RESNA

Working To Restore Nature

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ADDITIONAL SUBSURFACE INVESTIGATION

at

ARCO Station 4494
566 Hegenberger Road
Oakland, California

69038.10
10/27/92

Report prepared for

ARCO Products Company
P.O. Box 5811
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by

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October 27, 1992

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RESNA

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For ARCO Products Company

INTRODUCTION

At the request of ARCO Products Company (ARCO), RESNA Industries Inc. (RESNA), formerly Applied GeoSystems (AGS), performed an additional subsurface investigation at ARCO Station 4494, located at 566 Hegenberger Road, in Oakland, California. The objectives of this investigation were to further evaluate the lateral and vertical extent of gasoline hydrocarbons in the soil and groundwater beneath the northwestern portion and directly northeast of the site.

Work performed during this investigation included drilling one onsite soil boring (B-20), and two offsite soil borings (B-18 and B-19); constructing one 4-inch diameter groundwater monitoring well (MW-7) in boring B-20, and two 2-inch diameter groundwater monitoring wells (MW-5 and MW-6) in borings B-18 and B-19, respectively; developing the wells; surveying the monitoring wells; submitting selected soil samples from the borings for laboratory analyses; and preparing this report. Subsequent groundwater monitoring was performed by EMCON Associates (EMCON) of San Jose, California, and included groundwater sampling in conjunction with quarterly groundwater monitoring; and submitting the collected groundwater samples to a state-certified laboratory for analyses.

The work was performed in accordance with the Work Plan (AGS, May 15, 1991) and Addendum One to Work Plan (AGS, May 15, 1991). These documents were approved by the Alameda County Health Care Services Agency (ACHCSA) prior to commencement of this investigation. Field work began after obtaining permission from an adjoining property owner to drill borings B-18 and B-19, and install wells MW-5 and MW-6.

SITE DESCRIPTION AND BACKGROUND

General

The site is an operating gasoline station located at 566 Hegenberger Road, on the northeastern corner of the intersection of Hegenberger Road and Edes Avenue in Oakland, California, as shown on the Site Vicinity Map (Plate 1). The site is on a relatively flat concrete- and asphalt-covered lot at an elevation of approximately 5 feet above mean sea level, and is located in a commercial/industrial area of the City of Oakland, approximately 1000 feet east of Interstate Highway 880. This commercial/industrial area is occupied by a wide variety of businesses including fast food restaurants, the Oakland SPCA, union halls, tool manufacturers, trucking firms, construction firms, motels, and inns. The Oakland-Alameda County Coliseum Complex is located approximately ½-mile northwest of the site. The site is bounded by a restaurant to the north, a parking lot for a restaurant to the east, restaurants to the west across Hegenberger Road, and a Shell Oil service station across Edes Avenue to the South.

Before its development in 1969, the subject property was covered by a sparse growth of native grasses and weeds, and was situated on reclaimed tidal marshlands covered by approximately four feet of artificial fill (Soil Mechanics and Foundation Engineers [SMFE], 1968). The fill material was described by SMFE as heterogeneous sandy gravelly clay containing construction debris, including pieces of concrete, asphalt, and metallic slag. The source of the construction debris was unknown. Below the fill material was marshland soil and bay mud deposits. SMFE reported that the site may contain a buried tidal slough crossing the southern portion of the site. This slough was filled in between 1947 and 1953, based on observations of aerial photographs from those years, and replaced with an excavated drainage channel (Pacific Aerial Surveys, 1947 and 1953). This drainage channel was then filled in and replaced with a 72-inch storm drain pipeline sometime after 1968. Three pipelines were reported by SMFE in 1968 to cross the central portion of the property in a northeast-southwest direction, including the 72-inch diameter storm drain, a 48-inch-diameter sanitary sewer, and an abandoned sanitary sewer pipeline. Approximate locations of the storm drain and sewer lines based on plans supplied by City of Oakland Public Works are shown on Plate 2.

Microfiche plans at the City of Oakland Building Inspection Department indicate that the site was originally developed by Gulf Oil Company (Gulf) as a service station in 1969. Building plans for the Gulf station show three underground storage tanks (UST) east of the station building, and a fourth tank (possibly a waste-oil tank) may have been located adjacent to the east wall of the station building just south of the USTs. Records of the Oakland Fire Department indicate that Gulf removed and replaced one 10,000-gallon UST in 1975. No record of soil sampling to document possible leakage from the tank was found.

RESNA understands from information supplied by ARCO, that ARCO purchased the site from Gulf in 1977, and that one 280-gallon waste-oil UST was located west of the station building. On December 16, 1988, this waste-oil UST was excavated and removed from the site by Crosby and Overton of Oakland, California, leaving three 10,000-gallon USTs at the site; which consist of one UST that formerly contained regular leaded gasoline, one super-unleaded gasoline UST, and one regular-unleaded gasoline UST.

Regional and Local Geology

The site is located along the eastern margin of San Francisco Bay within the East Bay Plain, in the northwestern portion of the San Leandro Cone near the boundary of the Oakland Alluvial Plain (Hickenbottom and Muir, 1988). The East Bay Plain lies within the Coast Range geomorphic province and is characterized by broad alluvial fan margins sloping westward into San Francisco Bay.

The site and vicinity were formerly occupied by shallow tidal marshes, and a channelized tidal slough is still located directly west of the site, across Hegenberger Road. Helley and others (1979) mapped the earth materials underlying the site area as being Holocene bay mud estaurine deposits composed of unconsolidated, water-saturated, dark plastic clay and silty clay rich in organic materials, with local lenses and stringers of well-sorted silt, fine sand, and peat. These estaurine materials, known locally as Bay Mud, were deposited primarily in brackish- to salt-water marshes along the margins and beneath the waters of San Francisco Bay during interglacial periods before and after the Wisconsin Glaciation in late Pleistocene time (Goldman, 1969). The estuarine Bay Mud materials interfinger with

Holocene-age fine-grained alluvium deposited by standing floodwaters that periodically inundate the low interfluvial basin areas and fresh-water marshes (Helley and others, 1979).

Regional Hydrogeology

Groundwater quality in the water-bearing units of the San Leandro Cone generally meets recommended primary and secondary standards for drinking water. The most productive water wells in the San Leandro Cone are those completed within the older alluvium units. The older alluvium units consist of permeable alluvial fan deposits characterized by poorly consolidated to unconsolidated gravel, sand, silt and clay (Hickenbottom and Muir, 1988). These units contain appreciable quantities of groundwater, and are therefore considered to be the principal groundwater reservoir in the East Bay Plain area. Smaller amounts of groundwater occur in the younger alluvium, fluvial deposits, interfluvial basin deposits, and Bay Mud estaurine deposits. These deposits generally are relatively thin (less than 120 feet thick), and generally yield only small amounts of groundwater to wells. The Bay Mud acts as a barrier to the vertical movement of salt water from San Francisco Bay into the older alluvium. The Bay Mud is generally water-saturated because most of it lies below the water table. However, it is not considered as a useable source of groundwater to wells because of its low permeability and because it is believed to contain mostly salt water (Hickenbottom and Muir, 1988).

The direction of groundwater flow at the site appears to be to the northeast based on groundwater elevations as interpreted from depth-to-water (DTW) data collected at the site. The depth to first groundwater has been measured to be approximately 7 to 15 feet beneath the site during drilling, and stabilizes in the wells at approximately 7 to 9 feet.

The site is located approximately 3,500 feet east of San Leandro Bay, which is a smaller portion of San Francisco Bay. The nearest streams to the site are Elmhurst Creek, which is located approximately 1,300 feet north of the site, and San Leandro Creek which is located approximately 6,500 feet south of the site. Both creeks originate in the East Bay Hills, which are a part of the Diablo mountain range, and drain directly into San Leandro Bay. Water enters these creeks by direct runoff from rural and urban areas, through numerous small tributaries, and through numerous storm sewer outlets originating in the

urbanized areas. Water also enters the much larger San Leandro Creek from overflow of the East Bay Municipal Utility District's Lake Chabot reservoir located in the East Bay Hills north of the city of Castro Valley.

PREVIOUS WORK

A brief summary of previous work conducted at the site is included in Appendix A, Previous Work.

FIELD WORK

Drilling

Prior to drilling offsite borings B-18 and B-19, permission from the property owner, Mr. McManus, was obtained. Permits for monitoring well construction were obtained from the Alameda County Flood Control and Water Conservation District, Zone 7 (ACFCWCD). A copy of each permit is included in Appendix B. Three soil borings (B-18 through B-20) were drilled at the site on July 9 and 10, 1992, under the direction of a RESNA geologist. The drilling of the two offsite borings was also observed by Craig Fletcher, a geologist from Subsurface Consultants Inc. of Oakland, California, representing Mr. McManus. A summary of the field procedures followed by RESNA is included in Appendix C. The work for this site investigation was performed in accordance with the Site Safety Plan (AGS, March 16, 1991).

Borings B-18 and B-19 were drilled offsite to the east and completed as monitoring wells MW-5 and MW-6, respectively. Boring B-20 was drilled in the northwestern portion of the site, and was completed as monitoring well MW-7. Locations of the wells are shown on Plate 2.

Borings B-18, B-19 and B-20 were drilled to depths of approximately 21½, 21, and 18 feet, respectively.

Soil Sampling and Description

Soil samples were described in accordance with the Unified Soil Classification System (USCS), Plate 3, and collected for description and possible laboratory analyses at maximum intervals of 5 feet from the ground surface to the total depth of the borings as indicated on the Logs of Borings B-18 through B-20 (Plates 4 through 6). Twenty three samples were collected, sixteen were kept by RESNA, and seven were given to Craig Fletcher for geotechnical analyses as per an agreement between RENSA and the offsite owner. A summary of the sampling methods used is presented in Appendix C. Field monitoring of organic vapor concentrations in soil samples was performed using an organic vapor meter (OVM), which qualitatively measures organic vapors.

The earth materials encountered during this investigation consisted primarily of silty and sandy clays interbedded with sandy gravel and sand. Graphic interpretations of the soil stratigraphy encountered in the borings are shown on Geologic Cross Sections A-A', B-B', and C-C' (Plates 7 through 9). The locations of areas depicted by these cross sections are shown on Plate 2.

A section of asphalt underlain by baserock and fill material, approximately 6 feet thick, was encountered in borings B-18 through B-20. The fill material consists of silty clay to silty sand with brick fragments, and metallic slag. Underlying the fill in the southeastern half of the site is an apparent confining silty clay layer between the depths of approximately 5 and 15 feet. Beneath the confining silty clay layer is a sandy clay to clayey and silty sand water-bearing unit, approximately 5 to 10 feet thick. In the northwestern half of the site the water bearing unit underlies the fill material between the depths of approximately 6 and 18 feet. The water-bearing unit thins and grades into a sandy gravel to the southeast of the site. Beneath the water-bearing unit is an apparent perching layer of silty clay that appears to be at least 5 feet thick.

Groundwater was encountered in borings B-18 through B-20 between depths of 7 and 15 feet. Generally, initial water levels rose significantly (3 to 7 feet) in wells in the southeastern half of the site (MW-1, MW-2, MW-4, and MW-5) and either rose slightly, or did not rise in wells in the northwestern half of the site (MW-3, MW-6, MW-7). Therefore,

the water-bearing unit appears to be confined beneath the confining silty clay layer in the southeastern portion and unconfined in the northwestern portion of the site.

Product odor was not detected in the soil during drilling, and organic vapor meter (OVM) readings did not indicate the presence of petroleum hydorcarbons.

Soil cuttings generated from the borings were temporarily stored behind the station building, along the eastern property line and placed on and covered with visquene pending proper disposal. After completion of drilling on July 10, 1992, four soil samples were collected from the stockpile and submitted for compositing and laboratory analyses. The methods used to collect these samples from the stockpile are described in Appendix C.

Monitoring Well Construction and Development

Three groundwater monitoring wells (MW-5 through MW-7) were constructed in borings B-18 through B-20, respectively, using methods summarized in Appendix C. Offsite monitoring wells MW-5 and MW-6 were completed with two-inch-diameter, schedule 40 polyvinyl chloride (PVC) casing and the screened interval consisted of two-inch-diameter, 0.020-inch machine slotted PVC. The screened portions of monitoring wells MW-5 and MW-6 were set from depths of approximately 8 to 17 feet, and 8 to 16½ feet, respectively. Onsite well MW-7 was completed with four-inch diameter, schedule 40 PVC and the screened interval consisted of four-inch-diameter, 0.020-inch machine slotted PVC. The screened portion of well MW-7 was set from a depth of approximately 9 to 15 feet.

The wells were developed on July 22, 1992, to remove fine-grained sediments and to allow better communication between the water-bearing zone and the groundwater monitoring well. Development was performed by a RESNA technician using techniques of over-pumping until the water was determined to be relatively clear. A description of the methods used to develop the wells is included in Appendix C.

Groundwater Level Measurement and Sampling

Groundwater monitoring wells (MW-1 through MW-7) were monitored on July 15, and August 6, 1992, by EMCON. Depths-to-water (DTW) were measured in groundwater monitoring wells and water samples were collected and visually inspected for the presence of floating product. According to EMCON's Field Report Sheets and Summary of Groundwater Monitoring Data, no evidence of floating hydrocarbon product was observed in the water samples collected from wells MW-1 through MW-7 during these monitorings. The wells were purged prior to sampling on August 6, 1992. The results of EMCON's field work on the site, including DTW measurements, well purge data sheets, and subjective analyses for the presence of floating product in the groundwater in the onsite wells are presented on EMCON's Field Report Sheets and EMCON's Summary of Groundwater Monitoring Data, which are included in Appendix D.

EVALUATION OF GROUNDWATER GRADIENT

On July 24, 1992, the wellheads for the new groundwater monitoring wells MW-5 through MW-7, and for existing wells MW-2 and MW-3 were surveyed for top-of-casing (TOC) elevations to a City of Oakland Datum benchmark by John E. Koch, Licensed Land Surveyor, of Oakland, California. The results of this wellhead survey indicated an error in previous survey data resulting in elevations that were approximately 0.78 feet too low. Previous data has been corrected by this amount. The new survey data are included in Appendix E, Wellhead Survey. Groundwater elevations for each well were calculated by subtracting DTW measurements from the new TOC elevations. The DTW measurements, TOC elevations, and calculated groundwater elevations, based on new survey data, are presented in Table 2, Cumulative Groundwater Monitoring Data.

Groundwater was encountered initially in the previous borings/wells at depths of approximately 7 and 13 feet, and subsequently rose to static levels of between approximately 6 and 8 feet. The groundwater gradient and flow direction interpreted from the July 1992 groundwater elevations in wells MW-1, MW-3 and MW-4 (MW-2 was not used due to the presence of a skimmer) is approximately 0.01 to the north, generally away from the San Francisco Bay. The groundwater gradient and flow direction interpreted from the August

1992 groundwater elevations in wells MW-1, MW-3 and MW-4 and new wells MW-5 through MW-7, is approximately 0.01 to the north-northwest. The apparent shift in groundwater flow direction to the west could actually be due to refinement of the monitoring data with the presence of more wells. Nevertheless, the present flow direction is still different than the expected regional direction based on topography, and published information (Hickenbottom and Muir, 1988), which is estimated to be to the west-southwest.

LABORATORY METHODS

Soil Samples

Five soil samples collected from borings B-18 through B-20 were analyzed by Sequoia Analytical, of Redwood City, California (Hazardous Waste Testing Laboratory Certification # 1210) for total petroleum hydrocarbons as gasoline (TPHg) and benzene, toluene, ethylbenzene, and total xylenes (BTEX) using Environmental Protection Agency (EPA) methods 5030/8015/8020. At the request of ARCO's contractor, Dillard Trucking, Inc. of Byron, California, the samples from the soil stockpile were composited in the laboratory and analyzed for TPHg and BTEX using EPA Methods 5030/8015/8020.

Soil samples from the borings were selected for laboratory analyses based on:

- Location above first-encountered groundwater;
- Location in a potential confining or perching layer below first-encountered groundwater; and
- Areas where the presence of gasoline hydrocarbons was suspected.

Groundwater Samples

Groundwater samples obtained by EMCON on August 6, 1992, from monitoring wells MW-1 through MW-7 were analyzed by Columbia Analytical Services of San Jose, California (Hazardous Waste Testing Laboratory Certification #1426) for TPHg and BTEX using EPA

Methods 5030/8020/ DHS LUFT. The sample from MW-2 was also analyzed for the metals cadmium (Cd), chromium (Cr), nickel (Ni), and zinc (Zn) using EPA Method 6010 and lead (Pb) using EPA Method 7421.

RESULTS OF LABORATORY ANALYSES

Soil Samples

Results of laboratory analyses of the five soil samples from borings B-18 through B-20 are summarized in Table 1, Cumulative Results of Laboratory Analyses of Soil Samples. Chain of Custody forms and laboratory analyses reports for soil samples are included in Appendix F of this report.

Laboratory results of soil samples collected from borings B-18 and B-19, located off site to the east of the property, indicated nondetectable TPHg (less than 1 ppm) and BTEX (less than 0.005 ppm).

Laboratory results of the soil sample collected from boring B-20, located roughly downgradient of the pump islands, in the northwestern portion of the site, indicated nondetectable TPHg and BTEX with the exception of 0.022 ppm benzene at a depth of 7 feet. The other constituents, toluene, ethylbenzene, and total xylenes were nondetectable (less than 0.005).

Graphic interpretations of TPHg concentrations in subsurface soil are shown on the geologic cross sections (Plates 7 through 9).

Groundwater Samples

Results of laboratory analyses of water samples from MW-1 through MW-7 are summarized in Table 3, Cumulative Results of Laboratory Analyses of Water Samples - TPHg, TPHd, BTEX, and TOG, and Table 4, Cumulative Results of Laboratory Analyses of Water Samples - BNAs, VOCs, and Metals. Chain of Custody Records and Laboratory Analytical Reports for groundwater samples are included in Appendix D.

Laboratory analyses of groundwater samples collected monitoring well MW-2 for metals indicated concentrations to be 5 ppb Cd, 18 ppb Cr, 88 ppb Pb, 41 ppb Ni, and 4,770 ppb Zn.

Laboratory analyses of groundwater samples collected from wells MW-1, and MW-3 through MW-7 indicated nondetectable TPHg (less than 50 ppb) and BTEX (less than 0.5 ppb).

Laboratory analyses of the groundwater sample collected from well MW-2, located directly northeast of the USTs, indicated concentrations of 78,000 ppb TPHg; 2,500 ppb benzene; 6,700 ppb toluene; 2,900 ppb ethylbenzene; and 16,000 ppb total xylenes.

Graphic interpretations of TPHg and benzene concentrations in the groundwater are shown on Plate 12, TPHg Concentrations in Groundwater, and Plate 13, Benzene Concentrations in Groundwater.

Stockpiled Soil Cuttings

Results of laboratory analyses of the composited stockpile soil sample indicated nondetectable TPHg, toluene, and total xylenes; and, benzene and ethylbenzene concentrations of 0.014 ppm and 0.0060 ppm, respectively. These results are summarized in Table 1. The soil stockpiles were removed from the site by ARCO's contractor, Dillard Trucking Inc., of Byron, California, on July 17, 1992 and disposed at the BFI landfill in Livermore, California (see letter dated July 21, 1992, from Dillard in Appendix F).

CONCLUSIONS

RESNA concludes the following, based on the results of this and previous subsurface investigations:

- The majority of gasoline hydrocarbons in the soil at the site appear to be limited to an area beneath and directly northeast of the existing gasoline USTs, at depths between 3 and 20 feet. The highest TPHg concentrations (up to 52,000 ppb) are present in the saturated zone of the sandy clay to clayey sand water-bearing unit, at a depth of about 17 feet.

- As indicated by nondetectable TPHg concentrations (less than 1 ppm) in soil samples from the apparent silty clay perching layer beneath the site in borings/monitoring wells B-2/MW-2, B-3/MW-3, and B-4/MW-4, the vertical extent of gasoline related hydrocarbons in the soil appear to have been delineated at a depth of approximately 21 feet along the eastern and southwestern site boundaries. As indicated by the absence of subjective evidence of gasoline hydrocarbon (no odor and zero OVM readings) in soil samples from the perching layer in borings/monitoring wells B-18/MW-5 and B-19/MW-6, and nondetectable TPHg concentrations (less than 50 ppb) in groundwater samples from these wells (which are screened from the top of the silty clay perching layer through the shallowest water-bearing unit), the vertical extent of gasoline related hydrocarbons appears to have been delineated offsite to the east-northeast and onsite in the northwestern portion of the site.

- The lateral extent of gasoline related hydrocarbons in the soil appears to have been delineated to less than 1 ppm TPHg beneath the site.

- The water bearing zone beneath the site appears to be semi-confined. In the southeastern portion of the site the groundwater appears to be confined beneath a silty clay confining layer and in the northwestern portion it appears to be unconfined or semi-confined.

- TPHg and BTEX in the groundwater beneath the site appear to be localized, as they were only detected in MW-2, located directly downgradient of the USTs.

- Gasoline hydrocarbons appear not to have migrated offsite as evidenced by nondetectable levels of TPHg and BTEX in borings B-18 and B-19, and in wells MW-5 and MW-6.

DISTRIBUTION

It is recommended that copies of this report be forwarded to:

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San Francisco Bay Region
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LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological practice in California at the time this investigation was performed. Groundwater monitoring field procedures and acquisition of groundwater data were performed under the direction of EMCON; evaluation and warrant of their monitoring field data and field protocols is beyond RESNA's scope of work. With respect to groundwater monitoring, RESNA's scope of work was limited to interpretation of field and laboratory data. This investigation was conducted solely for the purpose of evaluating environmental conditions of the soil and groundwater with respect to hydrocarbon-product at the subject site in the immediate areas of and related to the gasoline-storage tanks and the former waste-oil tank. No soil engineering or geotechnical implications are stated or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this investigation 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.

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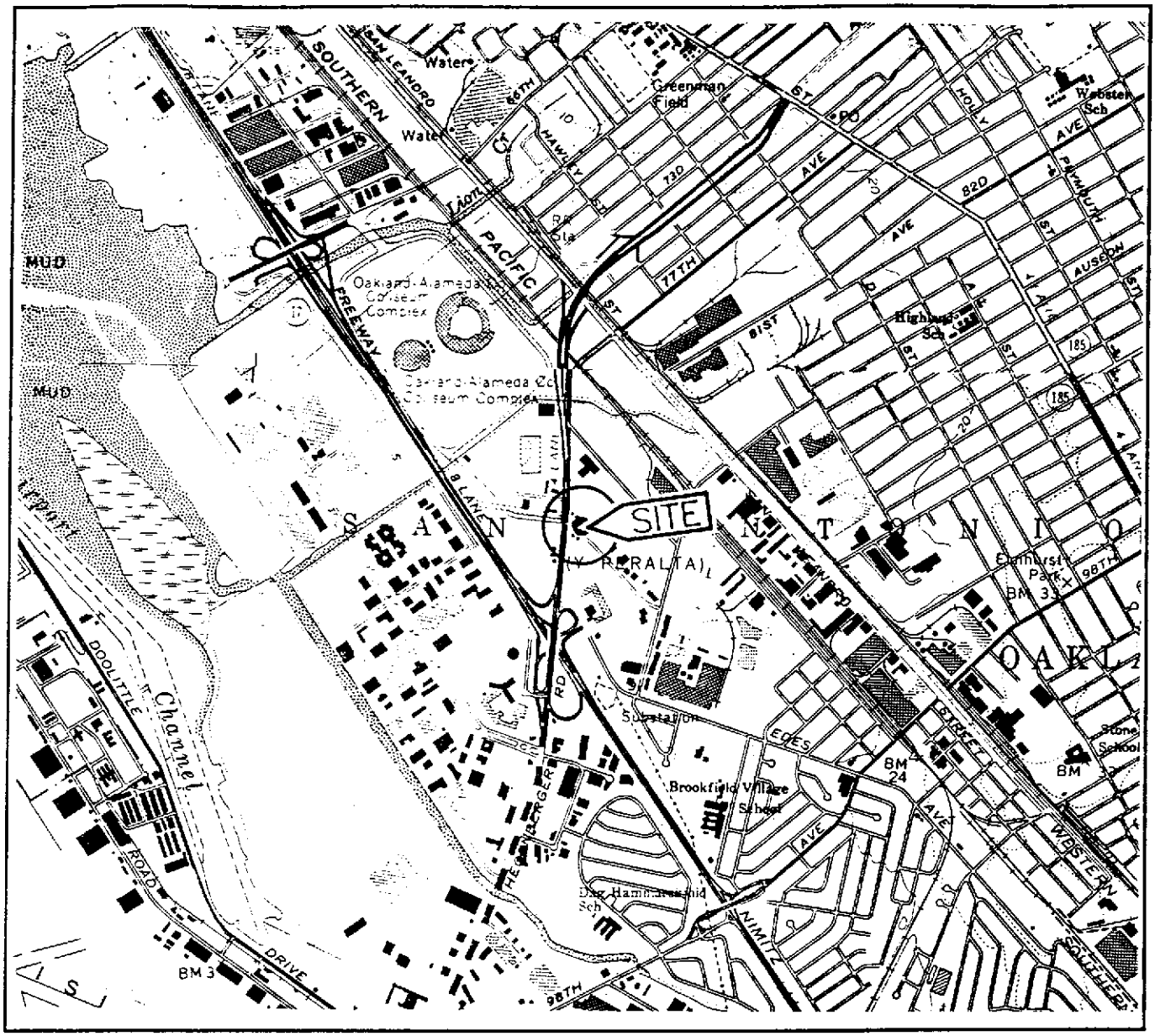

Base: U.S. Geological Survey
7.5-Minute Quadrangles
Oakland East/San Leandro, California
Photorevised 1980

LEGEND

⊙ = Site Location

Approximate Scale

2000 1000 0 2000 4000

feet

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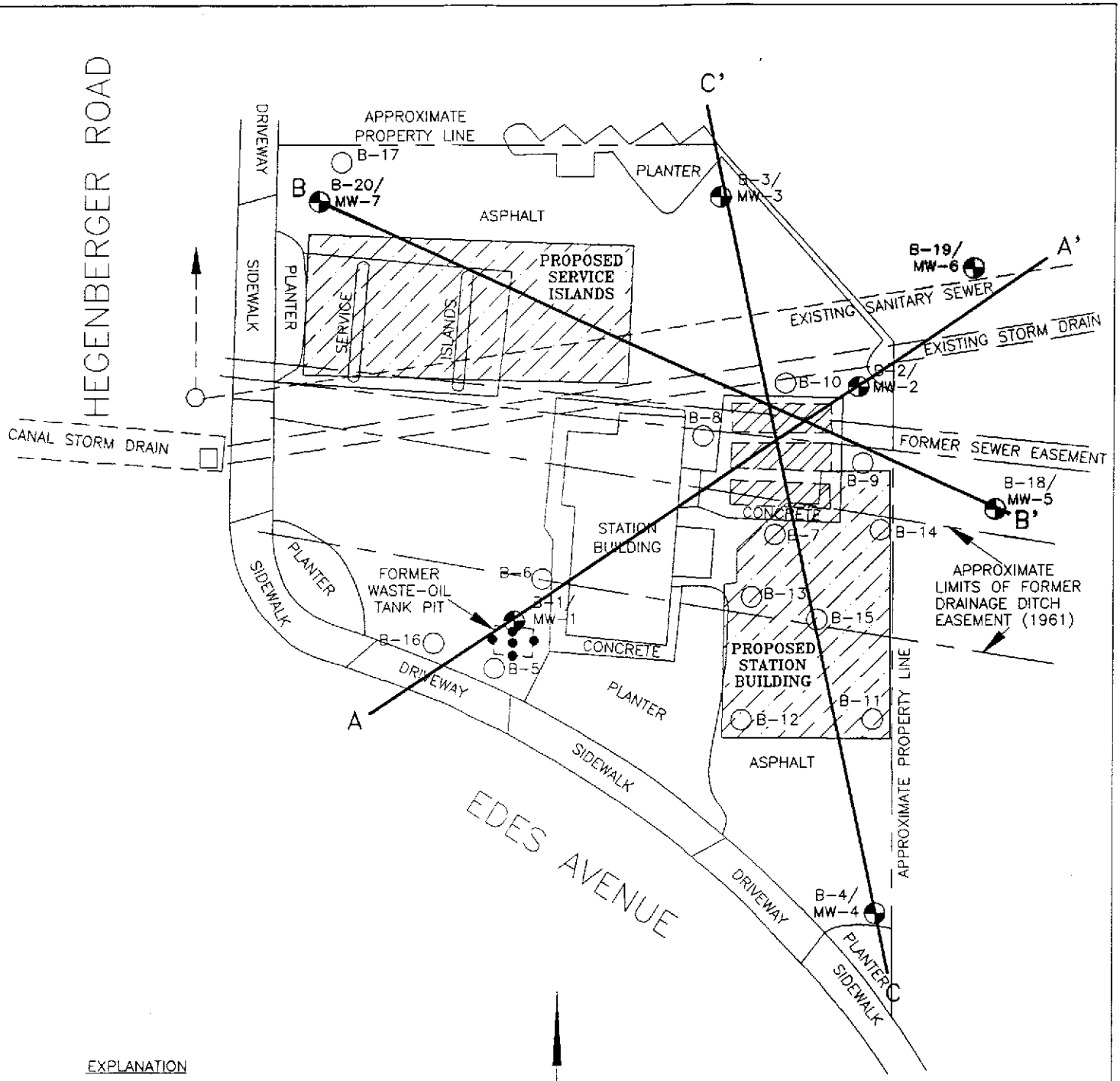
SITE VICINITY MAP
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

PLATE
1



EXPLANATION

- ● = Waste-oil tank excavation soil samples (Pacific Environmental Group, January 1989)
- B-20/MW-7 = Monitoring well (RESNA, October 1989, August 1990, July 1990)
- B-17 = Soil boring (RESNA, August 1990 and March 1991)
- = Existing product storage tanks
- C —— C' = Geologic cross section

N

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

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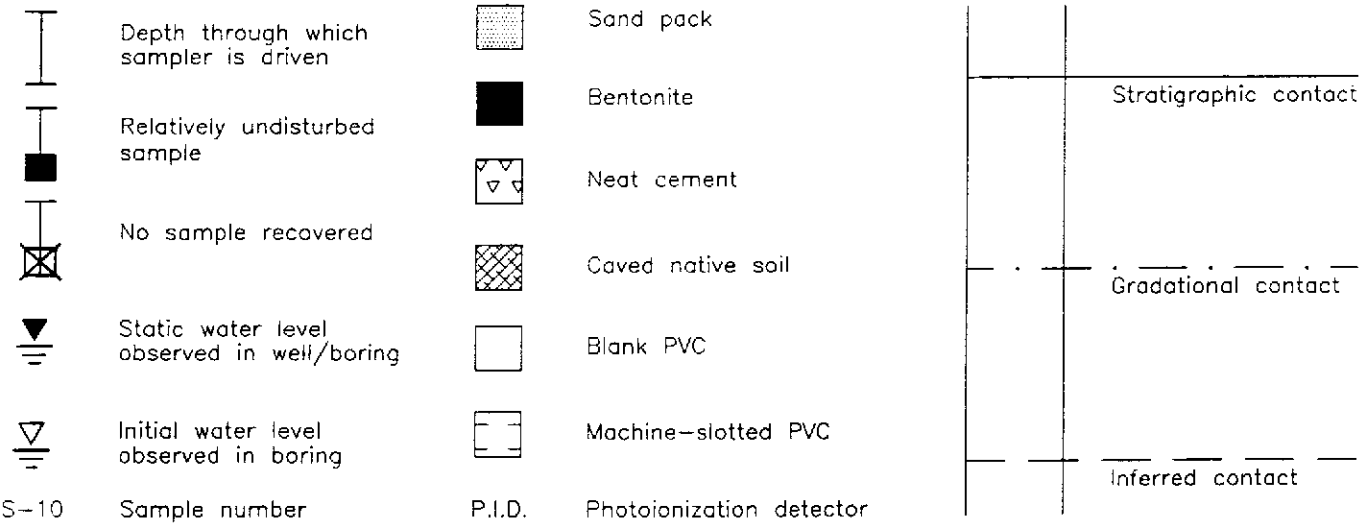
GENERALIZED SITE PLAN
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

PLATE
2

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, grave-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.



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.

GRADATIONAL AND INFERRED CONTACT 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.

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PROJECT 69038.10

UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY
ARCO Station 4494
566 Hegenberger Road
Oakland, California

PLATE 3

Depth of boring: 21-1/2 feet Diameter of boring: 8 inches Date drilled: 07/09/92

Well depth: 17 feet Material type: Sch 40 PVC Casing diameter: 2 inches

Screen interval: 8 to 17 feet Slot size: 0.020-inch

Drilling Company: Exploration Geoservices Driller: John and Dennis

Method Used: Hollow-Stem Auger Field Geologist: Rob Campbell

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt surface.	
0					Asphalt (2 inches).	
	S-1.5	5 13 7	0	SM/SC	Silty sand with clay, brown, damp, medium dense; fire brick fragments: fill.	
2				CL	Silty clay with sand, black, damp to moist, medium plasticity, very stiff; brick fragments: fill.	
4	S-5 S-5.5	5 6 8	0			
6				CH	Silty clay, bluish-green, moist, high plasticity, stiff; root fibers, sulfur odor.	
8						
10	S-10 S-10.5	2 1 1	0			
12					Moist to very moist at 13 feet.	
14				MH	Clayey silt, bluish-green, very moist, high plasticity, firm.	
	S-15 S-15.5	3 3 3	0	GW-GM	Sandy gravel with silt, bluish-green, wet, loose; sulfur odor.	
16				CH	Silty clay, bluish-green, moist to very moist, high plasticity, stiff; root fibers.	
18	S-18	6 7 10	0			
	S-19.5	5 6 9	0		Grades to brown at 19-1/2 feet.	
20	S-21	6 8 8				
					Total depth = 21-1/2 feet.	

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PROJECT: 69038.10

LOG OF BORING B-18/MW-5
ARCO Station 4494
566 Hegenberger Road
Oakland, California

PLATE
4

Depth of boring: 21 feet Diameter of boring: 8 inches Date drilled: 07/09/92

Well depth: 16-1/2 feet Material type: Sch 40 PVC Casing diameter: 2 inches

Screen interval: 8 to 16-1/2 feet Slot size: 0.020-inch

Drilling Company: Exploration Geoservices Driller: John and Dennis

Method Used: Hollow-Stem Auger Field Geologist: Rob Campbell

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Asphalt surface.	
0					Asphalt (2 inches).	
				GW-GM	Baserock, angular gravel, brown, damp, medium dense (4 incnes).	
2					Gravelly sand with silt, brown, damp, medium dense; fire brick debris: fill. Grades to black with metallic slag at 2 feet. Very hard drilling between 3 and 4 feet due to large cobbles of metallic slag and fire brick fragments.	
4						
	S-5.5	7	3	SP-SM	Sand with silt, medium-grained, black, moist, meaium densa, angular pebbles.	
6		14				
	S-7	7	1.5	CH	Sandy clay with silt, blue-green, moist, very soft; abundant organic matter, burrow holes, sulfur odor.	
8		2				
		1			Grades to more clay.	
	S-9.5	1	0		Encounterea water at 10 feet.	
10	S-10.5	1				
		1				
12						
14				SP	Sand, fine-grained, bluish-green, wet, dense.	
	S-14.5	15	0			
	S-15	27		GP	Gravel with sand, bluish-green, wet, dense.	
16		17				
		1		CH	Clay with silt, bueish-green, very moist to wet, high plasticity, firm; sulfur odor, root fibers.	
	S-17.5	2	0			
18		5				
		2				
	S-19	5	0		Grades to very moist.	
		4				
20	S-20.5	4	0			
		6				
					Total depth = 21 feet.	

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LOG OF BORING B-19/MW-6
ARCO Station 4494
566 Hegenberger Road
Oakland, California

PLATE
5

Depth of boring: 18 feet Diameter of boring: 12 inches Date drilled: 07/10/92

Well depth: 15 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 9 to 15 feet Slot size: 0.020-inch

Drilling Company: Exploration Geoservices Driller: John and Dennis

Method Used: Hollow-Stem Auger Field Geologist: Erin McLucas

Signature of Registered Professional:

Registration No.: CEG 1463 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt surface.	
					Asphalt (6 inches).	
				SM	Silty sand with coarse gravel and clay, medium-grained sand, black, damp, medium dense; metallic slag: fill.	
2						
4					Hard drilling between 4 and 6 feet due to angular slag fragments.	
6						
	S-7	1 0 0	0	CL / SM	Silty clay, gray with black mottling, moist, medium plasticity, stiff.	
8					Silty sand, fine-grained, gray, wet, loose; root fragments.	
10	S-10	2 2 2	0.6			
12						
14						
	S-15.5	3 3 7	0	CL	Silty clay, olive-gray mottled brown, moist, medium plasticity, stiff.	
16						
	S-17.5	5 5 7	0			
18					Total depth = 18 feet.	
20						

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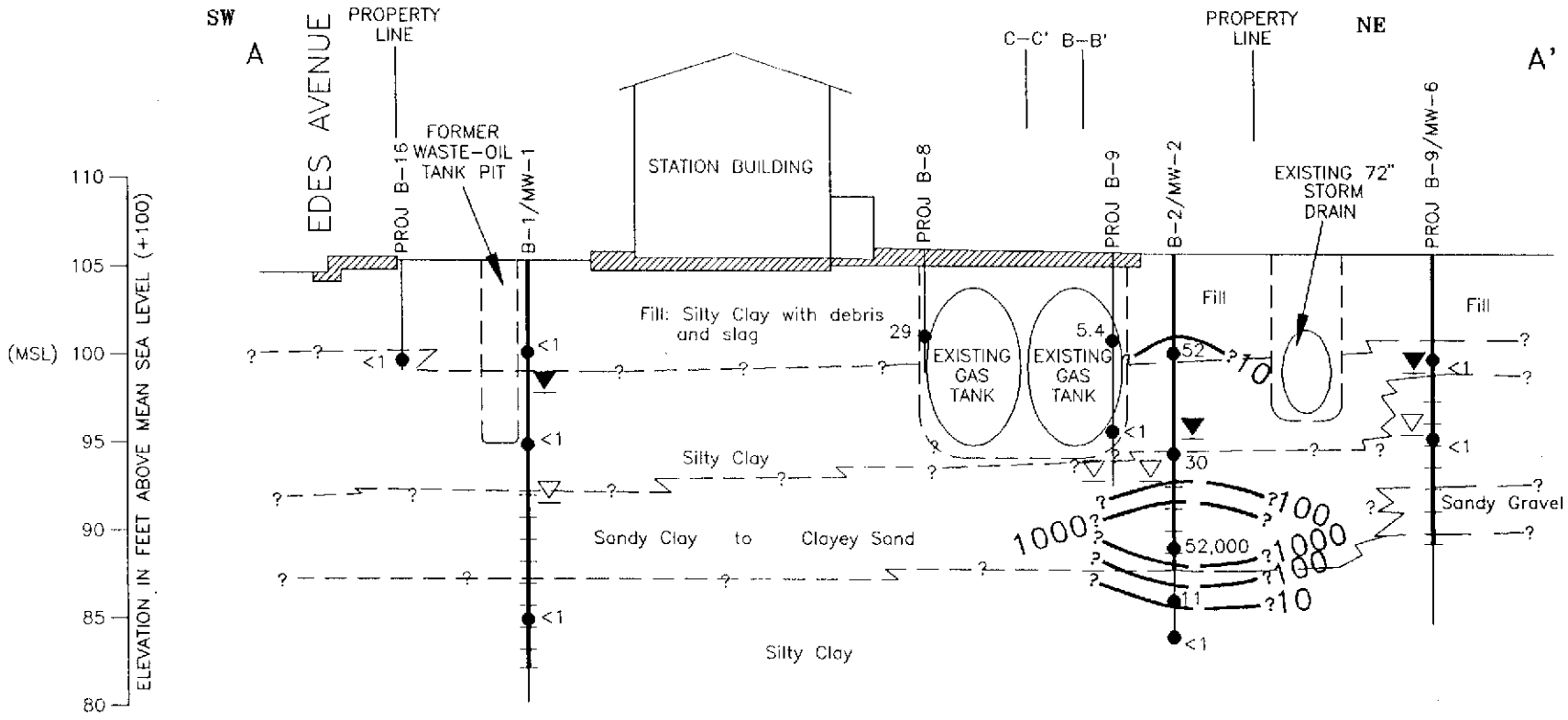
PROJECT: 69038.10

LOG OF BORING B-20/MW-7
ARCO Station 4494
566 Hegenberger Road
Oakland, California

PLATE 6



EXPLANATION

1000 — = Line of equal concentration of TPHg in soil in parts per million (ppm)

52,000 = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (8/6/92)

Approximate Horizontal Scale

30 15 0 30 60

feet

Approximate Vertical Scale

10 5 0 10 20

feet

PLATE 7

GEOLOGIC CROSS SECTION A-A'
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

RESNA
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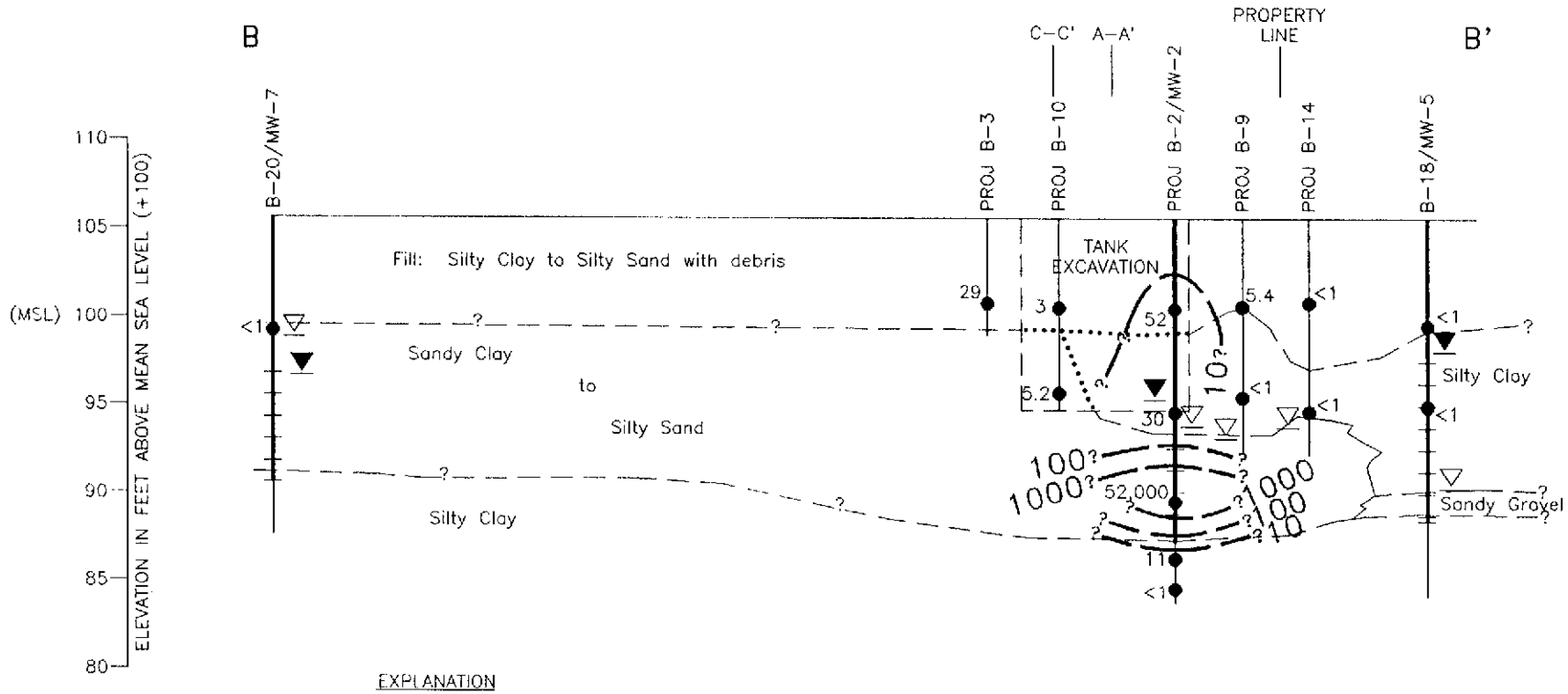
PROJECT 69038.10



EXPLANATION

1000 — = Line of equal concentration of TPHg in soil in parts per million (ppm)

52,000 ● = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (8/6/92)

Dotted line indicates inferred contact through tank excavation.

Approximate Horizontal Scale

30 15 0 30 60

feet

Approximate Vertical Scale

10 5 0 10 20

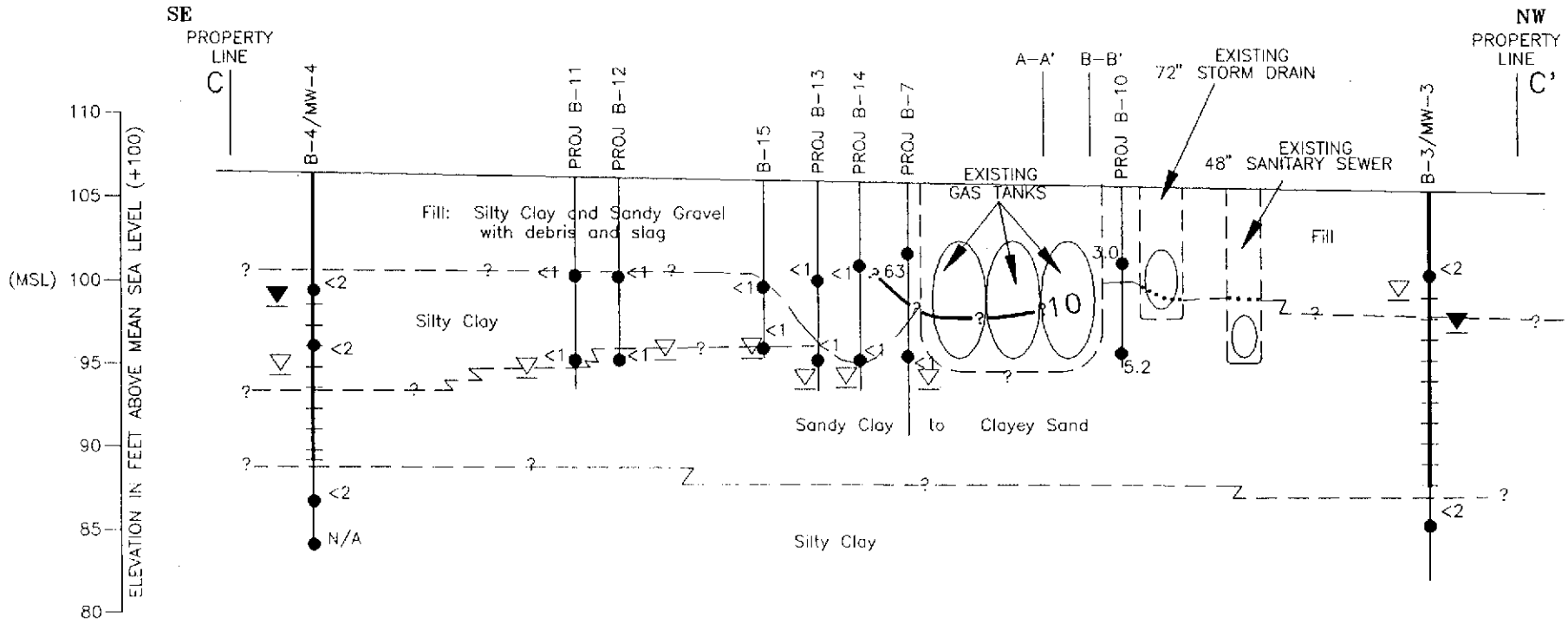
feet

PLATE 8

GEOLOGIC CROSS SECTION B-B'
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

RESNA
Working to Restore Nature

PROJECT 69038.10



EXPLANATION

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

63 = Laboratory analyzed soil sample showing concentration of TPHg in ppm

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (8/6/92)

Dotted line indicates inferred contact through tank excavation.

Approximate Horizontal Scale

30 15 0 30 60

feet

Approximate Vertical Scale

10 5 0 10 20

feet

PLATE 9

GEOLOGIC CROSS SECTION C-C'
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

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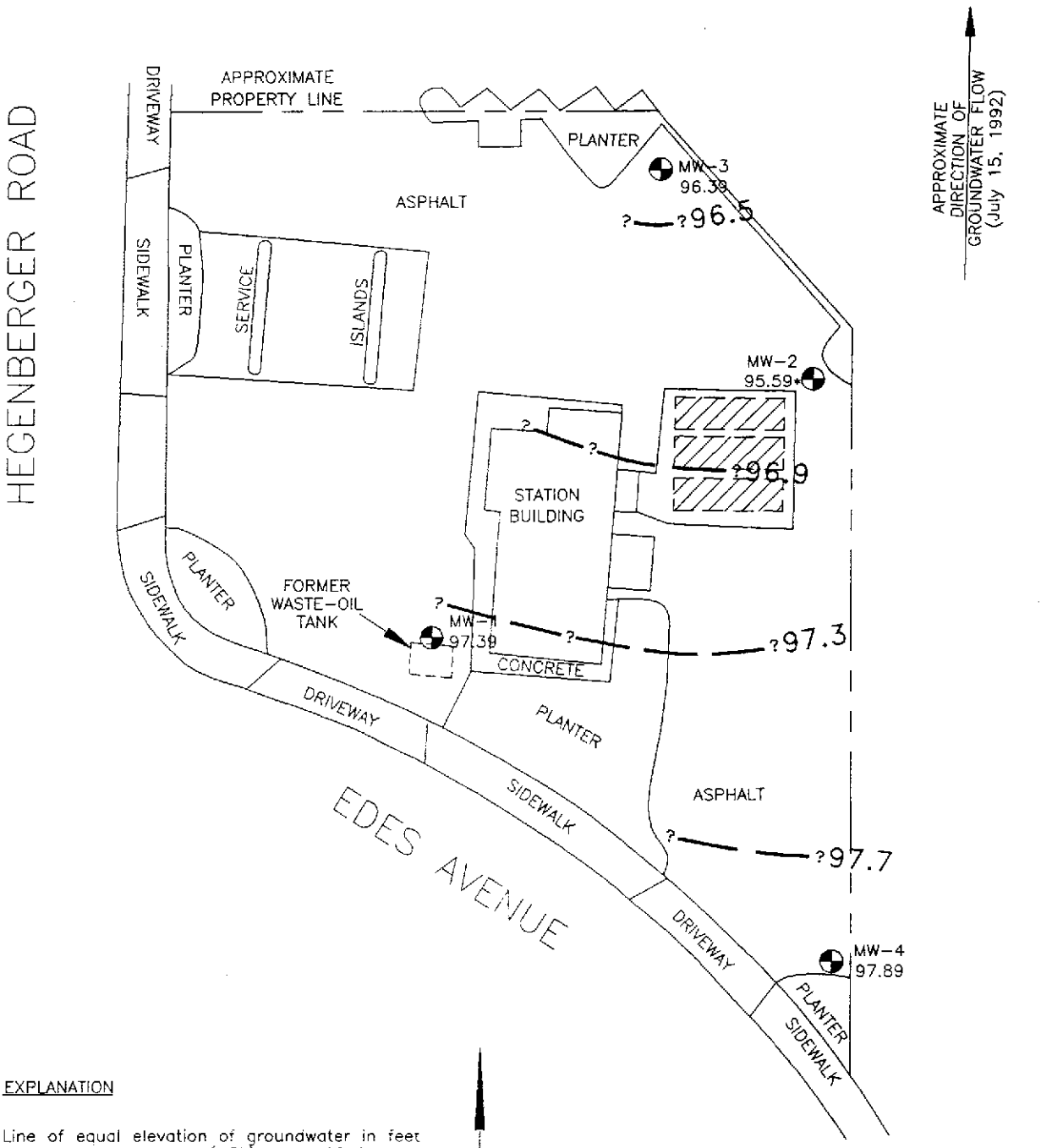
PROJECT 69038.10



EXPLANATION

97.00 = Line of equal elevation of groundwater in feet above mean sea level (MSL) plus 100 feet

97.89 = Elevation of groundwater in feet above MSL plus 100 feet, July 15, 1992

MW-4 = Monitoring well (RESNA, October 1989 and August 1990)

= Existing gasoline storage tanks

* = Anomalous groundwater elevation due to the presence of a skimmer in well; not used in groundwater gradient interpretation

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

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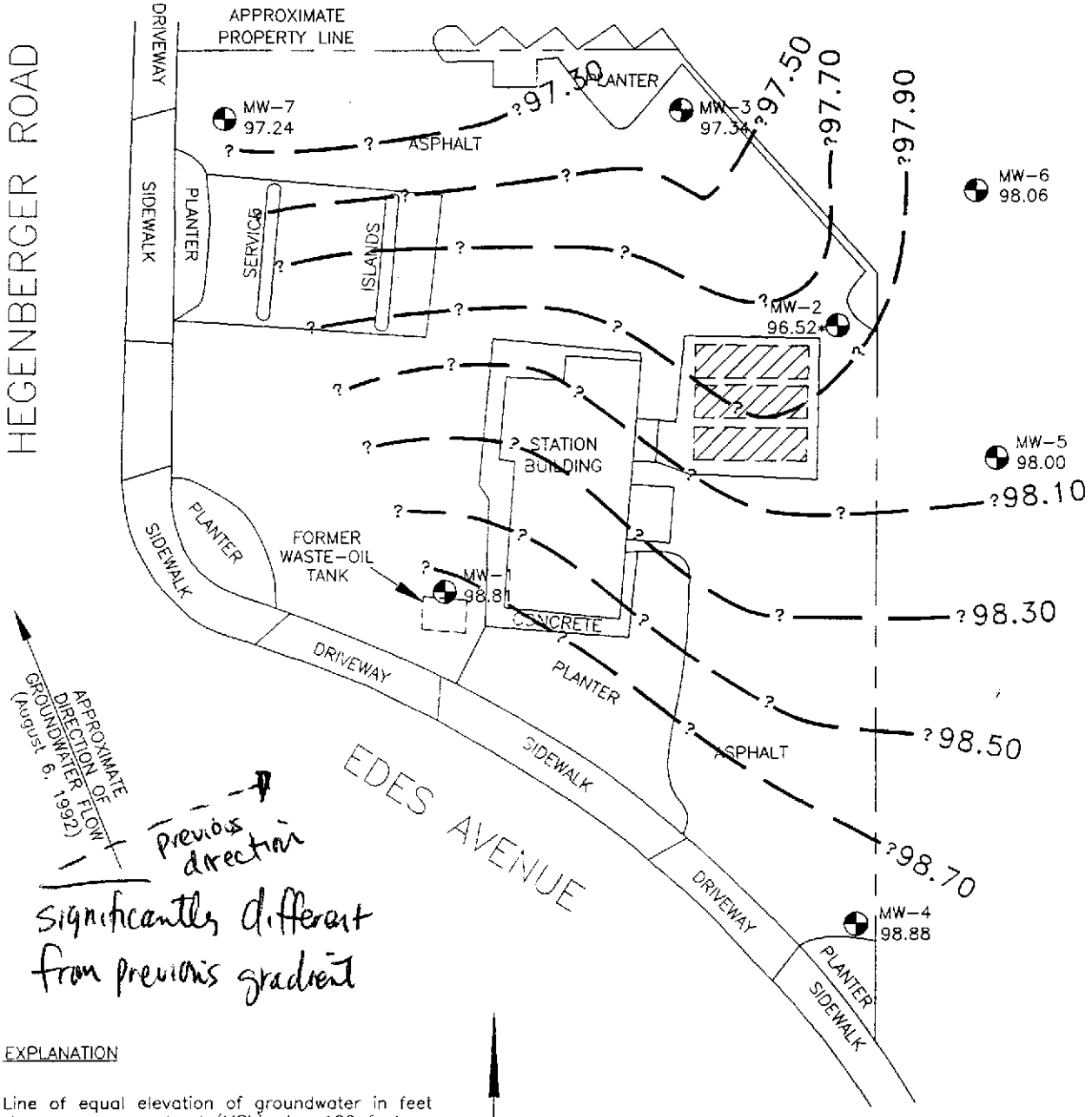
GROUNDWATER GRADIENT MAP
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

PLATE
10



EXPLANATION

98.70 = Line of equal elevation of groundwater in feet above mean sea level (MSL) plus 100 feet

98.88 = Elevation of groundwater in feet above MSL plus 100 feet, August 6, 1992

MW-7 = Monitoring well (RESNA, October 1989, August 1990, July 1992)

= Existing gasoline storage tanks

* = Anomalous groundwater elevation due to the presence of a skimmer in well; not used in groundwater gradient interpretation

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

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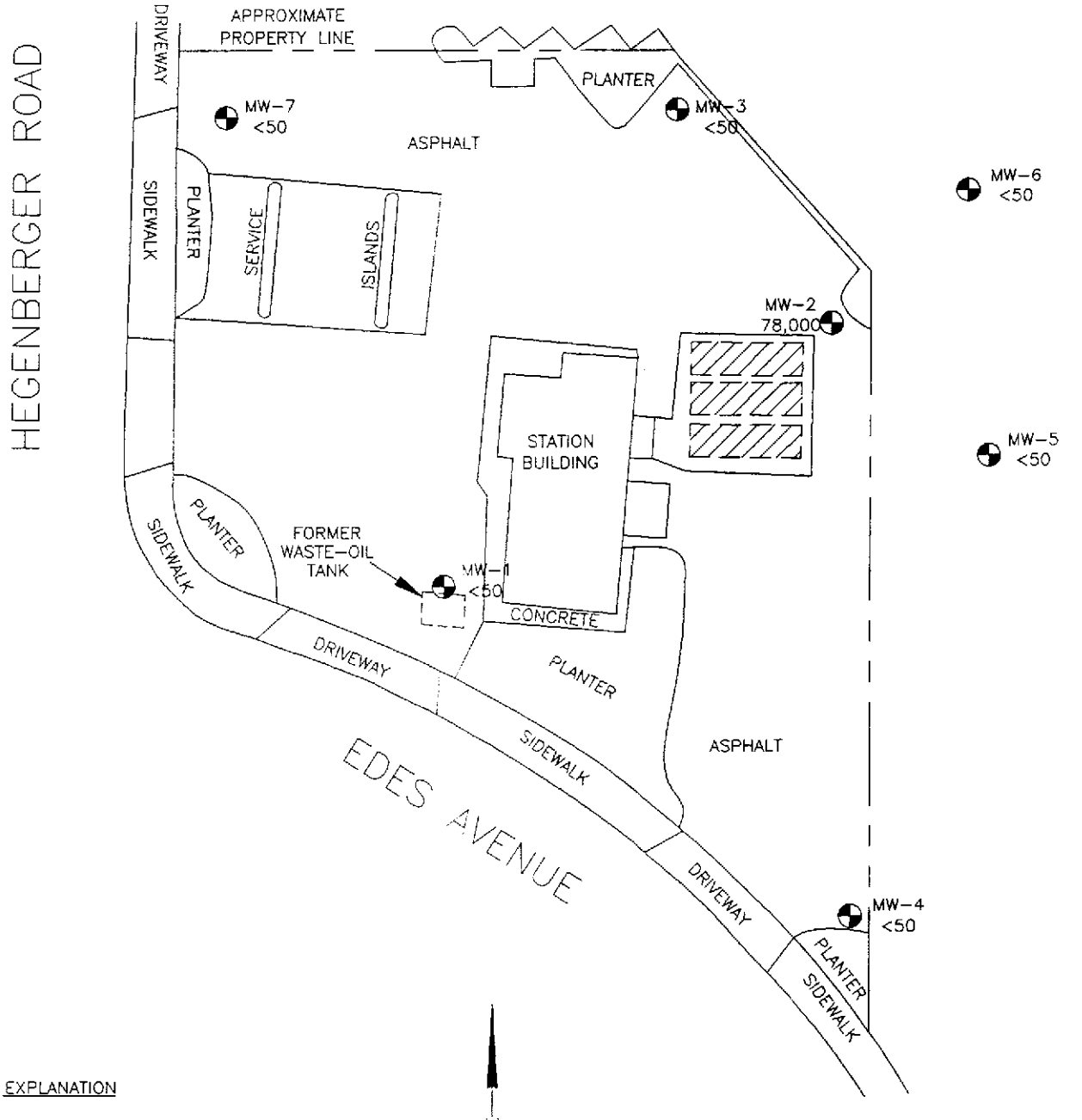
PROJECT 69038.10

GROUNDWATER GRADIENT MAP
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

PLATE 11



EXPLANATION

78,000 = Concentration of TPHg in groundwater in ppb, August 6, 1992

MW-7 = Monitoring well (RESNA, October 1989, August 1990, July 1992)

= Existing gasoline storage tanks

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

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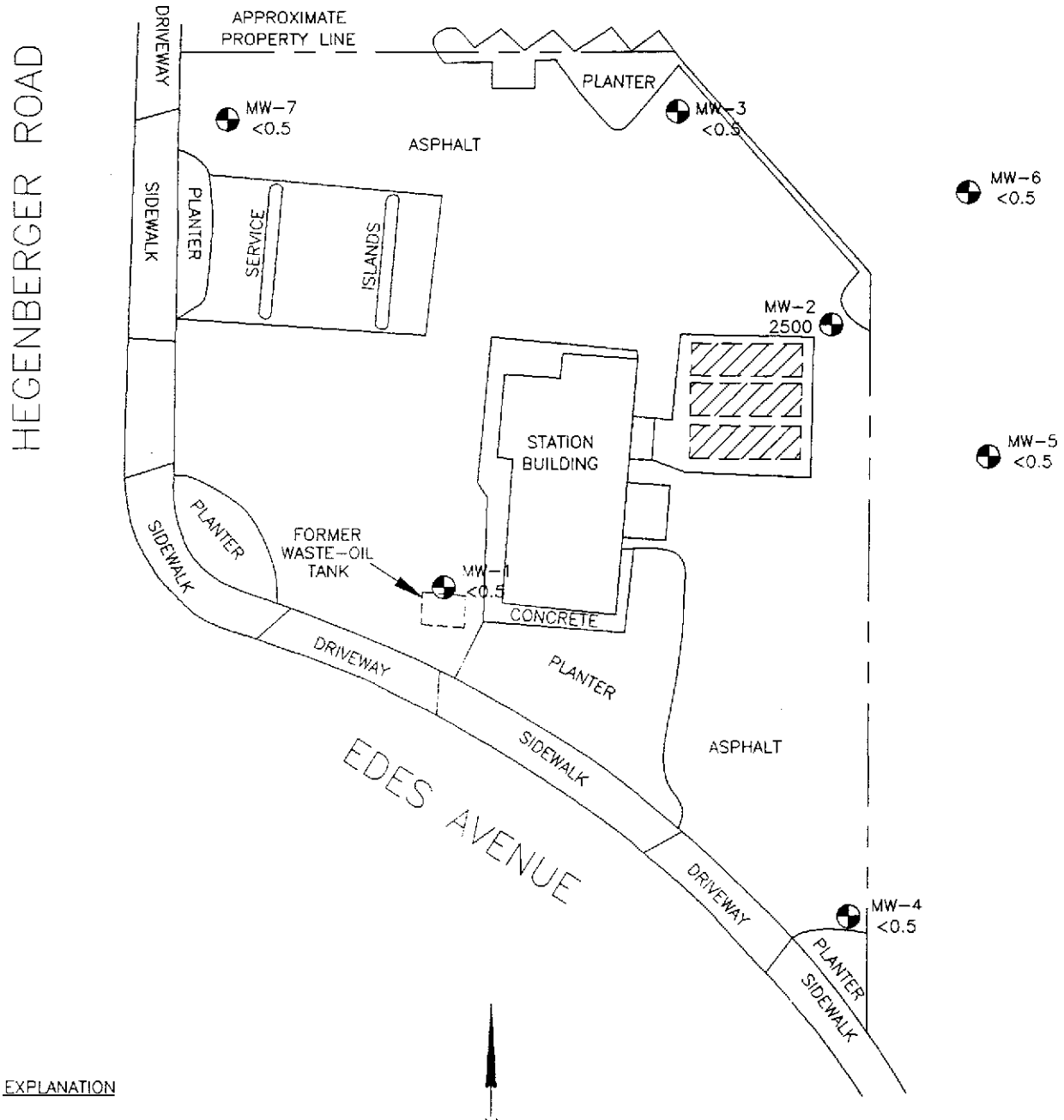
PROJECT 69038.10

TPHg CONCENTRATIONS IN GROUNDWATER
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

PLATE 12



EXPLANATION

2500 = Concentration of benzene in groundwater in ppb, August 6, 1992

MW-7 = Monitoring well (RESNA, October 1989, August 1990, July 1992)

= Existing gasoline storage tanks

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plans supplied by ARCO Products Co. (dated August 12, 1982) and City of Oakland Dept. of Public Works (dated December 19, 1961).

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BENZENE CONCENTRATIONS IN GROUNDWATER
ARCO Service Station 4494
566 Hegenberger Road
Oakland, California

PLATE 13

Additional Subsurface Investigation
ARCO Station 4494, Oakland, California

October 27, 1992
69038.10

TABLE 1
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
ARCO Station 4494
Oakland,California
(Page 1 of 3)

Sample ID	TPHg	TPHd	B	T	E	X	TOG
December 1988							
WO-1	11*	370.+**	NA	NA	NA	NA	4,500(4800)
WO-2	<5*	<10**	NA	NA	NA	NA	<20(<10)
January 1989							
WOSW-E	NA	<10**	NA	NA	NA	NA	190(50)
WOSW-S	NA	<10**	NA	NA	NA	NA	<10(<10)
WOSW-W	NA	<10**	NA	NA	NA	NA	<10(<10)
WOSW-N	NA	33**	NA	NA	NA	NA	200(400)
WOSW-N2	NA	<10**	NA	NA	NA	NA	10(<10)
October 1989							
S-5-B1	<1.0	200	<0.005	<0.005	<0.005	<0.005	1,600
S-10-B1	<1.0	<10	<0.005	<0.005	<0.005	<0.005	<30
S-20-B1	<1.0	<10	<0.005	<0.005	<0.005	<0.005	<30
S-24-B1	<1.0	<10	<0.005	<0.005	<0.005	<0.005	<30
S-5-B2	52	<10	1.8	0.25	0.48	2.6	280
S-11-B2	30	<10	0.75	0.51	0.43	2.7	<30
S-16-B2	52,000	5,700	<100	1,400	440	2,700	2,300
S-16-B2#	___	___	(120)	(930)	(490)	(3,200)	—
S-19-B2	11	14	0.25	1.2	0.22	1.5	<30
S-21-B2	<1.0	<10	<0.005	0.012	<0.005	0.021	<30
S-5-B3	<2.0	<10	<0.050	<0.050	<0.050	<0.050	<50
S-20-B3	<2.0	<10	<0.050	<0.050	<0.050	<0.050	<50
August 1990							
S-7-B4	<2.0	36	<0.050	<0.050	<0.050	<0.050	110
S-10-B4	<2.0	<10	<0.050	<0.050	<0.050	<0.050	<50
S-19.5-B4	<2.0	15	<0.050	<0.050	<0.050	<0.050	<50
S-22-B4	NA	<10	NA	NA	NA	NA	NA
S-6-B5	<2.0	<10	<0.050	<0.050	<0.050	<0.050	<50
March 1991							
S-5-B6	<1.0	NA	<0.005	<0.005	<0.005	<0.005	NA
S-5-B7	63	NA	1.0	0.23	0.86	1.8	NA
S-10-B7	<1.0	NA	<0.005	<0.005	<0.005	0.006	NA
S-5-B8	29	NA	0.86	0.088	0.36	0.21	NA
S-5-B9	5.4	NA	0.66	0.035	0.31	<0.005	NA
S-10-B9	<1.0	NA	0.037	<0.005	0.011	0.036	NA
S-5-B10	3.0	NA	0.28	0.013	<0.005	0.023	NA
S-10-B10	5.2	NA	0.53	0.036	0.096	0.23	NA
S-6-B11	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	330
S-11-B11	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<30
S-6-B12	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<30
S-11-B12	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<30
S-6-B13	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<30
S-11-B13	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<30
S-5-B14	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	570

See notes on Page 3 of 3.

TABLE 1
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
ARCO Station 4494
Oakland, California
(Page 2 of 3)

Sample ID	TPHg	TPHd	B	T	E	X	TOG
March 1991							
S-11-B14	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<30
S-6-B15	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	280
S-10.5-B15	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<30
S-5.5-B16	<1.0	<1.0	<0.005	<0.005	<0.005	<0.005	<30
S-6-B17	69	<100	1.3	1.7	1.0	2.2	1,100
July 1992							
S-5.5-B18	<1.0	NA	<0.0050	<0.0050	<0.0050	<0.0050	NA
S-10.5-B18	<1.0	NA	<0.0050	<0.0050	<0.0050	<0.0050	NA
S-5.5-B19	<1.0	NA	<0.0050	<0.0050	<0.0050	<0.0050	NA
S-10.5-B19	<1.0	NA	<0.0050	<0.0050	<0.0050	<0.0050	NA
S-7-B-20	<1.0	NA	0.022	<0.0050	<0.0050	<0.0050	NA
COMPOSITE STOCKPILE SAMPLES							
June 1990							
SP-O619-1A							
SP-0619-1B	19	110	<0.050	<0.050	0.087	0.67	<0.5
SP-0619-1C							
SP-0619-1D							
August 1990							
S-B3-1							
S-B3-2							
S-B4-1	<2.0	<10	<0.050	<0.050	<0.050	<0.050	<0.5
S-B4-2							
S-B4-3							
April 1991							
S-0411-1A							
S-0411-1B							
S-0411-1C	<1.0	NA	<0.0050	0.0080	0.0098	0.017	NA
S-0411-1D							
July 1992							
SP-0710-A							
SP-0710-B							
SP-0710-C	<1.0	NA	0.014	<0.0050	0.0060	<0.0050	NA

See notes on Page 3 of 3.

TABLE 1
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
ARCO Station 4494
Oakland, California
(Page 3 of 3)

Results in parts per million (ppm).

TPHg =	Total petroleum hydrocarbons as gasoline.
TPHd =	Total petroleum hydrocarbons as diesel.
B = benzene,	T = toluene, E = ethylbenzene, X = total xylenes
TOG =	Total oil and grease.
< =	Below indicated laboratory reporting limits.
ND =	Not detected above laboratory reporting limits for respective compounds.
NA =	Not analyzed.
* =	Analyzed as low boiling hydrocarbons as gasoline (LBHC-g).
** =	Analyzed as high boiling hydrocarbons as diesel (HBHC-d).
(4,800) =	Analyzed as high boiling hydrocarbons as oil (HBHC-o).
+ =	Chromatographic pattern of compounds detected and calculated as diesel does not match that of the diesel standard used for calibration.
# =	Results of analysis by EPA Method 8240.

Sample Identification:

S-10.5-B12
- S = Soil sample
- 10.5 = Sample depth in feet below ground surface
- B12 = Boring number

S-0411-1(A-D)
- S = Soil sample
- 0411 = Date sampled
- 1 = Soil pile
- (A-D) = Composite sample

TABLE 2
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 4494
Oakland, California
(Page 1 of 3)

Well Date	Elevation of Wellhead	Depth to Water	Water Elevation	Floating Product
MW-1				
06/06/90	105.31	6.65	98.66	None
08/16/90		7.00	98.31	None
08/21/90		7.05	98.26	None
09/07/90		7.24	98.07	None
11/20/90		7.46	97.85	None
11/29/90		7.40	97.91	None
12/19/90		6.99	98.32	None
01/29/91		7.23	98.08	None
02/27/91		7.45	97.86	None
03/07/91		6.96	98.35	None
03/26/91		6.02	99.29	None
05/02/91		7.04	98.27	None
06/27/91		6.71	98.60	None
07/24/91		6.91	98.40	None
08/22/91		6.85	98.46	None
09/30/91		7.04	98.27	None
10/17/91		7.22	98.09	None
11/21/91		7.17	98.14	None
12/18/91		7.46	97.85	None
01/19/92		7.44	97.87	None
02/20/92		6.25	99.06	None
03/20/92		6.40	98.91	None
04/20/92		6.88	98.43	None
05/19/92		7.10	98.21	None
06/08/92		7.22	98.09	None
07/15/92		7.92	97.39	None
08/06/92	106.10	7.29	98.81	None
MW-2				
06/06/90	105.78	9.00*	96.78*	0.92 Black Product
08/16/90		NM	NM	0.17 Black Product
08/21/90		NM	NM	0.17 Black Product
09/07/90		9.17*	96.61*	0.17 Black Product
11/20/90		9.20*	96.58*	Heavy Sheen
11/29/90		9.92*	95.86*	Heavy Sheen
12/19/90		8.95	96.83	None
01/29/91		9.01	96.77	Sheen
02/27/91		9.14	96.64	Sheen
03/07/91		8.94	96.84	Sheen
03/26/91		8.11	97.67	Sheen
05/02/91		8.72	97.06	None
06/27/91		9.20	96.58	Sheen

See notes on page 3 of 3.

TABLE 2
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 4494
Oakland, California
(Page 2 of 3)

Well / Date	Elevation of Wellhead	Depth to Water	Water Elevation	Floating Product
MW-2 (Cont.)				
07/24/91		9.25	96.53	None
08/22/91		9.20	96.58	None
09/30/91		9.31	96.47	Sheen
10/17/91		9.39	96.39	Sheen
11/21/91		9.20	96.58	None
12/18/91		9.23	96.55	Sheen
01/19/92		9.96**	95.82	Skimmer
02/20/92		9.13**	96.65	Skimmer
03/20/92	105.78	9.31**	96.47	Skimmer
04/20/92		9.69**	96.09	Skimmer
05/15/92		9.92**	95.86	Skimmer
06/08/92		9.84**	95.94	Skimmer
07/15/92		10.19**	95.59	Skimmer
08/06/92	106.57	10.05**	96.52	Skimmer
MW-3				
08/16/90	105.51	8.87	96.64	None
08/21/90		8.85	96.66	None
09/07/90		8.98	96.53	None
11/20/90		9.10	96.41	None
11/29/90		9.05	96.46	None
12/19/90		8.67	96.84	None
01/29/91		8.96	96.55	None
02/27/91		8.71	96.80	None
03/07/91		8.49	97.02	None
03/26/91		7.65	97.86	None
05/02/91		8.62	96.89	None
06/27/91		8.94	96.57	None
07/24/91		8.96	96.55	None
08/22/91		8.92	96.59	None
09/30/91		9.04	96.47	None
10/17/91		9.12	96.39	None
11/21/91		8.92	96.59	None
12/18/91		8.97	96.54	None
01/19/92		8.69	96.82	None
02/20/92		7.78	97.73	None
03/20/92		8.15	97.36	None
04/20/92		8.57	96.94	None
05/15/92		8.76	96.75	None
06/08/92		8.74	96.77	None
07/15/92		9.12	96.39	None
08/06/92	106.29	8.95	97.34	None

See notes on page 3 of 3.

TABLE 2
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 4494
Oakland, California
(Page 3 of 3)

Well Date	Elevation of Wellhead	Depth to Water	Water Elevation	Floating Product
MW-4				
08/16/90	106.61	8.16	98.45	None
08/21/90		8.22	98.39	None
09/07/90		8.39	98.22	None
11/20/90		8.57	98.04	None
11/29/90		8.53	98.08	None
12/19/90		8.13	98.48	None
01/29/91		8.66	97.95	None
02/27/91		8.44	98.17	None
03/07/91		8.18	98.43	None
03/26/91		7.56	99.05	None
05/02/91		8.25	98.36	None
06/27/91		7.75	98.86	None
07/24/91		8.12	98.49	None
08/22/91		7.98	98.63	None
09/30/91		8.26	98.35	None
10/17/91		8.42	98.19	None
11/21/91		8.65	97.96	None
12/18/91		8.77	97.84	None
01/19/92		8.42	98.19	None
02/20/92		7.60	99.01	None
03/20/92		7.61	99.00	None
04/20/92		8.15	98.46	None
05/15/92		8.34	98.27	None
06/08/92		8.40	98.21	None
07/15/92		8.72	97.89	None
08/06/92	107.40	8.52	98.88	None
MW-5				
08/06/92	105.19	7.19	98.00	None
MW-6				
08/06/92	105.07	7.01	98.06	None
MW-7				
08/06/92	105.52	8.28	97.24	None

Depth measurements in feet.
* = Floating Product present in well.
** = Skimmer Present (installed 12/24/91)
NM = Not measured.
Elevations in feet above mean sea level (plus one hundred feet to avoid negative ground-water elevations).
Wells surveyed by John Koch on 7/24/92. Elevations increased by an average of 0.78 due to a previous survey error.

TABLE 3
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES--TPHg, TPHd, BTEX, and TOG
ARCO Station 4494
Oakland, California
(Page 1 of 2)

Well / Date	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TOG
MW-1							
06/19/90	<50	<0.50	<0.50	<0.50	<0.50	<0.50	<5,000
08/16/90	<20	NA	<0.50	<0.50	<0.50	<0.50	NA
09/07/90	NA	NA	NA	NA	NA	NA	<5,000
11/29/90	<50	NA	<0.50	0.7	<0.50	<0.50	NA
03/07/91	<50	NA	<0.30	<0.30	<0.30	<0.50	NA
06/27/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
09/30/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
12/18/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
03/20/92	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
06/08/92	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
08/06/92	<50	NA	<0.5	<0.5	<0.5	<0.5	NA
MW-2							
06/19/90			Not sampled--product				
08/16/90			Not sampled--product				
09/07/90			Not sampled--product				
11/29/90			Not sampled--sheen				
03/07/91			Not sampled--sheen				
06/27/91			Not sampled--sheen				
09/30/91			Not sampled--sheen				
12/18/91			Not sampled--sheen				
03/20/92	48,000	NA	2,000	580	2,300	7,000	NA
06/08/92	43,000	NA	2,900	940	2,400	5,100	NA
08/06/92	78,000	NA	2,500	6,700	2,900	16,000	NA
MW-3							
08/16/90	<20	NA	<0.50	<0.50	<0.50	<0.50	NA
09/07/90	NA	NA	NA	NA	NA	NA	<5,000
11/29/90	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
03/07/91	<50	NA	<0.30	<0.30	<0.30	<0.50	NA
06/27/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
09/30/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
12/18/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
03/20/92	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
06/08/92	<50	NA	<.50	<0.50	<0.50	<0.50	NA
08/06/92	<50	NA	<0.5	<0.5	<0.5	<0.5	NA
MW-4							
08/16/90	<20	NA	<0.50	<0.50	<0.50	<0.50	NA
09/07/90	NA	NA	NA	NA	NA	NA	<5,000
11/29/90	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
03/07/91	<50	NA	<0.30	<0.30	<0.30	<0.50	NA

from tank pull, seem like they should be analyzing for TPHd & TOG

See notes on page 2 of 2.

TABLE 3
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES–TPHg, TPHd, BTEX, and TOG
ARCO Station 4494
Oakland, California
(Page 2 of 2)

Well / Date	TPHg	TPHd	Benzene	Toluene	Ethyl-benzene	Total Xylenes	TOG
MW-4 (Cont.)							
06/27/91	<30	NA	0.75	1.1	<0.30	1.6	NA
09/30/91	<30	NA	<0.30	<0.30	<0.30	<0.30	NA
12/18/91	<30	NA	0.83	1.2	<0.30	0.58	NA
03/20/92	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
06/08/92	<50	NA	<0.50	<0.50	<0.50	<0.50	NA
08/06/92	<50	NA	<0.5	<0.5	<0.5	<0.5	NA
MW-5							
08/06/92	<50	NA	<0.5	<0.5	<0.5	<0.5	NA
MW-6							
08/06/92	<50	NA	<0.5	<0.5	<0.5	<0.5	NA
Jan. 1990							
MCLs	—	—	1.0	—	680	1,750	—
DWAL	—	—	—	100	—	—	—

Results in parts per billion (ppb).
TPHg: Total petroleum hydrocarbons as gasoline by EPA Methods 5030 and 8015.
TPHd: Total petroleum hydrocarbons as diesel by EPA Methods 3550 and 8015.
BTEX: Benzene, toluene, ethylbenzene, and total xylene isomers by EPA Method 5030 and 8020.
TOG: Total oil and grease by EPA Standard Method 503E.
<: Less than laboratory detection limit.
NA: Not Analyzed.
MCL: State Maximum Contaminant Level (October 1990).
DWAL: State Drinking Water Action Level (October 1990).

TABLE 4
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES–BNAs, VOCs, and Metals
ARCO Station 4494
Oakland, California
(Page 1 of 2)

Well Date	BNAs	VOCs	Total Cadmium	Chromium	Lead	Nickel	Zinc
MW-1							
06/19/90	<0.05	<0.05	0.024	<0.02	0.10	NA	0.049
08/16/90	NA	NA	NA	NA	NA	NA	NA
11/29/90	NA	NA	NA	NA	NA	NA	NA
03/07/91	NA	NA	NA	NA	NA	NA	NA
06/27/91	NA	NA	NA	NA	NA	NA	NA
09/30/91	NA	NA	NA	NA	NA	NA	NA
12/18/91	NA	NA	NA	NA	NA	NA	NA
03/20/92	NA	NA	NA	NA	NA	NA	NA
06/08/92	NA	NA	0.003	<0.005	<0.002	<0.02	0.018
08/06/92	NA	NA	NA	NA	NA	NA	NA
MW-2							
06/08/92	NA	NA	0.214	0.402	0.658	0.434	252
08/06/92	NA	NA	5	18	88	41	4,770
MW-3							
08/16/90	<0.05	<0.05	<0.01	0.06	0.07	NA	0.07
11/29/90	NA	NA	NA	NA	NA	NA	NA
03/07/91	NA	NA	NA	NA	NA	NA	NA
06/27/91	NA	NA	NA	NA	NA	NA	NA
09/30/91	NA	NA	NA	NA	NA	NA	NA
12/18/91	NA	NA	NA	NA	NA	NA	NA
03/20/92	NA	NA	NA	NA	NA	NA	NA
06/08/92	NA	NA	<0.003	0.012	0.016	<0.02	0.038
08/06/92	NA	NA	NA	NA	NA	NA	NA
MW-4							
08/16/90	<0.05	<0.05	<0.01	<0.02	<0.02	NA	0.03
03/07/91	NA	NA	NA	NA	NA	NA	NA
11/29/90	NA	NA	NA	NA	NA	NA	NA
03/07/91	NA	NA	NA	NA	NA	NA	NA
06/27/91	NA	NA	NA	NA	NA	NA	NA
09/30/91	NA	NA	NA	NA	NA	NA	NA
12/18/91	NA	NA	NA	NA	NA	NA	NA
03/20/92	NA	NA	NA	NA	NA	NA	NA
06/08/92	NA	NA	<0.003	<0.005	<0.002	<0.02	0.013
08/06/92	NA	NA	NA	NA	NA	NA	NA
MW-5							
08/06/92	NA	NA	NA	NA	NA	NA	NA

See notes on page 2 of 2.

TABLE 4
CUMULATIVE RESULTS OF LABORATORY ANALYSES OF WATER SAMPLES--BNAs, VOCs, and Metals
ARCO Station 4494
Oakland, California
(Page 2 of 2)

Well Date	BNAs	VOCs	Total Cadmium	Chromium	Lead	Nickel	Zinc
MW-6 08/06/92	NA	NA	NA	NA	NA	NA	NA
MW-7 08/06/92	NA	NA	NA	NA	NA	NA	NA
MCLs	—	—	0.010	0.05	0.05	NE	NE

Results presented in milligrams per liter (mg/l), or parts per million (ppm).
NA: Not Analyzed.
<: Less than laboratory detection limits.
VOCs: Volatile Organic Compounds.
BNA: Base neutral and acid extractables.
MCLs: Maximum Contaminant Levels (California Department of Health Services, Office of Drinking Water, October 1990).
NE: No established MCL.

APPENDIX A

PREVIOUS WORK

PREVIOUS WORK

Beginning in December 1988 and continuing through January 1989, Pacific Environmental Group (PEG) of Santa Clara, California, and Crosby & Overton, Inc. (C&O), of Oakland, California, conducted an initial environmental investigation. The investigation included the removal of one 280-gallon waste-oil tank (WOT), and collection of soil samples from beneath the WOT for laboratory analyses (PEG, 1989). PEG reported that the WOT showed no evidence of leakage; however, a strong product odor was noted in the soil beneath the WOT. The tank pit was excavated to a depth of 7 feet, and one soil sample (WO-1) was collected for laboratory analyses. The tank pit was deepened to 10 feet, and a second sample was collected for laboratory analyses (WO-2). The laboratory results of sample WO-1, collected at 7 feet, indicated concentrations of 4,500 ppm total oil and grease (TOG), 4,800 ppm high boiling point hydrocarbons (HBPH) calculated as oil, and 370 ppm HBPH calculated as diesel. Laboratory analysis of sample WO-2, collected at 10 feet, indicated nondetectable levels of TPHg (less than 5 ppm), TOG (less than 20 ppm), HBPH calculated as oil (less than 10 ppm), and HBPH calculated as diesel (less than 10 ppm). These results are summarized in Table 1.

Four sidewall samples were taken at a depth of 7 feet in the tank excavation (WOSW-N, WOSW-E, WOSW-S, and WOSW-W). The results of these samples indicated that the concentration of TOG ranged from < 10 ppm to 200 ppm, HBPH calculated as oil ranged from < 10 ppm to 400 ppm, and HBPH calculated as diesel ranged from < 10 ppm to 33 ppm. The highest concentrations were found in sample WOSW-N. Based on these analytical results, 3-1/2 more feet of soil were excavated from the north wall of the former tank cavity to remove the hydrocarbon impacted soil (PEG, May 1989).

In October of 1989, RESNA drilled and sampled two soil borings (B-1 and B-2), and installed and sampled two groundwater monitoring wells (MW-1 and MW-2, respectively) (AGS, February 1991). Laboratory results of the soil and groundwater samples collected from the borings/wells indicated predominantly degraded gasoline hydrocarbons. Laboratory Analysis of soil samples from the borings for the presence of total metals, indicated concentrations below the Total Threshold Limit Concentration Values (TTLC) of the metals cadmium, chromium, lead, and zinc as reported in Title 22 of the California State Administrative Code (California Administrative Code, 1988).

Laboratory analysis of the groundwater samples collected from well MW-1 for the presence of total metals indicated detectable levels slightly above the Maximum Contaminant Levels (MCL) for Drinking Water (California State Department of Health Services, 1990). A black

hydrocarbon product ranging between 2 and 11 inches thick was reported in well MW-2 at the time of drilling and well installation. Due to the presence of the black hydrocarbon product in well MW-2, the investigation was suspended until a records search could be done to evaluate potential offsite contaminant sources in the inferred upgradient direction of the site (AGS, February 1991).

In February of 1990, an environmental records search was performed (AGS, October 1990) for all properties within a 1/2 mile radius of the site using information supplied by ARCO, Alameda County Flood Control and Water Conservation District (Zone 7), and the California Department of Water Resources. During the search it was discovered that several facilities in the area are under investigation for soil and groundwater impacted by solvents, metals, and petroleum hydrocarbons. In addition, numerous facilities in the area have used USTs for the storage of fuels and solvents. Many of these USTs were removed in the 1970's and early 1980's when there were few requirements for testing of soil and groundwater.

In August 1990, RESNA resumed work on the site with the drilling and sampling of three soil borings (B-3 through B-5), and the installation and sampling of two groundwater monitoring wells, MW-3 and MW-4 in borings B-3 and B-4, respectively. Laboratory results for the soil and water samples collected from the borings/wells indicated that hydrocarbons present were predominantly degraded gasoline, and concentrations of total metals to be slightly above MCLs in the groundwater, and slightly below TTLCs in the soil.

As a part of the initial subsurface investigation a survey of active, inactive, and destroyed water supply wells and monitoring wells listed with the County of Alameda Public Works Agency (CAPWA) was conducted. According to CAPWA records there were no active public-use or domestic-use water producing wells, but there were two industrial-use wells, one irrigation well, and 39 monitoring wells within a ½-mile radius of the site (AGS, February 1991).

In June 1990, AGS began quarterly monitoring and sampling of wells MW-1 and MW-2, monitoring wells MW-3 and MW-4 were installed in August 1990 and added to the quarterly monitoring program. The most recent quarterly monitoring of wells MW-1, MW-3, and MW-4, indicated nondetectable concentrations of gasoline hydrocarbons as gasoline in the groundwater (RESNA, May 1992). In previous quarters, a heavy sheen of black hydrocarbon product was reported in monitoring well MW-2, however, a skimmer was installed in MW-2 in November 1991, and in the first quarter 1992 no sheen was observed and the well was sampled. Laboratory results from MW-2 indicated concentrations of 48,000 ppm TPHg, 2,000 ppm benzene, 580 ppm toluene, 2,300 ppm ethylbenzene, and 7,000

ppm total xylenes. A groundwater gradient of approximately 0.02 to the northeast was indicated by the groundwater elevations measured between January 19 and March 20, 1992. This direction was consistent with previously interpreted gradients, but is opposite of the inferred groundwater gradient based on topography, and data presented by Hickenbottom and Muir (1988). Information obtained during the records search indicated that a buried tidal slough was present at the site before filling and development took place, and may be influencing the groundwater gradient.

In March 1991, RESNA conducted a preliminary tank replacement assessment (AGS, May 1991) which consisted of drilling and sampling twelve soil borings (B-6 through B-17), and analyzing selected soil samples from the borings. These borings were requested by ARCO to evaluate petroleum hydrocarbons in the soil before the pending removal and replacement of the existing USTs. One boring (B-6) was located in the vicinity of the then proposed future gasoline USTs; four borings (B-7 through B-10) were drilled around the perimeter of the three existing USTs; five soil borings were drilled in the area of the then proposed station building; one boring (B-16) was drilled in the vicinity of the southwestern corner of the then proposed gasoline USTs; and one boring (B-17) was drilled in the northwestern corner of the site.

The laboratory results from the soil samples analyzed indicated that the soil in the area of the existing USTs had been impacted by gasoline hydrocarbons. The soil in the area of the proposed station building had not been impacted by gasoline hydrocarbons, but had been impacted by TOG. The soil in the northwestern corner of the site had been impacted by both gasoline hydrocarbons and TOG.

In December of 1991, a Horner EZY Floating Product skimmer was installed in groundwater monitoring well MW-2 as an interim groundwater remediation system. The skimmer has been checked on a monthly basis since installation, and it appears that floating product has subsequently been removed.

APPENDIX B

WELL PERMITS

ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588 VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT ARCO Station 4494
566 Hegenberger Road
Oakland, CA

CLIENT
Name ARCO Products Company
Address P.O. Box 5811 Phone (415) 821-2435
City San Mateo Zip 94402

APPLICANT
Name RESNA INDustries
Address 3315 Almaden Expressway Suite 34 Phone (408) 264-7723
City San Jose Zip 95118

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

PROPOSED WATER SUPPLY WELL USE
Domestic ___ Industrial ___ Other monitoring
Municipal ___ Irrigation ___

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

DRILLER'S LICENSE NO. C57-484288

WELL PROJECTS
Drill Hole Diameter 8 1/0 in. Maximum
Casing Diameter 2 & 4 in. Depth 30 ft.
Surface Seal Depth 6 ft. Number 3
2 - 2" diameter wells
1 - 4" diameter well

GEOTECHNICAL PROJECTS
Number of Borings ___ Maximum
Hole Diameter ___ in. Depth ___ ft.

ESTIMATED STARTING DATE 7/9/92
ESTIMATED COMPLETION DATE 7/10/92

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

APPLICANT'S SIGNATURE

FOR OFFICE USE

PERMIT NUMBER 92320
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 logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

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

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

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

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 26 Jun 92
Wyman Hong

APPENDIX C

FIELD PROTOCOL

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 to 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 the above-mentioned 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 12-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 analyses are removed from the sampler and quickly sealed in their brass sleeves with aluminum foil, 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 analyses 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 analyses, 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 analyses 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 analyses 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 development method used, initial turbidity measurement, volume of water removed, final turbidity measurement, and other pertinent field data and observations are included in reports. 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.

APPENDIX D

EMCON'S FIELD REPORT SHEETS, SUMMARY OF GROUNDWATER MONITORING DATA, CHAIN OF CUSTODY FORMS AND LABORATORY ANALYTICAL REPORTS OF GROUNDWATER SAMPLES

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

Date July 20, 1992
Project G70-31.01

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
	July 1992 monthly water level survey, ARCO
	station 4494, 566 Hegenberger Road, 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:

Jim Butera JB

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 # : G70-31.01 STATION ADDRESS : 566 Hegenberger Road, Oakland DATE : 7/15-92

ARCO STATION # : 4494 FIELD TECHNICIAN : Rich Schaeffer DAY : Wed.

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	Yes	Yes	Yes	3259	Yes	7.92	7.92	N.D	N.D	23.6	—
2	MW-3	Yes	Yes	Yes	3259	Yes	9.12	9.12	N.D	N.D	18.45	—
3	MW-4	Yes	Yes	Yes	3259	Yes	8.72	8.72	N.D	N.D	18.51	—
4	MW-2	Yes	Yes	Yes	3259	Yes	10.19	10.19	N.D	N.D	17.75	SKIMMER EMPTY NO PRODUCT

SURVEY POINTS ARE TOP OF WELL CASINGS

EMCON ASSOCIATES
Consultants in Wastes Management and Environmental Control

Date August 25, 1992
Project G70-31.01

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

We are enclosing:

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

For your: X Information Sent by: X Mail

Comments:

Enclosed are the data from the third quarter 1992 monitoring event at ARCO service station 4494, 566 Hegenberger Road, Oakland, California. Groundwater monitoring is conducted consistent with applicable regulatory guidelines. Please call if you have any questions: (408) 453-2266.

Reviewed by: Jim Butera JB

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 # : G70-31.01 STATION ADDRESS : 566 Hegenberger Road, Oakland DATE : 8-6-92

ARCO STATION # : 4494 FIELD TECHNICIAN : J. Williams DAY :

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	3259	OK	7.29	7.29	ND	ND	23.5	—
2	MW-3						8.25	8.95	ND	ND	18.0	—
3	MW-4						8.52	8.53	ND	ND	[illegible]	15' [illegible]
4	MW-2						10.05	10.04	ND	ND	19.58	—
5	MW-5						7.19	7.1[illegible]	ND	ND	1[illegible].0	—
6	MW-6						7.01	7.02	ND	ND	18.2	—
7	MW-7						8.28	8.28	ND	ND	19.86	—

SURVEY POINTS ARE TOP OF WELL CASINGS

Summary of Groundwater Monitoring Data
Third Quarter 1992
ARCO Service Station 4494
566 Hegenberger Road, Oakland, California
micrograms per liter (µg/l) or parts per billion (ppb)

Well ID and Sample Depth	Sampling Date	Depth To Water (feet)	Floating Product Thickness (feet)	TPH[1] as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Total Xylenes (ppb)
MW-1(23)	08/06/92	7.29	ND.[2]	<50	<0.5	<0.5	<0.5	<0.5
MW-2(17)	08/06/92	10.05	ND.	78,000.	2,500.	6,700.	2,900.	16,000.
MW-3(19)	08/06/92	8.95	ND.	<50	<0.5	<0.5	<0.5	<0.5
MW-4(17)	08/06/92	8.52	ND.	<50	<0.5	<0.5	<0.5	<0.5
MW-5(16)	08/06/92	7.19	ND.	<50	<0.5	<0.5	<0.5	<0.5
MW-6(17)	08/06/92	7.01	ND.	<50	<0.5	<0.5	<0.5	<0.5
MW-7(14)	08/06/92	8.28	ND.	<50	<0.5	<0.5	<0.5	<0.5
FB-1[3]	08/06/92	NA.[4]	NA.	<50	<0.5	<0.5	<0.5	<0.5

1. TPH. = Total petroleum hydrocarbons
2. ND. = Not detected
3. FB. = Field blank
4. NA. = Not applicable

Summary of Groundwater Monitoring Data
Third Quarter 1992
ARCO Service Station 4494
566 Hegenberger Road, Oakland, California
micrograms per liter (µg/l) and milligrams per liter (mg/l)

Well ID and Sample Depth	Sampling Date	Cadmium (µg/l) (ppb)	Chromium (µg/l) (ppb)	Lead (µg/l) (ppb)	Nickel (µg/l) (ppb)	Zinc (µg/l) (ppb)
MW-2(17)	08/06/92	5	18	88	41	4,770

Summary of Groundwater Monitoring Data
Third Quarter 1992
ARCO Service Station 4494
566 Hegenberger Road, Oakland, California
micrograms per liter (µg/l) or parts per billion (ppb)

Well ID and Sample Depth	Sampling Date	Depth To Water (feet)	Floating Product Thickness (feet)	TPH[1] as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Total Xylenes (ppb)
MW-1(23)	08/06/92	7.29	ND.[2]	<50	<0.5	<0.5	<0.5	<0.5
MW-2(17)	08/06/92	10.05	ND.	78,000.	2,500.	6,700.	2,900.	16,000.
MW-3(19)	08/06/92	8.95	ND.	<50	<0.5	<0.5	<0.5	<0.5
MW-4(17)	08/06/92	8.52	ND.	<50	<0.5	<0.5	<0.5	<0.5
MW-5(16)	08/06/92	7.19	ND.	<50	<0.5	<0.5	<0.5	<0.5
MW-6(17)	08/06/92	7.01	ND.	<50	<0.5	<0.5	<0.5	<0.5
MW-7(14)	08/06/92	8.28	ND.	<50	<0.5	<0.5	<0.5	<0.5
FB-1[3]	08/06/92	NA.[4]	NA.	<50	<0.5	<0.5	<0.5	<0.5

1. TPH. = Total petroleum hydrocarbons
2. ND. = Not detected
3. FB. = Field blank
4. NA. = Not applicable

Columbia Analytical Services, Inc.

August 17, 1992

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

Re: **EMCON Project No. G70-31.01**
Arco Facility No. 4494

Dear Mr. Butera:

Enclosed are the results of the water samples submitted to our lab on August 7, 1992. For your reference, our service request number for this work is SJ92-0991.

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
Project: EMCON Project No. G70-31.01
Arco Facility No. 4494

Date Received: 08/07/92
Work Order #: SJ92-0991
Sample Matrix: Water

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

Sample Name:		MW-1 (23)	MW-2 (17)	MW-3 (19)
Date Analyzed:		08/11/92	08/12/92	08/11/92
Analyte	**MRL**			
Benzene	0.5	ND	2,500.	ND
Toluene	0.5	ND	6,700.	ND
Ethylbenzene	0.5	ND	2,900.	ND
Total Xylenes	0.5	ND	16,000.	ND
TPH as Gasoline	50	ND	78,000.	ND

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

Approved by Kevin Murphy Date August 17, 1992

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

Analytical Report

Client:	EMCON Associates	**Date Received:**	08/07/92
Project:	EMCON Project No. G70-31.01	**Work Order #:**	SJ92-0991
	Arco Facility No. 4494	**Sample Matrix:**	Water

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

Sample Name:		MW-4 (17)	MW-5 (16)	MW-6 (17)
Date Analyzed:		08/11/92	08/11/92	08/11/92
Analyte	**MRL**			
Benzene	0.5	ND	ND	ND
Toluene	0.5	ND	ND	ND
Ethylbenzene	0.5	ND	ND	ND
Total Xylenes	0.5	ND	ND	ND
TPH as Gasoline	50	ND	ND	ND

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

Approved by Kenneth Murphy Date August 17, 1992

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

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	08/07/92
Project:	EMCON Project No. G70-31.01	**Work Order #:**	SJ92-0991
	Arco Facility No. 4494	**Sample Matrix:**	Water

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

Sample Name:		MW-7 (14)	FB-1	Method Blank
Date Analyzed:		08/11/92	08/11/92	08/11/92
Analyte	**MRL**			
Benzene	0.5	ND	ND	ND
Toluene	0.5	ND	ND	ND
Ethylbenzene	0.5	ND	ND	ND
Total Xylenes	0.5	ND	ND	ND
TPH as Gasoline	50	ND	ND	ND

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

Approved by Kenneth Murphy Date Agist 17, 1992

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

Analytical Report

Client:	EMCON Associates	**Date Received:**	08/07/92
Project:	EMCON Project No. G70-31.01	**Work Order #:**	SJ92-0991
	Arco Facility No. 4494	**Sample Matrix:**	Water

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

Sample Name:	Method Blank
Date Analyzed:	08/12/92

Analyte	MRL	
Benzene	0.5	ND
Toluene	0.5	ND
Ethylbenzene	0.5	ND
Total Xylenes	0.5	ND
TPH as Gasoline	50	ND

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

Approved by Keenan Murphy Date August 17, 1992

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

Client: EMCON Associates
Project: EMCON Project No. G70-31.01
Arco Facility No. 4494

Date Received: 08/07/92
Work Order #: SJ92-0991

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

Date Analyzed: 08/11/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	273.	109.	85-115
Toluene	250.	275.	110.	85-115
Ethylbenzene	250.	264.	106.	85-115
Total Xylenes	750.	775.	103.	85-115
TPH as Gasoline	2,500.	2,352.	94.	90-110

Date Analyzed: 08/12/92

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	250.	273.	109.	85-115
Toluene	250.	278.	111.	85-115
Ethylbenzene	250.	268.	107.	85-115
Total Xylenes	750.	824.	110.	85-115
TPH as Gasoline	2,500.	2,582.	103.	90-110

TPH Total Petroleum Hydrocarbons

Approved by Kenneth Murphy Date August 17, 1992

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

Client: EMCON Associates
Project: EMCON Project No. G70-31.01
Arco Facility No. 4494

Date Received: 08/07/92
Work Order #: SJ92-0991
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 (23)	08/11/92	105.
MW-2 (17)	08/12/92	111.
MW-3 (19)	08/11/92	113.
MW-4 (17)	08/11/92	112.
MW-5 (16)	08/11/92	109.
MW-6 (17)	08/11/92	112.
MW-7 (14)	08/11/92	109.
FB-1	08/11/92	110.
MW-1 (23) MS	08/11/92	121.
MW-1 (23) DMS	08/11/92	124.
Method Blank	08/11/92	107.
Method Blank	08/12/92	107.
	CAS Acceptance Criteria	70-130

TPH Total Petroleum Hydrocarbons

Approved by Kevin A Murphy Date August 17, 1992

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

Client: EMCON Associates
Project: EMCON Project No. G70-31.01
Arco Facility No. 4494

Date Received: 08/07/92
Work Order #: SJ92-0991
Sample Matrix: Water

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

Sample Name: MW-1 (23)
Date Analyzed: 08/11/92

			Spike Result		Percent Recovery		
Analytes	Spike Level	Sample Result	MS	DMS	MS	DMS	Acceptance Criteria
TPH as Gasoline	250.	ND	281.	274.	112.	110.	70-140

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

Approved by Kevin Murphy Date August 17, 1992

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

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no. 4494	City (Facility) OAKLAND	Project manager (Consultant) JIM BUERA	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		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 ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	TOTAL METALS Pb	RECOVERY
MW-1(23)	1-2	2		X		X	HCl	8-6-92	1318		X	X										
MW-2(17)	3-4	2		X		X	HCl		1544		X	X										
MW-3(18)	5-6	2		X		X	HCl		1358		X	X										
MW-4(12)	7-8	2		X		X	HCl		1505		X	X										
MW-5(16)	9-10	2		X		X	HCl		1638		X	X										
MW-6(17)	11-12	2		X		X	HCl		1733		X	X										
MW-7(14)	13-14	2		X		X	HCl		1901		X	X										
FD-1	15-16	2		X		X	HCl		1915		X	X										
				X																		
MW-2(17)		1		X			HNO_3		1753												X	

Special detection Limit/reporting: Lowest Possible

Special QA/QC: AS Normal

Remarks: 2-40 ml VOA's

METALS: NON-FILTERED 1-500 ml HNO_3 G70-310

Lab number: SJ92-0991

Turnaround time

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

Condition of sample: bubbles in MW-1, MW-2,3,4,5,6 product in MW-2

Temperature received: cool

Relinquished by sampler	Date 8-7-92	Time 9:33	Received by 8-7-92 0933
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)

Columbia Analytical Services inc.

August 19, 1992

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

Re: **ARCO #4494 - Oakland/Project #G70-31.01/SJ920991**

Dear Jim:

Enclosed are the results of the sample submitted to our lab on August 7, 1992. For your reference, these analyses have been assigned our work order number K924932C.

All analyses were performed in accordance with our laboratory's quality assurance program. Reproduction of reports is allowed only in whole, not in part. Results apply only to the samples analyzed.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin Elliott

Colin B. Elliott
Senior Project Chemist

Columbia Analytical Services, Inc.

Charles J. Worley, for

Lawrence J. Jacoby, Ph.D.
Quality Assurance Coordinator

CBE/do

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Associates	**Date Received:**	08/07/92
Project:	ARCO #4494 - Oakland	**Work Order No.:**	K924932C
Sample Matrix:	Water		

Total Metals
µg/L (ppb)

	Sample Name:	MW-2	Method Blank
	Lab Code:	K4932-1	K4932-MB
Analyte	**EPA Method**	**MRL**	
Cadmium	6010	3	5 ND
Chromium	6010	5	18 ND
Lead	7421	2	88 ND
Nickel	6010	20	41 ND
Zinc	6010	10	4,770 ND

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

000 1

Approved by Alan Elliot Date 8/19/92

317 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 206/577-7222 • Fax 206/636-1068

APPENDIX A

LABORATORY QC RESULTS

347 South 13th Avenue • P.O. Box 479 • Kelso, Washington 98626 • Telephone 206/577-7222 • Fax 206/636-1068

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Associates
Project: ARCO #4494 - Oakland
Sample Matrix: Water

Date Received: 08/07/92
Work Order No.: K924932C

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals
µg/L (ppb)

Sample Name: MW-2
Lab Code: K4932-1

						Percent Recovery			
Analyte	**MRL**	**Spike Level**	**Sample Result**	**Spiked Sample Result**	**Duplicate Spiked Sample Result**	**Spiked Sample**	**Duplicate Spiked Sample**	**CAS Acceptance Criteria**	**Relative Percent Difference**
Cadmium	3	50	5	52	54	94	98	75-125	4
Chromium	5	200	18	204	213	93	98	75-125	4
Lead	2	20	88	106	107	90	95	75-125	<1
Nickel	20	500	41	484	496	89	91	75-125	2
Zinc	10	500	4,770	5,290	5,400	NA	NA	75-125	2

MRL Method Reporting Limit
NA Not Applicable because of the sample matrix. Accuracy of the spike recovery value is reduced, since the sample concentration was greater than four times the amount spiked.

Approved by _____ Date 8/19/92

C0603

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Associates
Project: ARCO #4494 - Oakland

Date Analyzed: 08/14/92
Work Order No.: K924932C

Initial Calibration Verification (ICV) Summary
µg/L (ppb)

Analyte	EPA Method	True Value	Result	Percent Recovery
Cadmium	6010	1,250	1,270	102
Chromium	6010	500	508	102
Lead	7421	98.4	104	106
Nickel	6010	1,250	1,300	104
Zinc	6010	1,250	1,280	102

ICV Source: EPA ICV

Approved by Celia Ellis Date 8/19/92

00014

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. EMCGC-92-1

Chain of Custody

ARCO Facility no. 4494	City (Facility) OAKLAND	Project manager (Consultant) JIM BUERA	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 ENCON ASSOCIATES	Address (Consultant) 1938 JUNCTION Ave San Jose		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 Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	TOTAL METALS per request
MW-1(23)		2		X		X	HCl	8-6-92	1318		X	X									
MW-2(17)		2		X		X	HCl		1544		X	X									
MW-3(19)		2		X		X	HCl		1358		X	X									
MW-4(17)		2		X		X	HCl		1505		X	X									
MW-5(16)		2		X		X	HCl		1638		X	X									
MW-6(17)		2		X		X	HCl		1733		X	X									
MW-7(19)		2		X		X	HCl		1901		X	X									
FB-1		2		X		X	HCl		1915		X	X									
				X																	
MW-2(17)		1		X			HNO_3		1953												X

Special detection Limit/reporting: Lowest Possible

Special QA/QC: As Normal

Remarks: 2-40 ml VOA's

METALS: NON-FILTERED 1-500 ml HNO_3 G70-310

Lab number: SJ92-094

Turnaround time

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

Condition of sample: 4 bbls in MW-1, MW-2, 3, 4, 5, 6 product in MW-2

Temperature received: cool

Relinquished by sampler	Date 8-7-92	Time 9:33	Received by 8-7-92 0933
Relinquished by CAS/ST	Date 8/7/92	Time 1600	Received by
Relinquished by	Date	Time	Received by laboratory Jon K. CAS Date 8/8/92 Time 0930

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

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: G70-31.01 | SAMPLE ID: MW-1

PURGED BY: S. Williams | CLIENT NAME: ARCO 4494

SAMPLED BY: S. Williams | LOCATION: Oakland-CA

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

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

CASING ELEVATION (feet/MSL): ND | VOLUME IN CASING (gal.): 10.63

DEPTH TO WATER (feet): 7.29 | CALCULATED PURGE (gal.): 53.16

DEPTH OF WELL (feet): 23.5 | ACTUAL PURGE VOL. (gal.): 21

DATE PURGED: 08-06-97 | Start (2400 Hr) 1256 | End (2400 Hr) 1301

DATE SAMPLED: 08-06-97 | Start (2400 Hr) 1316 | End (2400 Hr) 1318

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1301	11	7.00	7260	74.4	Lt Brown	Mod
	22	DRY				
1320	Replicate	7.33	7740	72.5	Lt Brown	Heavy
	42					
	53					

D. O. (ppm): ND | ODOR: None | COLOR (COBALT 0 - 100): NR | TURBIDITY (NTU 0 - 200): NR

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

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

WELL INTEGRITY: OK | LOCK #: 3255

REMARKS: DRIED AFTER 21 GALLONS Time 1305

Meter Calibration: Date: 8-6-97 | Time: 1234 | Meter Serial #: ___ | Temperature °F: 77.9

(EC 1000 1022 / 1000) (DI ___) (pH 7 7.03 / 7.00) (pH 10 10.05 / 10.00) (pH 4 4.00 / ___)

Location of previous calibration: MW-1

Signature: [signature] | Reviewed By: JL | Page 1 of 7

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/9

EMCON ASSOCIATES

PROJECT NO: 620-31-01 SAMPLE ID: MW-7

PURGED BY: S. WILLIAMS CLIENT NAME: ARCO 4464

SAMPLED BY: S. WILLIAMS LOCATION: OAKLAND CA.

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

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

CASING ELEVATION (feet/MSL): N R VOLUME IN CASING (gal.): 4.90

DEPTH TO WATER (feet): 10.05' CALCULATED PURGE (gal.): 24.50

DEPTH OF WELL (feet): 17.52 ACTUAL PURGE VOL. (gal.): 55

DATE PURGED: 08-06-92 Start (2400 Hr) 1520 End (2400 Hr) 1525

DATE SAMPLED: 08-06-92 Start (2400 Hr) 17:50 End (2400 Hr) 1753

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1525	5	7.49	9446	73.9	GREY	HEAVY

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): (Total metals)

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

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: DRIED AFTER 5.5 GALLONS TIME 1525
NO Recharge Condition

Meter Calibration: Date: ___ Time: 1234 Meter Serial #: ___ Temperature °F: ___

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

Location of previous calibration: ___

Signature: ___ Reviewed By: TL Page 2 of 7

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 670-31.01 SAMPLE ID: MW-3

PURGED BY: J.W. Williams CLIENT NAME: ARCO 4494

SAMPLED BY: J.W. Williams LOCATION: Oakland, CA

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 5.93

DEPTH TO WATER (feet): 8.95 CALCULATED PURGE (gal.): 29.65

DEPTH OF WELL (feet): 18 ACTUAL PURGE VOL. (gal.): 30

DATE PURGED: 05-06-92 Start (2400 Hr) 1335 End (2400 Hr) 1352

DATE SAMPLED: 05-06-92 Start (2400 Hr) 1357 End (2400 Hr) 1358

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1338	6	7.39	3980	73.7	GRAY	HEAVY
1342	12	7.14	1065	72.0	"	"
1347	18	7.18	9490	70.4	"	"
1349	24	7.19	9750	71.0	"	"
1353	30	7.22	9300	70.4	"	"

D. O. (ppm): NR ODOR: MODR. 0 (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	✓ Bailer (Teflon®)
✓ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: WATER IN BOX

Meter Calibration: Date: ___ Time: 1334 Meter Serial #: ___ Temperature °F: ___

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

Location of previous calibration: MW-1

Signature: [signature] Reviewed By: JB Page 3 of 7

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 670-3101 SAMPLE ID: MW-4

PURGED BY: J. Williams CLIENT NAME: ARCO 4494

SAMPLED BY: J. Williams LOCATION: OAKLAND

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

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

CASING ELEVATION (feet/MSL): NP VOLUME IN CASING (gal.): 6.33

DEPTH TO WATER (feet): 8.52 CALCULATED PURGE (gal.): 31.65

DEPTH OF WELL (feet): 18.17 ACTUAL PURGE VOL. (gal.): 19.5

DATE PURGED: 08-06-92 Start (2400 Hr) 1435 End (2400 Hr) 1450

DATE SAMPLED: 08-06-92 Start (2400 Hr) 1503 End (2400 Hr) 1508

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1441	6.5	7.07	9220	73.8	Brown	Heavy
1445	13	7.08	9720	71.9	"	"
1450	19.5	7.48	9580	70.8	"	"
1508	Reduced	7.12	9990	70.4	"	"

D. O. (ppm): N.R. ODOR: Slight

N/R (COBALT 0 - 100) N/R (NTU 0 - 200)

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

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

WELL INTEGRITY: OK LOCK #: 3259

REMARKS: DRIED after 19.5 GALLONS @ 1450

Meter Calibration: Date: ___ Time: 1024 Meter Serial #: ___ 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 1

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 670-31.01 SAMPLE ID: MW-5

PURGED BY: J Williams CLIENT NAME: ARCO 4494

SAMPLED BY: J Williams LOCATION: OAKLAND CA

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

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

CASING ELEVATION (feet/MSL): NR VOLUME IN CASING (gal.): 1.60

DEPTH TO WATER (feet): 7.19 CALCULATED PURGE (gal.): 8.04

DEPTH OF WELL (feet): 17.0 ACTUAL PURGE VOL. (gal.): 8

DATE PURGED: 08-06-92 Start (2400 Hr) 1618 End (2400 Hr) 1631

DATE SAMPLED: 08-06-92 Start (2400 Hr) 1631 End (2400 Hr) 1638

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1622	1.5	6.97	1430	74.9	GREY	HEAVY
1625	3	7.16	1282	74.9	"	"
1627	~~4~~ 4.5	7.19	1247	75.5	"	"
1629	6	7.26	1106	73.4	"	"
1631	8	7.26	1091	73.1		

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

FIELD QC SAMPLES COLLECTED AT THIS WELL (i.e. FB-1, XDUP-1): NO

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

WELL INTEGRITY: OK LOCK #: 2259

REMARKS: ___

Meter Calibration: Date: ___ Time: 1224 Meter Serial #: ___ Temperature °F: ___

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

Location of previous calibration: OAKLAND

Signature: [signature] Reviewed By: JB Page 5 of 7

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/9

EMCON ASSOCIATES

PROJECT NO: 670-31.01 SAMPLE ID: MW-6

PURGED BY: J. Williams CLIENT NAME: ARCO 4494

SAMPLED BY: J. Williams LOCATION: OAKLAND CA

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

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

CASING ELEVATION (feet/MSL): WR VOLUME IN CASING (gal.): 1.83

DEPTH TO WATER (feet): 7.02 CALCULATED PURGE (gal.): 9.16

DEPTH OF WELL (feet): 18.20 ACTUAL PURGE VOL (gal.): 10

DATE PURGED: 08-06-92 Start (2400 Hr) 1717 End (2400 Hr) 1727

DATE SAMPLED: 08-06-92 Start (2400 Hr) 1730 End (2400 Hr) 1733

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1719	2	6.87	6690	72.2	GREY	HEAVY
1721	4	6.90	5840	72.4	"	"
1723	6	6.92	5840	72.3	"	"
1725	8	6.93	5830	72.3	"	"
1727	10	6.95	5930	72.1	"	"

D. O. (ppm): WR ODOR: Slight

COLOR (COBALT 0 - 100): NR TURBIDITY (NTU 0 - 200): NR

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	✓ Bailer (Teflon®)
✓ Centrifugal Pump	___ Bailer (PVC)	___ DDL Sampler	___ Bailer (Stainless Steel)
___ Submersible Pump	___ Bailer (Stainless Steel)	___ Dipper	___ Submersible Pump
___ Well Wizard™	___ Dedicated	___ Well Wizard™	___ Dedicated
Other: ___		Other: ___	

WELL INTEGRITY: OK LOCK #: 8289

REMARKS: ___

Meter Calibration: Date: 8-6-92 Time: 1645 Meter Serial #: ___ Temperature °F: 74

(EC 1000 1000 / 1000) (DI ___) (pH 7 7.0 / 7.0) (pH 10 10.0 / 10.0) (pH 4 4.0 / 4.0)

Location of previous calibration: Mobile

Signature: ___ Reviewed By: JD Page 6 of 7

WATER SAMPLE FIELD DATA SHEET

Rev. 2, 5/91

EMCON ASSOCIATES

PROJECT NO: 470-31-01 SAMPLE ID: MW-7

PURGED BY: J. Williams CLIENT NAME: ARCO 4484

SAMPLED BY: J. Williams LOCATION: OAKLAND CA

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

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

CASING ELEVATION (feet/MSL): NP VOLUME IN CASING (gal.): 7.92

DEPTH TO WATER (feet): 8.28 CALCULATED PURGE (gal.): 19.61

DEPTH OF WELL (feet): 14.26 ACTUAL PURGE VOL. (gal.): 17.5

DATE PURGED: 05-06-92 Start (2400 Hr) 1830 End (2400 Hr) 1841

DATE SAMPLED: 05-06-92 Start (2400 Hr) ___ End (2400 Hr) 1901

TIME (2400 Hr)	VOLUME (gal.)	pH (units)	E.C. (µmhos/cm @ 25° C)	TEMPERATURE (°F)	COLOR (visual)	TURBIDITY (visual)
1833	4	7.09	1105	73.8	GREY	HEAVY
1835	8	7.06	1328	73.4	"	"
1834	12	7.05	1400	73.2	"	"
1840	16	7.09	1238	72.4	"	"
1903	Recharge	7.16	1401	72.6	"	"

D. O. (ppm): N/A ODOR: Slight

NC (COBALT 0 - 100) NC (NTU 0 - 200)

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

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

WELL INTEGRITY: OK LOCK #: 3257

REMARKS: DRIED AFTER PURGING TIME 1841

Meter Calibration: Date: ___ Time: 1649 Meter Serial #: ___ Temperature °F: ___

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

Location of previous calibration: ___

Signature: [signature] Reviewed By: JD Page 7 of 7

APPENDIX E

WELLHEAD SURVEY

JOHN E. KOCH, P.L.S. RESNA PROJ.#69038.08 JEK JOB #92062

Well Designation	Elevation	Description
MW-5	5.19	Top of PVC Casing
	5.44	Top of Box
MW-6	5.07	Top of PVC Casing
	5.44	Top of Box
MW-7	5.52	Top of PVC Casing
	5.80	Top of Box

NOTES:

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

2. Top of PVC Casing Elevation is at notch set on top of 4" PVC for MW-2, MW-3 (found mark) & MW-7 and at top of 2" PVC for MW-5 and MW-6. Notch bearing N for MW-2, 5, 6 & 7 and NW for MW-3.

3. Top of Box Elevation is at notch set on rim for all wells. Notch bearing N for MW-2, 5, 6 & 7 and NW for MW-3.

4. Top of Casing Elevation on MW-2 was found to be 0.79' higher and on MW-3 was found to be 0.78' higher than on previous report provided by client. It is therefore inferred that MW-1 and 4 are likely also to be approx. 0.79' higher than given on previous report of 08/19/89 as provided by client.

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

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

07/31/92

Tabulation of Elevations as of
6:00 p.m. 07/24/92

Job #92062
RESNA Project 69038.08
Project Geologist:Joel Coffman
Site: Arco Station 4494
566 Hegenberger Road
@ Edes Avenue
Oakland, CA

BENCHMARK: Bench Mark #1661 (El.=5.512') is a Cut Square on west side of Hegenberger Rd, northerly of Hwy. 17, at nose of island dividing Oakland bound freeway traffic and Hegenberger Rd. traffic southbound, on face of rolled curb, laying under and between two main PG&E high voltage transmission lines crossing Hegenberger Rd. Datum is City of Oakland ((=(USGS)+3.00')).

MONITOR WELL DATA TABLE

Well Designation	Elevation	Description
MW-2	6.57	Top of PVC Casing
	6.75	Top of Box
MW-3	6.29	Top of PVC Casing
	6.60	Top of Box

APPENDIX F

CHAIN OF CUSTODY FORMS AND LABORATORY ANALYTICAL REPORTS OF SOIL SAMPLES

SEQUOIA ANALYTICAL

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

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

Project: Arco 4494, Oakland

Enclosed are the results from 5 soil samples received at Sequoia Analytical on July 13,1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2072325	Soil, S-5.5-B18	7/9/92	EPA 5030/8015/8020
2072326	Soil, S-10.5-B18	7/9/92	EPA 5030/8015/8020
2072327	Soil, S-5.5-B19	7/9/92	EPA 5030/8015/8020
2072328	Soil, S-10.5-B19	7/9/92	EPA 5030/8015/8020
2072329	Soil, S-7-B20	7/10/92	EPA 5030/8015/8020

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 - San Jose	Client Project ID:	Arco 4494, Oakland	Sampled:	7/9-10/92
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil	Received:	Jul 13, 1992
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	Jul 29, 1992
Attention: Joel Coffman	First Sample #:	207-2325		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 207-2325 S-5.5-B18	Sample I.D. 207-2326 S-10.5-B18	Sample I.D. 207-2327 S-5.5-B19	Sample I.D. 207-2328 S-10.5-B19	Sample I.D. 207-2329 S-7-B20	Sample I.D.
Purgeable Hydrocarbons	1.0	N.D.	N.D.	N.D.	N.D.	N.D.	
Benzene	0.0050	N.D.	N.D.	N.D.	N.D.	0.022	
Toluene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	
Ethyl Benzene	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	
Total Xylenes	0.0050	N.D.	N.D.	N.D.	N.D.	N.D.	
Chromatogram Pattern:		--	--	--	--	Discrete Peaks	

Quality Control Data

Report Limit Multiplication Factor:	1.0	1.0	1.0	1.0	1.0
Date Analyzed:	7/19/92	7/19/92	7/19/92	7/19/92	7/23/92
Instrument Identification:	GCHP-7	GCHP-7	GCHP-7	GCHP-7	GCHP-6
Surrogate Recovery, %: (QC Limits = 70-130%)	91	96	88	87	102

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

SEQUOIA ANALYTICAL

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

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

Client Project ID: Arco 4494, Oakland

QC Sample Group: 2072325 - 29

Reported: Jul 29, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	A.Miraftab	A.Miraftab	A.Miraftab	A.Miraftab
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jul 19, 1992	Jul 19, 1992	Jul 19, 1992	Jul 19, 1992
QC Sample #:	GBLK071992	GBLK071992	GBLK071992	GBLK071992
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.19	0.18	0.19	0.55
Matrix Spike % Recovery:	95	90	95	92
Conc. Matrix Spike Dup.:	0.19	0.19	0.19	0.56
Matrix Spike Duplicate % Recovery:	95	95	95	93
Relative % Difference:	0.0	5.4	0.0	1.8

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

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

SEQUOIA ANALYTICAL

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

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

Client Project ID: Arco 4494, Oakland

QC Sample Group: 2072325 - 29

Reported: Jul 29, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R.Geckler	R.Geckler	R.Geckler	R.Geckler
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jul 23, 1992	Jul 23, 1992	Jul 23, 1992	Jul 23, 1992
QC Sample #:	GBLK072392	GBLK072392	GBLK072392	GBLK072392
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.19	0.20	0.20	0.60
Matrix Spike % Recovery:	95	100	100	100
Conc. Matrix Spike Dup.:	0.19	0.20	0.19	0.57
Matrix Spike Duplicate % Recovery:	95	100	95	95
Relative % Difference:	0.0	0.0	5.1	5.1

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

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

SEQUOIA ANALYTICAL

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

Project: ARCO 4494, Oakland

Enclosed are the results from 1 soil sample received at Sequoia Analytical on July 13,1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2071593	Soil, SP A-D	7/10/92	EPA 5030/8015/8020

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 4494, Oakland	Sampled:	Jul 10, 1992
3315 Almaden Expwy., Suite 34	Sample Matrix:	Soil	Received:	Jul 13, 1992
San Jose, CA 95118	Analysis Method:	EPA 5030/8015/8020	Reported:	Jul 14, 1992
Attention: Joel Coffman	First Sample #:	207-1593		

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit mg/kg	Sample I.D. 207-1593 SP A-D
Purgeable Hydrocarbons	1.0	N.D.
Benzene	0.0050	0.014
Toluene	0.0050	N.D.
Ethyl Benzene	0.0050	0.0060
Total Xylenes	0.0050	N.D.
Chromatogram Pattern:		Gas

Quality Control Data

Report Limit Multiplication Factor:	1.0
Date Analyzed:	7/13/92
Instrument Identification:	GCHP-1
Surrogate Recovery, %: (QC Limits = 70-130%)	88

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

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 4494, Oakland

QC Sample Group: 207-1593

Reported: Jul 14, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	C. Donohue	C. Donohue	C. Donohue	C. Donohue
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Jul 13, 1992	Jul 13, 1992	Jul 13, 1992	Jul 13, 1992
QC Sample #:	GBLK071392 MS/MSD	GBLK071392 MS/MSD	GBLK071392 MS/MSD	GBLK071392 MS/MSD
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	0.20	0.20	0.20	0.60
Conc. Matrix Spike:	0.22	0.22	0.22	0.66
Matrix Spike % Recovery:	110	110	110	110
Conc. Matrix Spike Dup.:	0.21	0.21	0.22	0.64
Matrix Spike Duplicate % Recovery:	105	105	110	107
Relative % Difference:	4.7	4.7	0.0	3.1

Quality Assurance Statement: All standard operating procedures and quality control requirements have been met.

SEQUOIA ANALYTICAL

Maria Lee
Project Manager

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

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

Dillard Trucking, Inc.

ENVIRONMENTAL SERVICES
P.O. BOX 218 BYRON, CALIFORNIA 94514
(510) 634-6850 FAX (510) 634-0569

July 21, 1992

Resna
San Jose, CA

FAX #408-264-2435

Attn: Joel Coffman

RE: Arco #4494 - 566 Hegenberger Rd., Oakland, CA

Dear Joel:

Please be advised that the drill cuttings from the above referenced service station site have been removed.

The drill cuttings were transported to BFI Landfill, Livermore on 07-17-92.

If you have any questions please do not hesitate to contact me.

Sincerely,

DILLARD TRUCKING, INC.

Donna L. Pedersen

Donna L. Pedersen
Estimator

DLP/st

cc:file

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No.

Chain of Custody

ARCO Facility no. #494	City (Facility) OAKLAND	Project manager (Consultant) JOEL CONFFMAN	Laboratory name SEQUOIA
ARCO engineer MIKE WIELAND	Telephone no. (ARCO) (415) 511-2449	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA	Address (Consultant) 3315 ALMADEN EXPRESSWAY, SUITE 34, SAN JOSE CA 95118		Contract number 07073

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 Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
SPA	6		✓			✓					X	T		Composite 4 to 1					207 1593			
SPB	6		✓			✓					X											
SPC	6		✓			✓					X											
SPD	6		✓			✓					X											

Special detection Limit/reporting

Special QA/QC

Remarks
Composite samples 4 to 1 for analysis

Lab number

Method of shipment

Turnaround time:
- Priority Rush 1 Business Day ☒
- Rush 2 Business Days WO ☒
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☐

Condition of sample: good

Temperature received: cool

	Date	Time	
Relinquished by sampler	7/13	0940	Received by Cindy McDonald
Relinquished by Cindy McDonald	7/13	10:10	Received by
Relinquished by	Date	Time	Received by laboratory R. Gould — Date 7/13/90 — Time 1015

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