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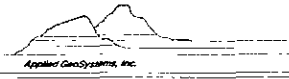
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**LETTER REPORT
LIMITED SUBSURFACE ENVIRONMENTAL
INVESTIGATION**

at
ARCO Station 2152
22141 Center Street
Castro Valley, California

69013.08

7/17/92



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July 17, 1992
0710MWHE
69013.08

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

Subject: Letter Report on Limited Subsurface Environmental Investigation at ARCO Station 2152, 22141 Center Street, Castro Valley, California.

Mr. Whelan:

At the request of ARCO Products Company (ARCO), and in response to the Alameda County Health Care Services Agency (ACHCSA) letter dated September 4, 1991 (ACHCSA, 1991), RESNA Industries Inc.(RESNA) has performed a limited subsurface environmental investigation at ARCO Station 2152, located at 22141 Center Street, in Castro Valley, California. The objectives of this investigation are to evaluate 1) the extent of gasoline hydrocarbons in the soil beneath the former product delivery lines; 2) the lateral and vertical extent of gasoline hydrocarbons in the soil previously detected in boring B-18 during RESNA's previous investigation (RESNA, July 2, 1991); and 3) evaluate the feasibility of installing additional vapor extraction wells at the subject site. The work was performed in accordance with the proposed work outlined in the Work Plan (RESNA, October 22, 1991).

The work performed for this limited investigation included drilling two soil borings (B-19 and B-20), collecting soil samples from the borings, submitting selected soil samples for laboratory analyses and receiving results, analyzing field and office data, and preparing this letter report. This report summarizes environmental work previously performed by RESNA and others, and describes field methods and results used during this investigation. Recommendations for additional environmental work at the site will be prepared under a separate cover.

Site Description and Background

General

ARCO Station 2152 is an operating service station located southwest of the intersection of Center Street and Grove Way in Castro Valley, California. The location of the site is shown on the Site Vicinity Map, Plate 1. The site is a relatively flat, asphalt- and concrete-covered lot at an elevation of approximately 217 feet above mean sea level. Local topography in the vicinity of the site slopes gently southwestward. The site is bounded by residential properties to the southeast and west-southwest of the site, and by commercial properties to the northwest across Grove Way and northeast across Center Street.

The following information was supplied by ARCO. The site was formerly occupied by five underground storage tanks (USTs) which consisted of one 12,000-gallon gasoline UST (designated T1) and four 6,000-gallon gasoline UST (designated T2 through T5). UST T1 was installed in 1983 and stored unleaded supreme gasoline, USTs T2 through T4 were installed in 1976 and stored unleaded regular gasoline, and UST T5 was installed in 1976 and stored leaded regular gasoline. In August 1989, these tanks were removed, and replaced with three fiberglass 12,000-gallon gasoline USTs in the same tank pit location. In October 1989, the product dispenser lines and product line sump associated with the former tanks were replaced with new equipment. The approximate locations of the former tanks, existing tanks, and other pertinent site features are shown on the Generalized Site Plan, Plate 2.

Geology and Hydrogeology

Regionally, the site is in the Castro Valley Basin, which is bounded by the Diablo Range to the north, south, and east. The site is bounded by the Hayward Fault to the west. This basin is underlain by unconsolidated Pleistocene alluvium consisting of a heterogeneous mixture of poorly consolidated clay, silt, sand, and gravel derived from the Diablo Range (Helley, et. al., 1979). Earth materials encountered during our previous subsurface investigations at the site consisted of silty to sandy clay and clayey sand to sandy gravel. Groundwater was encountered within clayey sand to sandy gravel at depths of approximately 52 to 58 feet. Claystone of the Panoche Formation was encountered at depths of approximately 58 to 60 feet (Applied GeoSystems [AGS], November 1990). The direction of groundwater flow is toward the southwest, based on groundwater monitoring data collected from the wells at the site between January and March 1992 (RESNA, May 1, 1992).

Previous Work

Previous subsurface environmental investigations performed at the site are summarized in Appendix A.

Field Work

Drilling

Field work at the site was conducted in accordance with the field protocol and the Site Safety Plan (RESNA, February 11, 1992). A description of the field methods is included in Appendix B, Field Methods. A drilling permit was acquired from the Alameda County Flood Control and Water Conservation District (ACFCWCD - Zone 7) prior to drilling. A copy of the permit is included in Appendix C, Drilling Permit. Two soil borings, B-19 and B-20, were drilled on February 12 and 13, 1992. Boring B-19 was drilled northwest and boring B-20 was drilled southeast of the pump island adjacent to Center Street to evaluate the extent of gasoline hydrocarbons in the soil from the former product delivery lines and pump island. The locations of the borings are shown on Plate 2.

Soil Sampling and Description

A total of 21 soil samples were collected from borings B-19 and B-20 for description and possible laboratory analysis. A summary of the United Soil Classification System (USCS) used to identify the soil encountered during the drilling is presented on Plate 3, and the description of the soil encountered in the borings is presented on the Logs of Borings, Plates 4 through 8. Soil samples from borings were collected at intervals of 5 feet or less from the ground surface to a depth of 49.5 feet in boring B-19 and 52.5 feet in boring B-20. Four soil samples were also collected from the drill cuttings, generated during the drilling of borings B-19 and B-20, to evaluate whether it would be feasible to dispose of the cuttings at a Class III sanitary landfill. Sampling procedures are described in Appendix B. Qualitative field measurements of organic vapors present in the soil samples were made with an organic vapor meter (OVM). These measurements are considered an approximate estimate of petroleum hydrocarbon concentrations and are shown on the boring logs in the column marked P.I.D. (photoionization detection) (see Plates 4 through 8). Field screening with the OVM indicated that significant concentrations of petroleum hydrocarbons were not present in borings B-19 and B-20. As a result, vapor extraction wells were not constructed in either boring.

The earth materials encountered during this investigation consisted primarily of sandy silt to silty clay and clayey sand to sandy gravel with cobbles (see Logs of Borings and Geologic

Cross Sections E-E' and F-F', Plates 9 and 10). In general, sandy silt and silty clay up to 9 feet thick was encountered beneath the surface asphalt. These near surface sandy silts and silty clays are underlain by numerous interbedded layers of clayey to gravelly sands and clayey to sandy gravel with cobbles between depths of approximately 20 feet and 50 feet. Weathered bedrock lies beneath the sands and gravel and locally consists of a feldspathic arkosic sandstone that is brown, very moist, with low hardness, moderately weathered, and interbedded with saturated clay seams. The bedrock was encountered in boring B-20 at a depth of approximately 50 feet. Groundwater was encountered directly above the bedrock at a depth of 53 feet in boring B-20. Drilling was terminated at the depth of 50½ feet due to auger refusal at that depth in boring B-19. Drilling was very difficult between the gravel layers where localized cobbles (0.5 to 0.8 feet in diameter) were encountered and some soil samples were not recovered through these layers.

Laboratory Methods

Soil Samples

All soil samples were preserved as specified for the applicable analytical method (see Appendix B), and delivered with Chain of Custody Records to Sequoia Analytical Laboratories of Redwood City, California, a state-certified laboratory (Hazardous Waste Testing Laboratory Certification #1210) for soil analyses. Twelve of the soil samples collected from borings B-19 and B-20 were analyzed in accordance with ACHCSA requirements for gasoline constituents benzene, toluene, ethylbenzene, and total xylenes (BTEX) and total petroleum hydrocarbons as gasoline (TPHg) using modified Environmental Protection Agency (EPA) Methods 5030/8015/8020, and were delivered under Chain of Custody protocol. The soil samples were selected for laboratory analysis based on the following criteria:

- at 5-foot intervals and/or change in stratigraphic units, as recommended by California Department of Health Services (DHS) guidelines;
- location above first-encountered groundwater.

Four soil samples from the drill cutting soil pile were submitted to an ARCO-contracted State-certified laboratory and were composited into one sample to be analyzed for TPHg and BTEX using EPA Methods 5030/8015/8020. The four soil samples were delivered under Chain of Custody protocol.

Results of Laboratory Analyses

Soil Samples

Laboratory analyses results of the twelve soil samples from the two borings and the composite soil sample from the soil cuttings indicate nondetectable concentrations of TPHg (less than 1 part per million [ppm]) and BTEX (less than 0.0050 ppm). These results are summarized in Table 1, Results of Laboratory Analyses of Soil Samples. The drill cuttings were removed from the site by an ARCO-contracted State licensed hauler. The Chain of Custody Records and Laboratory Analysis Reports are presented in Appendix D, Laboratory Analyses Reports and Chain of Custody Records.

Discussion of Results

The presently interpreted extent of hydrocarbon impacted soil beneath the southern portion of the site is shown on Geologic Cross Sections, Plates 9 and 10. The nondetectable concentrations of TPHg and BTEX from selected soil samples analyzed from borings B-19 and B-20 indicate that the hydrocarbons previously detected in the immediate vicinity of the former USTs has not impacted the soil beneath the pump island near Center Street. Tank Pit Soil Sampling Locations, Plate 11 and Product-Line Sample Locations, Plate 12, depict soil sample locations and analytical results during the tank removal and replacement activities conducted at the site during August through October 1989 and depicts a localized hydrocarbon source in the immediate vicinity of the former product line sump (AGS, January 1990). Hydrocarbon concentrations detected in boring B-18 represent a separate, localized hydrocarbon source directly beneath the subject pump island. Nondetectable concentrations (TPHg and BTEX) of selected soil samples analyzed from boring B-19 show that the former product delivery lines did not leak gasoline hydrocarbons into the soil in the immediate vicinity.

Conclusions

Based on the results of this limited investigation RESNA concludes the following:

- The field and laboratory results reported nondetectable concentrations of TPHg and BTEX in soil samples collected from recently drilled borings B-19 and B-20.
- Previously detected gasoline hydrocarbons in the vicinity of the southeastern pump island have been delineated to the northwest and southeast. The gasoline hydrocarbons previously detected beneath the southeastern pump island appear to

be limited to the immediate vicinity of boring B-18 and appear to be from a separate source than the gasoline hydrocarbons previously detected beneath the former USTs.

- Field screening with an OVM during drilling indicated nondetectable levels of hydrocarbons, therefore, vapor extraction wells were not constructed in borings B-19 and B-20 as outlined in the work plan (RESNA, October 22, 1991).
- Because groundwater has not been significantly impacted by gasoline hydrocarbons, groundwater remediation does not appear to be necessary at this site.

Recommendations

- Based upon confirmation borings B-19 and B-20, tank complex soil samples, and borings from previous investigations, the extent of gasoline hydrocarbons in the soil appears to be delineated at the site. RESNA recommends proceeding with installation of soil vapor extraction system to remediate soils at the site.

Distribution

RESNA recommends that copies of this Limited Subsurface Environmental Investigation be sent to the following:

Mr. Richard Hiatt
Regional Water Quality Control Board
San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, California 94612

Mr. Scott Seery
Alameda County Health Care Services Agency
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Limitations

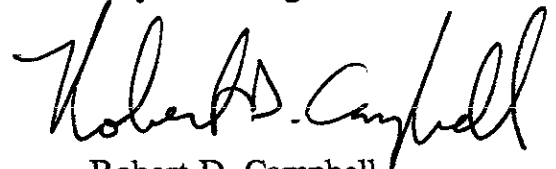
This report was prepared in accordance with generally accepted standards of environmental geological and engineering practice in California at the time this investigation was performed. This investigation was conducted solely for the purpose of evaluating environmental conditions of the soil with respect to gasoline hydrocarbons associated with onsite former underground storage tanks and product lines. No soil engineering or geotechnical references are implied or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this assessment is made from a limited number of observation points. Subsurface conditions may vary away from the data points available. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of assessment.

If you have any questions or comments regarding this report, please call us at (408) 264-7723.

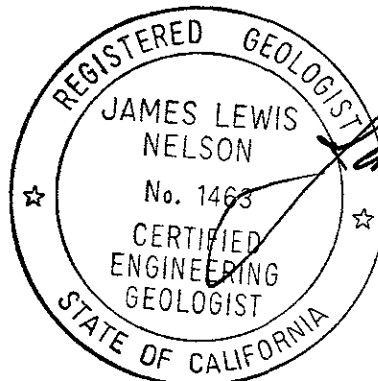
Sincerely,
RESNA Industries Inc.



Joel Coffman
Project Geologist



Robert D. Campbell
Staff Geologist



James L. Nelson
Certified Engineering
Geologist No. 1463

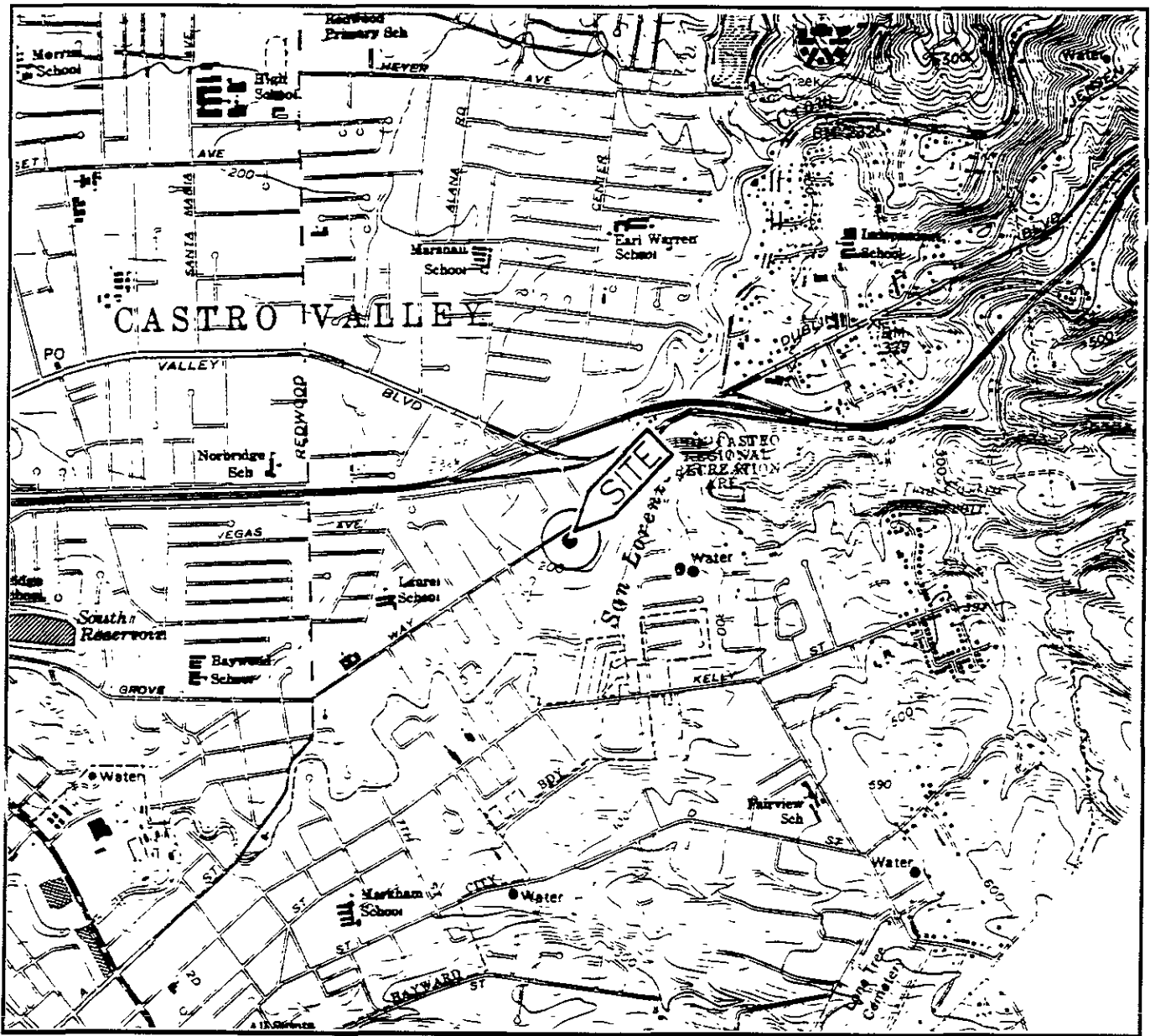
cc: H.C. Winsor, ARCO Products Company

Enclosures: References

- Plate 1, Site Vicinity Map
- Plate 2, Generalized Site Plan
- Plate 3, Unified Soil Classification System and Symbol Key
- Plate 4
- through 8, Logs of borings B-19 and B-20
- Plate 9, Geologic Cross Section E-E'
- Plate 10, Geologic Cross Section F-F'
- Plate 11, Tank Pit Soil Sampling Locations
- Plate 12, Product-Line Soil Sample Locations
- Table 1, Results of Laboratory Analyses of Soil Samples, February 1992
- Appendix A; Previous Work
 - Table A-1; Cumulative Results of Laboratory Analyses of Soil Samples
 - Table A-2; Results of Laboratory Analyses of Tank Pit Soil Samples
 - Table A-3; Results of Laboratory Analyses of Product-Line Soil Samples
 - Table A-4; Vapor-Extraction Test Field Monitoring Data
 - Table A-5; Vapor-Extraction Test Laboratory Analytical Data
 - Table A-6; Cumulative Groundwater Monitoring Data
 - Table A-7; Cumulative Results of Laboratory Analyses of Groundwater Samples
- Appendix B; Field Methods
- Appendix C; Drilling Permit
- Appendix D; Laboratory Analyses Reports and Chain of Custody Records

REFERENCES

- Alameda County Health Care Services Agency. September 4, 1991. Letter from Scott Seery requesting soil venting proposal.
- Applied GeoSystems. May 26, 1989. Limited Environmental Site Assessment, 22141 Center Street, Castro Valley, California, AGS 69013-1.
- Applied GeoSystems. January 18, 1990. Limited Subsurface Environmental Investigation Related to Underground Tank Removal, 22141 Center Street, Castro Valley, California, AGS 69013-2.
- Applied GeoSystems. November 13, 1990. Environmental Subsurface Investigation at ARCO Station 2152, 22141 Center Street, Castro Valley, California, AGS 69013-4.
- Applied GeoSystems. March 24, 1991. Letter Report, Quarterly Ground-Water Monitoring, First Quarter 1991, 22141 Center Street, Castro Valley, California, AGS 69013-5.
- Applied GeoSystems. May 20, 1991. Letter Report, Quarterly Ground-Water Monitoring, Second Quarter 1991, 22141 Center Street, Castro Valley, California, AGS 69013-5.
- Helley, et. al., 1970.
- RESNA. July 2, 1991. Supplemental Subsurface and Remedial Investigation at ARCO Station 2152, 22141 Center Street, Castro Valley, California. AGS 69013-6.
- RESNA. October 8, 1991. Supplemental Subsurface and Remedial Investigation at ARCO Station 2152, 22141 Center Street, Castro Valley, California. AGS 69013-5.
- RESNA. October 22, 1991. Work Plan for Additional Subsurface Investigation and Design and Permitting of Vapor Extraction System at ARCO Station 2152, 22141 Center Street, Castro Valley, California. RESNA 69013.08.
- RESNA. February 11, 1992. Site Safety Plan at ARCO Station 2152, 22141 Center Street, Castro Valley, California. RESNA 69013.08.
- RESNA. May 1, 1992. Letter Report Quarterly Monitoring, First Quarter 1992 at ARCO Station 2152, 22141 Center Street, Castro Valley, California. RESNA 69013.09

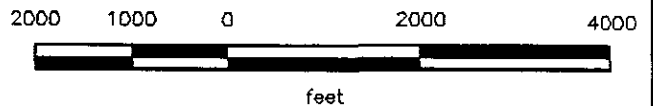


Base: U.S. Geological Survey
 7.5-Minute Quadrangles
 Hayward, California.
 Photorevised 1980

LEGEND

● = Site Location

Approximate Scale

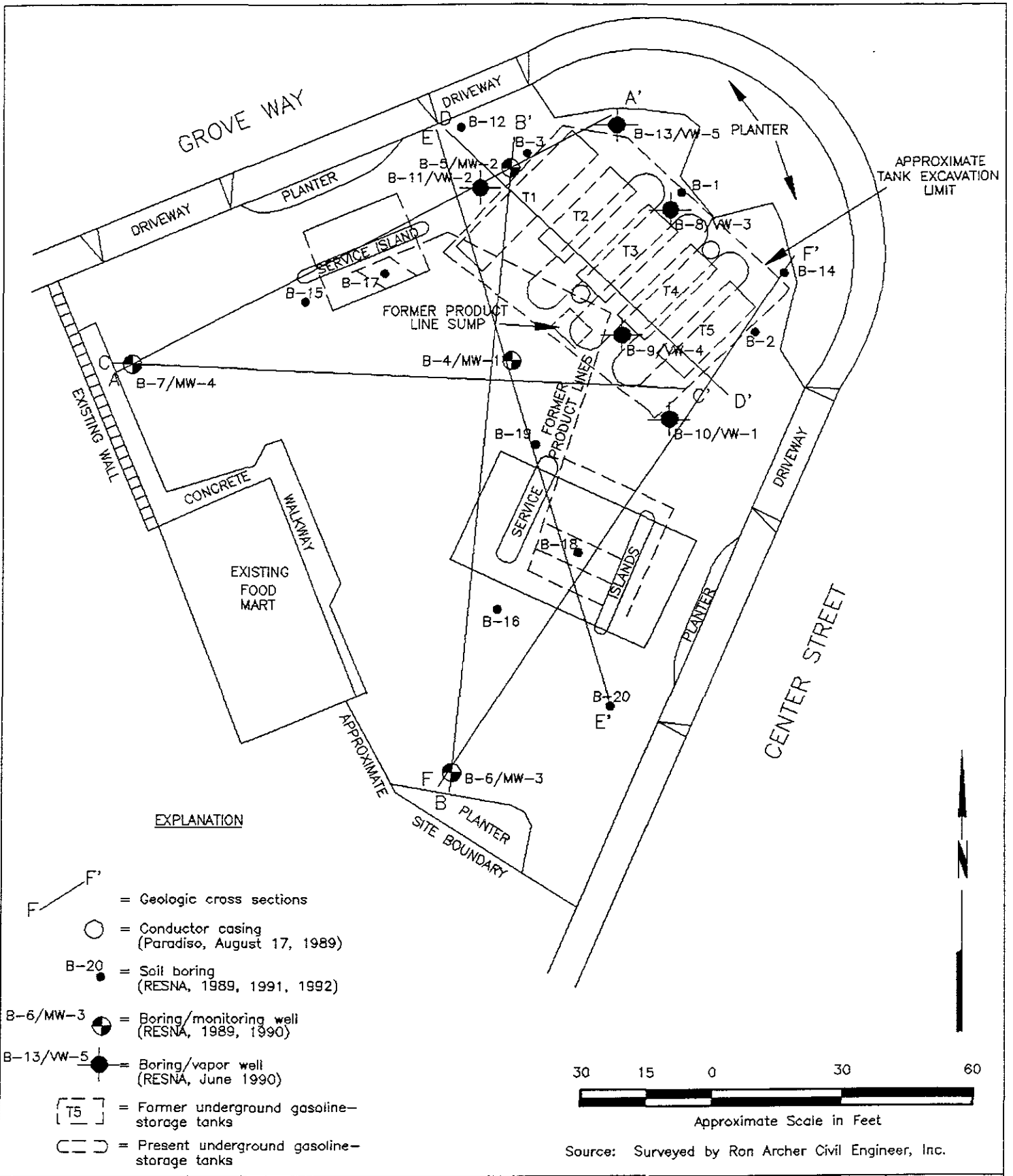


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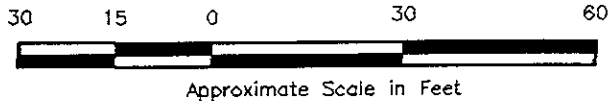
SITE VICINITY MAP
ARCO Station 2152
22141 Center Street
Castro Valley, California

PLATE
1



EXPLANATION

- F — F' = Geologic cross sections
- = Conductor casing (Paradiso, August 17, 1989)
- B-20 ● = Soil boring (RESNA, 1989, 1991, 1992)
- B-6/MW-3 ● = Boring/monitoring well (RESNA, 1989, 1990)
- B-13/VW-5 ● = Boring/vapor well (RESNA, June 1990)
- [T5] = Former underground gasoline-storage tanks
- = Present underground gasoline-storage tanks



Source: Surveyed by Ron Archer Civil Engineer, Inc.














GENERALIZED SITE PLAN
ARCO Station 2152
22141 Center Street
Castro Valley, California

PLATE
2

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISION	LTR	DESCRIPTION	MAJOR DIVISION	LTR	DESCRIPTION		
COARSE- GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	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.	
		GP			CL		Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
		GM			OL		
		GC			SILTS AND CLAYS LL>50		MH
	SAND AND SANDY SOILS	SW		CH		Inorganic Clays of high plasticity, fat Clays.	
		SP		OH			Organic Clays of medium to high plasticity, organic Silts.
		SM		HIGHLY ORGANIC SOILS		PT	
	SC						

- | | |
|---|---|
|  Depth through which sampler is driven
 Relatively undisturbed sample
 No sample recovered
 Static water level observed in well/boring
 Initial water level observed in boring
<p>S-10 Sample number</p> |  Sand pack
 Bentonite
 Neat cement
 Caved native soil
 Blank PVC
 Machine-slotted PVC
<p>P.I.D. Photoionization detector</p> |
|---|---|

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

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



**UNIFIED SOIL CLASSIFICATION SYSTEM PLATE
AND SYMBOL KEY
ARCO Station 2152
22141 Center Street
Castro Valley, California**

3

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Depth of boring: 50-1/2 feet Diameter of boring: 12.25 inches Date drilled: 02/12/92
 Well depth: N/A Material type: N/A Casing diameter: N/A
 Screen interval: N/A Slot size: N/A
 Drilling Company: Exploration Drilling Driller: Bruce
 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.
0					Asphalt (3 inches) and baserock (6 inches); gravelly sand, gray, damp, dense.	▽▽▽▽
				CL	Sandy clay with some silt, dark gray, moist, low plasticity, very stiff.	▽▽▽▽
				ML	Color change to brown with black mottling. Sandy silt, brown, damp, low plasticity, very stiff.	▽▽▽▽
4	S-4.5	5 9 19	0			▽▽▽▽
6						▽▽▽▽
8				CL	Silty clay, brown, damp, medium plasticity, very stiff.	▽▽▽▽
10	S-9.5	9 12 14	0	SC	Clayey sand, fine-grained, brown, damp, medium dense.	▽▽▽▽
12						▽▽▽▽
14	S-14.5	5 6 10	0			▽▽▽▽
16						▽▽▽▽
18					Rougher drilling.	▽▽▽▽
				SP	Gravelly sand, fine-grained gravel and coarse-grained sand, brown, damp, dense.	▽▽▽▽
20	S-19.5	10 16 16	0			▽▽▽▽
						▽▽▽▽
						▽▽▽▽
						▽▽▽▽

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LOG OF BORING B-19
 ARCO Station 2152
 22141 Center Street
 Castro Valley, California

PLATE

4

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
-22				SP	Gravelly sand, fine-grained gravel and coarse-grained sand, brown, damp, dense. Encountered cobbles (3-1/2 to 4 inches in diameter), mixed with medium-grained sand, brown, at 21 to 24 feet.	▽▽▽▽
-24	S-25	10 12 13	0		Sand, fine-grained, brown, moist, medium dense.	▽▽▽▽
-26						▽▽▽▽
-28						▽▽▽▽
-30	S-29.5	6 16 29	0	SW	Gravelly sand, fine-grained gravel and fine- to coarse-grained sand, brown, damp, dense. <u>Rougher drilling at 31 feet.</u>	▽▽▽▽
-32				GC	Clayey coarse-grained gravel with some medium-grained sand, brown, damp, dense.	▽▽▽▽
-34	S-34.5	6 18 20	0			▽▽▽▽
-36						▽▽▽▽
-38				GP	Sandy gravel, coarse-grained sand and gravel, brown with dark brown streaks, damp, very dense.	▽▽▽▽
-40	S-39.5	22 38 50/1"	0		No sample due to cobble.	▽▽▽▽
-42						▽▽▽▽
-44	S-44.5	30 50/5"0				▽▽▽▽
-46				GC	Clayey gravel with some coarse-grained sand, brown, moist, very dense. Easier drilling at 48 feet. Moist soil on end of bit.	▽▽▽▽
-48				SC	Clayey sand with gravel, medium-grained sand and coarse-grained gravel, brown, moist, very dense; very moist at 50 feet.	▽▽▽▽
-50	S-49.5	25 50/5"0				▽▽▽▽
					Total depth = 50-1/2 feet.	

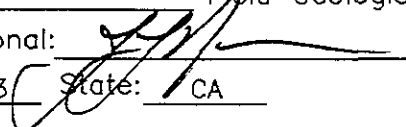


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LOG OF BORING B-19
 ARCO Station 2152
 22141 Center Street
 Castro Valley, California

PLATE
 5

Depth of boring: 53-1/2 feet Diameter of boring: 8.25 inches Date drilled: 02/13/92
 Well depth: N/A Material type: N/A Casing diameter: N/A
 Screen interval: N/A Slot size: N/A
 Drilling Company: Exploration Drilling Driller: John
 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.
0					Asphalt (3 inches) and baserock (6 inches): gravelly sand, gray, damp, dense.	▽▽▽▽
2				ML	Sandy silt, medium-grained sand, brown, damp, low plasticity, very stiff.	▽▽▽▽
4	S-4.5	14 28 29	0			▽▽▽▽
6					Harder drilling at 7 feet.	▽▽▽▽
8				SM/SC	Silty sand with some clay, fine- to medium-grained sand, brown, damp, medium dense.	▽▽▽▽
10	S-9.5	9 12 14	0			▽▽▽▽
12					Clay layers interbedded with sand; clay is grayish-brown, moist, possesses medium plasticity.	▽▽▽▽
14	S-14.5	8 12 19	0		Grades to medium-grained sand.	▽▽▽▽
16				SP	Sand, medium-grained, brown, damp, medium dense.	▽▽▽▽
18					Harder drilling at 18 feet.	▽▽▽▽
20	S-19.5	6 11 11	0	GP	Sandy gravel, coarse-grained sand and fine-grained gravel, brown, damp, medium dense.	▽▽▽▽

(Section continues downward)



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LOG OF BORING B-20
 ARCO Station 2152
 22141 Center Street
 Castro Valley, California

PLATE
 6

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
-22				GP	Sandy gravel, coarse-grained sand and fine-grained gravel, brown, damp, medium dense.	▽▽▽▽ ▽▽▽▽ ▽▽▽▽ ▽▽▽▽ ▽▽▽▽ ▽▽▽▽ ▽▽▽▽ ▽▽▽▽ ▽▽▽▽ ▽▽▽▽
					<u>Grades back into sands; easier drilling at 23 feet.</u>	
-24	S-24.5	7 9 13	0	SP	Sand, fine-grained, brown, damp, medium dense.	
-26						
-28				SW	Gravelly sand, medium- to coarse-grained sand, brown, damp, dense; particles consist of subrounded clasts of	
-30	S-29.5	10 12 18	0		<u>Very rough drilling beginning at about 31 feet.</u>	
-32				GW	Sandy gravel, fine-grained sand and coarse-grained gravel to cobbles, brown, damp, very dense.	
-34	S-34.5	27 50/6"				
-36						
-38						
-40	S-39.5	50/6"	0		Becoming silty with medium-grained sand and coarse-grained gravel, moist.	
-42					<u>Easier drilling at 42 feet.</u>	
-44	S-44.5	6 7 20	0	SC	Clayey sand with gravel, fine-grained sand and coarse-grained gravel, gray, moist, medium dense.	
-46						
-48						
-50	S-50	33 25	0			



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LOG OF BORING B-20
ARCO Station 2152
22141 Center Street
Castro Valley, California

PLATE
7

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
-52	S-52.5	27 50	1"0		Feldspathic, arkosic sandstone, brown, very moist, low hardness, interbedded with saturated clay seams, moderately weathered; with clay cement.	
					Water at 53 feet.	
-54					Total depth = 53-1/2 feet.	
-56						
-58						
-60						
-62						
-64						
-66						
-68						
-70						
-72						
-74						
-76						
-78						
-80						

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LOG OF BORING B-20
ARCO Station 2152
22141 Center Street
Castro Valley, California

PLATE
8

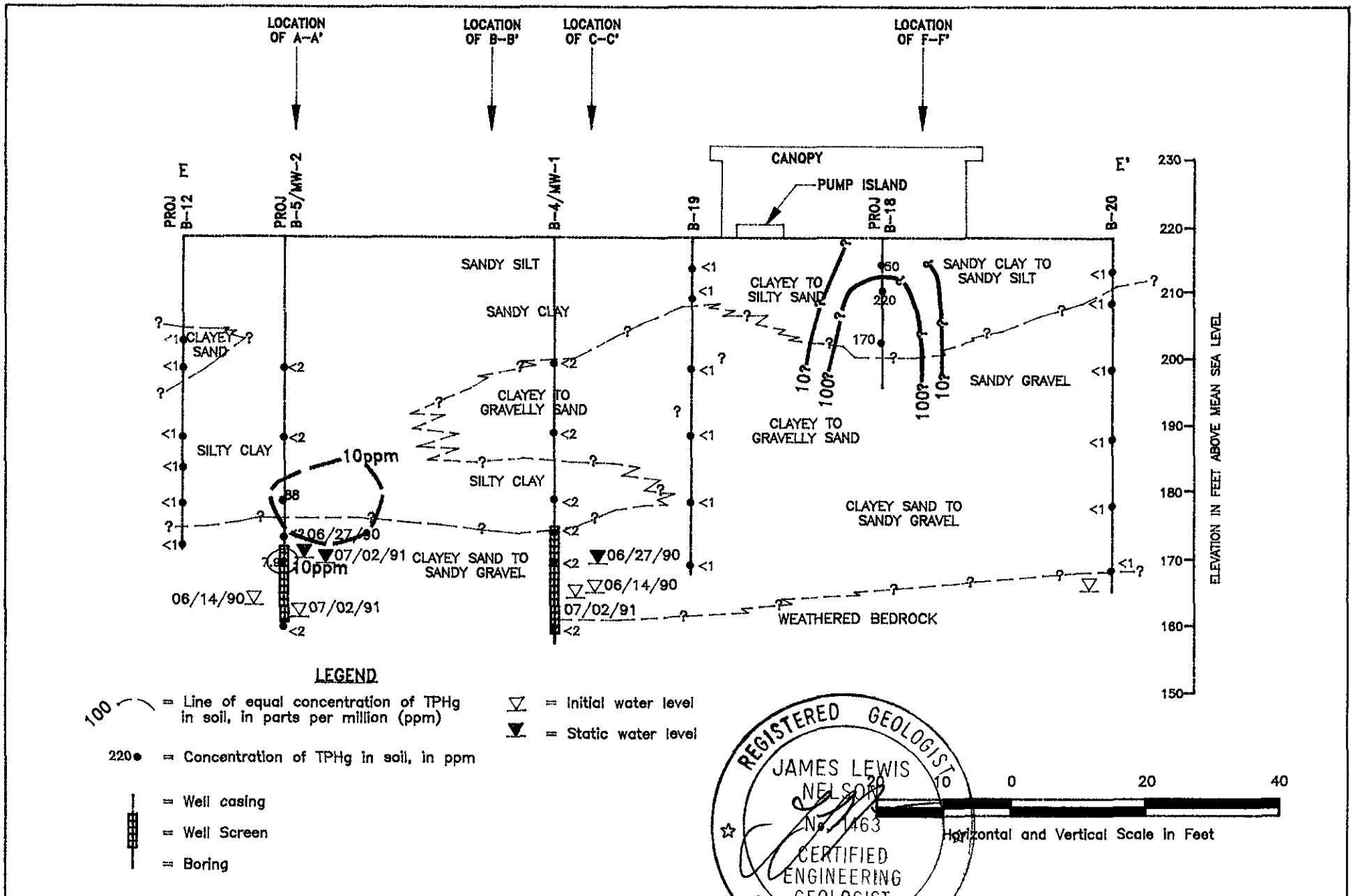


PLATE
9

GEOLOGIC CROSS SECTION E-E'

**ARCO Station 2152
22141 Center Street
Castro Valley, California**

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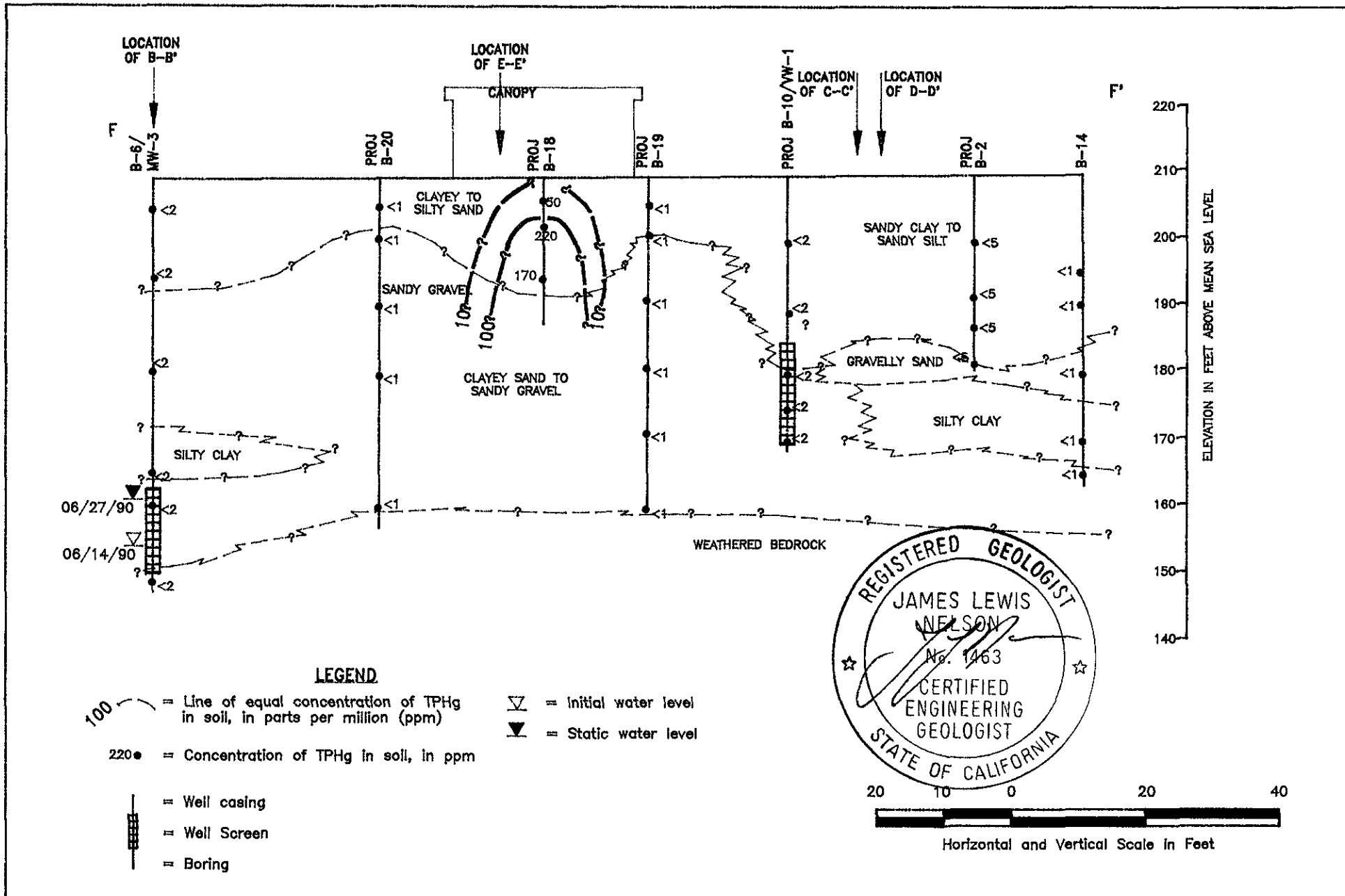


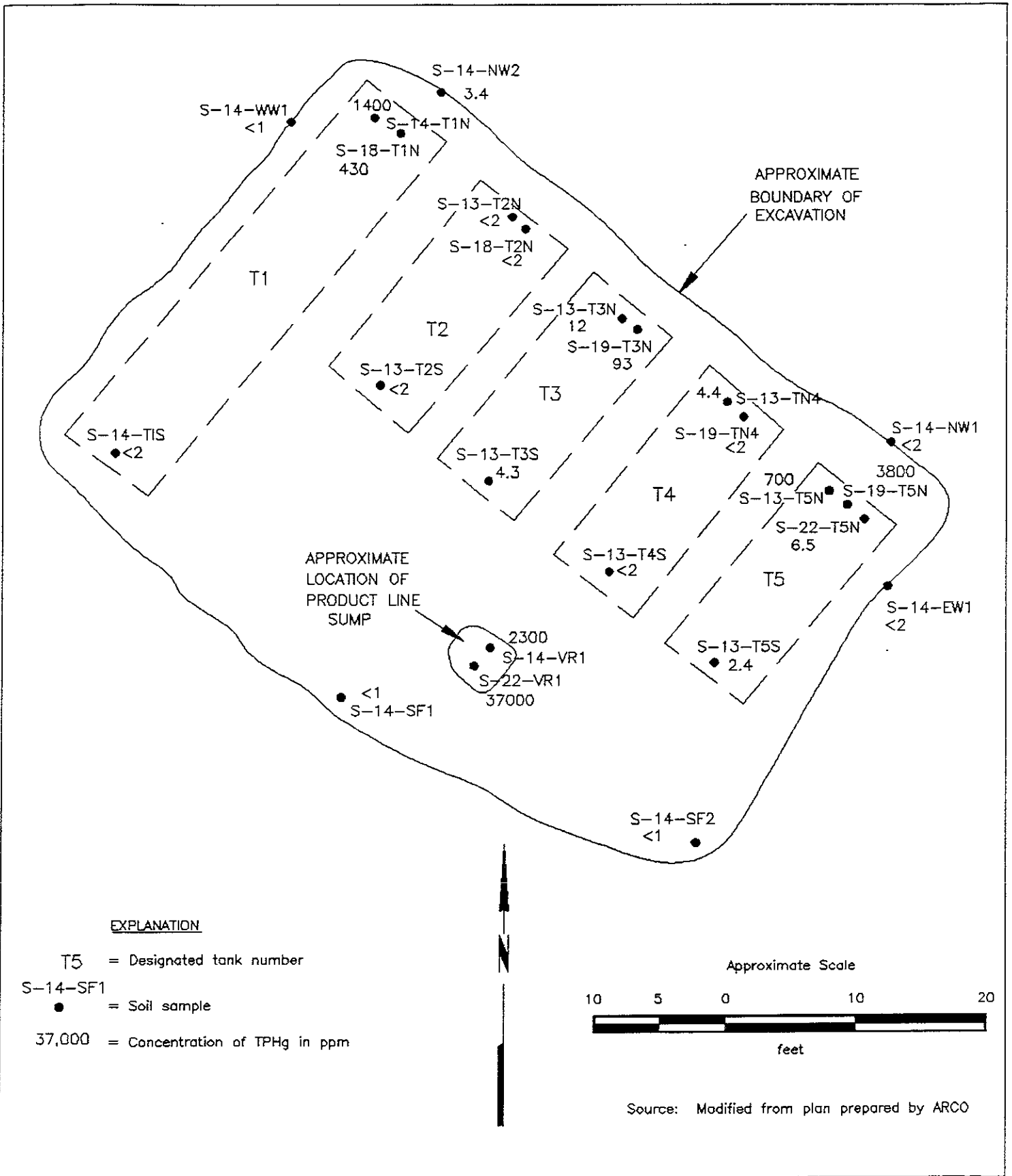
PLATE
10

GEOLOGIC CROSS SECTION F-F'

ARCO Station 2152
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Castro Valley, California

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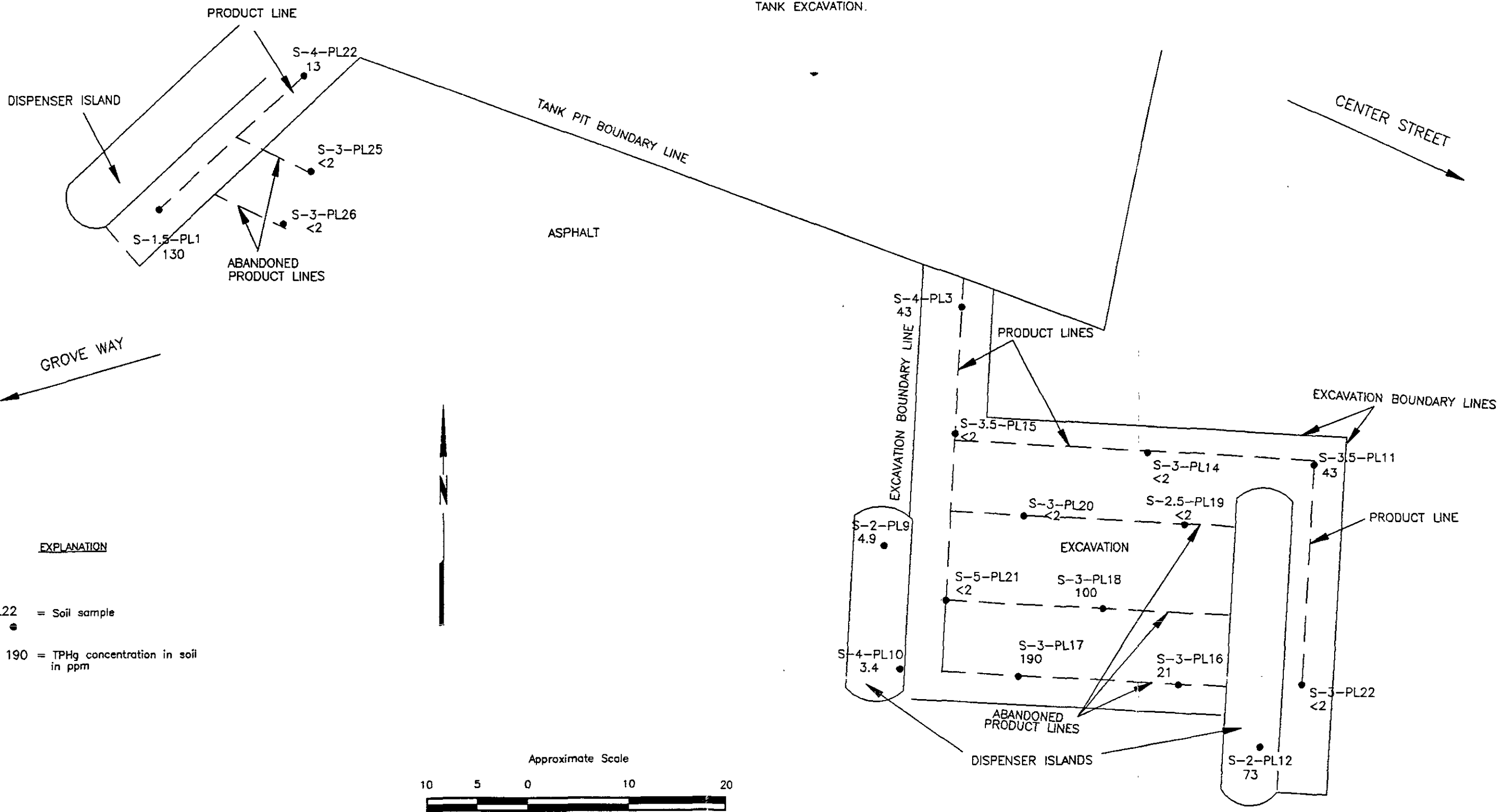
PROJECT 69013.08



TANK PIT SOIL SAMPLING LOCATIONS
ARCO Station 2152
22141 Center Street
Castro Valley, California

PLATE
11

PROJECT 69013.08



PRODUCT-LINE SOIL SAMPLE LOCATIONS
ARCO Station 2152
22141 Center Street
Castro Valley, California

PLATE
12



TABLE 1
 RESULTS OF LABORATORY ANALYSES
 OF SOIL SAMPLES
 ARCO Station 2152
 Castro Valley, California

Sample ID	Date	TPHg	B	T	E	X
S-4.5-B19	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-9.5-B19	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-19.5-B19	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-29.5-B19	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-39.5-B19	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-49.5-B19	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-4.5-B20	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-9.5-B20	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-19.5-B20	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-29.5-B20	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-39.5-B20	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-50-B20	02/12-13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
CPSS-1,2,3,4	02/13/92	<1.0	<0.0050	<0.0050	<0.0050	<0.0050

Results in parts per million (ppm).

TPHg: Total petroleum hydrocarbons as gasoline (analyzed by EPA Methods 5030/8015).

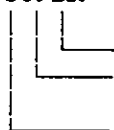
B:benzene T:toluene E:ethylbenzene X:total xylene isomers

BTEX analyzed by EPA Method 8020.

<: Less than the laboratory detection limits.

Sample ID:

S-50-B20



Boring number
 Approximate sample
 depth in feet
 Soil Sample

CPSS-1,2,3,4



Composite sample
 Composite Soil Sample

APPENDIX A
PREVIOUS WORK

PREVIOUS WORK

May 1989 Limited Site Assessment

AGS performed a limited site assessment (AGS, May 26, 1989) to evaluate the presence of gasoline hydrocarbons in soil near the underground gasoline-storage tanks prior to ARCO's planned tank replacement at the site. The work involved drilling three soil borings (B-1 through B-3) close to the fill ends of the tanks. The locations of these borings are shown on Plate 2. Results of laboratory analysis of soil samples from the borings indicated nondetectable concentrations (<5.0 ppm) of gasoline hydrocarbons, with the exception of two samples collected from depths of 30 and 35 feet in boring B-1 (5.1 ppm TPHg) and two samples collected from depths of 5 and 10 feet in boring B-3 (460 and 5.6 ppm TPHg, respectively). Groundwater was not encountered in the borings drilled to depths of 45 feet. Results of laboratory analyses of soil samples collected during the drilling are summarized in Table A-1, Cumulative Results of Laboratory Analyses of Soil Samples.

August through October 1989 Tank Removal and Replacement

In September 1989, B-8 and B-9 were drilled to evaluate the lateral and vertical extent of gasoline hydrocarbons in soil in the tank pit. Twelve inch diameter polyvinyl chloride (PVC) conductor casings were installed in the borings to provide access for future exploratory drilling and/or well installation. The earth materials encountered during this investigation consisted primarily of silty to sandy clay and clayey sand to sandy gravel. In general, silty to sandy clay with some interbeds of clayey sand to sandy gravel up to 20 feet thick was encountered beneath the surface asphalt. In addition, the tank pit is backfilled with pea gravel to a depth of approximately 20 feet. Clayey sand to sandy gravel was encountered between the depths of approximately 42 and 58 feet. Groundwater was encountered within the clayey sand to sandy gravel at depths of approximately 52 to 56 feet. Hard, dry claystone bedrock was encountered beneath the clayey sand to sandy gravel to the bottom of the deepest boring.

The former underground gasoline-storage tanks and product-dispenser lines were removed from the site by Paradiso Construction Company on August 17, 1989 and during September 9 through October 4, 1989 (AGS, January 18, 1990). Based on field observations, no holes were noted in the tanks during removal. AGS collected soil samples from the former tank pit from depths of 13 to 22 feet and from beneath the former product-dispenser lines. The results of the laboratory analyses of soil samples from the gasoline-tank pit indicated significant concentrations (up to 37,000 ppm) of TPHg in soil at depths of 13 and 22 feet beneath the former product line sump. AGS also collected soil samples from beneath the former product-dispenser lines. TPHg concentrations ranging from <2.0 ppm to 73 ppm

were reported in 11 soil samples collected from beneath the lines at a depth of approximately three feet, and TPHg concentrations of 100 to 190 ppm were reported in soil samples from the southwestern ends of the dispenser islands near Grove Way and Center Street. Results of laboratory analyses of the samples collected from the former tank pit and beneath the former product lines are presented on Tables A-2 and A-3.

Approximately 1,850 cubic yards of soil excavated from the gasoline-tank pit and the product-dispenser line trenches were aerated onsite between August 21 and October 10, 1989 in accordance with Regulation 8, Rule 40 of the Bay Area Air Quality Management District (BAAQMD). AGS collected composite soil samples from the aerated soil to verify TPHg concentrations of 100 ppm or lower. Paradiso Construction Company arranged for the soil to be transported to Redwood Landfill in Novato, California by Conrad Trucking of Escalon, California. Three new, 12,000-gallon, fiberglass tanks were installed at the site by Paradiso Construction Company along with new product delivery lines in September 1989.

Based on the findings from this limited subsurface investigation, AGS concluded the following: the vertical extent of gasoline hydrocarbons in soil beneath the former tanks had not been delineated; the lateral extent of gasoline hydrocarbons in the area of the former tanks above depths of approximately 14 feet appeared to be limited to the tank-pit area, with the possible exception of the northwestern side of the tank pit; and the extent of gasoline hydrocarbons was not delineated near the southwestern ends of the dispenser islands. As a result, AGS proposed a subsurface investigation to delineate the gasoline hydrocarbons onsite.

June through September 1990 Subsurface Investigation

In June 1990, AGS conducted a subsurface investigation to evaluate the extent of gasoline hydrocarbons in soil and groundwater beneath the site (AGS, November 13, 1990). This work included drilling six soil borings (B-4 through B-7, B-10, and B-11), constructing four 4-inch-diameter groundwater monitoring wells (MW-1 through MW-4) in borings B-4 through B-7, respectively, constructing two 2-inch-diameter vadose zone monitoring wells (VW-1 and VW-2), collecting soil samples for laboratory analysis, developing the wells, collecting water samples for laboratory analysis, evaluating the groundwater flow direction and gradient, performing a well search, and preparing a report documenting the findings and conclusions.

Based on the results of the subsurface investigation, it was concluded that:

- o elevated concentrations of gasoline hydrocarbons previously reported beneath the former gasoline-storage tanks and product line sump appear to be limited laterally to the tank pit area, with the possible exception of the areas northwest of the tank pit near boring B-3, and the northeastern corner of the tank pit;
- o the vertical extent of gasoline hydrocarbons in soil beneath the former tank pit, and the lateral and vertical extent of gasoline hydrocarbons beneath the dispenser islands have not been delineated; and
- o analyses of groundwater samples collected on June 25 and 26, 1990, indicated the presence of low concentrations of gasoline hydrocarbons with TPHg ranging from 27 to 64 parts per billion (ppb) in wells MW-1 through MW-3, benzene ranging from 0.63 to 0.65 ppb in wells MW-1 and MW-3, toluene at 1.5 ppb, and total xylenes at 2.0 ppb in well MW-3. These concentrations were below regulatory action levels. Analyses of groundwater samples collected on September 26, 1990, indicated nondetectable concentrations of gasoline hydrocarbons in MW-1 through MW-4 (see Table 1).

January through April 1991 Supplemental Subsurface and Remediation Investigation

For this investigation, nine soil borings (B-8, B-9, and B-12 through B-18) were drilled on January 14 through 17, and February 21, 1991 (RESNA, July 2, 1991). Borings B-12 and B-14 were drilled northwest and northeast of the former tank pit to delineate the lateral extent of gasoline hydrocarbons in soil in these areas. Borings B-15 through B-18 were drilled in the area of and southwest of the former product lines to evaluate the extent of gasoline hydrocarbons in soil in these areas and in the downgradient direction of groundwater flow from these areas. Because elevated concentrations of gasoline hydrocarbons were detected in the subsurface soil beneath the former tank pit, borings B-8 and B-9 (VW-3 and VW-4) were drilled through polyvinyl chloride (PVC) conductor casing, which had been installed by others within the tank pit during tank replacement activities.

Once borings B-8, B-9, and B-13 were drilled, three vapor-extraction wells (VW-3 through VW-5) were constructed in the soil borings for purposes of performing a vapor-extraction test (VET) and for potential future use in a vapor extraction system (VES). Wells VW-3 and VW-4 were constructed through 12-inch diameter PVC conductor casing previously installed within the tank pit during tank replacement activities at the site. The wells were completed with 4-inch-diameter PVC casing. Well casings were set in the wells to depths of approximately 32 to 39 feet. The screened casings for the monitoring wells consist of 4-inch-diameter machine-slotted PVC with 0.020-inch-wide slots set from the total depth of the well to depth of approximately 24 to 28 feet. Solid casing was set from the top of the screened casing to a few inches below the ground surface.

Vapor Extraction Test

RESNA performed a VET onsite on February 15, 1991. Two objectives of the VET were: (1) to collect operational data to evaluate the efficiency and practicality of vapor extraction as a soil remediation alternative; and (2) to select the most appropriate off-gas treatment alternative, if the operational data suggests that vapor-extraction is recommended.

The vapor-extraction equipment consisted of: (1) a six-cylinder internal combustion (I.C.) engine; (2) instrumentation for measuring air flow, air velocity, air pressure, temperature, electrical current, and volatile organic compound (VOC) concentrations; and (3) PVC piping, fittings, and wellhead connections.

Five vapor-extraction wells installed onsite were used for the VET. The location of these wells, as well as other pertinent site features, are shown on the Generalized Site Plan, Plate 2. RESNA operated the VET for approximately six hours. The vapor-extraction equipment was operated for twenty-minutes each on vapor-extraction wells VW-1, VW-2, and VW-3 before collecting a sample from each well.

RESNA then operated the vapor-extraction equipment on vapor-extraction well VW-5 for approximately two hours while monitoring the change in vacuum at observation wells VW-2, VW-3, VW-4, and VW-1. The distances between vapor-extraction well VW-5 and VW-2, VW-3, VW-4, and VW-1 are 29.0, 27.7, 48.5, and 61.9 feet, respectively. Air flow rate, vacuum, VOC concentration, and temperature were monitored at the influent to the I.C. engine. One influent air sample was collected after system stabilization, and a second influent and an effluent sample were taken after two hours of operation. The effluent sample was taken to verify the destruction efficiency of the I.C. engine of both benzene and TPHg.

RESNA then operated the vapor-extraction equipment on vapor-extraction well VW-1 for approximately two hours while monitoring the change in vacuum at wells VW-2, VW-3, VW-4, and VW-5. The distances between vapor-extraction well VW-1 and VW-2, VW-3, VW-4, and VW-5 are 61.3, 34.5, 17.7 and 61.9 feet, respectively. Air flow rate, vacuum, VOC concentration, and temperature were monitored at the influent to the I.C. engine. One influent air sample was collected after system stabilization, and a second influent sample was taken after two hours of operation.

The results of the investigation were as follows:

- o laboratory analysis of soil samples collected from borings B-8 and B-9, drilled through the conductor casing in the former tank pit, indicated nondetectable concentrations of TPHg (below method detection limit [MDL] of 1.0 ppm), with the exception of 680 ppm TPHg reported in a sample collected from a depth of 22 feet in boring B-9;
- o laboratory analysis of soil samples collected from borings B-12, B-13, and B-14, drilled north and northeast of the former tank pit, indicated nondetectable concentrations of TPHg at depths of approximately 15 to 45 feet;
- o laboratory analysis of soil samples collected from borings B-15 through B-18, drilled at and downgradient (southwest) of the former product lines, indicated nondetectable concentrations of TPHg, with the exception of 1.7 ppm TPHg reported in a sample collected from a depth of 2 feet in boring B-16, and 50 ppm, 220 ppm, and 170 ppm from depths of 4, 8, and 15-1/2 feet in boring B-18. Laboratory analysis for organic lead of samples from borings B-17 and B-18 indicated nondetectable (mdl of 0.5 ppm) concentrations;
- o the vacuum impact across the 20 foot deep pea gravel backfill in the tank pit was determined to be greater than 61 feet at a vapor extraction test vacuum of 40 to 48 inches of water and an extraction point flow rate greater than 50 cubic feet per meter (cfm). The pea gravel exhibits very high porosity to air flow and impacted field test results;
- o the vacuum impact in the silty clay layer of native soil below the tank pit backfill was determined to be less than 10 feet at the same vacuum and air flow rates above;
- o well VW-2 showed no measurable vacuum impact in either test run primarily because it is screened in the silty clay layer and is not sufficiently close to the pea gravel backfill to be impacted at the test vacuums and air flow rates tested; and
- o TPHg vapor concentrations from the wells ranged from nondetectable to 3,600 ppm.

The results from the vapor-extraction tests on VW-1 through VW-5 are presented on Table A-4, Vapor-Extraction Test Field Monitoring Data and Table A-5, Vapor Extraction Test Laboratory Analytical Data.

Cumulative Groundwater Monitoring

Cumulative groundwater monitoring at the site has established an approximate gradient of 0.01 toward the southwest. Groundwater monitoring was initiated at the site in June 1990. The depths-to-water measurements and wellhead elevations are shown on Table A-6, Cumulative Groundwater Monitoring. Gasoline hydrocarbons have not significantly impacted the groundwater during the past quarterly monitoring episodes conducted at the site. The analytical results of groundwater are shown on Table A-7, Cumulative Results of Laboratory Analyses of Groundwater Samples.

TABLE A-1
 CUMULATIVE RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
 ARCO Station 2152
 Castro Valley, California
 Page 1 of 3

Date	Sample ID	TPHg	B	T	E	X
4/13/89	S-10-B1	<2.0	<0.050	<0.050	<0.050	<0.050
4/13/89	S-20-B1	<2.0	0.11	0.15	<0.050	0.19
4/13/89	S-25-B1	<2.0	0.22	0.34	0.088	0.38
4/13/89	S-30-B1	5.1	0.42	0.89	0.11	0.56
4/13/89	S-35-B1	5.1	0.40	0.72	0.094	0.42
4/13/89	S-40-B1	<2.0	0.10	<0.050	<0.050	<0.050
4/13/89	S-45-B1	<2.0	<0.050	<0.050	<0.050	<0.050
4/13/89	S-10-B2	<2.0	<0.050	<0.050	<0.050	<0.050
4/13/89	S-20-B2	<2.0	<0.050	<0.050	<0.050	<0.050
4/13/89	S-25-B2	<2.0	<0.050	<0.050	<0.050	<0.050
4/13/89	S-30-B2	<2.0	<0.050	<0.050	<0.050	<0.050
4/13/89	S-5-B3	460	5.1	34	9.6	51
4/13/89	S-10-B3	5.6	<0.050	0.11	<0.050	1.0
4/13/89	S-20-B3	<2.0	<0.050	<0.050	0.055	0.068
4/13/89	S-25-B3	<2.0	<0.050	<0.050	0.17	0.16
4/13/89	S-30-B3	<2.0	<0.050	<0.050	<0.050	<0.050
6/15/90	S-20-B4	<2.0	<0.050	<0.050	<0.050	<0.050
6/15/90	S-29.5-B4	<2.0	<0.050	<0.050	<0.050	<0.050
6/15/90	S-40-B4	<2.0	<0.050	<0.050	<0.050	<0.050
6/15/90	S-44.5-B4	<2.0	<0.050	<0.050	<0.050	<0.050
6/15/90	S-49.5-B4	<2.0	<0.050	<0.050	<0.050	<0.050
6/15/90	S-59-B4	<2.0	<0.050	<0.050	<0.050	<0.050
6/14/90	S-20-B5	<2.0	<0.050	<0.050	<0.050	0.077
6/14/90	S-30-B5	<2.0	0.17	<0.050	<0.050	0.16
6/14/90	S-40-B5	88	2.1	7.2	1.8	13
6/14/90	S-45-B5	<2.0	<0.050	<0.050	<0.050	<0.050
6/14/90	S-49.5-B5	7.9	<0.050	<0.050	<0.050	0.096
6/14/90	S-59-B5	<2.0	<0.050	<0.050	<0.050	<0.050
6/12/90	S-5-B6	<2.0	<0.050	<0.050	<0.050	<0.050
6/12/90	S-15-B6	<2.0	<0.050	<0.050	<0.050	<0.050
6/12/90	S-29.5-B6	<2.0	<0.050	<0.050	<0.050	<0.050
6/12/90	S-44.5-B6	<2.0	<0.050	<0.050	<0.050	<0.050
6/12/90	S-49.5-B6	<2.0	<0.050	<0.050	<0.050	<0.050
6/12/90	S-62-B6	<2.0	<0.050	<0.050	<0.050	<0.050

See notes on page 3 of 3.

TABLE A-1
 CUMULATIVE RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
 ARCO Station 2152
 Castro Valley, California
 Page 2 of 3

Date	Sample ID	TPHg	B	T	E	X
6/13/90	S-5-B7	<2.0	<0.050	<0.050	<0.050	<0.050
6/13/90	S-15-B7	<2.0	<0.050	<0.050	<0.050	<0.050
6/13/90	S-30-B7	<2.0	<0.050	<0.050	<0.050	<0.050
6/13/90	S-44.5-B7	<2.0	<0.050	0.10	<0.050	0.093
6/13/90	S-49-B7	<2.0	<0.050	<0.050	<0.050	<0.050
6/13/90	S-61-B7	<2.0	<0.050	<0.050	<0.050	<0.050
1/16/91	S-20-B8	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-15-B8	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-33-B8	<1.0	0.006	<0.005	<0.005	<0.005
1/16/91	S-39-B8	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-22-B9	680	<0.005	19	16	91
1/16/91	S-26-B9	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-29-B9	<1.0	0.006	<0.005	<0.005	<0.005
1/16/91	S-33-B9	<1.0	<0.005	<0.005	<0.005	<0.005
6/18/90	S-10-B10	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-20-B10	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-30-B10	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-35-B10	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-40-B10	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-5-B11	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-15-B11	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-25-B11	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-35-B11	<2.0	<0.05	<0.05	<0.05	<0.05
6/18/90	S-40-B11	<2.0	<0.05	<0.05	<0.05	<0.05
1/16/91	S-15-B12	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-30-B12	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-35-B12	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-40-B12	<1.0	0.028	<0.005	<0.005	<0.005
1/16/91	S-47-B12	<1.0	0.028	<0.005	<0.005	0.006
1/16/91	S-15-B13	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-20-B13	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-25-B13	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-30-B13	<1.0	0.033	<0.005	<0.005	0.018
1/16/91	S-35-B13	<1.0	0.030	<0.005	<0.005	<0.005
1/16/91	S-40-B13	<1.0	0.096	<0.005	<0.005	<0.005
1/16/91	S-45-B13	<1.0	<0.005	<0.005	<0.005	<0.005

See notes on page 3 of 3.

TABLE A-1
 CUMULATIVE RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
 ARCO Station 2152
 Castro Valley, California
 Page 3 of 3

Date	Sample ID	TPHg	B	T	E	X
1/16/91	S-15-B14	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-20-B14	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-30-B14	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-40-B14	<1.0	<0.005	<0.005	<0.005	0.007
1/16/91	S-45-B14	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-5-B15	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-10-B15	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-2-B16	1.7	0.037	<0.005	0.080	<0.005
1/16/91	S-5-B16	<1.0	<0.005	<0.005	<0.005	<0.005
1/16/91	S-10-B16	<1.0	<0.005	<0.005	<0.005	<0.005
2/14/91	S-5½-B17*	<1.0	<0.005	<0.005	<0.005	0.007
2/14/91	S-10-B17*	<1.0	<0.005	<0.005	<0.005	<0.005
2/14/91	S-4-B18*	50	0.12	1.2	0.62	4.3
2/14/91	S-8-B18*	220	0.31	7.3	5.5	36
2/14/91	S-15½-B18*	170	0.84	9.0	4.4	24
1/29/91	S-0129- SP1,2,3,4*	<0.5	<0.005	<0.005	<0.005	<0.005
4/11/91	S-0411- 1A,B,C,D	<1.0	<0.0050	<0.0050	<0.0050	<0.0050

Results in parts per million (ppm).

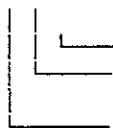
TPHg: Total petroleum hydrocarbons as gasoline (analyzed by EPA Method 5030).

B:benzene T:toluene E:ethylbenzene X:total xylene isomers

BTEX analyzed by EPA Method 8020.

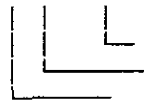
*: Selected samples analyzed for Organic Lead (by California Luft method [12/87]) and nondetectable concentrations (see lab sheets for detection limits) were reported in all samples.

Sample ID: S-40-B11



Boring number
 Approximate sample
 depth in feet
 Soil Sample

S-0129-SP1,2,3,4



Composite sample
 Sample date
 Soil Sample

TABLE A-2
 RESULTS OF LABORATORY ANALYSES OF TANK-PIT SOIL SAMPLES
 ARCO Station 2152
 Castro Valley, California

Date	Sample #	TPHg	B	T	E	X
<u>Tank-Pit Excavation</u>						
08/18/89	S-14-T1S	<2	0.24	<0.05	<0.05	<0.05
08/18/89	S-13-T2S	<2	<0.05	<0.05	<0.05	<0.05
08/18/89	S-13-T3S	4.3	0.09	<0.05	<0.05	<0.05
08/18/89	S-13-T4S	<2	<0.05	<0.05	<0.05	<0.05
08/18/89	S-13-T5S	2.4	<0.05	<0.05	<0.05	<0.05
08/18/89	S-14-T1N	1,400	0.72	6.1	11	130
08/18/89	S-13-T2N	<2	0.076	<0.05	1.1	8.5
08/18/89	S-13-T3N	12	0.29	0.29	0.22	1.3
08/18/89	S-13-T4N	4.4	<0.05	<0.05	<0.05	0.23
08/18/89	S-13-T5N	700	4.6	2.0	4.6	83
08/18/89	S-18-T1N	430	<0.05	<0.05	1.1	8.5
08/18/89	S-18-T2N	<2	0.076	<0.05	<0.05	0.092
08/18/89	S-19-T3N	93	0.11	0.11	0.74	3.5
08/18/89	S-19-T4N	<2	<0.05	<0.05	<0.05	<0.05
08/18/89	S-19-T5N	3,800	<0.05	15	18	150
08/24/89	S-22-T5N	6.5	<0.05	0.36	0.093	0.82
08/22/89	S-14-NW1	<2	<0.05	<0.05	<0.05	<0.05
08/22/89	S-14-EW1	<2	<0.05	<0.05	<0.05	<0.05
08/30/89	S-14-NW2	3.4	<0.005	<0.005	<0.005	.030
08/30/89	S-14-WW1	<1	<0.005	<0.005	<0.005	<0.005
08/30/89	S-14-SF1	<1	<0.005	<0.005	<0.005	<0.005
08/30/89	S-14-SF2	<1	<0.005	<0.005	<0.005	<0.005
08/30/89	S-14-VR1	2,300	<2	<2	19	146
08/30/89	S-22-VR1	37,000	<40	510	38	2,600

Results in milligrams per kilogram (mg/kg) or parts per million (ppm).

TPHg: Total petroleum hydrocarbons as gasoline

B: Benzene T: Toluene E: Ethylbenzene X: Total xylenes

<: Less than the detection limit for the analysis method.

Sample Identification:

S-14-T1S

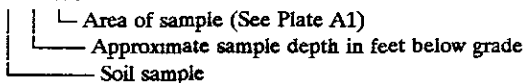


TABLE A-3
 RESULTS OF LABORATORY ANALYSES OF PRODUCT-LINE SOIL SAMPLES
 ARCO Station 2152
 Castro Valley, California

Date	Sample #	TPHg	B	T	E	X
<u>Center Street Dispensers</u>						
09/06/89	S-4-PL3	43	1.0	3.2	0.74	4.0
09/06/89	S-2-PL9	4.9	0.24	0.18	0.16	0.64
09/06/89	S-4-PL10	3.4	0.21	0.18	0.11	0.25
09/06/89	S-3.5-PL11	43	1.0	3.2	0.74	4.0
09/06/89	S-2-PL12	73	0.13	<0.050	0.60	3.6
09/11/89	S-3-PL14	<2	<0.050	<0.050	<0.050	<0.050
09/11/89	S-3.5-PL15	<2	<0.050	<0.050	<0.050	0.087
09/15/89	S-3-PL16	21	0.14	0.84	0.42	2.5
09/15/89	S-3-PL17	190	0.85	7.4	2.3	14
09/15/89	S-3-PL18	100	0.72	3.3	1.2	7.2
09/15/89	S-2.5-PL19	<2	<0.050	<0.050	<0.050	<0.050
09/15/89	S-3-PL20	<2	<0.050	<0.050	<0.050	<0.050
09/15/89	S-5-PL21	<2	<0.050	<0.050	<0.050	<0.050
09/15/89	S-3-PL22	<2	<0.050	<0.050	<0.050	<0.050
<u>Grove Street Dispensers</u>						
09/06/89	S-1.5-PL1	130	1.6	3.8	2.4	13
09/19/89	S-4-PL22	13	0.20	0.97	0.16	1.2
10/04/89	S-3-PL25	<2	<0.050	<0.05	<0.050	<0.050
10/04/89	S-3-PL26	<2	<0.050	<0.050	<0.050	<0.050

Results in milligrams per kilogram (mg/kg) or parts per million (ppm).

TPHg: Total petroleum hydrocarbons as gasoline

B: Benzene T: Toluene E: Ethylbenzene X: Total xylenes

<: Less than the detection limit for the analysis method.

Sample identification:

S-4-PL3



Area of sample (See Plate A2)

Approximate sample depth in feet below grade

Soil sample

TABLE A-4
 VAPOR-EXTRACTION TEST FIELD MONITORING DATA
 ARCO Station 2152
 Castro Valley, California

Extraction Point VW-5

Flow	Influent Air Stream		Temp.	Observation Wells			
	Concentration	Vacuum		VW-2 Vacuum	VW-3 Vacuum	VW-4 Vacuum	VW-1 Vacuum
>50	<400	40	72	<0.01	.04	<0.01	<0.01
>50	400	42	72	<0.01	.04	<0.01	<0.01
>50	400	42	72	<0.01	.04	<0.01	<0.01
>50	<400	42	72	<0.01	.04	<0.01	<0.01
>50	<400	42	72	<0.01	.04	<0.01	<0.01
Distance from extraction well VW-5 (feet):				29.0	27.7	48.4	61.9

Extraction Point VW-1

Flow	Influent Air Stream		Temp.	Observation Wells			
	Concentration	Vacuum		VW-2 Vacuum	VW-3 Vacuum	VW-4 Vacuum	VW-5 Vacuum
>50	200	42	72	<0.01	<0.01	.08	.01
>50	200	48	72	<0.01	<0.01	.09	.01
>50	<200	48	72	<0.01	<0.01	.08	.01
>50	<200	48	70	<0.01	0.01	.08	.01
>50	<200	48	70	<0.01	0.01	.08	.01
Distance from extraction well VW-1 (feet):				61.3	34.5	17.7	61.9

Flow measured in cubic feet per minute (cfm).
 Concentration measured in parts per million by volume (ppmv) on Photoionization Meter.
 Vacuum measured in inches of water column vacuum.
 Temperature measured in degrees Fahrenheit.

TABLE A-5
VAPOR-EXTRACTION TEST LABORATORY ANALYTICAL DATA
ARCO Station 2152
Castro Valley, California

Vapor Sample number	Taken from	Elapsed time	Benzene	Toluene	Ethylbenzene	Xylenes	TPH
AS-0215-1	VW-1 inf	20	<85	340	140	840	43
AS-0215-2	VW-2 inf	20	<85	13,000	2,500	5,800	3,400
AS-0215-3	VW-3 inf	20	<85	<250	68	430	<30
AS-0215-4	VW-5 inf	15	3,600	480	1,600	6,100	170
AS-0215-5	VW-5 inf	120	400	<250	230	880	36
AS-0215-6	VW-5 eff	125	<85	<250	230	1,700	<30
AS-0215-7	VW-1 inf	5	92	<250	140	1,000	<30
AS-0215-8	VW-1 inf	120	<85	620	270	1,400	110

All measurements are in parts per billion by volume (ppbv); except 1) Time, which is measured in minutes, and 2) TPH, which is measured in parts per million by volume (ppmv).

TABLE A-6
 CUMULATIVE GROUNDWATER MONITORING DATA
 ARCO Station 2152
 Castro Valley, California
 (Page 1 of 3)

Date Well Measured	Depth of Well	Well Elevation	Static Water Depth	Water Elevation	
<u>MW-1</u>					
06/25/90	58.10	217.16	49.80	167.36	
09/07/90			50.00	167.16	
09/26/90			50.09	167.07	
12/14/90			50.44	166.72	
01/08/91			50.45	166.71	
02/21/91			50.51	166.65	
03/19/91			50.16	167.00	
04/02/91			50.14	167.02	
05/02/91			57.80	49.77	167.39
06/18/91				49.75	167.41
07/08/91				49.80	167.36
08/22/91				50.08	167.08
09/18/91				50.11	167.05
10/15/91				50.30	166.86
11/13/91				50.30	166.86
12/27/91	50.28	166.88			
01/18/92	50.39	166.77			
02/20/92	50.16	167.00			
03/13/92	49.75	167.41			
06/08/92	49.30	167.86			
<u>MW-2</u>					
06/25/90	59.20	216.50	49.04	167.46	
09/07/90			49.22	167.28	
09/26/90			49.32	167.18	
12/14/90			49.66	166.84	
01/08/91			49.72	166.78	
02/21/91			49.77	166.73	
03/19/91			49.44	167.06	
04/02/91			49.43	167.07	
05/02/91			58.90	49.03	167.47
06/18/91				48.98	167.52
07/08/91				49.03	167.47
08/22/91				49.30	167.20
09/18/91				49.34	167.16
10/15/91				49.51	166.99
11/13/91				49.53	166.97
12/27/91	49.49	167.01			
01/18/92	49.60	166.90			
02/20/92	49.39	167.11			
03/13/92	48.97	167.53			
06/08/92	48.50	168.00			

See notes on Page 3 of 3.

TABLE A-6
 CUMULATIVE GROUNDWATER MONITORING DATA
 ARCO Station 2152
 Castro Valley, California
 (Page 2 of 3)

Date Well Measured	Depth of Well	Well Elevation	Static Water Depth	Water Elevation
<u>MW-3</u>				
06/25/90	59.70	217.57	50.55	167.02
09/07/90			50.73	166.84
09/26/90			50.81	166.76
12/14/90			51.15	166.42
01/08/91			51.16	166.41
02/21/91			51.21	166.36
03/19/91			50.93	166.64
04/02/91			50.92	166.65
05/02/91	59.34		50.51	167.06
06/18/91			50.47	167.10
07/08/91			50.54	167.03
08/22/91			50.80	166.77
09/18/91			50.82	166.75
10/15/91			51.02	166.55
11/13/91			51.03	166.54
12/27/91			51.01	166.56
01/18/92			51.15	166.42
02/20/92			50.84	166.73
03/13/92			50.39	167.18
06/08/92			50.00	167.57
<u>MW-4</u>				
06/25/90	60.30	215.18	48.06	167.12
09/07/90			48.25	166.93
09/26/90			48.35	166.83
12/14/90			48.68	166.50
01/08/91			48.70	166.48
02/21/91			48.76	166.42
03/19/91			48.44	166.74
04/02/91			48.43	166.75
05/02/91	60.00		48.04	167.14
06/18/91			48.00	167.18
07/08/91			48.04	167.14
08/22/91			48.34	166.84
09/18/91			48.35	166.83
10/15/91			48.54	166.64
11/13/91			48.56	166.62
12/27/91			48.52	166.66
01/18/92			48.68	166.50

See notes on Page 3 of 3.

TABLE A-6
CUMULATIVE GROUNDWATER MONITORING DATA
ARCO Station 2152
Castro Valley, California
(Page 3 of 3)

Date Well Measured	Depth of Well	Well Elevation	Static Water Depth	Water Elevation
<u>MW-4 (Cont.)</u>				
02/20/92			48.37	166.81
03/13/92			47.96	167.22
06/08/92			47.52	169.64

Depth measurements in feet. Water elevation is mean sea level.
Static water level measured in feet below top of casing.

TABLE A-7
 CUMULATIVE RESULTS OF LABORATORY ANALYSES
 OF GROUNDWATER SAMPLES
 ARCO Station 2152
 Castro Valley, California

Well	Date	TPHg	B	T	E	X
MW-1	06/26/90	64	0.63	<0.50	<0.50	<0.50
	09/26/90	<50	<0.50	<0.50	<0.50	<0.50
	01/08/91	<50	<0.50	<0.50	<0.50	<0.50
	04/02/91	<50	<0.05	<0.05	<0.05	<0.05
	07/08/91	120	2.3	4.6	1.3	9.6
	10/15/91	<30	<0.30	<0.30	<0.30	<0.30
	03/13/92	<50	<0.50	<0.50	<0.50	<0.50
	06/08/92	<50	<0.50	<0.50	<0.50	<0.50
MW-2	06/26/90	27	<0.50	<0.50	<0.50	<0.50
	09/26/90	<50	<0.50	<0.50	<0.50	<0.50
	01/08/91	<50	<0.50	<0.50	<0.50	<0.50
	04/02/91	<50	<0.05	<0.05	<0.05	<0.05
	07/08/91	30	0.42	0.47	<0.30	0.89
	10/15/91	<30	<0.30	<0.30	<0.30	<0.30
	03/13/92	<50	<0.50	<0.50	<0.50	<0.50
	06/08/92	<50	<0.50	<0.50	<0.50	<0.50
MW-3	06/25/90	52	0.65	1.5	<0.50	2.0
	09/26/90	<50	<0.50	<0.50	<0.50	<0.50
	01/08/91	<50	<0.50	<0.50	<0.50	<0.50
	04/02/91	<50	<0.05	<0.05	<0.05	<0.05
	07/08/91	67	0.69	1.5	0.65	4.7
	10/15/91	<30	<0.30	<0.30	<0.30	<0.30
	03/13/92	<50	<0.50	<0.50	<0.50	<0.50
	06/08/92	<50	<0.50	<0.50	<0.50	<0.50
MW-4	06/25/90	<20	<0.50	<0.50	<0.50	<0.50
	09/26/90	<50	<0.50	<0.50	<0.50	<0.50
	01/08/91	<50	<0.50	<0.50	<0.50	<0.50
	04/02/91	<50	<0.05	<0.05	<0.05	<0.05
	07/08/91	50	1.4	2.4	0.62	4.2
	10/15/91	<30	<0.30	<0.30	<0.30	<0.30
	03/13/92	<50	<0.50	<0.50	<0.50	<0.50
	06/08/92	<50	<0.50	<0.50	<0.50	<0.50

Results in parts per billion (ppb).

TPHg: Total petroleum hydrocarbons as gasoline

B:benzene T:toluene E:ethylbenzene X:total xylene isomers

APPENDIX B
FIELD METHODS

FIELD METHODS

Site Safety Plan

The Site Safety Plan (RESNA, February 11, 1992) describes the safety requirements for the evaluation of gasoline hydrocarbons in soil and groundwater 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 were briefed on the contents of the Site Safety Plan before work began. A copy of the Site Safety Plan was available for reference by appropriate parties during the work. The Staff Geologist of RESNA was Site Safety Officer for the project.

Soil Borings

Prior to the drilling of borings and construction of monitoring wells, permits were acquired from the appropriate regulatory agency. Copies of the permits are included in Appendix C of this report. Prior to drilling, Underground Services Alert was notified of our intent to drill, and known underground utility lines and structures were marked. The borings were drilled by a truck-mounted drill rig equipped with 10- or 12-inch-diameter, hollow-stem augers. The augers were steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. After the borings were drilled, monitoring wells were constructed in the borings, or the borings were backfilled to the ground surface with neat-cement grout and bentonite.

Borings for groundwater monitoring wells were drilled to a depth of no more than 20 feet below the depth at which a saturated zone was first encountered, or a short distance into a stratum beneath the saturated zone which was of moisture content and consistency to be judged as a perching layer by the field geologist, whichever was shallower.

Drill Cuttings

Drill cuttings subjectively evaluated for hydrocarbons at levels greater than 100 ppm were separated from those subjectively evaluated for hydrocarbons at levels less than 100 ppm. Evaluation was based either on subjective evidence of soil discoloration, or on measurements made using a field calibrated OVM. Readings were taken by placing a soil sample into a ziplock-type plastic bag and allowing volatilization to occur. The intake probe of the OVM was then inserted into the headspace created in the plastic bag immediately after opening it. The drill cuttings from the borings were placed on plastic at the site, and covered with plastic. The cuttings were removed to a Sanitary Landfill by ARCO.

Soil Sampling in Borings

Soil samples were collected at no greater than 5-foot intervals from the ground surface to the total depth of the borings. The soil samples were 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 were laboratory-cleaned, steam-cleaned, or washed thoroughly with Alconox® and water, prior to each use. The sampler was driven with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive six inches was counted and recorded to evaluate the relative consistency of the soil.

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

One of the samples in brass sleeves not selected for laboratory analysis at each sampling interval was tested in the field using an OVM that was field calibrated at the beginning of each day it was used. This testing was 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 report.

Upon completion of drilling at the site, four soil samples were collected from the drill cutting pile and prepared for laboratory analysis using the method described above. These samples were sent to and composited in an ARCO-contracted State-certified laboratory to perform the analyses requested within a 48-hour turnaround period. The results were then sent to an ARCO-contracted State licensed waste hauler and the drill cutting pile was removed from the site.

Logging of Borings

A geologist was present to log the soil cuttings and samples using the Unified Soil Classification System. Samples not selected for chemical analysis, and the soil in the sampler shoe, were 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.

APPENDIX C
DRILLING PERMIT



ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

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

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

FOR OFFICE USE

LOCATION OF PROJECT ARCO Station 2152
22141 Center Street
Castro Valley, CA

PERMIT NUMBER 92049
LOCATION NUMBER

CLIENT
Name ARCO Products Company
Address P.O. Box 5811 Phone (415) 571-2434
City San Mateo Zip 94402

PERMIT CONDITIONS

Circled Permit Requirements Apply

APPLICANT
Name RESNA Industries

A. GENERAL

Address 3315 Almaden Exa Phone (408) 264-7723
City San Jose Zip 95118

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.

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

B. WATER WELLS, INCLUDING PIEZOMETERS

PROPOSED WATER SUPPLY WELL USE
Domestic _____ Industrial _____ Other Vapor wells
Municipal _____ Irrigation _____

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.

DILLING METHOD:
Mud Rotary _____ Air Rotary _____ Auger
Cable _____ Other _____

DRILLER'S LICENSE NO. (C-57) 384167

- 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.

WELL PROJECTS
Drill Hole Diameter 10 1/4 in. Maximum
Casing Diameter 4 in. Depth 50 ft.
Surface Seal Depth 10 ft. Number 2

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

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

- E. WELL DESTRUCTION. See attached.

ESTIMATED STARTING DATE 2/11/92
ESTIMATED COMPLETION DATE 2/13/92

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 77968.

APPLICANT'S SIGNATURE Robert D. Conner Date 1/27/92

Approved Wyman Hong Date 28 Jan 92
Wyman Hong

APPENDIX D

LABORATORY ANALYSES REPORTS AND CHAIN OF CUSTODY RECORDS



SEQUOIA ANALYTICAL

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

RECEIVED

FEB 24 1992

RESNA
SAN JOSE

RESNA
3315 Almaden Expressway, Ste 34
San Jose, CA 95118
Attention: Joel Coffman

Project: Arco 2152, Castro Valley

Enclosed are the results from 12 soil samples received at Sequoia Analytical on February 14, 1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2022442	Soil, S-4.5-B19	2/12-13/92	EPA 5030/8015/8020
2022443	Soil, S-9.5-B19	2/12-13/92	EPA 5030/8015/8020
2022444	Soil, S-19.5-B19.2	2/12-13/92	EPA 5030/8015/8020
2022445	Soil, S-29.5-B19	2/12-13/92	EPA 5030/8015/8020
2022446	Soil, S-39.5-B19	2/12-13/92	EPA 5030/8015/8020
2022447	Soil, S-49.5-B19	2/12-13/92	EPA 5030/8015/8020
2022448	Soil, S-4.5-B20	2/12-13/92	EPA 5030/8015/8020
2022449	Soil, S-9.5-B20	2/12-13/92	EPA 5030/8015/8020
2022450	Soil, S-19.5-B20	2/12-13/92	EPA 5030/8015/8020
2022451	Soil, S-29.5-B20	2/12-13/92	EPA 5030/8015/8020
2022452	Soil, S-39.5-B20	2/12-13/92	EPA 5030/8015/8020
2022453	Soil, S-50-B20	2/12-13/92	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
Project Manager



SEQUOIA ANALYTICAL

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

RESNA	Client Project ID: Arco 2152, Castro Valley	Sampled: 2/12-13/92
3315 Almaden Expressway, Ste 34	Matrix Descript: Soil	Received: Feb 14, 1992
San Jose, CA 95118	Analysis Method: EPA 5030/8015/8020	Analyzed: Feb 19, 1992
Attention: Joel Coffman	First Sample #: 202-2442	Reported: Feb 21, 1992

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	Ethyl Benzene mg/kg (ppm)	Xylenes mg/kg (ppm)
202-2442	S-4.5-B19	N.D.	N.D.	N.D.	N.D.	N.D.
202-2443	S-9.5-B19	N.D.	N.D.	N.D.	N.D.	N.D.
202-2444	S-19.5-B19.2	N.D.	N.D.	N.D.	N.D.	N.D.
202-2445	S-29.5-B19	N.D.	N.D.	N.D.	N.D.	N.D.
202-2446	S-39.5-B19	N.D.	N.D.	N.D.	N.D.	N.D.
202-2447	S-49.5-B19	N.D.	N.D.	N.D.	N.D.	N.D.
202-2448	S-4.5-B20	N.D.	N.D.	N.D.	N.D.	N.D.
202-2449	S-9.5-B20	N.D.	N.D.	N.D.	N.D.	N.D.
202-2450	S-19.5-B20	N.D.	N.D.	N.D.	N.D.	N.D.
202-2451	S-29.5-B20	N.D.	N.D.	N.D.	N.D.	N.D.

Detection Limits:	1.0	0.0050	0.0050	0.0050	0.0050
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Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
 Maria Lee
 Project Manager



SEQUOIA ANALYTICAL

680 Chesapeake Drive • Redwood City, CA 94063
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RESNA	Client Project ID: Arco 2152, Castro Valley	Sampled: 2/12-13/92
3315 Almaden Expressway, Ste 34	Matrix Descript: Soil	Received: Feb 14, 1992
San Jose, CA 95118	Analysis Method: EPA 5030/8015/8020	Analyzed: Feb 19, 1992
Attention: Joel Coffman	First Sample #: 202-2452	Reported: Feb 21, 1992

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

Sample Number	Sample Description	Low/Medium B.P.	Benzene	Toluene	Ethyl	Xylenes
		Hydrocarbons			Benzene	
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
		(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
202-2452	S-39.5-B20	N.D.	N.D.	N.D.	N.D.	N.D.
202-2453	S-50-B20	N.D.	N.D.	N.D.	N.D.	N.D.

Detection Limits:	1.0	0.0050	0.0050	0.0050	0.0050
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Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard.
Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
 Maria Lee
 Project Manager



SEQUOIA ANALYTICAL

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RESNA
3315 Almaden Expressway, Ste 34
San Jose, CA 95118

Client Project ID: Arco 2152, Castro Valley

Attention: Joel Coffman

QC Sample Group: 2022442-53

Reported: Feb 21, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl- benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	A. Maralit	A. Maralit	A. Maralit	A. Maralit
Reporting Units:	mg/kg	mg/kg	mg/kg	mg/kg
Date Analyzed:	Feb 19, 1992	Feb 19, 1992	Feb 19, 1992	Feb 19, 1992
QC Sample #:	BLK021992	BLK021992	BLK021992	BLK021992
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	0.64
Matrix Spike % Recovery:	110	110	110	107
Conc. Matrix Spike Dup.:	0.21	0.20	0.20	0.57
Matrix Spike Duplicate % Recovery:	105	100	100	95
Relative % Difference:	4.7	9.5	9.5	12

SEQUOIA ANALYTICAL

Maria Lee
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 Products Company
Division of AtlanticRichfieldCompany

Task Order No. **2152-91-3A**

Chain of Custody

ARCO Facility no. 2152	City (Facility) Castro Valley	Project manager (Consultant) Joel Coffman	Laboratory name SEQUOIA
ARCO engineer Chuck Carmel	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 264-7723	Contract number
Consultant name RESNA	Address (Consultant) 3315 Almaden Exp. Suite 34 San Jose, CA 95118		Method of shipment SEQUOIA Field rock
		Fax no. (Consultant) (408) 264-2735	Special detection Limit/reporting

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA 8020/8020/8015	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/ISM500E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals <input type="checkbox"/> VOA <input type="checkbox"/> VOA <input type="checkbox"/>	Semim Metals <input type="checkbox"/> VOA <input type="checkbox"/>	CAM Metals EPA 601/7000 TTLC <input type="checkbox"/> STLCL <input type="checkbox"/>	Lead Org./DHS <input type="checkbox"/> Lead EPA 7420/7421 <input type="checkbox"/>	PIH	
			Soil	Water	Other	Ice	Acid																
S-45-B19			✓			✓		2/12/92		✓													
S-95-B19			✓			✓				✓													
S-145-B19			✓			✓																✓	
S-195-B19			✓			✓				✓													
S-25-B19			✓			✓				✓												✓	
S-295-B19			✓			✓				✓												✓	
S-345-B19			✓			✓				✓												✓	
S-395-B19			✓			✓				✓												✓	
S-445-B19			✓			✓				✓												✓	
S-495-B19			✓			✓				✓												✓	
S-45-B20			✓			✓		2/13/92		✓													
S-95-B20			✓			✓				✓													
S-145-B20			✓			✓																✓	
S-195-B20			✓			✓				✓													
S-245-B20			✓			✓																✓	
S-295-B20			✓			✓				✓												✓	

Method of shipment: **SEQUOIA Field rock**

Special detection Limit/reporting:

Special QA/QC:

Remarks: **K. A. ... 1412**

Lab number:

Turnaround time:

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample: Good	Temperature received:
Relinquished by sampler Robert D. Campbell	Date 2-14-92 Time 1200
Relinquished by Ken Foltz	Date 2-14-92 Time 1550
Relinquished by	Date
Received by Ken Foltz	Received by laboratory
Received by R. Nugra	Date
	Time

ARCO Products Company 

Division of AtlanticRichfieldCompany

Task Order No. **2152-91-3A**

Chain of Custody

ARCO Facility no. 2152	City (Facility) Castro Valley	Project manager (Consultant) Joel Coffman	Laboratory name SEQUOIA
ARCO engineer Chick Carmel	Telephone no (ARCO)	Telephone no. (Voc) 264-7723	Contract number
Consultant name RESNA	Address (Consultant) 3315 Almaden Exp Suite 34, San Jose, CA 95118		Method of shipment SEQUOIA FIELD TECH
		Fax no (Consultant) 2435	Special detection Limit/reporting

Sample ID	Lab no.	Container no	Matrix			Preservation		Sampling date	Sampling time	BTEX EPA 8020	BTEX/TPH EPA 8010/8015	TPH Modified 8015 Gas Diesel	Oil and Grease 413.1 413.2	TPH EPA 418.1/SM503E	EPA 801/8010	EPA 824/8240	EPA 825/8270	TCLP Metals VOA VOC	Sem Metals VOA VOC	CAM Metals EPA 8010/7000 TTLC STLC	Lead Org/DHS Lead EPA 7420/7421	Hold	Special QA/QC	Remarks
			Soil	Water	Other	Ice	Acid																	
S-34.5-B20			X					2/13/92														X		
S-39.5-B20			X							X												X		
S-44.5-B20			X							X												X		
S-50-B20			X							X												X		
S-52.5-B20			X																			X		

Condition of sample: Good	Temperature received:	Priority Rush 1 Business Day <input type="checkbox"/>
Relinquished by sampler Robert D. Campbell	Date 2-14-92 Time 1200	Rush 2 Business Days <input type="checkbox"/>
Relinquished by Ken Follett	Date 2-11-92 Time 1530	Expedited 5 Business Days <input type="checkbox"/>
Relinquished by	Date	Time
Received by laboratory	Date	Time
		Standard 10 Business Days <input checked="" type="checkbox"/>



SEQUOIA ANALYTICAL

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(415) 364-9600 • FAX (415) 364-9233

FEB 23 1992

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

RESNA
SAN JOSE

Project: Arco 2152, Castro Valley

Enclosed are the results from 1 soil samples received at Sequoia Analytical on February 14, 1992. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
2022234	Soil, CPSS-1-4 Comp.	2/13/92	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
Project Manager



SEQUOIA ANALYTICAL

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RESNA	Client Project ID: Arco 2152, Castro Valley	Sampled: Feb 13, 1992
3315 Almaden Expwy., Suite 34	Matrix Descript: Soil	Received: Feb 14, 1992
San Jose, CA 95118	Analysis Method: EPA 5030/8015/8020	Analyzed: Feb 18, 1992
Attention: Joel Coffman	First Sample #: 202-2234	Reported: Feb 19, 1992

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons			Ethyl Benzene Xylenes	
		mg/kg (ppm)	Benzene mg/kg (ppm)	Toluene mg/kg (ppm)	mg/kg (ppm)	mg/kg (ppm)
202-2234	CPSS-1-4 Comp.	N.D.	N.D.	N.D.	N.D.	N.D.

Detection Limits:	1.0	0.0050	0.0050	0.0050	0.0050
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Low to Medium Boiling Point Hydrocarbons are quantitated against a gasoline standard. Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Maria Lee
 Maria Lee
 Project Manager



SEQUOIA ANALYTICAL

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

RESNA

Client Project ID: Arco 2152, Castro Valley

3315 Almaden Expwy., Suite 34
San Jose, CA 95118

Attention: Joel Coffman

QC Sample Group: 202-2234

Reported: Feb 19, 1992

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl- benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	A. Maralit	A. Maralit	A. Maralit	A. Maralit
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Feb 18, 1992	Feb 18, 1992	Feb 18, 1992	Feb 18, 1992
QC Sample #:	GBLK021892	GBLK021892	GBLK021892	GBLK021892
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	0.53
Matrix Spike % Recovery:	95	90	95	88
Conc. Matrix Spike Dup.:	0.19	0.19	0.19	0.54
Matrix Spike Duplicate % Recovery:	95	95	95	90
Relative % Difference:	0.0	5.4	0.0	1.9

SEQUOIA ANALYTICAL

Maria Lee
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 Products Company

Division of AtlanticRichfieldCompany

Task Order No. **2152-91-3A**

Chain of Custody

ARCO Facility no 2152	City (Facility) Castro Valley	Project manager (Consultant) Joel Coffman	Laboratory name Sequoia
ARCO engineer Chuck Carmel	Telephone no. (ARCO)	Telephone no. (408) 264-7723	Contract number
Consultant name KESNA	Address (Consultant) 3315 Almaden Expressway Suite 34 San Jose, CA 95118		
		Fax no. (408) 264-2435	

Sample I.D.	Lab no.	Container no.	Matrix			Preservation		Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas <input type="checkbox"/> Diesel <input type="checkbox"/>	Oil and Grease 413.1 <input type="checkbox"/> 413.2 <input type="checkbox"/>	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCMP Metals <input type="checkbox"/> VOA <input type="checkbox"/> YOA <input type="checkbox"/>	Semi Metals EPA 6010/7000 TLLC <input type="checkbox"/> STLC <input type="checkbox"/>	Lead Ctg./DHS <input type="checkbox"/> Lead EPA 7420/7421 <input type="checkbox"/>		
			Soil	Water	Other	Ice	Acid															
CPSS-1			1			1		2/13/92			X											
CPSS-2			1			1		↓														
CPSS-3			1			1																
CPSS-4			1			1																

Method of shipment
Sequoia field Tech

Special detection Limit/reporting

Special QA/QC

Remarks
Please Composite these samples for 1 Analysis

Lab number

Turnaround time

Priority Rush 1 Business Day

Rush 2 Business Days

Expedited 5 Business Days

Standard 10 Business Days

Condition of sample: good	Temperature received:
Relinquished by sampler Robert D. Campbell	Date 2-14-92 Time 1200
Relinquished by Ken Follett	Received by Ken Follett Time 1300
Relinquished by	Received by A. NUGRA
Date	Date
Time	Time