volatile Organic Compounds
EPA Methods 5030/8010
µg/L (ppb)

Sample Name: MW-3 (25)
Date Analyzed: 06/19/92

Compound	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
1,1-Dichloroethene	10	ND	10.7	10.2	107.	102.	28-167
Trichloroethene	10	ND	10.7	10.7	107.	107.	35-146
Tetrachloroethene	10	1.9	12.5	12.3	106.	104.	26-162

ND None Detected at or above the method reporting limit

Approved by _____ Date June 26, 1992

APPENDIX B

CHAIN OF CUSTODY

[redacted]od[redacted] Co[redacted]any[redacted]
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no: 6148
City (Facility): OAKLAND
Project manager (Consultant): JILL BUTERA
ARCO engineer: Kyle Christie
Telephone no (ARCO): (415) 571-2434
Telephone no (Consultant): (408) 453-0719
Fax no (Consultant): (408) 453-0452
Consultant name: EMCON ASSOCIATES
Address (Consultant): 1938 JUNCTION AVENUE SAN JOSE

Laboratory name: CAS
Contract number: 07077
Method of shipment: Sampler will Deliver

Sample I.D.	Lab no	Container no	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH GAS EPA M602/8020/8015	TPH Modified 8015 Gas / Diesel	Oil and Grease 413.1 / 413.2	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Semi Metals / VOA / VOA	CAM Metals EPA 6010/7000 TTLC / STLC	Lead Org./DHS Lead EPA 7420/7421		
MW-1(25)	1-5	6		X		X	HCl	6/12/92	13:45		X		X		X							
MW-2(		6		X		X	HCl				X		X		X		no sample					
MW-3(25)	6-10	6		X		X	HCl	6/12/92	14:25		X		X		X							
FB-1	11-12	2		X		X	HCl	6/12/92	13:45		X											
MW-1(25)	13	2		X		X	NP	6/12/92	13:45			X										
MW-2(		2		X		X	NP					X				no sample						
MW-3(25)	14	2		X		X	NP	6/12/92	14:25			X										

Special detection limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks:
2-VOA's: TPH GAS
2-VOA's: EPA 601
2-Liter HCl: TOG
2 Liter NP: TPH DIES
670-39.01

Lab number: SJ92-073

Condition of sample: OK, except received plastic NP for diesel
Temperature received: Cool

Relinquished by sampler: [signature] Date: 6/12/92 Time: 15:51
Received by: [signature] Date: 6-12-92 Time: 1551
Relinquished by: Date: Time:
Received by:
Relinquished by: Date: Time:
Received by laboratory: Date: Time:

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

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

Columbia Analytical Services, Inc.

July 9, 1992

Jim Butera
EMCON Associates
1921 Ringwood Avenue
San Jose, CA 95131

Re: EMCON Project No. G70-39.01
Arco Facility No. 6148

Dear Mr. Butera:

Enclosed are the results of the water samples submitted to our lab on July 6, 1992. For your reference, our service request number for this work is SJ92-0809.

All analyses were performed in accordance with the laboratory's quality assurance program.

Please call if you have any questions.

Respectfully submitted:

COLUMBIA ANALYTICAL SERVICES, INC.

Keoni A. Murphy
Laboratory Manager

Annelise J. Bazar
Regional QA Coordinator

le/KAM

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

Analytical Report

Client:	EMCON Associates	Date Received:	07/06/92
Project:	EMCON Project No. G70-39.01	Date Extracted:	07/07/92
	Arco Facility No. 6148	Date Analyzed:	07/08/92
Sample Matrix:	Water	Work Order #:	SJ92-0809

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

Sample Name	MRL	TPH as Diesel
MW-1 (25)	50.	ND
MW-3 (25)	50.	1,600.*
Method Blank	50	ND

MRL Method Reporting Limit
TPH Total Petroleum Hydrocarbons
ND None Detected at or above the method reporting limit
* Sample contains a lower boiling point hydrocarbon mixture quantitated as diesel. The chromatogram does not match the typical diesel fingerprint.

Approved by Kenneth Murphy Date July 9, 1992

APPENDIX A

LABORATORY QC RESULTS

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 07/06/92
Work Order #: SJ92-0809
Sample Matrix: Water

QA/QC Report
Continuing Calibration Summary
TPH as Diesel
EPA Methods 3510/DHS LUFT Method
mg/L (ppm)

Date Analyzed: 07/08/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
TPH as Diesel	1,000.	907.	91.	90-110

TPH Total Petroleum Hydrocarbons

Approved by [signature] Date JUN 9 1992

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 07/06/92
Work Order #: SJ92-0809
Sample Matrix: Water

QA/QC Report
Surrogate Recovery Summary
TPH as Diesel
EPA Method 3510/DHS LUFT Method

Sample Name	Date Analyzed	Percent Recovery P-Terphenyl
MW-1 (25)	07/08/92	79.
MW-3 (25)	07/08/92	79.
MS	07/08/92	90.
DMS	07/08/92	96.
Method Blank	07/08/92	86.
	CAS Acceptance Criteria	55-145

TPH Total Petroleum Hydrocarbons

Approved by _____ Date July 9, 1992

Client: EMCON Associates
Project: EMCON Project No. G70-39.01
Arco Facility No. 6148

Date Received: 07/06/92
Work Order #: SJ92-0809
Sample Matrix: Water

QA/QC Report
Matrix Spike/Duplicate Matrix Spike Summary
TPH as Diesel
DHS LUFT Method
µg/L (ppb)

Date Analyzed: 07/08/92

Parameter	Spike Level	Sample Result	Spike Result MS	Spike Result DMS	Percent Recovery MS	Percent Recovery DMS	Acceptance Criteria
Diesel	4,440.	ND	4,200.	4,290.	95.	97.	55-145

ND None Detected at or above the method reporting limit
TPH Total Petroleum Hydrocarbons

Approved by _____ Date 7/9/92

APPENDIX B

CHAIN OF CUSTODY

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no 6148 City (Facility) OAKLAND

ARCO engineer Kyle Christie Telephone no (ARCO) (408) 571-2434

Consultant name EMCON ASSOCIATES

Project manager (Consultant) JIM BUTERA

Telephone no (Consultant) (408) 453-0719 Fax no (Consultant) (408) 453-0452

Address (Consultant) 1938 JUNCTION AVE SAN JOSE CA

Laboratory name CAS

Contract number 07077

Method of shipment Sampler will deliver

Sample I.D.	Lab no	Container no	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
MW-1(25)	1-2	2		X		X	NP	7-2-92	1240			X										
MW-3(25)	3-4	2		X		X	NP	7-2-92	1334			X										

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2 - liter gla[ss] NP per well

G70-3901

48hr TAT oked by J Butera

Lab number SJ92-080[illegible]

Turnaround time

Priority Rush 1 Business Day ☒

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample: OK

Temperature received: Cool

Relinquished by sampler: Kevin Reichelderfer — Date 7-6-92 Time 1003

Received by: [signature] AF

Relinquished by: [signature] — Date 7-6-92 Time 1510

Received by: [signature] 7-6-92 1510

Relinquished by — Date — Time

Received by laboratory — Date — Time

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

APPC 3292 (2 91)

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

RECEIVED
JUL 92
RESNA
SAN JOSE

Date July 9, 1992
Project G70-39.01

To:
Mr. Joel Coffman
RESNA/ Applied Geosystems
3315 Almaden Expressway, Suite 34
San Jose, California 95050

We are enclosing:

Copies	Description
2	Depth To Water / Floating Product Survey Results
2	Summary of Groundwater Monitoring Data
2	Certified Analytical Reports with Chain-of-Custody
5	Water Sample Field Data Sheets

For your: X Information Sent by: X Mail

Comments:

Enclosed are the data from the second quarter 1992 monitoring event at ARCO service station 6148. Please note that wells MW-1 and MW-3 were resampled for diesel analysis on July 2, 1992 due to quality assurance deficiencies associated with the original analysis of these samples. Both the original and resample diesel results are enclosed for your review. Groundwater monitoring is conducted consistent with applicable regulatory guidelines.

Reviewed by: Jim Butera

REGISTERED PROFESSIONAL ENGINEER
SHREERANG N. DHARASKER
No. 00470
Exp 6/30/96
CHEMICAL
STATE OF CALIFORNIA

Shreerang N. Dharasker, Senior Project Engineer.

1938 Junction Avenue, San Jose, California 95131-2102, (408) 453-0719 Fax (408) 453-0452

WATER SAMPLE FIELD DATA SHEET

Rev. 2 3/91

EMCON ASSOCIATES

PROJECT NO: 67C-39 C1 SAMPLE ID: MW-1

PURGED BY: S. Hartan/K. Reichelderfer CLIENT NAME: ARCO #4149

SAMPLED BY: S. Hartan/K. Reichelderfer LOCATION: Oakland, CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): - VOLUME IN CASING (gal.): 4.96

DEPTH TO WATER (feet): 19.16 CALCULATED PURGE (gal.): 24.82

DEPTH OF WELL (feet): 25.73 ACTUAL PURGE VOL. (gal.): 25 CC

DATE PURGED: 6/12/92 Start (2400 Hr) 13:15 End (2400 Hr) 13:35

DATE SAMPLED: 6/12/92 Start (2400 Hr) 13:43 End (2400 Hr) 13:45

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
13:19	5	5.99	442	66.7	cloudy	slight
13:21	10	6.09	466	67.4	cloudy	slight
13:23	15	6.36	466	67.5	cloudy	slight
13:26	20	6.19	460	67.6	cloudy	slight
13:36	25	6.21	454	67.2	clear	trace

D. O. (ppm): NR ODOR: moderate NR (COBALT 0 - 100) NR (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
X Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: 3209

REMARKS: ___

Meter Calibration: Date: 6/12/92 Time: 12:50 Meter Serial #: 9912 Temperature °F: 69.5

(EC 1000 1411 / 1000) (DI ___) (pH 7 7.01 / 7.00) (pH 10 9.97 / 10.00) (pH 4 3.95 / ___)

Location of previous calibration: ___

Signature: ___ Reviewed By: JB Page 1 of 5

WATER SAMPLE FIELD DATA SHEET

Rev. 2 3/91

EMCON ASSOCIATES

PROJECT NO: G70-39.01 | SAMPLE ID: MW-1

PURGED BY: K REICHELDERFER | CLIENT NAME: ARCO 6148

SAMPLED BY: K REICHELDERFER | LOCATION: 5131 SHATTUCK AVE OAKLAND

TYPE: Ground Water X | Surface Water ___ | Treatment Effluent ___ | Other ___

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

CASING ELEVATION (feet/MSL): — | VOLUME IN CASING (gal.): 4.95

DEPTH TO WATER (feet): 18.25 | CALCULATED PURGE (gal.): 24.76

DEPTH OF WELL (feet): 25.80 | ACTUAL PURGE VOL. (gal.): 14.00

DATE PURGED: 7-2-92 | Start (2400 Hr) 1200 | End (2400 Hr) 1242

DATE SAMPLED: 7-2-92 | Start (2400 Hr) 1235 | End (2400 Hr) 1240

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1207	5.00	5.89	529	72.9	CLOUDY	LIGHT
1210	10.00	6.19	547	72.1	1	1
1214	~~15.00~~	DRIED	WELL @ 14.00 GALLONS			1
1242	~~RECHARGE~~	6.03	525	70.7	↓	↓
	~~25.00~~					
D. O. (ppm): NR		ODOR: MILD			NR (COBALT 0 - 100)	NR (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
X Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: GOOD | LOCK #: 3259

REMARKS: LWC HAS A CRACKED EDGE
DRIED WELL @ 14.00 GALLONS

Meter Calibration: Date: 7-2-92 | Time: 1130 | Meter Serial #: 9203 | Temperature °F: 72.3

(EC 1000 1049 / 1000) (DI ___) (pH 7 7.09 / 7.00) (pH 10 10.04 / 10.00) (pH 4 3.98 / ___)

Location of previous calibration: ___

Signature: Kevin Reichelderfer | Reviewed By: JB | Page 2 of 5

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 7C-39 C1 SAMPLE ID: MW-2

PURGED BY: ~~S Horton/K Reichelderfer~~ CLIENT NAME: ARCO #6149

SAMPLED BY: ~~S Horton/K Reichelderfer~~ NA LOCATION: Oakland, CA

TYPE: Ground Water X Surface Water ____ Treatment Effluent ____ Other ____

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

CASING ELEVATION (feet/MSL): — VOLUME IN CASING (gal.): ~~5.77~~ NA

DEPTH TO WATER (feet): 17.67 CALCULATED PURGE (gal.): 26.EC /

DEPTH OF WELL (feet): 25.79 ACTUAL PURGE VOL. (gal.): ____ /

DATE PURGED: 6/17/97 Start (2400 Hr) ____ End (2400 Hr) ____

DATE SAMPLED: 6/17/97 Start (2400 Hr) ____ End (2400 Hr) ____

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
			NC Sample			
			Well Contained Product			

D. O. (ppm): NR ODOR: ____ NR (COBALT 0 - 100) NR (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
____ 2" Bladder Pump	____ Bailer (Teflon®)	____ 2" Bladder Pump	~~X~~ Bailer (Teflon®)
____ Centrifugal Pump	____ Bailer (PVC)	____ DDL Sampler	____ Bailer (Stainless Steel)
X Submersible Pump	____ Bailer (Stainless Steel)	____ Dipper	____ Submersible Pump
____ Well Wizard™	____ Dedicated	____ Well Wizard™	____ Dedicated
Other: NA		Other: NA	

WELL INTEGRITY: Good LOCK #: 3259

REMARKS: ____

Meter Calibration: Date: 6/17/97 Time: ____ Meter Serial #: 5917 Temperature °F: ____

(EC 1000 ____ / ____) (DI ____) (pH 7 ____ / ____) (pH 10 ____ / ____) (pH 4 ____ / ____)

Location of previous calibration: MW-1

Signature: [signature] Reviewed By: JS

WATER SAMPLE FIELD DATA SHEET

EMCON ASSOCIATES

PROJECT NO: 7C-39 C1 SAMPLE ID: MW-3

PURGED BY: S. Horton / K. Reichelderfer CLIENT NAME: ARCO # 6145

SAMPLED BY: S. Horton / K. Reichelderfer LOCATION: Oakland, CA

TYPE: Ground Water X Surface Water ___ Treatment Effluent ___ Other ___

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

CASING ELEVATION (feet/MSL): ___ VOLUME IN CASING (gal.): 5.12

DEPTH TO WATER (feet): 14.01 CALCULATED PURGE (gal.): 25.61

DEPTH OF WELL (feet): 25.92 ACTUAL PURGE VOL. (gal.): 26.00

DATE PURGED: 6/17/97 Start (2400 Hr) 13:55 End (2400 Hr) 14:13

DATE SAMPLED: 6/17/97 Start (2400 Hr) 14:23 End (2400 Hr) 14:25

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
14:02	5.5	6.36	447	66.5	clear	slight
14:04	11	6.30	496	66.9	clear	slight
14:07	16	6.29	510	66.7	clear	slight
14:09	21	6.35	556	66.1	clear	trace
14:13	26	6.36	564	66.0	clear	trace

D. O. (ppm): NR ODOR: strong NR (COBALT 0 - 100) NR (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
X Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: Good LOCK #: 3259

REMARKS: ___

Meter Calibration: Date: 6/17/97 Time: ___ Meter Serial #: 5217 Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-1

Signature: [signature] Reviewed By: JB Page 4 of 5

WATER SAMPLE FIELD DATA SHEET

Rev. 2 3/91

EMCON ASSOCIATES

PROJECT NO: 670-39.01 | SAMPLE ID: MW-3

PURGED BY: K REICHELDERFER | CLIENT NAME: ARCO 6148

SAMPLED BY: K REICHELDERFER | LOCATION: 5131 SHATTUCK AVE OAKLAND

TYPE: Ground Water X | Surface Water ___ | Treatment Effluent ___ | Other ___

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

CASING ELEVATION (feet/MSL): ___ | VOLUME IN CASING (gal.): 4.96

DEPTH TO WATER (feet): 18.24 | CALCULATED PURGE (gal.): 24.80

DEPTH OF WELL (feet): 25.80 | ACTUAL PURGE VOL. (gal.): 13.50

DATE PURGED: 7-2-92 | Start (2400 Hr) 1253 | End (2400 Hr) 1337

DATE SAMPLED: 7-2-92 | Start (2400 Hr) 1330 | End (2400 Hr) 1334

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1259	5.00	6.13	514	71.5	CLOUDY	LIGHT
1302	10.00	6.24	542	71.0	"	"
1304	WELL	DRIED @	13.50	GALLONS	"	"
1337	RECHARGE	6.15	6.42	70.2	↓	↓

D. O. (ppm): NR | ODOR: MILD | COLOR: NR (COBALT 0 - 100) | TURBIDITY: NR (NTU 0 - 200)

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

PURGING EQUIPMENT		SAMPLING EQUIPMENT	
___ 2" Bladder Pump	___ Bailer (Teflon®)	___ 2" Bladder Pump	X Bailer (Teflon®)
___ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
X Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: GOOD | LOCK #: 3259

REMARKS: 1304 - WELL DRIED @ 13.50 GALLONS

Meter Calibration: Date: 7-2-92 | Time: ___ | Meter Serial #: 9203 | Temperature °F: ___

(EC 1000 ___ / ___) (DI ___) (pH 7 ___ / ___) (pH 10 ___ / ___) (pH 4 ___ / ___)

Location of previous calibration: MW-1

Signature: [signature] | Reviewed By: JB | Page 1 of 5

APPENDIX D

WELLHEAD SURVEY

JOHN E. KOCH
Land Surveyor
CA. State Lic. No. LS4811
5427 Telegraph Ave., Suite A
Oakland, CA 94609
(510)655-9956
FAX(510)655-9745

Applied GeoSystems
3315 Almaden Expressway, Suite 34
San Jose CA 95118
(408) 264-7723
FAX(408) 264-2435

01/02/92

Tabulation of Elevations as of
12:00 p.m. 12/27/91

Job #91084
AGS Project Job # 61035.02
Project Manager: Joel Coffman
Site: Arco Station 6148
5131 Shattuck Avenue
@ 52nd Street
Oakland, CA

BENCHMARK: #3172 Cut square in top of curb. Northeast end of island, triangle shaped,at east side of crosswalk at Telegraph Avenue and Claremont Avenue.
(Elev.116.271' City of Oakland Datum) *see note 1.

MONITOR WELL DATA TABLE

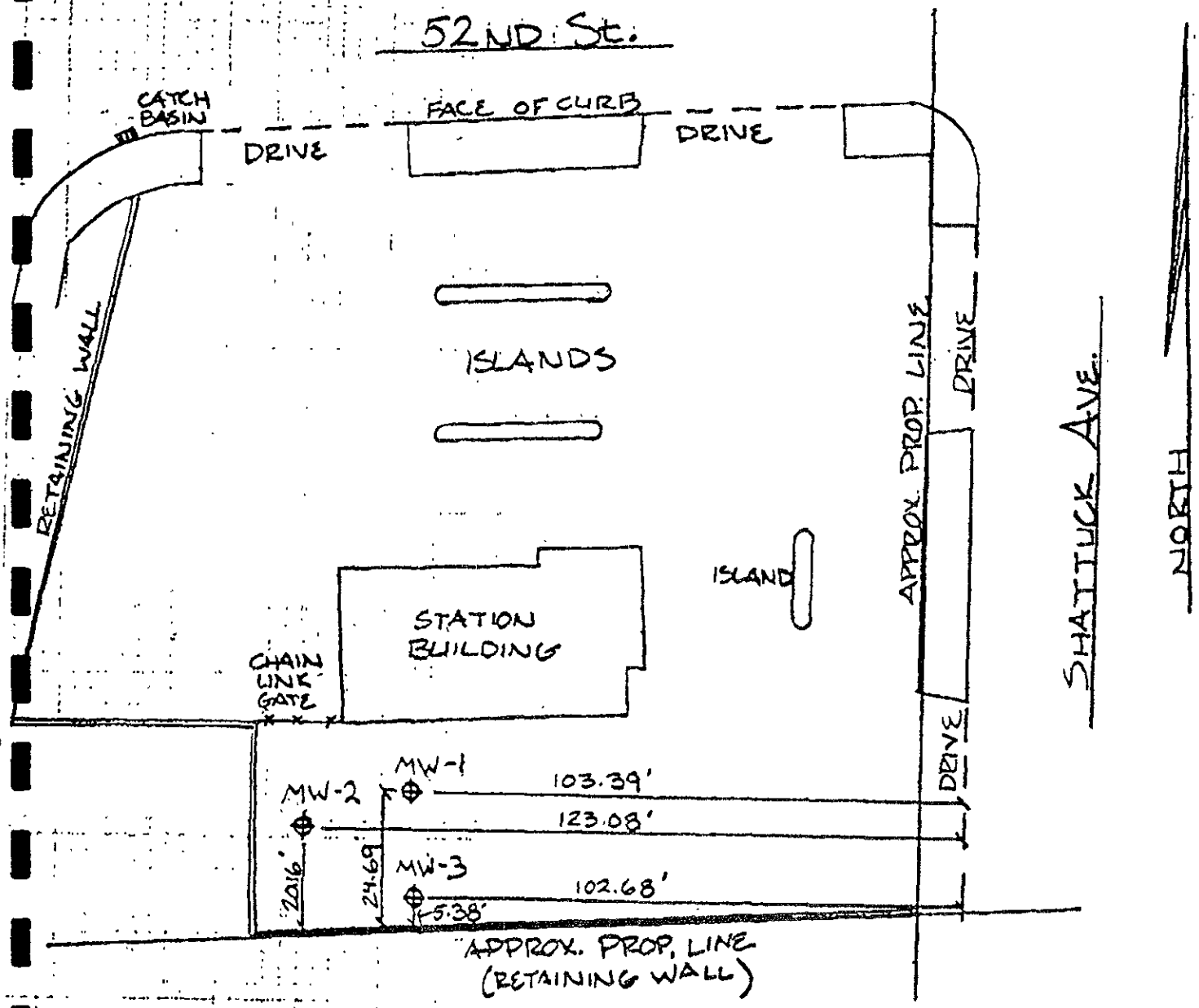
Well Designation	Elevation	Description
MW-1	108.03	Top of P.V.C. Casing
	108.27	Top of Box
MW-2	107.43	Top of P.V.C. Casing
	107.70	Top of Box
MW-3	107.77	Top of P.V.C. Casing
	108.06	Top of Box

NOTE:

1. Datum is City of Oakland = (USGS) +3.00

2. Top of Casing Elevation (T.O.C.El.) is at set mark on rim of PVC.

3. Ground Elevation (Gd. El.) is at set mark on top of box.



SCALE 1" = 30'

30 15 0 30

ELEVATIONS

WELL	T.O.C.	T.O.B
MW1	108.03	108.27
MW2	107.43	107.70
MW3	107.77	108.06

JEK JOB # 91084

CLIENT: AGS/RESNA

SITE: ARCO STATION 6148

JOHN E KOCH
LAND SURVEYOR
CA STATE LIC. NO. LS 4811
5427 TELEGRAPH AVE. SUITE A
OAKLAND CA 94609

APPENDIX E

CHAIN OF CUSTODY RECORDS
LABORATORY ANALYSES REPORTS

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RECEIVED

JAN 17 1992

RESNA
SAN JOSE

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Project: Arco 6148, Oakland

Enclosed are the results from 14 soil samples received at Sequoia Analytical on December 20,1991. The requested analyses are listed below:

1124291	Soil, S-10.5-B3	12/20/91	EPA 3550/8015 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1124292	Soil, S-17.5-B3	12/20/91	Ca, Cr, Pb, Zn, Ni EPA 3550/8015 EPA 5030/8015/8020 EPA 8240 SM 5520 E&F (Gravimetric)
1124293	Soil, S-26.5-B3	12/20/91	Ca, Cr, Pb, Zn, Ni EPA 3550/8015 EPA 5030/8015/8020 EPA 8240 SM 5520 E&F (Gravimetric)
1124294	Soil, S-17.5-B1	12/20/91	Ca, Cr, Pb, Zn, Ni EPA 3550/8015 EPA 5030/8015/8020 EPA 8240 SM 5520 E&F (Gravimetric)
1124295	Soil, S-22.5-B1	12/20/91	Ca, Cr, Pb, Zn, Ni EPA 3550/8015 EPA 5030/8015/8020 EPA 8240 SM 5520 E&F (Gravimetric)
1124296	Soil, S-26.5-B1	12/20/91	EPA 3550/8015 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1124297	Soil, S-12-B2	12/19/91	EPA 3550/8015 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1124298	Soil, S-17-B2	12/19/91	Ca, Cr, Pb, Zn, Ni EPA 3550/8015 EPA 5030/8015/8020 EPA 8240

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SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
			SM 5520 E&F (Gravimetric)
1124299	Soil, S-25.5-B2	12/19/91	Ca, Cr, Pb, Zn, Ni EPA 3550/8015 EPA 5030/8015/8020 EPA 8240 SM 5520 E&F (Gravimetric)
1124300	Soil, S-30.5-B2	12/19/91	EPA 3550/8015 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1124301	Soil, S-10.5-B4	12/19/91	EPA 3550/8015 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1124302	Soil, S-15.5-B4	12/19/91	EPA 3550/8015 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)
1124303	Soil, S-18.5-B4	12/19/91	Ca, Cr, Pb, Zn, Ni EPA 3550/8015 EPA 5030/8015/8020 EPA 8240 SM 5520 E&F (Gravimetric)
1124304	Soil, S-20-B4	12/19/91	EPA 3550/8015 EPA 5030/8015/8020 EPA 8240 SM 5520 E&F (Gravimetric)

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Maria Lee

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Dec 30, 1991
Attention: Joel Coffman	First Sample #:	112-4292	Reported:	Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
112-4292	S-17.5-B3	320	0.65	0.65	2.3	5.9
Detection Limits:		10	0.050	0.050	0.050	0.050

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

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Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Dec 30, 1991
Attention: Joel Coffman	First Sample #:	112-4294	Reported:	Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
112-4294	S-17.5-B1	470	2.3	5.1	5.1	24
Detection Limits:		**50**	**0.25**	**0.25**	**0.25**	**0.25**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

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Maria Lee
Project Manager

1124291.RRR <3>

SEQUOIA ANALYTICAL

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled: Dec 19, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received: Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Analyzed: Dec 30, 1991
Attention: Joel Coffman	First Sample #:	112-4297	Reported: Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
112-4297	S-12-B2	N.D.	N.D.	N.D.	N.D.	N.D.
112-4299	S-25.5-B2	N.D.	0.015	0.016	N.D.	0.019
112-4300	S-30.5-B2	N.D.	0.015	0.0080	N.D.	N.D.
112-4301	S-10.5-B4	N.D.	N.D.	N.D.	N.D.	N.D.
112-4302	S-15.5-B4	N.D.	0.010	N.D.	N.D.	N.D.
112-4304	S-20-B4	N.D.	0.0070	N.D.	N.D.	N.D.
Detection Limits:		**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1992
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Dec 30, 1991
Attention: Joel Coffman	First Sample #:	112-4298	Reported:	Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
112-4298	S-17-B2	740	2.3	13	7.7	41
Detection Limits:		100	0.50	0.50	0.50	0.50

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

1124291.ARR <5>

SEQUOIA ANALYTICAL

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(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Dec 30, 1991
Attention: Joel Coffman	First Sample #:	112-4303	Reported:	Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS with BTEX DISTINCTION (EPA 8015/8020)

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
112-4303	S-18.5-B4	65	0.42	0.22	0.54	0.77
Detection Limits:		**5.0**	**0.025**	**0.025**	**0.025**	**0.025**

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

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Maria Lee

Maria Lee
Project Manager

1124291.RRR <6>

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 3550/8015	Extracted:	Dec 31, 1991
Attention: Joel Coffman	First Sample #:	112-4291	Analyzed:	Jan 2, 1992
			Revised:	Jan 15, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
112-4291	S-10.5-B3	N.D.
112-4293	S-26.5-B3	N.D.
112-4295	S-22.5-B1	N.D.
112-4296	S-26.5-B1	N.D.

Detection Limits:	**1.0**

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard
Analytes reported as N.D were not present above the stated limit of detection.

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Maria Lee
Project Manager

1124291 RRR <7>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled: Dec 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received: Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 3550/8015	Extracted: Dec 31, 1991
Attention: Joel Coffman	First Sample #:	112-4292	Analyzed: Jan 2, 1992
			Reported: Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
112-4292	S-17.5-B3	230

Detection Limits:	20

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

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Maria Lee
Project Manager

1124291.RRR <8>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 3550/8015	Extracted:	Dec 31, 1991
Attention: Joel Coffman	First Sample #:	112-4294	Analyzed:	Jan 2, 1992
			Reported:	Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
112-4294	S-17.5-B1	370

Detection Limits:	50

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

1124291.RRR <9>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 3550/8015	Extracted:	Dec 31, 1991
Attention: Joel Coffman	First Sample #:	112-4297	Analyzed:	Jan 2, 1992
			Reported:	Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
112-4297	S-12-B2	N.D.
112-4299	S-25.5-B2	N.D.
112-4300	S-30.5-B2	N.D.
112-4301	S-10.5-B4	N.D.
112-4302	S-15.5-B4	N.D.
112-4303	S-18.5-B4	41
112-4304	S-20-B4	N.D.

Detection Limits:	**1.0**

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 3550/8015	Extracted:	Dec 31, 1991
Attention: Joel Coffman	First Sample #:	112-4298	Analyzed:	Jan 2, 1992
			Reported:	Jan 8, 1992

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
112-4298	S-17-B2	540

Detection Limits:	50

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

1124291.RRR <11>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled: Dec 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received: Dec 20, 1991
San Jose, CA 95118	Analysis Method:	SM 5520 E&F (Gravimetric)	Extracted: Jan 2, 1992
Attention: Joel Coffman	First Sample #:	112-4291	Analyzed: Jan 2, 1992
			Revised: Jan 15, 1992

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/kg (ppm)
112-4291	S-10.5-B3	N.D.
112-4292	S-17.5-B3	N.D.
112-4293	S-26.5-B3	N.D.
112-4294	S-17.5-B1	N D.
112-4295	S-22.5-B1	N.D.
112-4296	S-26.5-B1	N.D.

Detection Limits:	30

Analytes reported as N D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-26.5-B3	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 8240	Analyzed:	Jan 6, 1992
Attention: Joel Coffman	Lab Number:	112-4293	Reported:	Jan 8, 1992

VOLATILE ORGANICS by GC/MS (EPA 8240)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Acetone	500	N.D.
Benzene	100	N.D.
Bromodichloromethane	100	N.D.
Bromoform	100	N.D.
Bromomethane	100	N.D.
2-Butanone	500	N.D.
Carbon disulfide	100	N.D.
Carbon tetrachloride	100	N.D.
Chlorobenzene	100	N.D.
Chloroethane	100	N.D.
2-Chloroethyl vinyl ether	500	N.D.
Chloroform	100	N.D.
Chloromethane	100	N.D.
Dibromochloromethane	100	N.D.
1,1-Dichloroethane	100	N.D.
1,2-Dichloroethane	100	N.D.
1,1-Dichloroethene	100	N.D.
cis-1,2-Dichloroethene	100	N.D.
trans-1,2-Dichloroethene	100	N.D.
1,2-Dichloropropane	100	N.D.
cis-1,3-Dichloropropene	100	N.D.
trans-1,3-Dichloropropene	100	N.D.
Ethylbenzene	100	N.D.
2-Hexanone	500	N.D.
Methylene chloride	500	N.D.
4-Methyl-2-pentanone	500	N.D.
Styrene	100	N.D.
1,1,2,2-Tetrachloroethane	100	N.D.
Tetrachloroethene	100	N.D.
Toluene	100	N.D.
1,1,1-Trichloroethane	100	N.D.
1,1,2-Trichloroethane	100	N.D.
Trichloroethene	100	N.D.
Trichlorofluoromethane	100	N.D.
Vinyl acetate	100	N.D.
Vinyl chloride	100	N.D.
Total Xylenes	100	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-17.5-B1	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 8240	Analyzed:	Jan 3, 1992
Attention: Joel Coffman	Lab Number:	112-4294	Reported:	Jan 8, 1992

VOLATILE ORGANICS by GC/MS (EPA 8240)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Acetone	500	N.D.
Benzene	100	1,300
Bromodichloromethane	100	N.D.
Bromoform	100	N.D.
Bromomethane	100	N.D.
2-Butanone	500	N.D.
Carbon disulfide	100	N.D.
Carbon tetrachloride	100	N.D.
Chlorobenzene	100	N.D.
Chloroethane	100	N.D.
2-Chloroethyl vinyl ether	500	N.D.
Chloroform	100	N.D.
Chloromethane	100	N.D.
Dibromochloromethane	100	N.D.
1,1-Dichloroethane	100	N.D.
1,2-Dichloroethane	100	N.D.
1,1-Dichloroethene	100	N.D.
cis-1,2-Dichloroethene	100	N.D.
trans-1,2-Dichloroethene	100	N.D.
1,2-Dichloropropane	100	N.D.
cis-1,3-Dichloropropene	100	N.D.
trans-1,3-Dichloropropene	100	N.D.
Ethylbenzene	100	1,800
2-Hexanone	500	N.D.
Methylene chloride	500	N.D.
4-Methyl-2-pentanone	500	N.D.
Styrene	100	N.D.
1,1,2,2-Tetrachloroethane	100	N.D.
Tetrachloroethene	100	N.D.
Toluene	100	1,800
1,1,1-Trichloroethane	100	N.D.
1,1,2-Trichloroethane	100	N.D.
Trichloroethene	100	N.D.
Trichlorofluoromethane	100	N.D.
Vinyl acetate	100	N.D.
Vinyl chloride	100	N.D.
Total Xylenes	100	8,800

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

1124291.RRR <16>

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-22.5-B1	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 8240	Analyzed:	Jan 3, 1992
Attention: Joel Coffman	Lab Number:	112-4295	Reported:	Jan 8, 1992

VOLATILE ORGANICS by GC/MS (EPA 8240)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Acetone	500	N.D.
Benzene	100	N.D.
Bromodichloromethane	100	N.D.
Bromoform	100	N.D.
Bromomethane	100	N.D.
2-Butanone	500	N.D.
Carbon disulfide	100	N.D.
Carbon tetrachloride	100	N.D.
Chlorobenzene	100	N.D.
Chloroethane	100	N.D.
2-Chloroethyl vinyl ether	500	N.D.
Chloroform	100	N.D.
Chloromethane	100	N.D.
Dibromochloromethane	100	N.D.
1,1-Dichloroethane	100	N.D.
1,2-Dichloroethane	100	N.D.
1,1-Dichloroethene	100	N.D.
cis-1,2-Dichloroethene	100	N.D.
trans-1,2-Dichloroethene	100	N.D.
1,2-Dichloropropane	100	N.D.
cis-1,3-Dichloropropene	100	N.D.
trans-1,3-Dichloropropene	100	N.D.
Ethylbenzene	100	N.D.
2-Hexanone	500	N.D.
Methylene chloride	500	N.D.
4-Methyl-2-pentanone	500	N.D.
Styrene	100	N.D.
1,1,2,2-Tetrachloroethane	100	N.D.
Tetrachloroethene	100	N.D.
Toluene	100	N.D.
1,1,1-Trichloroethane	100	N.D.
1,1,2-Trichloroethane	100	N.D.
Trichloroethene	100	N.D.
Trichlorofluoromethane	100	N.D.
Vinyl acetate	100	N.D.
Vinyl chloride	100	N.D.
Total Xylenes	100	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

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Project Manager

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-17-B2	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 8240	Analyzed:	Jan 7, 1992
Attention: Joel Coffman	Lab Number:	112-4298	Reported:	Jan 8, 1992

VOLATILE ORGANICS by GC/MS (EPA 8240)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Acetone	16,500	N.D.
Benzene	3,300	4,300
Bromodichloromethane	3,300	N.D.
Bromoform	3,300	N.D.
Bromomethane	3,300	N.D.
2-Butanone	16,500	N.D.
Carbon disulfide	3,300	N.D.
Carbon tetrachloride	3,300	N.D.
Chlorobenzene	3,300	N.D.
Chloroethane	3,300	N.D.
2-Chloroethyl vinyl ether	16,500	N.D.
Chloroform	3,300	N.D.
Chloromethane	3,300	N.D.
Dibromochloromethane	3,300	N.D.
1,1-Dichloroethane	3,300	N.D.
1,2-Dichloroethane	3,300	N.D.
1,1-Dichloroethene	3,300	N.D.
cis-1,2-Dichloroethene	3,300	N.D.
trans-1,2-Dichloroethene	3,300	N.D.
1,2-Dichloropropane	3,300	N.D.
cis-1,3-Dichloropropene	3,300	N.D.
trans-1,3-Dichloropropene	3,300	N.D.
Ethylbenzene	3,300	57,000
2-Hexanone	16,500	N.D.
Methylene chloride	16,500	N.D.
4-Methyl-2-pentanone	16,500	N.D.
Styrene	3,300	N.D.
1,1,2,2-Tetrachloroethane	3,300	N.D.
Tetrachloroethene	3,300	N.D.
Toluene	3,300	92,000
1,1,1-Trichloroethane	3,300	N.D.
1,1,2-Trichloroethane	3,300	N.D.
Trichloroethene	3,300	N.D.
Trichlorofluoromethane	3,300	N.D.
Vinyl acetate	3,300	N.D.
Vinyl chloride	3,300	N.D.
Total Xylenes	3,300	360,000

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

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Maria Lee

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Project Manager

1124291.RRR <18>

SEQUOIA ANALYTICAL

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-25.5-B2	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 8240	Analyzed:	Jan 3, 1992
Attention: Joel Coffman	Lab Number:	112-4299	Reported:	Jan 8, 1992

VOLATILE ORGANICS by GC/MS (EPA 8240)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Acetone	500	N.D.
Benzene	100	N.D.
Bromodichloromethane	100	N.D.
Bromoform	100	N.D.
Bromomethane	100	N.D.
2-Butanone	500	N.D.
Carbon disulfide	100	N.D.
Carbon tetrachloride	100	N.D.
Chlorobenzene	100	N.D.
Chloroethane	100	N.D.
2-Chloroethyl vinyl ether	500	N.D.
Chloroform	100	N.D.
Chloromethane	100	N.D.
Dibromochloromethane	100	N.D.
1,1-Dichloroethane	100	N.D.
1,2-Dichloroethane	100	N.D.
1,1-Dichloroethene	100	N.D.
cis-1,2-Dichloroethene	100	N.D.
trans-1,2-Dichloroethene	100	N.D.
1,2-Dichloropropane	100	N.D.
cis-1,3-Dichloropropene	100	N.D.
trans-1,3-Dichloropropene	100	N.D.
Ethylbenzene	100	N.D.
2-Hexanone	500	N.D.
Methylene chloride	500	N.D.
4-Methyl-2-pentanone	500	N.D.
Styrene	100	N.D.
1,1,2,2-Tetrachloroethane	100	N.D.
Tetrachloroethene	100	N.D.
Toluene	100	N.D.
1,1,1-Trichloroethane	100	N.D.
1,1,2-Trichloroethane	100	N.D.
Trichloroethene	100	N.D.
Trichlorofluoromethane	100	N.D.
Vinyl acetate	100	N.D.
Vinyl chloride	100	N.D.
Total Xylenes	100	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

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Project Manager

1124291.RRR <19>

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-18.5-B4	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 8240	Analyzed:	Jan 3, 1992
Attention: Joel Coffman	Lab Number:	112-4303	Reported:	Jan 8, 1992

VOLATILE ORGANICS by GC/MS (EPA 8240)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Acetone	500	N.D.
Benzene	100	460
Bromodichloromethane	100	N.D.
Bromoform	100	N.D.
Bromomethane	100	N.D.
2-Butanone	500	N.D.
Carbon disulfide	100	N.D.
Carbon tetrachloride	100	N.D.
Chlorobenzene	100	N.D.
Chloroethane	100	N.D.
2-Chloroethyl vinyl ether	500	N.D.
Chloroform	100	N.D.
Chloromethane	100	N.D.
Dibromochloromethane	100	N.D.
1,1-Dichloroethane	100	N.D.
1,2-Dichloroethane	100	N.D.
1,1-Dichloroethene	100	N.D.
cis-1,2-Dichloroethene	100	N.D.
trans-1,2-Dichloroethene	100	N.D.
1,2-Dichloropropane	100	N.D.
cis-1,3-Dichloropropene	100	N.D.
trans-1,3-Dichloropropene	100	N.D.
Ethylbenzene	100	1,700
2-Hexanone	500	N.D.
Methylene chloride	100	N.D.
4-Methyl-2-pentanone	500	N.D.
Styrene	100	N.D.
1,1,2,2-Tetrachloroethane	100	N.D.
Tetrachloroethene	100	N.D.
Toluene	100	240
1,1,1-Trichloroethane	100	N.D.
1,1,2-Trichloroethane	100	N.D.
Trichloroethene	100	N.D.
Trichlorofluoromethane	100	N.D.
Vinyl acetate	100	N.D.
Vinyl chloride	100	N.D.
Total Xylenes	100	3,200

Analytes reported as N.D. were not present above the stated limit of detection.

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Project Manager

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-20-B4	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 8240	Analyzed:	Jan 3, 1992
Attention: Joel Coffman	Lab Number:	112-4304	Reported:	Jan 8, 1992

VOLATILE ORGANICS by GC/MS (EPA 8240)

Analyte	Detection Limit µg/kg	Sample Results µg/kg
Acetone	500	N.D.
Benzene	100	N.D.
Bromodichloromethane	100	N.D.
Bromoform	100	N.D.
Bromomethane	100	N.D.
2-Butanone	500	N.D.
Carbon disulfide	100	N.D.
Carbon tetrachloride	100	N.D.
Chlorobenzene	100	N.D.
Chloroethane	100	N.D.
2-Chloroethyl vinyl ether	500	N.D.
Chloroform	100	N.D.
Chloromethane	100	N.D.
Dibromochloromethane	100	N.D.
1,1-Dichloroethane	100	N.D.
1,2-Dichloroethane	100	N.D.
1,1-Dichloroethene	100	N.D.
cis-1,2-Dichloroethene	100	N.D.
trans-1,2-Dichloroethene	100	N.D.
1,2-Dichloropropane	100	N.D.
cis-1,3-Dichloropropene	100	N.D.
trans-1,3-Dichloropropene	100	N.D.
Ethylbenzene	100	N.D.
2-Hexanone	500	N.D.
Methylene chloride	500	N.D.
4-Methyl-2-pentanone	500	N.D.
Styrene	100	N.D.
1,1,2,2-Tetrachloroethane	100	N.D.
Tetrachloroethene	100	N.D.
Toluene	100	N.D.
1,1,1-Trichloroethane	100	N.D.
1,1,2-Trichloroethane	100	N.D.
Trichloroethene	100	N.D.
Trichlorofluoromethane	100	N.D.
Vinyl acetate	100	N.D.
Vinyl chloride	100	N.D.
Total Xylenes	100	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

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Maria Lee

Maria Lee
Project Manager

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-17.5-B3	Received:	Dec 20, 1991
San Jose, CA 95118			Extracted:	Dec 30, 1991
Attention: Joel Coffman	Lab Number:	112-4292	Analyzed:	12/31/91-1/2/92
			Reported:	Jan 8, 1992

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	0.95
Chromium	0.50	31
Lead	0.25	3.9
Zinc	0.50	66
Nickel	2.5	38

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

1124291.RRR <22>

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-26.5-B3	Received:	Dec 20, 1991
San Jose, CA 95118			Extracted:	Dec 30, 1991
Attention: Joel Coffman	Lab Number:	112-4293	Analyzed:	12/31/91-1/2/92
			Reported:	Jan 8, 1992

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	0.77
Chromium	0.50	48
Lead	0.25	6.9
Zinc	0.50	70
Nickel	2.5	66

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-17.5-B1	Received:	Dec 20, 1991
San Jose, CA 95118			Extracted:	Dec 30, 1991
Attention: Joel Coffman	Lab Number:	112-4294	Analyzed:	12/31/91-1/2/92
			Reported:	Jan 8, 1992

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	0.87
Chromium	0.50	31
Lead	0.25	8.3
Zinc	0.50	62
Nickel	2.5	41

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee

Maria Lee
Project Manager

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680 Chesapeake Drive • Redwood City, CA 94063
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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-22.5-B1	Received:	Dec 20, 1991
San Jose, CA 95118			Extracted:	Dec 30, 1991
Attention: Joel Coffman	Lab Number:	112-4295	Analyzed:	12/31/91-1/2/92
			Reported:	Jan 8, 1992

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	0.82
Chromium	0.50	30
Lead	0.25	4.1
Zinc	0.50	62
Nickel	2.5	34

Analytes reported as N.D. were not present above the stated limit of detection.

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-17-B2	Received:	Dec 20, 1991
San Jose, CA 95118			Extracted:	Dec 30, 1991
Attention: Joel Coffman	Lab Number:	112-4298	Analyzed:	12/31/91-1/2/92
			Reported:	Jan 8, 1992

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	0.87
Chromium	0.50	24
Lead	0.25	6.7
Zinc	0.50	58
Nickel	2.5	46

Analytes reported as N.D. were not present above the stated limit of detection.

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Project Manager

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-25.5-B2	Received:	Dec 20, 1991
San Jose, CA 95118			Extracted:	Dec 30, 1991
Attention: Joel Coffman	Lab Number:	112-4299	Analyzed:	12/31/91-1/2/92
			Reported:	Jan 8, 1992

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	N.D.
Chromium	0.50	28
Lead	0.25	2.8
Zinc	0.50	45
Nickel	2.5	26

Analytes reported as N.D. were not present above the stated limit of detection.

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Maria Lee
Project Manager

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RESNA	Client Project ID:	Arco 6148, Oakland	Sampled:	Dec 19, 1991
3315 Almaden Expwy., Suite 34	Sample Descript:	Soil, S-18.5-B4	Received:	Dec 20, 1991
San Jose, CA 95118			Extracted:	Dec 30, 1991
Attention: Joel Coffman	Lab Number:	112-4303	Analyzed:	12/31/91-1/2/92
			Reported:	Jan 8, 1992

LABORATORY ANALYSIS

Analyte	Detection Limit mg/kg	Sample Results mg/kg
Cadmium	0.50	N.D.
Chromium	0.50	27
Lead	0.25	3.6
Zinc	0.50	57
Nickel	2.5	35

Analytes reported as N.D. were not present above the stated limit of detection.

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Maria Lee
Project Manager

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: Arco 6148, Oakland
QC Sample Group: 112-4291-4304
Reported: Jan 8, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes	Diesel	Total Recov. Pet. Oil	Lead
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8015	SM 5520 E&F	EPA 7421
Analyst:	M. Nipp	M. Nipp	M. Nipp	M. Nipp	M. Laikhtman	A. Do	M. Mistry
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Dec 30, 1991	Dec 30, 1991	Dec 30, 1991	Dec 30, 1991	Jan 2, 1992	Jan 2, 1992	Dec 31, 1991
QC Sample #:	GBLK123091 MS/MSD	GBLK123091 MS/MSD	GBLK123091 MS/MSD	GBLK123091 MS/MSD	DBLK123191	BLK010292	112-4303
Sample Conc.:	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	3.6
Spike Conc. Added:	0.20	0.20	0.20	0.60	15	5000	50
Conc. Matrix Spike:	0.15	0.20	0.19	0.58	11	4600	50
Matrix Spike % Recovery:	75	100	95	97	73	92	93
Conc. Matrix Spike Dup.:	0.15	0.19	0.19	0.59	11	4600	50
Matrix Spike Duplicate % Recovery:	75	95	95	98	73	92	93
Relative % Difference:	0.0	5.1	0.0	1.7	0.0	0.0	0.0

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

% Recovery: $\frac{\text{Conc. of M.S. - Conc. of Sample}}{\text{Spike Conc. Added}} \times 100$

Relative % Difference: $\frac{\text{Conc. of M.S. - Conc. of M.S.D.}}{(\text{Conc. of M.S. + Conc. of M.S.D.}) / 2} \times 100$

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RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: Arco 6148, Oakland
QC Sample Group: 112-4291-4304
Reported: Jan 8, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Cadmium	Chromium	Nickel	Zinc
Method:	EPA 6010	EPA 6010	EPA 6010	EPA 6010
Analyst:	C. Medefesser	C. Medefesser	C. Medefesser	C. Medefesser
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jan 2, 1992	Jan 2, 1992	Jan 2, 1992	Jan 2, 1992
QC Sample #:	112-4299	112-4299	112-4299	112-4299
Sample Conc.:	N.D.	28	26	45
Spike Conc. Added:	100	100	100	100
Conc. Matrix Spike:	100	130	130	150
Matrix Spike % Recovery:	100	102	104	105
Conc. Matrix Spike Dup.:	100	130	120	150
Matrix Spike Duplicate % Recovery:	100	102	94	105
Relative % Difference:	0.0	0.0	8.0	0.0

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Maria Lee
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

1124291.RRR <30>

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco 6148, Oakland	
3315 Almaden Expwy., Suite 34	Method (units):	EPA 8240 (µg/L purged)	Q.C. Sample Dates
San Jose, CA 95118	Analyst(s):	M. Williams	
Attention: Joel Coffman	QC Sample #:	VBLK010692	Analyzed: Jan 6, 1992
			Reported: Jan 8, 1992

QUALITY CONTROL DATA REPORT

Analyte	Sample Conc.	Spike Conc. Added	Conc. Matrix Spike	Matrix Spike % Recovery	Conc. Matrix Spike Duplicate	Matrix Spike Duplicate % Recovery	Relative % Difference
1,1-Dichloro-ethene	N.D.	50	39	78	40	80	2.5
Trichloroethene	N.D.	50	44	88	43	86	2.3
Benzene	N.D.	50	41	82	39	78	5.0
Toluene	N.D.	50	46	92	44	88	4.4
Chlorobenzene	N.D.	50	46	92	44	88	4.4

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

1124291.RRR <31>

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 6148-91-2A

Chain of Custody

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Chuck Carmel	Telephone no. (ARCO)	Telephone no. (Consultant) (408)264-7723	Fax no. (Consultant) (408)264-2435	Contract number 07-073
Consultant name RESNA	Address (Consultant) 331F Almaden Expy, Suite 34, San Jose, CA 95118		Method of shipment Sequoia Courier

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Water	Other	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☒ Diesel ☒	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	Metals ☐ VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
S-5.5-B2		1	✓			✓		12/19/91												
S-10.5-B2		1	✓			✓		12/19/91												
S-12-B2		1	✓			✓		12/19/91				X	X			1124	27			
S-15.5-B2		1	✓			✓		12/19/91												
S-17-B2		1	✓			✓	TTLC	12/19/91				X	X			1104	28			
S-20.5-B2		1	✓			✓	TTLC	12/19/91												
S-25.5-B2		1	✓			✓		12/19/91				X	X			1104	99			
S-30.5-B2		1	✓			✓		12/19/91				X	X			1124	00			
S-5.5-B4		1	✓			✓		12/19/91												
S-10.5-B4		1	✓			✓		12/19/91				X	X			1124	01			
S-15.5-B4		1	✓			✓		12/19/91				X	X			1124	02			
S-18.5-B4		1	✓			✓		12/19/91				X	X			1124	03			
S-20-B4		1	✓			✓		12/19/91				X	X			1124	04			

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

Condition of sample: Good		Temperature received: COO	
Relinquished by sampler Barbara Sieminski	Date 12/20/91	Time 440 PM	Received by [illegible] 314
Relinquished by [illegible]	Date	Time	Received by [illegible]
Relinquished by	Date	Time	Received by laboratory	Date	Time

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 6148-91-2A

Chain of Custody

ARCO Facility no. 6148	City (Facility) Oakland	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Chuck Carmel	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA	Address (Consultant) 3315 Almaden Exp, Suite 34, San Jose, CA 95118		Contract number 0003

Method of shipment: Sequoia Courier

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas / Diesel	Oil and Grease 413.1 / 413.2 / E	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TLC Metals / VOA / VOA	CAM Metals EPA 6010/7000 TTLC / STLC	Lead Org./DHS / Lead EPA 7420/7421	
S-5.5-B3		1	✓			✓		12/20/91													
S-10.5-B3		1	✓			✓	✓	12/20/91				X	X							12491	
S-15.5-B3		1	✓			✓		12/20/91													
S-17.5-B3		1	✓			✓	✓	12/20/91				X	X			X				12492	
S-19-B3		1	✓			✓		12/20/91													
S-24.5-B3		1	✓			✓		12/20/91													
S-26.5-B3		1	✓			✓	✓	12/20/91				X	X			X				12493	
S-17.5-B1		1	✓			✓		12/20/91				X	X			X				12494	
S-22.5-B1		1	✓			✓		12/20/91				X	X			X				12495	
S-26.5-B1		1	✓			✓		12/20/91	✓			X	X							12496	

Special detection Limit/reporting

Special QA/QC

Remarks: Metals: Cd, Cr, Pb, Zn + Ni

Lab number

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

Condition of sample: good		Temperature received: cool	
Relinquished by sampler: Barbara Sieminski	Date: 12/20/91	Time: 1440 PM	Received by: [illegible] 3PM
Relinquished by: [illegible]	Date: [illegible]	Time: [illegible]	Received by: A. Nagle
Relinquished by:	Date:	Time:	Received by laboratory:	Date:	Time:

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

APPC-3292 (2-91)

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Project: Arco #6148, Oakland

Enclosed are the results from 1 soil samples received at Sequoia Analytical on December 20,1991. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1123897	Soil, S1220-SP, (A-D)	12/20/91	EPA 3550/8015 EPA 5030/8015/8020 SM 5520 E&F (Gravimetric)

Please contact me if you have any questions. In the meantime, thank you for the opportunity to work with you on this project.

Very truly yours,

SEQUOIA ANALYTICAL

Maria Lee

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco #6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 3550/8015	Extracted:	Dec 23, 1991
Attention: Joel Coffman	First Sample #:	112-3897	Analyzed:	Dec 23, 1991
			Reported:	Dec 26, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
112-3897	S1220-SP, (A-D)	11

Detection Limits:	**1.0**

High Boiling Point Hydrocarbons are quantitated against a diesel fuel standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco #6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Sample Descript.:	Soil, S1220-SP, (A-D)	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Dec 26, 1991
Attention: Joel Coffman	Lab Number:	112-3897	Reported:	Dec 26, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS WITH BTEX DISTINCTION (EPA 8015/8020)

Analyte	Detection Limit mg/kg (ppm)	Sample Results mg/kg (ppm)
Low to Medium Boiling Point Hydrocarbons	1.0	25
Benzene	0.0050	0.11
Toluene	0.0050	0.14
Ethyl Benzene	0.0050	0.11
Xylenes	0.0050	0.38

Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA	Client Project ID:	Arco #6148, Oakland	Sampled:	Dec 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Dec 20, 1991
San Jose, CA 95118	Analysis Method:	SM 5520 E&F (Gravimetric)		
Attention: Joel Coffman	First Sample #:	112-3897	Analyzed:	Dec 26, 1991
			Reported:	Dec 26, 1991

TOTAL RECOVERABLE PETROLEUM OIL

Sample Number	Sample Description	Oil & Grease mg/kg (ppm)
112-3897	S1220-SP, (A-D)	N.D.

Detection Limits:	30

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
(415) 364-9600 • FAX (415) 364-9233

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95118
Attention: Joel Coffman

Client Project ID: Arco #6148, Oakland
QC Sample Group: 112-3897
Reported: Dec 27, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Oil & Grease	Benzene	Toluene	Ethyl-Benzene	Xylenes	Diesel
Method:	SM 5520 E&F	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8015
Analyst:	M. Mistry	A. Maralit	A. Maralit	A. Maralit	A. Maralit	R. Lee
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Dec 26, 1991	Dec 23, 1991	Dec 23, 1991	Dec 23, 1991	Dec 23, 1991	Dec 23, 1991
QC Sample #:	BLK122691	GBLK122391	GBLK122391	GBLK122391	GBLK122391	DBLK122391
Sample Conc.:	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	5000	0.20	0.20	0.20	0.60	15
Conc. Matrix Spike:	4000	0.20	0.19	0.18	0.54	11
Matrix Spike % Recovery:	80	100	95	90	90	73
Conc. Matrix Spike Dup.:	3900	0.18	0.18	0.17	0.50	10
Matrix Spike Duplicate % Recovery:	78	90	90	85	83	67
Relative % Difference:	1.3	11	5.4	5.7	7.7	9.5

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

% Recovery:	Conc. of M.S. - Conc. of Sample / Spike Conc. Added	x 100
Relative % Difference:	Conc. of M.S. - Conc. of M.S.D. / (Conc. of M.S. + Conc. of M.S.D.) / 2	x 100

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 6148-91-2

Chain of Custody

ARCO Facility no.	6148
City (Facility)	Oakland
Project manager (Consultant)	Joel Coffman
ARCO engineer	Chuck Carmel
Telephone no (ARCO)	
Telephone no (Consultant)	(408) 264-7723
Fax no. (Consultant)	(408) 264-2435
Consultant name	RESNA
Address (Consultant)	3315 Almaden Exp., Suite 34, San Jose, CA 95118
Laboratory name	Sequoia
Contract number	07-073
Method of shipment	Sequoia courier

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
S-1220-SPA		1	✓			✓		12/20/91			11	23	89	17								
S-1220-SPB		1	✓			✓		12/20/91														
S-1220-SPC		1	✓			✓		12/20/91			X	X	X									
S-1220-SPD		1	✓			✓		12/20/91														

Special detection Limit/reporting

Special QA/QC

Remarks
4-8 [illegible]
[illegible]

Lab number

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

Condition of sample: good		Temperature received: cool	
Relinquished by sampler: Barbara [illegible]	Date: 12/20/91 Time: 4:45 PM	Received by: Chris 319	
Relinquished by: Chris 319	Date: 12/20/91 Time: 6:15	Received by: [illegible signature]	
Relinquished by	Date Time	Received by laboratory	Date Time

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