



grettler — ryan inc.

91 JUL 26 PM 12:50

July 23, 1991

County of Alameda
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

Attention: Mr. Dennis Byrne

Certified Mail

Reference: ARCO Service Station #2169
889 West Grand Avenue
Oakland, California 94607

Mr. Byrne:

As requested by ARCO Products Company, we are forwarding a copy of Preliminary Tank Replacement Report for the above referenced location.

If you should have any questions or comments, please call.

Sincerely,

Keith E. Bullock

KEB/jpz

Enclosure

cc: Mr. Charles Carmel, ARCO Products Company
Mr. H. C. Winsor, ARCO Products Company
Mr. Tom Callaghan, Regional Water Quality Control Board (certified mail)



GeoStrategies Inc.

PRELIMINARY TANK REPLACEMENT REPORT

ARCO Service Station No. 2169
889 West Grand Avenue
Oakland, California

792702-1

July 1, 1991



GeoStrategies Inc.

2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545

(415) 352-4800

July 1, 1991

RECEIVED

JUL 16 1991

Gettler-Ryan Inc.
2150 West Winton Avenue
Hayward, California 94545

GETTLER-RYAN INC.
GENERAL CONTRACTORS

Attn: Keith Bullock

Re: PRELIMINARY TANK REPLACEMENT REPORT
ARCO Service Station No. 2169
889 West Grand Avenue
Oakland, California

Gentlemen:

INTRODUCTION

This Preliminary Tank Replacement report by GeoStrategies Inc. (GSI) describes the results of the drilling and soil sampling of five soil borings and the abandonment of a monitoring well at the above referenced location (Plates 1 and 2). The scope of work presented in this document was performed at the request of ARCO Products Company. The five soil borings (A-A through A-E) were drilled on May 14, 1991, as a preliminary site investigation prior to the replacement of the underground storage tank's (UGST's). In addition, on May 14, 1991, a monitoring well located adjacent to the UGST's was abandoned. Field work and laboratory analytical methods were performed to comply with current State of California Water Resource Control Board (SWRCB) guidelines and ARCO Retail Marketing Environmental procedures. GSI Field Methods and Procedures are presented in Appendix A.

SITE DESCRIPTION

The site is presently occupied by an operating ARCO Service Station. The service station consists of one building and four fueling islands. The existing UGST complex consists of four tanks: one 12,000 gallon (unleaded), one 8,000 gallon (regular), one 6,000 gallon (super unleaded), and one 6,000 gallon (diesel).

GeoStrategies Inc.

Gettler-Ryan Inc.
July 1, 1991
Page 2

FIELD PROCEDURES

Soil Borings

A total of five soil borings (A-A through A-E) were drilled on-site at locations specified by ARCO Products Company. Four borings (A-B through A-E) were drilled adjacent to the existing UGST complex to a total depth of 15 feet. One boring (A-A) was drilled to a total depth of 20 feet within the area designated for the proposed UGST complex (Plate 2). The borings were drilled with a truck-mounted rig using 8-inch diameter continuous flight hollow-stem augers. A GSI geologist observed the drilling and logged the soils encountered from each boring using the Unified Soil Classification System (ASTM D 2488-84) and Munsell Soil Color Charts. The exploratory boring logs are presented in Appendix B.

Soil Sampling

Soil samples were collected from each boring at approximately five foot depth intervals by advancing a modified California split-spoon sampler through the bottom of the augers (ASTM D 1586-84 Modified). The sampler was either hydraulically pushed or driven a maximum of eighteen inches using a 140-pound sliding hammer with a 30-inch drop. Blow counts measured in equivalent Standard Penetration blows/foot are shown on each boring log in Appendix B.

Soil from each sampled interval was used to perform head-space analysis in the field to screen for the presence of Volatile Organic Compounds (VOCs). Head-space analysis involved transferring soil from the sampler into a clean jar and immediately covering the jar with aluminum foil, secured with a ring-type threaded lid. After approximately 20 minutes, the foil was pierced and the head-space within the jar was tested for VOCs measured in parts per million (OVM units) using an OVM photoionization detector (PID). These procedures are performed and recorded as reconnaissance data, and GSI does not consider field screening techniques to be verification of contamination. Head-space analysis results are presented on each boring log in Appendix B.

GeoStrategies Inc.

Gettler-Ryan Inc.
July 1, 1991
Page 3

Soil samples were retained from the sampler for chemical analysis in clean brass or stainless steel liners, covered on both ends with aluminum foil and plastic end caps. Soil samples were then labeled, placed in a cooler with blue ice and transported, under Chain-of-Custody, to Sequoia Analytical (Sequoia), a State-certified environmental laboratory located in Redwood City, California.

Well Abandonment

The monitoring well adjacent to the UGST complex was observed to be a perforated 8-inch corrugated metal pipe installed to a depth of 20 feet. This well was abandoned by hydraulically pulling out the pipe, drilling out the hole with 12-inch augers to a depth of 20 feet and backfilling through the augers with neat cement to the surface. The location of this abandoned well is shown on Plate 2 (Permit No. 91261).

HYDROGEOLOGIC CONDITIONS AND SITE GEOLOGY

The site is located at the base of the Berkeley Hills approximately 1/2-mile east of the San Francisco Bay. The site is situated on alluvial-fan deposits of the Temescal Formation comprised of interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures (Radbruch, D.H., 1957).

The boring logs indicate the site is underlain by clay with varying amounts of silt and sand to a depth of approximately 10 feet. Silt with varying amounts of sand were encountered from 10 to approximately 14 feet and sand is present from approximately 14 to the total explored depth of 20 feet. Based on these boring logs a fence diagram was prepared showing general geologic relationships (Plate 3).

Ground-water was encountered in each of the borings at approximately 13.5 feet below grade. Local topography suggest ground-water flows to the west.

GeoStrategies Inc.

Gettler-Ryan Inc.
July 1, 1991
Page 4

SOIL CHEMICAL ANALYTICAL RESULTS

Selected soil samples were analyzed for Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) and Diesel (TPH-Diesel) according to EPA Method 8015 (Modified) and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) using EPA Method 8020. Chemical analyses were performed at Sequoia Analytical in Redwood City, California.

Soil samples collected from the four borings (A-B through A-E) drilled within 10 feet of the existing UGST complex had detected concentrations of TPH-Gasoline ranging from 2.3 to 1,900 parts per million (ppm), benzene ranging from 0.10 to 18 ppm, and TPH-Diesel ranging from 1.6 to 300 ppm. The 9.5 foot soil sample collected from boring A-A drilled in the proposed UGST complex location had detected concentrations of TPH-Gasoline (69 ppm), Benzene (1.0 ppm), and TPH-Diesel (31 ppm). The 4.5 foot sample from boring A-A was reported as none detected (ND) for all the constituents analyzed. Soil chemical data are summarized in Table 1 and the Sequoia Analytical certified analytical report is presented in Appendix C.

SUMMARY OF FINDINGS

The results of this investigation are summarized below:


- o Four soil borings (A-B through A-E) were drilled to a depth of 15 feet adjacent to the existing UGST complex. These borings contained detectable concentrations of TPH-Gasoline, TPH-Diesel and BTEX.
- o One soil boring (A-A) was drilled to a depth of 20 feet in the proposed UGST complex location. This boring contained detectable concentrations of TPH-Gasoline (69 ppm) and TPH-Diesel (31 ppm), at a depth of 9.5 feet.
- o Ground-water in these borings was encountered at approximately 13.5 feet below grade.
- o The pre-existing 20-foot-deep monitoring well adjacent to the tank complex was properly abandoned.

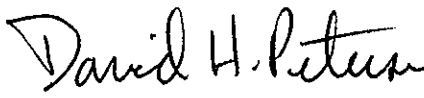
GeoStrategies Inc.

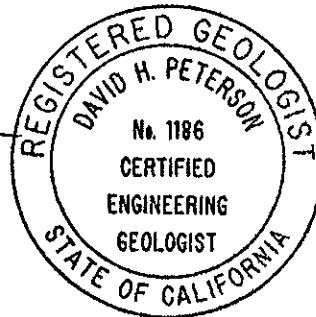
Gettler-Ryan Inc.
July 1, 1991
Page 5

If you have any questions, please call.

GeoStrategies Inc. by,


Thomas D. Leavitt
Geologist


David H. Peterson
C.E.G. 1186



TDL/DHP/mlg

- Plate 1. Vicinity Map
- Plate 2. Site Plan
- Plate 3. Cross Sections

- Appendix A: GSI Field Methods and Procedures
- Appendix B: Exploratory Boring Logs
- Appendix C: Soil Chemical Analytical Report and Chain-of-Custody

GeoStrategies Inc.

References Cited

Dorothy H. Radbuch, 1957, Areal and Engineering Geology of the Oakland West Quadrangle, California, Map I-239.

TABLE 1

SOIL ANALYSES DATA

SAMPLE NO	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	TPH-D (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
A-A-4.5	14-May-91	22-May-91	<1.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-A-9.5	14-May-91	22-May-91	69	31	1.0	3.8	1.6	7.8
A-B-5.5	14-May-91	22-May-91	250	31	2.1	6.2	4.5	30
A-B-10.5	14-May-91	22-May-91	960	280	16	61	19	110
A-C-6.0	14-May-91	22-May-91	<1.0	<1.0	<0.005	<0.005	<0.005	<0.0050
A-C-11.0	14-May-91	22-May-91	1,900	300	18	64	44	220
A-D-6.0	14-May-91	22-May-91	2.3	1.6	0.10	0.019	0.11	0.44
A-D-9.5	14-May-91	22-May-91	10	1.6	0.27	0.021	0.47	1.7
A-E-6.5	14-May-91	22-May-91	<1.0	<1.0	0.16	<0.0050	0.0070	<0.0050
A-E-10.5	14-May-91	22-May-91	330	130	3.9	17	6.5	39

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline

TPH-D = Total Petroleum Hydrocarbons calculated as Diesel

PPM = Parts Per Million

Note: 1. All data shown as <x are reported as ND (none detected).



gettler — ryan inc.

91 JUL 25 PM 12:59

July 23, 1991

County of Alameda
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

Attention: Mr. Dennis Byrne

Certified Mail

Reference: ARCO Service Station #2169
889 West Grand Avenue
Oakland, California 94607

Mr. Byrne:

As requested by ARCO Products Company, we are forwarding a copy of Preliminary Tank Replacement Report for the above referenced location.

If you should have any questions or comments, please call.

Sincerely,

Keith E. Bullock

KEB/jpz

Enclosure

cc: Mr. Charles Carmel, ARCO Products Company
Mr. H. C. Winsor, ARCO Products Company
Mr. Tom Callaghan, Regional Water Quality Control Board (certified mail)



GeoStrategies Inc.

PRELIMINARY TANK REPLACEMENT REPORT

ARCO Service Station No. 2169
889 West Grand Avenue
Oakland, California

792702-1

July 1, 1991



GeoStrategies Inc.

2140 WEST WINTON AVENUE
HAYWARD, CALIFORNIA 94545

(415) 352-4800

July 1, 1991

Gettler-Ryan Inc.
2150 West Winton Avenue
Hayward, California 94545

Attn: Keith Bullock

Re: PRELIMINARY TANK REPLACEMENT REPORT
ARCO Service Station No. 2169
889 West Grand Avenue
Oakland, California

RECEIVED

JUL 16 1991

GETTLER-RYAN INC.
GENERAL CONTRACTORS

Gentlemen:

INTRODUCTION

This Preliminary Tank Replacement report by GeoStrategies Inc. (GSI) describes the results of the drilling and soil sampling of five soil borings and the abandonment of a monitoring well at the above referenced location (Plates 1 and 2). The scope of work presented in this document was performed at the request of ARCO Products Company. The five soil borings (A-A through A-E) were drilled on May 14, 1991, as a preliminary site investigation prior to the replacement of the underground storage tank's (UGST's). In addition, on May 14, 1991, a monitoring well located adjacent to the UGST's was abandoned. Field work and laboratory analytical methods were performed to comply with current State of California Water Resource Control Board (SWRCB) guidelines and ARCO Retail Marketing Environmental procedures. GSI Field Methods and Procedures are presented in Appendix A.

SITE DESCRIPTION

The site is presently occupied by an operating ARCO Service Station. The service station consists of one building and four fueling islands. The existing UGST complex consists of four tanks: one 12,000 gallon (unleaded), one 8,000 gallon (regular), one 6,000 gallon (super unleaded), and one 6,000 gallon (diesel).

GeoStrategies Inc.

Gettler-Ryan Inc.
July 1, 1991
Page 2

FIELD PROCEDURES

Soil Borings

A total of five soil borings (A-A through A-E) were drilled on-site at locations specified by ARCO Products Company. Four borings (A-B through A-E) were drilled adjacent to the existing UGST complex to a total depth of 15 feet. One boring (A-A) was drilled to a total depth of 20 feet within the area designated for the proposed UGST complex (Plate 2). The borings were drilled with a truck-mounted rig using 8-inch diameter continuous flight hollow-stem augers. A GSI geologist observed the drilling and logged the soils encountered from each boring using the Unified Soil Classification System (ASTM D 2488-84) and Munsell Soil Color Charts. The exploratory boring logs are presented in Appendix B.

Soil Sampling

Soil samples were collected from each boring at approximately five foot depth intervals by advancing a modified California split-spoon sampler through the bottom of the augers (ASTM D 1586-84 Modified). The sampler was either hydraulically pushed or driven a maximum of eighteen inches using a 140-pound sliding hammer with a 30-inch drop. Blow counts measured in equivalent Standard Penetration blows/foot are shown on each boring log in Appendix B.

Soil from each sampled interval was used to perform head-space analysis in the field to screen for the presence of Volatile Organic Compounds (VOCs). Head-space analysis involved transferring soil from the sampler into a clean jar and immediately covering the jar with aluminum foil, secured with a ring-type threaded lid. After approximately 20 minutes, the foil was pierced and the head-space within the jar was tested for VOCs measured in parts per million (OVM units) using an OVM photoionization detector (PID). These procedures are performed and recorded as reconnaissance data, and GSI does not consider field screening techniques to be verification of contamination. Head-space analysis results are presented on each boring log in Appendix B.

GeoStrategies Inc.

Gettler-Ryan Inc.
July 1, 1991
Page 3

Soil samples were retained from the sampler for chemical analysis in clean brass or stainless steel liners, covered on both ends with aluminum foil and plastic end caps. Soil samples were then labeled, placed in a cooler with blue ice and transported, under Chain-of-Custody, to Sequoia Analytical (Sequoia), a State-certified environmental laboratory located in Redwood City, California.

Well Abandonment

The monitoring well adjacent to the UGST complex was observed to be a perforated 8-inch corrugated metal pipe installed to a depth of 20 feet. This well was abandoned by hydraulically pulling out the pipe, drilling out the hole with 12-inch augers to a depth of 20 feet and backfilling through the augers with neat cement to the surface. The location of this abandoned well is shown on Plate 2 (Permit No. 91261).

HYDROGEOLOGIC CONDITIONS AND SITE GEOLOGY

The site is located at the base of the Berkeley Hills approximately 1/2-mile east of the San Francisco Bay. The site is situated on alluvial-fan deposits of the Temescal Formation comprised of interfingering lenses of clayey gravel, sandy silty clay, and sand-clay-silt mixtures (Radbruch, D.H., 1957).

The boring logs indicate the site is underlain by clay with varying amounts of silt and sand to a depth of approximately 10 feet. Silt with varying amounts of sand were encountered from 10 to approximately 14 feet and sand is present from approximately 14 to the total explored depth of 20 feet. Based on these boring logs a fence diagram was prepared showing general geologic relationships (Plate 3).

Ground-water was encountered in each of the borings at approximately 13.5 feet below grade. Local topography suggest ground-water flows to the west.

GeoStrategies Inc.

Gettler-Ryan Inc.
July 1, 1991
Page 4

SOIL CHEMICAL ANALYTICAL RESULTS

Selected soil samples were analyzed for Total Petroleum Hydrocarbons calculated as Gasoline (TPH-Gasoline) and Diesel (TPH-Diesel) according to EPA Method 8015 (Modified) and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) using EPA Method 8020. Chemical analyses were performed at Sequoia Analytical in Redwood City, California.

Soil samples collected from the four borings (A-B through A-E) drilled within 10 feet of the existing UGST complex had detected concentrations of TPH-Gasoline ranging from 2.3 to 1,900 parts per million (ppm), benzene ranging from 0.10 to 18 ppm, and TPH-Diesel ranging from 1.6 to 300 ppm. The 9.5 foot soil sample collected from boring A-A drilled in the proposed UGST complex location had detected concentrations of TPH-Gasoline (69 ppm), Benzene (1.0 ppm), and TPH-Diesel (31 ppm). The 4.5 foot sample from boring A-A was reported as none detected (ND) for all the constituents analyzed. Soil chemical data are summarized in Table 1 and the Sequoia Analytical certified analytical report is presented in Appendix C.

SUMMARY OF FINDINGS

The results of this investigation are summarized below:


- o Four soil borings (A-B through A-E) were drilled to a depth of 15 feet adjacent to the existing UGST complex. These borings contained detectable concentrations of TPH-Gasoline, TPH-Diesel and BTEX.
- o One soil boring (A-A) was drilled to a depth of 20 feet in the proposed UGST complex location. This boring contained detectable concentrations of TPH-Gasoline (69 ppm) and TPH-Diesel (31 ppm), at a depth of 9.5 feet.
- o Ground-water in these borings was encountered at approximately 13.5 feet below grade.
- o The pre-existing 20-foot-deep monitoring well adjacent to the tank complex was properly abandoned.

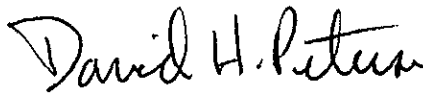
GeoStrategies Inc.

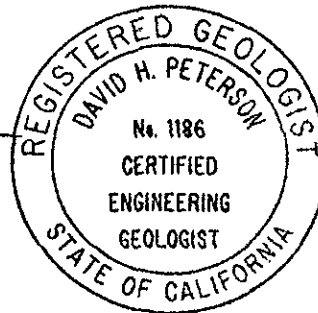
Gettler-Ryan Inc.
July 1, 1991
Page 5

If you have any questions, please call.

GeoStrategies Inc. by,


Thomas D. Leavitt
Geologist


David H. Peterson
C.E.G. 1186



TDL/DHP/mlg

Plate 1. Vicinity Map
Plate 2. Site Plan
Plate 3. Cross Sections

Appendix A: GSI Field Methods and Procedures
Appendix B: Exploratory Boring Logs
Appendix C: Soil Chemical Analytical Report and Chain-of-Custody

GeoStrategies Inc.

References Cited

Dorothy H. Radbuch, 1957, Areal and Engineering Geology of the Oakland West Quadrangle, California, Map I-239.

TABLE 1

SOIL ANALYSES DATA								
SAMPLE NO	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	TPH-D (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
A-A-4.5	14-May-91	22-May-91	<1.0	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
A-A-9.5	14-May-91	22-May-91	69	31	1.0	3.8	1.6	7.8
A-B-5.5	14-May-91	22-May-91	250	31	2.1	6.2	4.5	30
A-B-10.5	14-May-91	22-May-91	960	280	16	61	19	110
A-C-6.0	14-May-91	22-May-91	<1.0	<1.0	<0.005	<0.005	<0.005	<0.0050
A-C-11.0	14-May-91	22-May-91	1,900	300	18	64	44	220
A-D-6.0	14-May-91	22-May-91	2.3	1.6	0.10	0.019	0.11	0.44
A-D-9.5	14-May-91	22-May-91	10	1.6	0.27	0.021	0.47	1.7
A-E-6.5	14-May-91	22-May-91	<1.0	<1.0	0.16	<0.0050	0.0070	<0.0050
A-E-10.5	14-May-91	22-May-91	330	130	3.9	17	6.5	39

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline

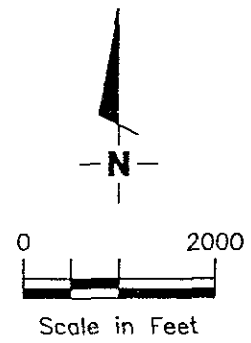
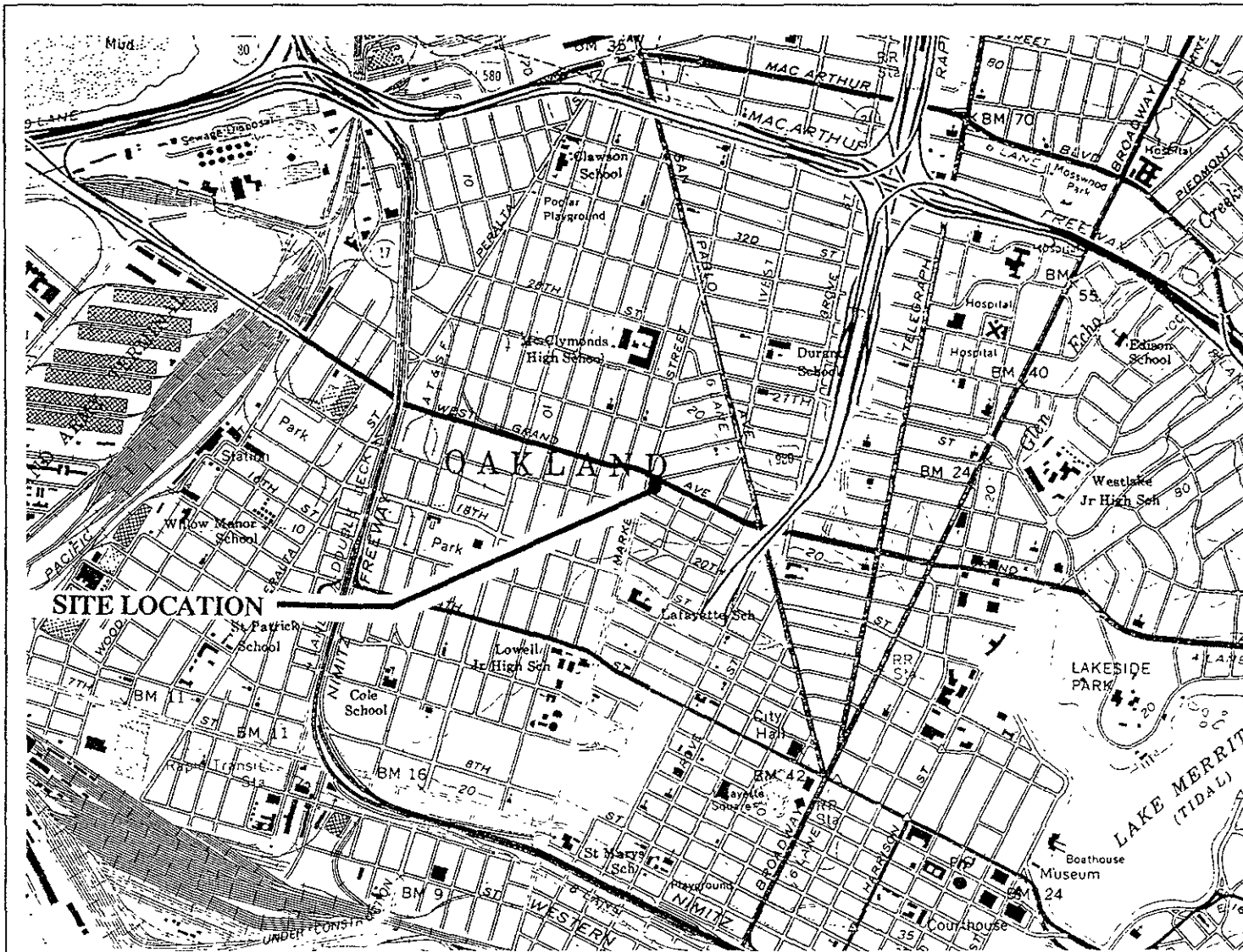
TPH-D = Total Petroleum Hydrocarbons calculated as Diesel

PPM = Parts Per Million

Note: 1. All data shown as <x are reported as ND (none detected).

GeoStrategies Inc.

ILLUSTRATIONS



Base Map: USGS Topographic Map



GeoStrategies Inc.

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

PLATE

1

JOB NUMBER
7927

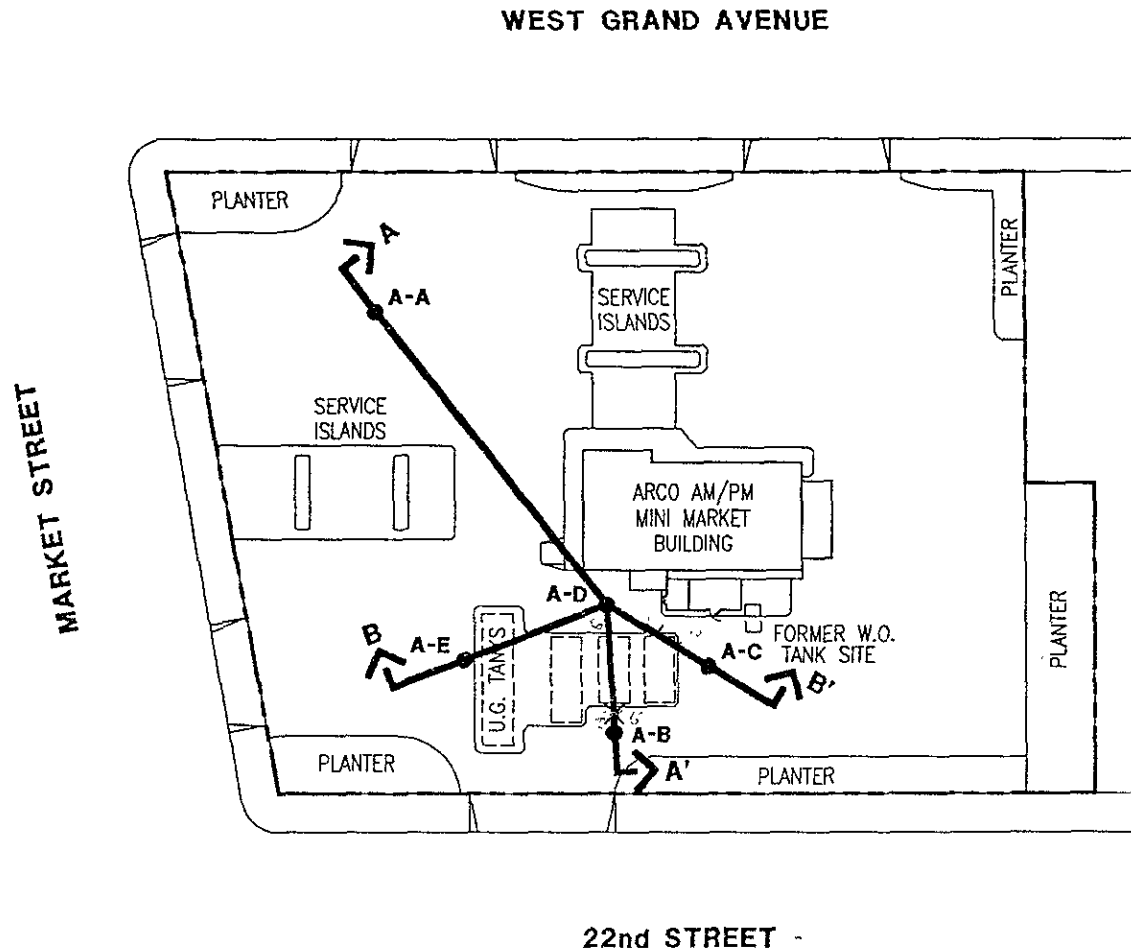
REVIEWED BY

DATE
5/91

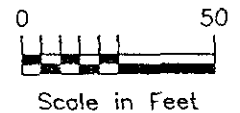
REVISED DATE

EXPLANATION

- Soil Boring
- ✕ Abandoned well
- ↔ Sections



Base Map: ARCO Site Plan dated 6-17-83 and
 ARCO Tank & Line Replacement
 Site Plan dated 4-22-91



GeoStrategies Inc.

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

PLATE

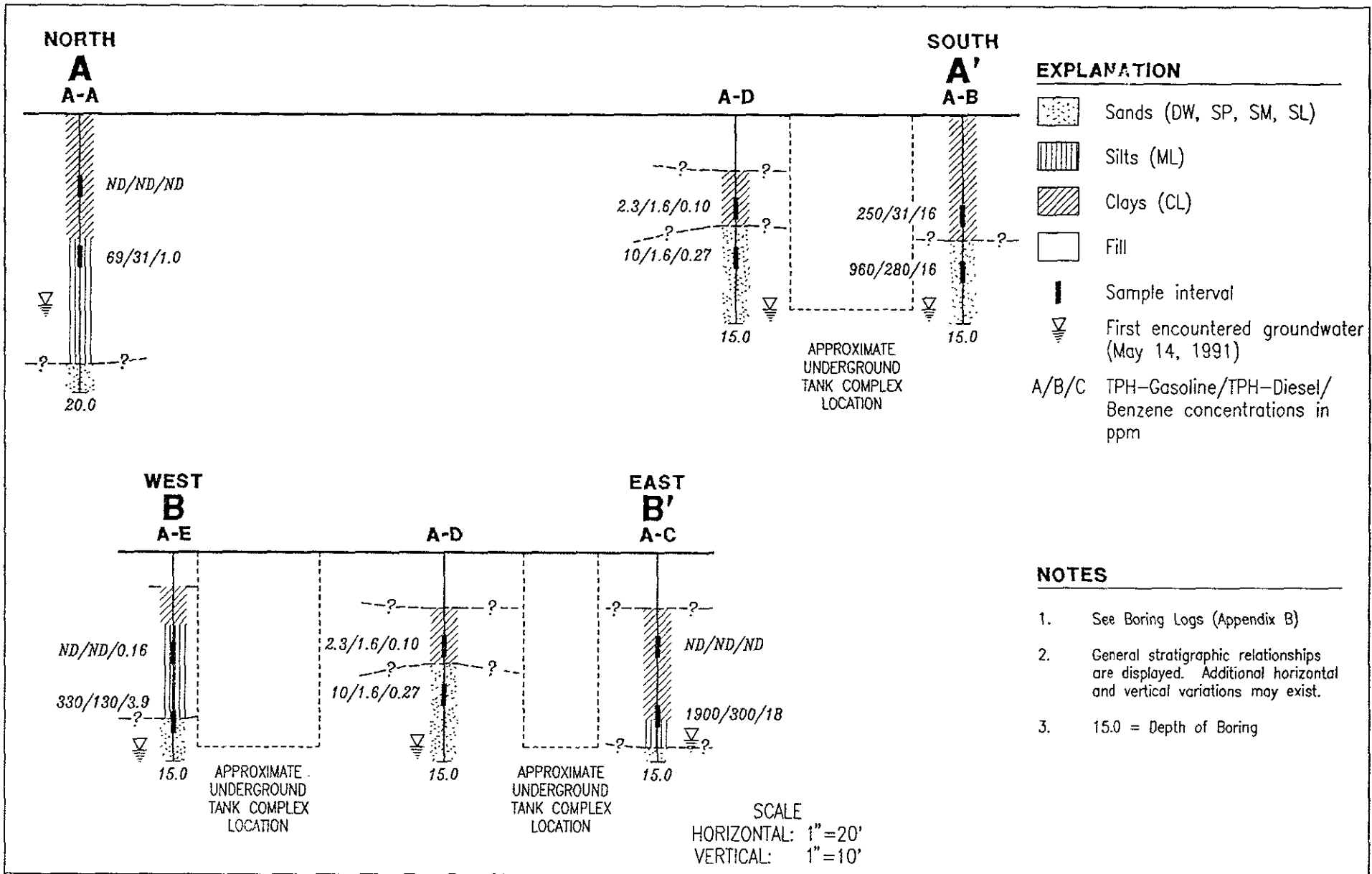
2

JOB NUMBER
 792702-1

REVIEWED BY
 DHP

DATE
 7/91

REVISED DATE



GeoStrategies Inc.

CROSS SECTIONS
 ARCO Service Station #2169
 889 West Grand Avenue
 Oakland, California

PLATE

3

JOB NUMBER
 792702-1

REVIEWED BY
 DHP

DATE
 7/91

REVISED DATE

GeoStrategies Inc.

APPENDIX A
GSI FIELD METHODS AND PROCEDURES

FIELD METHODS AND PROCEDURES

EXPLORATION DRILLING

Mobilization

Prior to any drilling activities, GeoStrategies Inc. (GSI) will verify that necessary drilling permits have been secured.

Utility locations will be located and drilling will be conducted so as not to disrupt activities at a project site. GSI will obtain and review available public data on subsurface geology and if warranted, the location of wells within a half-mile of the project site will be identified. Drillers will be notified in advance so that drilling equipment can be inspected prior to performing work.

Drilling

The subsurface investigations are typically performed to assess the lateral and vertical extent of petroleum hydrocarbons present in soils and groundwater. Drilling methods will be selected to optimize field data requirements as well as be compatible with known or suspected subsurface geologic conditions.

Monitoring wells are installed using a truck-mounted hollow-stem auger drill rig or mud-rotary drill rig. Typically, the hollow-stem rig is used for wells up to 100 feet, if subsurface conditions are favorable. Wells greater than 100-feet deep are typically drilled using mud-rotary techniques. When mud rotary drilling is used, an electric log will be performed for additional lithological information. Also during mud rotary drilling, precautions will be taken to prevent mud from circulating contaminants by using a conductor casing to seal off contaminated zones. Samples will be collected for lithologic logging by continuous chip, and where needed by drive sample or core as specified by the supervising geologist.

Soil Sampling - cont.

Soil borings not converted to monitoring wells will be backfilled (sealed) to ground surface using either a neat cement or cement-bentonite grout mixture. Backfilling will be tremied by continuously pumping grout from the bottom to the top of the boring where depth exceeds 20' or as required by local permit requirements.

All field and office work, including exploratory boring logs, are prepared under the direction of a registered geologist.

Monitoring Well Installation

Monitoring well casing and screen will be constructed of Schedule 40, flush-joint threaded polyvinylchloride (PVC). The well screen will be factory mill-slotted unless additional open area is required (eg. conversion to an extraction well in a low-yield aquifer). The screen length will be placed adjacent to the aquifer material to a minimum of 2-feet above encountered water. No screen shall be placed in a borehole that potentially creates hydraulic interconnection of two or more aquifer units. Screen slot size and well sand pack will be compatible with encountered aquifer materials, as confirmed by sieve analysis.

Monitoring wells will be completed below grade (Figure 2) unless special conditions exist that require above-grade completion design. In the event a monitoring well is required in an aquifer unit beneath an existing aquifer, the upper aquifer will be sealed off by installing a steel conductor casing with an annular neat cement or cement-bentonite grout seal. This seal will be continuously tremie pumped from the bottom of the annulus to ground surface.

The monitoring well sand pack will be placed adjacent to the entire screened interval and will extend a recommended minimum distance of 2-feet above the top of the screen. No sand pack will be placed that interconnects two or more aquifer units. A minimum 2-foot bentonite pellet or bentonite slurry seal will be placed above the sand pack. Sand pack, bentonite, and cement seal levels will be confirmed by sounding the annulus with a calibrated weighted tape. The remaining annular space above the bentonite seal will be grouted with a bentonite-cement mixture and will be tremie-pumped from the bottom of the annular space to the ground surface. The bentonite content of the grout will not exceed 5 percent by weight. A field log of boring and a field well completion form will be prepared by GSI for each well installed.

Decontamination of drilling equipment before drilling and between wells will consist of steam cleaning, and/or Alconox wash.

Well Development

All newly installed wells will be properly developed within 48 hours of completion. No well will be developed until the well seal has set a minimum of 12 hours. Development procedures will include one or more of the methods described below:

Bailing

Bailing will be used to remove suspended sediments and drilling fluids from the well, where applicable. The bailer will be raised and lowered through the column of water in the well so as to create a gentle surging action in the screened interval. This technique may be used in conjunction with other techniques, such as pumping, and may be used alone if the well is of low yield.

Pumping

Pumping will be used in conjunction with bailing or surging. The pump will be operated in such a manner as to gently surge the entire screened interval of the well. This may involve operating the pump with a packer type mechanism attached and slowly raising and lowering the pump, or by cycling the pump off and on to allow water to move in and out of the screened interval. Care will be used not to overpump a well.

Surging

Surging will be performed on wells that are screened in known or suspected high yield formations and/or on larger diameter (recovery) wells. A surge block will be raised and lowered through the entire screened interval, forcing water in and out of the well screen and sand pack. Pumping or air lifting will be used in conjunction with this method of development to remove any sediment brought into the well during surging.

Air Lifting

Air lifting will be used to remove sediment from wells as an alternative to pumping under certain conditions. When appropriate, a surge block designed for use with air lifting will be used to agitate the entire screened interval and water will be lifted out of the well using forced air. When air lifting is performed, the air source will be either nitrogen or filtered air and the procedure will be performed gently to prevent any damage to the well screen or casing and to insure that discharged water is contained.

Well Development - cont.

All well developing equipment will be thoroughly decontaminated prior to development using a steam cleaner and/or Alconox detergent wash and clean water rinse. During development procedures, field parameters (temperature, specific conductance and pH) will be monitored and recorded on well development forms (Figure 3). Equilibration requirements consist of a minimum of three readings with the following accuracy standards:

pH	± 0.1 pH units
Specific Conductance	$\pm 10\%$ of full scale reading
Temperature	± 0.5 degrees Celsius

The wells will be developed until water is visibly clear and free of sediment, and well purging parameters stabilized. A minimum of 8 to 10 well volumes will be purged from each well, if feasible. If well purging parameters have not stabilized before 10 casing volumes have been removed, well development will continue until purging parameters have stabilized and formation water is being drawn into the well. The adequacy of well development will be judged by the field technician performing the well development and based on known formation conditions.

Well Surveying

Monitoring wells will be surveyed to obtain top of box elevations to the nearest ± 0.01 foot. Water level measurements will be recorded to the nearest ± 0.01 foot and referenced to Mean Sea Level (MSL). If additional wells are required, then existing and newly installed wells are surveyed relative to MSL.

GeoStrategies Inc.

APPENDIX B
EXPLORATORY BORING LOGS

MAJOR DIVISIONS					TYPICAL NAMES
COARSE-GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 15% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 15% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE-GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS	ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS	
		CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS	
		OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%	MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS	
		CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
		OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY	
HIGHLY ORGANIC SOILS		PT		PEAT AND OTHER HIGHLY ORGANIC SOILS	

- LL - Liquid Limit (%)
- PI - Plastic Index (%)
- PID - Volatile Vapors in ppm
- MA - Particle Size Analysis
- 2.5 YR 6/2 - Soil Color according to Munsell Soil Color Charts (1975 Edition)
- 5 GY 5/2 - GSA Rock Color Chart

- No Soil Sample Recoverd
- "Undisturbed" Sample
- Bulk or Classification Sample
- First Encountered Ground Water Level
- Piezometric Ground Water Level
- Penetration - Sample drive hammer weight - 140 pounds falling 30 inches. Blows required to drive sampler 1 foot are indicated on the logs

Field location of boring: (See Plate 2)	Project No.: 792702	Date: 05/14/91	Boring No:
	Client: ARCO Products Company		A-A
	Location: 889 West Grand Avenue		Sheet 1
	City: Oakland, California		of 2
Logged by: TDL		Driller: Bayland	
Casing installation data:			

Drilling method: Hollow Stem Auger	Top of Box Elevation:	Datum:
Hole diameter: 8-inches		

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Description	
								Water Level	
				0					
				1					PAVEMENT SECTION - 1.0 ft.
				2					CLAY (CL) - very dark gray (10YR 3/1), stiff, damp, medium plasticity; 90% fines; moderately silty; 10% fine sand.
				3					
4	400	S&H	A-A-	4					
	400	push	4.5						COLOR CHANGE to brown (10YR 4/3) at 4.0 ft.
	500			5					
				6					
				7					
				8					
1350	11	S&H	A-A-	9					SILT (ML) - yellowish brown (10YR 5/4), medium stiff, damp, low plasticity; 90% fines; moderately clayey; 10% fine sand; mottles.
			9.5	10					
				11					
				12					
				13					
25	16	S&H	A-A-	14					COLOR CHANGE to light yellowish brown (10YR 6/4), at 13.5 ft, saturated, increase fine sand to 25%.
			14.5	15					
				16					
				17					
				18					hard at 18.0 ft.
				19					

Remarks:
* Converted to equivalent Standard Penetration blows/ft.

Field location of boring: (See Plate 2)	Project No.: 792702	Date: 05/14/91	Boring No:
	Client: ARCO Products Company		A-A
	Location: 889 West Grand Avenue		Sheet 2
	City: Oakland, California		of 2
	Logged by: T.D.L.	Driller: Bayland	

Casing installation data:

Drilling method: Hollow Stem Auger

Hole diameter: 8-inches

Top of Box Elevation: Datum:

PID (ppm)	Blows/ft* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Water Level		Description
								Time	Date	
2	29	S&H	A-A-19.5	20						SAND with GRAVEL (SP) - brown (10YR 5/3), loose, saturated; 70% medium to coarse sand; 15% gravel; 15% fine sand. Bottom of Boring at 20.0 ft. 05/14/91
				21						
				22						
				23						
				24						
				25						
				26						
				27						
				28						
				29						
				30						
				31						
				32						
				33						
				34						
				35						
				36						
				37						
				38						
				39						

Remarks:

Field location of boring: (See Plate 2)	Project No.: 792702	Date: 05/14/91	Boring No:
	Client: ARCO Products Company		A-B
	Location: 889 West Grand Avenue		Sheet 1
	City: Oakland, California		of 1
	Logged by: T.D.L.	Driller: Bayland	
Casing installation data:			

Drilling method: Hollow Stem Auger	Top of Box Elevation:	Datum:
Hole diameter: 8-inches		

PTD (ppm)	Blows/ft.* or Pressure (psf)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Water Level		Time	Date	Description
								13.5'				
				0								
				1								PAVEMENT SECTION - 1.0 ft.
				2								CLAY (CL) - very dark gray (10YR 3/1), very stiff, damp, medium plasticity; 85% fines; moderately silty; 15% fine sand.
				3								
				4								
1050	400 400 500	S&H push	A-B- 5.5	5								COLOR CHANGE to grayish brown (10YR 5/2), at 4.5 ft; increase to fine sand to 25%.
				6								
				7								
				8								
				9								
853	9	S&H	A-B- 10.5	10								SAND (SP) - gray (5Y 5/1), medium dense, moist; 95% fine sand; 5% silt.
				11								
				12								
				13								
980	8	S&H	A-B- 14.5	14								saturated, mottles
				15								
				16								Bottom of Boring at 15.0 ft.
				17								05/14/91
				18								
				19								

Remarks: * Converted to equivalent Standard Penetration blows/ft.

Field location of boring: (See Plate 2)	Project No.: 792702	Date: 05/14/91	Boring No:
	Client: ARCO Products Company		A-C
	Location: 889 West Grand Avenue		Sheet 1
	City: Oakland, California		of 1
	Logged by: T.D.L.	Driller: Bayland	
Casing installation data:			

Drilling method: Hollow Stem Auger	Top of Box Elevation:	Datum:
Hole diameter: 8-inches		

PID (ppm)	Blows/ft.* or Pressure (psf)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Water Level		Time	Date	Description
								13.5				
				0								
				1								PAVEMENT SECTION - 1.0 ft.
				2								FILL - SAND (SP) - brownish yellow (10YR 6/6), medium dense, damp; 100% sand.
				3								
				4								CLAY (CL) - very dark gray (10YR 3/1), very stiff, damp, medium plasticity; 90% fines; slightly silty; 10% fine sand.
				5								
12	400	S&H	A-C-6.0	6								COLOR CHANGE to very dark gray (10YR 3/1) at 5.0 ft; increase fine sand to 25%
	400	push		7								
	500			8								
				9								
				10								
1118	6	S&H	A-C-11.0	11								COLOR CHANGE to dark gray (10YR 4/1) at 10.0 ft, wet.
				12								
				13								
				14								SILT with SAND (ML) - brown (10Y 5/3), medium stiff, saturated; 80% silt; 20% fine sand.
1066	6	S&H	A-C-14.5	15								SAND (SP) - very dark grayish brown (10YR 3/2), loose, saturated, medium dense; 100% medium to fine sand.
				16								
				17								Bottom of Boring at 15.0 ft.
				18								05/14/91
				19								

Remarks: * Converted to equivalent Standard Penetration blows/ft.

Field location of boring: (See Plate 2)	Project No.: 792702	Date: 05/14/91	Boring No:
	Client: ARCO Products Company		A-D
	Location: 889 West Grand Avenue		Sheet 1
	City: Oakland, California		of 1
	Logged by: T.D.L.	Driller: Bayland	
Casing installation data:			

Drilling method: Hollow Stem Auger	Top of Box Elevation:	Datum:
Hole diameter: 8-inches		

PID (ppm)	Blows/ft.* or Pressure (psi)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Water Level		Time	Date	Description
								13.5'				
				0								
				1								PAVEMENT SECTION - 1.0 ft.
				2								FILL - SAND (SP) - brownish yellow (10YR 6/6), medium dense, damp; 100% fine sand.
				3								
				4								
				5								CLAY with SAND (CL) - very dark gray (10YR 5/1), very stiff, damp, medium plasticity; 70% fine; moderately silty; 30% fine sand.
1142	400 500 500	S&H push	A-D- 6.0	6								COLOR CHANGE to brown (10YR 5/3) at 6.5 ft.
				7								
				8								
625	6	S&H	A-D- 9.5	9								SILTY SAND (SM) - olive gray (5Y 5/2), medium dense, damp; 60% fine sand; 40% fines; slightly clayey.
				10								COLOR CHANGE to yellowish brown (10YR 5/4) at 9.5 ft.
				11								
				12								
				13								
957	6	S&H	A-D- 14.5	14								SAND (SP) gray (5Y 5/1), loose, saturated; 95% fine sand; 5% silt; mottles.
				15								
				16								Bottom of Boring at 15.0 ft. 05/14/91
				17								
				18								
				19								

Remarks: *Converted to equivalent Standard Penetration blows/ft.

Field location of boring: (See Plate 2)	Project No.: 792702	Date: 05/14/91	Boring No:
	Client: ARCO Products Company		A-E
	Location: 889 West Grand Avenue		Sheet 1
	City: Oakland, California		of 1
	Logged by: T.D.L.	Driller: Bayland	
Casing installation data:			

Drilling method: Hollow Stem Auger	Top of Box Elevation:	Datum:
Hole diameter: 8-inches		

PID (ppm)	Blows/ft.* or Pressure (psf)	Type of Sample	Sample Number	Depth (ft.)	Sample	Well Detail	Soil Group Symbol (USCS)	Water Level		Description
								13.5'		
				0						PAVEMENT SECTION - 1.0 ft.
				1						FILL - SAND (SP) - brownish yellow (10YR 6/6), medium dense, damp; 100% fine sand.
				2						
				3						
				4						CLAY with SAND (CL) - very dark gray (10YR 5/1), very stiff, damp, medium plasticity; 70% fines; moderately silty; 30% fine sand.
				5						
106	500 500 600	S&H push	A-E- 6.5	6						SILT with SAND (ML) - olive gray (5Y 5/2), stiff, damp, non-plastic; 65% fines; moderately clayey; 35% fine sand.
				7						
				8						
				9						
810	5	S&H	A-E- 10.5	10						COLOR CHANGE to brown (10YR 5/3) at 9.5 ft, mottles.
				11						
				12						
				13						
53	7	S&H	A-E- 14.5	14						SILTY SAND (SM) - olive (5Y 5/3), medium dense, saturated; 60% fine sand; 40% fines; slightly clayey.
				15						SAND (SP) - olive gray (5Y 5/2), medium dense, saturated; 100% fine sand.
				16						
				17						Bottom of Boring at 15.0 ft.
				18						05/14/91
				19						

Remarks: * Converted to equivalent Standard Penetration blows/ft.

GeoStrategies Inc.

**APPENDIX C
SOIL CHEMICAL ANALYTICAL REPORT
AND CHAIN-OF-CUSTODY**



SEQUOIA ANALYTICAL

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Keith Bullock

Project: 792702, Arco 2169, Oakland

Enclosed are the results from 11 soil samples received at Sequoia Analytical on May 15, 1991. The requested analyses are listed below:

1052139	Soil, A-A-4.5	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052140	Soil, A-A-9.5	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052141	Soil, A-B-5.5	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052142	Soil, A-B-10.5	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052143	Soil, A-C-6.0	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052144	Soil, A-C-11.0	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052145	Soil, A-D-6.0	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052146	Soil, A-D-9.5	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052147	Soil, A-E-6.5	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052148	Soil, A-E-10.5	5/14/91	EPA 3550/8015 EPA 5030/8015/8020
1052149 A-D	Soil, AS-1A-D composite	5/14/91	California LUFT Manual, 12/87 EPA 3550/8015 EPA 5030/8015/8020



SEQUOIA ANALYTICAL

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

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

A handwritten signature in black ink that reads "Vickie Tague" with a long horizontal flourish extending to the right.

Vickie Tague
Project Manager



SEQUOIA ANALYTICAL

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Kelth Bullock

Client Project ID: 792702, Arco 2169, Oakland
Matrix Descript: Soil
Analysis Method: EPA 5030/8015/8020
First Sample #: 105-2139

Sampled: May 14, 1991
Received: May 15, 1991
Analyzed: May 16-22, 1991
Reported: May 22, 1991

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
105-2139	A-A-4.5	N.D.	N.D.	N.D.	N.D.	N.D.
105-2140	A-A-9.5	69	1.0	3.8	1.6	7.8
105-2141	A-B-5.5	250	2.1	6.2	4.5	30
105-2142	A-B-10.5	960	16	61	19	110
105-2143	A-C-6.0	N.D.	N.D.	N.D.	N.D.	N.D.
105-2144	A-C-11.0	1900	18	64	44	220
105-2145	A-D-6.0	2.3	0.10	0.019	0.11	0.44
105-2146	A-D-9.5	10	0.27	0.021	0.47	1.7
105-2147	A-E-6.5	N.D.	0.16	N.D.	0.0070	N.D.
105-2148	A-E-10.5	300	3.9	17	6.5	39
1052149 A-D	AS-1A-D, composite	55	0.37	2.5	1.2	6.7

Detection Limits:	1.0	0.0050	0.0050	0.0050	0.0050
--------------------------	-----	--------	--------	--------	--------

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

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

1052139.GET <1>



SEQUOIA ANALYTICAL

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Keith Bullock

Client Project ID: 792702, Arco 2169, Oakland
Matrix Descript: Soil
Analysis Method: EPA 3550/8015
First Sample #: 105-2139

Sampled: May 14, 1991
Received: May 15, 1991
Extracted: May 21, 1991
Analyzed: May 21, 1991
Reported: May 22, 1991

TOTAL PETROLEUM FUEL HYDROCARBONS (EPA 8015)

Sample Number	Sample Description	High B.P. Hydrocarbons mg/kg (ppm)
105-2139	A-A-4.5	N.D.
105-2140	A-A-9.5	31
105-2141	A-B-5.5	31
105-2142	A-B-10.5	280
105-2143	A-C-6.0	N.D.
105-2144	A-C-11.0	300
105-2145	A-D-6.0	1.6
105-2146	A-D-9.5	1.6
105-2147	A-E-6.5	N.D.
105-2148	A-E-10.5	130
1052149 A-D	AS-1A-D, composite	42

Detection Limits: 1.0

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

SEQUOIA ANALYTICAL


Vickie Tague
Project Manager

Please Note:

The hydrocarbon matrix found in samples 1052140, 1052141, 1052145, and 1052146 does not match the diesel standard. Lower boiling point compounds predominate (possibly gasoline). In samples 1052142, 1052144, 1052148 and 1052149, both diesel fuel and the lower weight matrix are present.



SEQUOIA ANALYTICAL

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Kelth Bullock

Client Project ID: 792702, Arco 2169, Oakland
Sample Descript: Soil
Analysis Method: California LUFT Manual, 12/87
First Sample #: 105-2149 A-D

Sampled: May 14, 1991
Received: May 15, 1991
Analyzed: May 22, 1991
Reported: May 22, 1991

ORGANIC LEAD

Sample Number	Sample Description	Sample Results mg/kg (ppm)
1052149 A-D	AS-1A-D composite	N.D.

Detection Limits:

0.050

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

SEQUOIA ANALYTICAL


Vickie Tague
Project Manager

1052139.GET <3>



SEQUOIA ANALYTICAL

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Keith Bullock

Client Project ID: 792702, Arco 2169, Oakland

Q C Sample Group: 105-2149

Reported: May 22, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Organic Lead
----------------	--------------

Method: LUFT
 Analyst: V. Patel
 Reporting Units: mg/kg
 Date Analyzed: May 22, 1991
 QC Sample #: 105-2362

Sample Conc.: N.D.

Spike Conc. Added: 0.50

Conc. Matrix Spike: 0.44

Matrix Spike % Recovery: 88

Conc. Matrix Spike Dup.: 0.46

Matrix Spike Duplicate % Recovery: 92

Relative % Difference: 4.4

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

SEQUOIA ANALYTICAL

V. Tague
Vickie Tague
Project Manager

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Keith Bullock

Client Project ID: 792702, Arco 2169, Oakland

Q C Sample Group: 1052139, 49

Reported: May 22, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
---------	---------	---------	---------------	---------

Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	R. Eastman	R. Eastman	R. Eastman	R. Eastman
Reporting Units:	ng	ng	ng	ng
Date Analyzed:	May 21, 1991	May 21, 1991	May 21, 1991	May 21, 1991
QC Sample #:	GBLK052191	GBLK052191	GBLK052391	GBLK052191

Sample Conc.:	N.D.	N.D.	N.D.	N.D.
---------------	------	------	------	------

Spike Conc. Added:	100	100	100	300
--------------------	-----	-----	-----	-----

Conc. Matrix Spike:	96	94	95	280
---------------------	----	----	----	-----

Matrix Spike % Recovery:	96	94	95	93
--------------------------	----	----	----	----

Conc. Matrix Spike Dup.:	110	100	100	310
--------------------------	-----	-----	-----	-----

Matrix Spike Duplicate % Recovery:	110	100	100	103
------------------------------------	-----	-----	-----	-----

Relative % Difference:	14	6.2	5.1	10
------------------------	----	-----	-----	----

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

SEQUOIA ANALYTICAL

V. Tague
Vickie Tague
Project Manager

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Keith Bullock

Client Project ID: 792702, Arco 2169, Oakland

Q C Sample Group: 1052141-44, 47-48

Reported: May 22, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
---------	---------	---------	---------------	---------

Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J. Dinsay	J. Dinsay	J. Dinsay	J. Dinsay
Reporting Units:	mg/	mg/	mg/	mg/
Date Analyzed:	May 17, 1991	May 17, 1991	May 17, 1991	May 17, 1991
QC Sample #:	GBLK051791	GBLK051791	GBLK051791	GBLK051791

Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	100	100	100	300
Conc. Matrix Spike:	110	100	100	310
Matrix Spike % Recovery:	110	100	100	103
Conc. Matrix Spike Dup.:	110	100	100	320
Matrix Spike Duplicate % Recovery:	110	100	100	107
Relative % Difference:	0	0	0	3.2

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

SEQUOIA ANALYTICAL

V. Tague
Vickie Tague
Project Manager

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Keith Bullock

Client Project ID: 792702, Arco 2169, Oakland

Q C Sample Group: 105-2145

Reported: May 22, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl Benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	J. Dinsay	J. Dinsay	J. Dinsay	J. Dinsay
Reporting Units:	ng	ng	ng	ng
Date Analyzed:	May 16, 1991	May 16, 1991	May 16, 1991	May 16, 1991
QC Sample #:	GBLK051691	GBLK051691	GBLK051691	GBLK051691
Sample Conc.:	N.D.	N.D.	N.D.	ND.
Spike Conc. Added:	100	100	100	300
Conc. Matrix Spike:	98	96	94	290
Matrix Spike % Recovery:	98	96	94	97
Conc. Matrix Spike Dup.:	100	99	96	290
Matrix Spike Duplicate % Recovery:	100	99	96	97
Relative % Difference:	2.0	3.1	2.1	0

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

SEQUOIA ANALYTICAL

Vickie Tague
Project Manager

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Kelth Bullock

Client Project ID: 792702, Arco 2169, Oakland

Q C Sample Group: 1052140, 46

Reported: May 22, 1991

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:	ng	ng	ng	ng
Date Analyzed:	May 22, 1991	May 22, 1991	May 22, 1991	May 22, 1991
QC Sample #:	GBLK052291	GBLK052291	GBLK052291	GBLK052291

Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	100	100	100	300
Conc. Matrix Spike:	100	110	110	340
Matrix Spike % Recovery:	100	110	110	113
Conc. Matrix Spike Dup.:	100	110	110	330
Matrix Spike Duplicate % Recovery:	100	110	110	110
Relative % Difference:	0	0	0	3.0

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

SEQUOIA ANALYTICAL

V. Tague
Vickie Tague
Project Manager

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

Gettler Ryan
2150 W. Winton Avenue
Hayward, CA 94545
Attention: Keith Bullock

Client Project ID: 792702, Arco 2169, Oakland

Q C Sample Group: 1052139-49

Reported: May 22, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	High Boiling Point Hydrocarbons
----------------	------------------------------------

Method: EPA 8015
 Analyst: R. Lee
 Reporting Units: ng
 Date Analyzed: May 21, 1991
 QC Sample #: DBLK052191

Sample Conc.: N.D.

Spike Conc.
Added: 900

Conc. Matrix
Spike: 940

Matrix Spike
% Recovery: 104

Conc. Matrix
Spike Dup.: 740

Matrix Spike
Duplicate
% Recovery: 82

Relative
% Difference: 24

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

SEQUOIA ANALYTICAL

V. Tague
Vickie Tague
Project Manager

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

ARCO Facility no. 2169	City (Facility) OAKLAND	Project manager (Consultant) Keith Bullock	Laboratory name SEQUOIA
ARCO engineer Charles Carmel	Telephone no. (ARCO)	Telephone no. (Consultant) 783-7500	Contract number 07-073
Consultant name GeoSTRANGES	Address (Consultant) 2140 West Winton Hayward, CA.		
			Fax no. (Consultant) 783-1089

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 802/EPA 8020	BTX/TPH EPA M62/802/8015	TPH Modified 8015 Gas <input checked="" type="checkbox"/> Diesel <input checked="" type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM403E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCMP Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	SEM Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	CAN Metals EPA 601/7000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org /DHS Lead EPA 74207421 <input type="checkbox"/>	
			Soil	Water	Other	Ice	Acid															
A-A-4.5			X			X		5/14/91		X	X							1052139				
A-A-7.4																						
A-A-9.5			X			X		5/14/91		X	X							1052140				
A-B-5.5			X			X		5/14/91		X	X							1052141				
A-B-10.5			X			X		5/14/91		X	X							1052142				
A-C-6.0			X			X		5/14/91		X	X							1052143				
A-C-10.0			X			X		5/14/91		X	X							1052144				
A-D-6.0			X			X		5/14/91		X	X							1052145				
A-D-9.5			X			X		5/14/91		X	X							1052146				
A-E-6.5			X			X		5/14/91		X	X							1052147				
A-E-10.5			X			X		5/14/91		X	X							1052148				

Method of shipment
SEQUOIA FIELD TECH

Special detection Limit/reporting

Special QA/QC

Remarks
Job # 792702

TPH-Gas
Btex
TPH-Diesel

Lab number
1052139

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

Condition of sample: <i>good</i>		Temperature received: <i>cool</i>	
Relinquished by sampler <i>Monica Lemley</i>	Date 1/15/91 Time 13:30	Received by <i>Joey J. Jencks</i>	
Relinquished by <i>Joey J. Jencks</i>	Date 5-15-91 Time 4:45PM	Received by	
Relinquished by	Date	Received by laboratory <i>Bear Stauper</i>	Date 5/15/91 Time 11:45

ARCO Facility no. **2169** City (Facility) **OAKLAND** Project manager (Consultant) **Kern Bullock**
 ARCO engineer **Charles CARMEL** Telephone no. (ARCO) Telephone no. (Consultant) **783-7500** Fax no. (Consultant) **783-1089**
 Consultant name **Geostrenger** Address (Consultant) **2140 Westwinton Hayward CA**

Laboratory name **Sevusia**
 Contract number

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 802/EPA 8020	BTEX/TPH EPA 1602/8020/8015	TPH Modified 8015 Gas <input checked="" type="checkbox"/> Diesel <input checked="" type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SMS03E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/> Semi <input type="checkbox"/>	CAM Metals EPA 601/87000 TLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Org./DHS <input checked="" type="checkbox"/> Lead EPA 7420/7421 <input type="checkbox"/>	
			Soil	Water	Other	Ice	Acid														
AS-1A			X			X		5/14/91	16:00		X	X									X
AS-1B			X			X		5/14/91	16:00		X	X									X
AS-1C			X			X		5/14/91	16:00		X	X									X
AS-1D			X			X		5/14/91	16:00		X	X									X

Method of shipment

Special detection Limit/reporting

Special QA/QC

Remarks
Job # 792702
Composite Samples

Lab number
1052139

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

Condition of sample: Temperature received:
 Relinquished by sampler **Kern Bullock** Date **5/15/91** Time **13:30** Received by **Joe Jencks**
 Relinquished by **Joe Jencks** Date **5-15-91** Time **4:45 PM** Received by
 Relinquished by Date Time Received by laboratory **Alth Jaeger** Date **5/15/91** Time **1645**