A RESNA Company

RESNA
Working To Restore Nature

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the results

SUBSURFACE ENVIRONMENTAL INVESTIGATION

at

ARCO Station 6041
7249 Village Parkway
Dublin, California

60006.02 2/12/92

Report prepared for

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

by

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February 12, 1992

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Applied GeoSystems, Inc.
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Prepared for ARCO Products Company

INTRODUCTION

ARCO Products Company (ARCO) contracted with RESNA Industries, Inc. (RESNA) to conduct a subsurface environmental investigation at ARCO Station 6041 located at 7249 Village Parkway in Dublin, California. The purpose of this work was to evaluate the presence of gasoline hydrocarbons in the soil and groundwater beneath the site; to evaluate impact to first groundwater; and to evaluate the gradient of first groundwater beneath the site. This investigation was initiated after a station customer failed to remove a hose from the vehicle before driving off, resulting in a spill from one of the pumps on the southeastern service island.

Work performed for this investigation included drilling three soil borings (B-1 through B-3), collecting and describing soil samples from the borings, installing and developing three 4-inch-diameter groundwater monitoring wells (MW-1 through MW-3) in the borings, sampling groundwater from the monitoring wells, performing laboratory analyses on selected soil and groundwater samples, measuring groundwater levels, surveying wellhead elevations, and preparing this report presenting field procedures, results, and conclusions. This work was performed as outlined in our Work Plan, (RESNA, August 22, 1991), and Addendum One to Work Plan (RESNA, August 22, 1991). These documents were approved by the Alameda County Health Care Services Agency (ACHCSA) prior to commencement of the investigation.

SITE DESCRIPTION AND BACKGROUND

General

ARCO Station 6041 is located at the northern corner of the intersection of Village Parkway and Amador Valley Boulevard in Dublin, California. The location is shown on Plate 1, Site Vicinity Map. The site is on a relatively flat, predominantly asphalt- and concrete-covered lot at an elevation of approximately 335 feet above mean sea level. Pertinent site features include four service islands (two located in the northwestern portion of the site and two located in the southeastern portion of the site), a station building, four underground gasoline-storage tanks (USTs) in the southern part of the site, and the former waste-oil tank pit adjacent to the northern wall of the station building in the northern portion of the site. Pertinent site features are shown on Plate 2, Generalized Site Plan.

Regional and Local Hydrogeology

ARCO Station 6041 is located in the northwestern end of the Livermore Valley, within the Coast Ranges Geomorphic Province of Northern California. The Livermore Valley is approximately 13 miles long oriented in an east-west direction, approximately 4 miles wide, and is surrounded by hills of the Diablo Range. In the vicinity of the site the valley floor slopes gently to the south-southeast. Soil in the vicinity of the subject site is mapped as holocene alluvium that consists of unconsolidated, moderately to poorly sorted silt and clay rich in organic material interfingered with and graded into coarser grained stream deposits toward higher elevations (E.J. Helley, K.R. Lajoie, W.E. Spangle, and M.L. Blair; 1979). Holocene alluvium (10 to 50 feet thick) overlies pleistocene alluvium consisting of weekly consolidated poorly sorted, irregular interbedded clay, silt, sand and gravel, and older sedimentary deposits. The Calaveras Fault is approximately 1/2-mile west of the site.

The Livermore Valley groundwater basin is divided into subbasins on the basis of fault traces or other hydrogeologic discontinuities (California Department of Water Resources, 1974). The groundwater system in Livermore Valley is a multi-layered system with an unconfined aquifer overlying a sequence of leaky or semiconfined aquifers. The subject site is located within the Dublin groundwater subbasin. The groundwater in this subbasin has

been reported to be at depths ranging from 10 to 60 feet below ground surface (Alameda County Flood Control and Water Conservation District, Zone 7 [ACFCWCD], 1991). The groundwater gradient is generally toward the south-southeast (ACFCWCD, Zone 7; 1991). The principal streams in the vicinity of the site are Alamo Canal which flows 0.6 mile southeast of the site, and Dublin Creek which connects with Alamo Canal 0.6 mile south of the site.

PREVIOUS WORK

Previous subsurface environmental investigations related to the former waste-oil storage tank removal and field observations related to the fuel spillage are summarized in Appendix A.

FIELD WORK

Drilling

Field work at the site was conducted in accordance with RESNA's field protocol in the Work Plan (RESNA, August 22, 1991) and Site Safety Plan (RESNA, August 30, 1991). A description of the field methods and Site Safety Plan is included in Appendix B, Field Protocol. A well construction permit was acquired from the ACFCWCD prior to drilling. A copy of this permit is included in Appendix C. On September 12 and 13, 1991, three soil borings (B-1 through B-3) were drilled at the site and groundwater monitoring wells (MW-1 through MW-3) were constructed in the borings.

Boring B-1 was drilled between the underground gasoline-storage tanks and northwestern service islands, and groundwater monitoring well MW-1 was installed in the boring, to investigate the presence of gasoline hydrocarbons in soil and groundwater in the inferred downgradient direction of the service islands. Boring B-2 was drilled in the southeastern part of the site, in the immediate vicinity of the southeastern service islands where the unauthorized release of gasoline occurred in September 1990; and groundwater monitoring well MW-2 was installed in the boring to evaluate the presence of gasoline hydrocarbons in the soil and groundwater near the location of the reported spill. Boring B-3 was drilled southeast (in the inferred downgradient direction) of the underground gasoline-storage

tanks, and groundwater monitoring well MW-3 was installed in the boring, to investigate the presence and evaluate the extent of gasoline hydrocarbons in the southern part of the site. The soil boring/monitoring well locations are shown on Plate 2.

Soil Sampling and Description

A total of 16 soil samples were collected from soil borings B-1 through B-3 for description and possible laboratory analyses. A summary of the Unified Soil Classification System used to identify the soil encountered during drilling is presented on Plate 3, and descriptions of the soil encountered in the borings are presented on the Logs of Borings, Plates 4 through 7. Soil samples from borings B-1 through B-3 were collected at a maximum interval of 5 feet. Sampling procedures are described in Appendix B.

The earth materials encountered during this investigation consisted primarily of sandy to silty clay interbedded with clayey to silty sand. Sandy clay was encountered at the site immediately below the baserock to depths of approximately 5 to 7 feet below ground surface. Below this sandy clay a layer of dry silty to medium-grained sand was present to depths of approximately 8 to 9-1/2 feet. This silty to medium-grained sand was underlain by silty clay, which extended to depths of approximately 10-1/2 to 15 feet. Groundwater was encountered at depths of approximately 10-1/2 to 15 feet in clayey sand. Groundwater encountered in this clayey sand stratum appears to be confined by the overlying silty clay, as evidenced by water levels stabilizing at approximately 9-1/2 to 11-1/2 feet below ground surface. A stratum of sandy clay with some gravel, which may be a perching or confining layer, was encountered beneath the water-bearing clayey sand at approximately 12-1/2 to 17-1/2 feet below the ground surface in the borings and to the bottom of the deepest boring at 22-1/2 feet. Graphic interpretations of the soil stratigraphy encountered in the borings are shown on Geologic Cross Sections A-A', B-B', and C-C' (Plate 8). Locations of the cross sections are depicted on Plate 2.

Product odor was noted in the soil samples collected at the depths between 4 to 17 feet from boring B-1; 4 to 12 feet from boring B-2; and 9 to 16 feet from boring B-3. Field Organic Vapor Meter (OVM) readings, which yield order of magnitude estimates only, were taken of soil samples from borings B-1 through B-3. OVM readings ranged from

nondetectable to 515 parts per million (ppm). OVM readings of soil samples collected from borings B-1 through B-3 are shown on the boring logs (Plates 4 through 7) in the column labeled PID (photoionization detector).

Soil cuttings generated from the borings were temporarily stockpiled onsite along the northeastern property line and covered with plastic sheeting pending disposal. The soil cuttings were stored in two separate stockpiles based on subjective evidence of hydrocarbons, one containing cuttings from borings B-1 and B-3, and one containing cuttings from boring B-2. After the completion of drilling on September 13, 1991, four soil samples were collected from each stockpile and submitted for compositing and laboratory analyses of total petroleum hydrocarbons as gasoline (TPHg) and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX). The method used to obtain these samples is described in Appendix B.

Monitoring Well Construction and Development

Three groundwater monitoring wells (MW-1 through MW-3) were constructed in borings B-1 through B-3, respectively. The wells were completed with four-inch-diameter schedule 40 polyvinyl chloride (PVC) casing. Well casings were set in the wells to the depths of approximately 14 to 17-1/2 feet below ground surface. The screened casings for the monitoring wells consisted of 4-inch-diameter, 0.020 machine slotted PVC set from the total depth of the wells to approximately 10-1/2 to 14 feet below the ground surface. Blank PVC casing was set from the top of the screened casing to within a few inches below the ground surface.

The wells were developed on September 17, 1991, to remove fine-grained sediments and to allow better communication between the water-bearing zone and the groundwater monitoring well. Details regarding well construction and development are described in Appendix B.

Groundwater Level Measurement and Sampling

Depths-to-water (DTW) were measured in the wells MW-1 through MW-3, and groundwater samples were collected and visually inspected for floating product on September 20, 1991. Water samples collected from wells MW-1 through MW-3 did not exhibit a presence of floating product or product odor on September 20, 1991. Groundwater monitoring wells MW-1 through MW-3 were also purged and sampled at that time. DTW measurements were also taken in these wells on October 22, 1991. Appendix B contains a description of subjective analyses and sampling procedures, and well purge data sheets.

EVALUATION OF GROUNDWATER GRADIENT

On October 11, 1991, the wellheads for the groundwater monitoring wells MW-1 through MW-3 were surveyed to a local National Geodetic Vertical Datum benchmark by John E. Koch, a licensed land surveyor. The results of this wellhead survey are included in Appendix D, Wellhead Survey. Groundwater elevations for each well were calculated by subtracting the measured DTW from the elevation of the wellhead. The measured DTW, wellhead elevations, and groundwater elevations are presented in Table 1, Groundwater Monitoring Data.

The groundwater gradients evaluated for the first encountered water-bearing zone on September 20, and October 22, 1991, ranged from 0.002 to 0.004 to the southwest. Plates 9 and 10, Groundwater Gradient Maps, are graphic interpretations of the groundwater gradients on those dates.

LABORATORY METHODS

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

Soil Samples

Soil samples collected from borings B-1 through B-3 were analyzed in accordance with ACHCSA requirements for the gasoline constituents BTEX and TPHg using modified Environmental Protection Agency (EPA) Methods 5030/8015/8020. The soil samples were selected for laboratory analyses based on:

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

Soil samples collected from the stockpiles were composited in the laboratory and analyzed for TPHg and BTEX by EPA Method 5030/8015/8020.

Groundwater Samples

Water samples obtained from monitoring wells MW-1 through MW-3 were analyzed in accordance with ACHCSA requirements for BTEX and TPHg by modified EPA Methods 5030/8015/8020.

RESULTS OF LABORATORY ANALYSES

Soil Samples

The results of laboratory analyses are summarized in Table 2, Results of Laboratory Analyses of Soil Samples. Copies of the laboratory reports and Chain-of-Custody records for the soil samples are included in Appendix E.

- Laboratory analyses of soil samples collected from the boring B-1, located between the underground gasoline-storage tanks and the northwestern service islands, indicated 150 ppm TPHg in the sample collected at the depth of 9-1/2 feet, and nondetectable levels (less than 1 ppm) in the samples collected at 14-1/2 and 21-1/2 feet below ground surface.

- Laboratory analyses of soil samples collected from the boring B-2, located next to the southeastern service islands, where the spillage occurred, indicated 2.5 ppm and 6.3 ppm of TPHg in the samples collected at the depths of 4-1/2 and 9-1/2 feet, respectively, and a nondetectable concentration of TPHg (less than 1 ppm) in the sample collected at 15-1/2 feet.

- Laboratory analyses of soil samples collected from the boring B-3, located generally downgradient of the underground gasoline-storage tanks and the fuel spill location, indicated 52 ppm of TPHg in the sample collected at the depth of 9-1/2 feet, and a nondetectable concentration of TPHg (less than 1 ppm) in the sample collected at 19-1/2 feet below ground surface.

BTEX concentrations in the soil samples collected from borings B-1 through B-3 ranged from nondetectable levels (less than 0.0050 ppm) to 13 ppm of total xylene.

Laboratory analyses of soil samples collected from stockpiles reported low levels of TPHg and BTEX (maximum 18 ppm TPHg and 1.8 ppm total xylenes, respectively). The results of laboratory analyses of stockpile samples are shown in Table 2. The soil stockpiles were removed from the site and transported to BFI Landfill in Livermore by ARCO's contractor, Dillard Trucking Inc. of Byron, California, on October 2, 1991.

Groundwater Samples

The results of laboratory analyses for water samples are summarized in Table 3, Results of Laboratory Analyses of Groundwater Samples. Plate 11, TPHg/Benzene Concentrations in Groundwater, shows concentrations of TPHg and benzene in groundwater on September 20, 1991. Chain of Custody records and laboratory analyses reports are included in Appendix E.

- The highest concentrations of TPHg (990 parts per billion [ppb]), benzene (50 ppb), toluene (100 ppb), ethylbenzene (11 ppb) and xylenes (200 ppb) were detected in the groundwater sample collected from monitoring well MW-3, located downgradient and near to the gasoline-storage tanks, and downgradient of the spill location.

- Laboratory results of the water sample collected from monitoring well MW-2, located in the immediate vicinity of the fuel spill, indicated 130 ppb TPHg and 6.6 ppb benzene.

- Laboratory analyses of the groundwater sample collected from monitoring well MW-1, located between the underground gasoline-storage tanks and the northwestern service islands, indicated 410 ppb TPHg and 28 ppb benzene.

DISCUSSION AND CONCLUSIONS

The presently interpreted extent of gasoline hydrocarbon impacted soil beneath the site is presented on the Geologic Cross Sections, Plate 8. Gasoline hydrocarbon concentrations over 100 ppm were not reported in the soil samples collected from the borings with the exception of one sample from a depth of 9-1/2 feet in B-1 (150 ppm TPHg) located near the northwestern service islands. The soil in the vicinity of the southeastern service islands, where the unauthorized fuel spill reportedly occurred in September 1990, appears to be impacted by low levels of gasoline hydrocarbons (less than 10 ppm of TPHg) as evidenced by analytical results from soil samples collected from boring B-2.

The lateral extent of gasoline hydrocarbons in the soil at the site appears not delineated below 10 ppm except in the southeastern part of the site. The vertical extent of gasoline hydrocarbons in the soil in the areas of the borings has been delineated to nondetectable levels (less than 1 ppm) at the depth of approximately 14-1/2 to 19-1/2 feet below ground surface.

Shallow groundwater, encountered at a depth of approximately 10-1/2 to 15 feet in the borings, appears to be confined or partially confined since water levels have stabilized in the wells at depths of 9 to 11 feet. Groundwater appears to be present in a relatively thin (2 - 3 foot thick) clayey sand layer underlain by sandy clay.

At the present time, groundwater beneath the site appears to be impacted by gasoline hydrocarbons at concentrations up to 990 ppb TPHg. Benzene concentrations (as high as 50 ppb) exceed the state maximum contaminant level (MCL) in the three wells. Ethylbenzene and total xylene concentrations were below MCLs in the wells, and toluene concentrations were below the recommended drinking water action level (DWAL) in wells MW-1 and MW-2 and at the DWAL in well MW-3. The extent of gasoline hydrocarbons in the groundwater has not been delineated.

The highest concentrations of gasoline hydrocarbons in soil and groundwater were reported near the underground gasoline-storage tanks and the northwestern service islands (B-3/MW-3 and B-1/MW-1), and the lowest concentrations were reported near the southeastern service island (B-2/MW-2). Even assuming that the spill of September 1990 would have reached groundwater instantaneously, estimates of flow velocity based on the subsurface materials encountered and the groundwater gradient indicate that sufficient time has not elapsed between the spill and the present time to allow for migration of the spill to the locations of the other site wells. These factors combine to suggest that the fuel spill which occurred on September 25, 1990, is not the sole source of gasoline hydrocarbons detected beneath the site.

LIMITATIONS

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

REFERENCES

Alameda County Flood Control and Water Conservation District, Zone 7. January 16, 1991. Fall 1990 groundwater Level Report.

Applied GeoSystems. September 19, 1990. Letter Report Limited Environmental Investigation Related to the Removal of Waste-Oil Tank at ARCO Station 6041, 7249 Village Parkway, Dublin, California. RESNA Report No. 60006-1.

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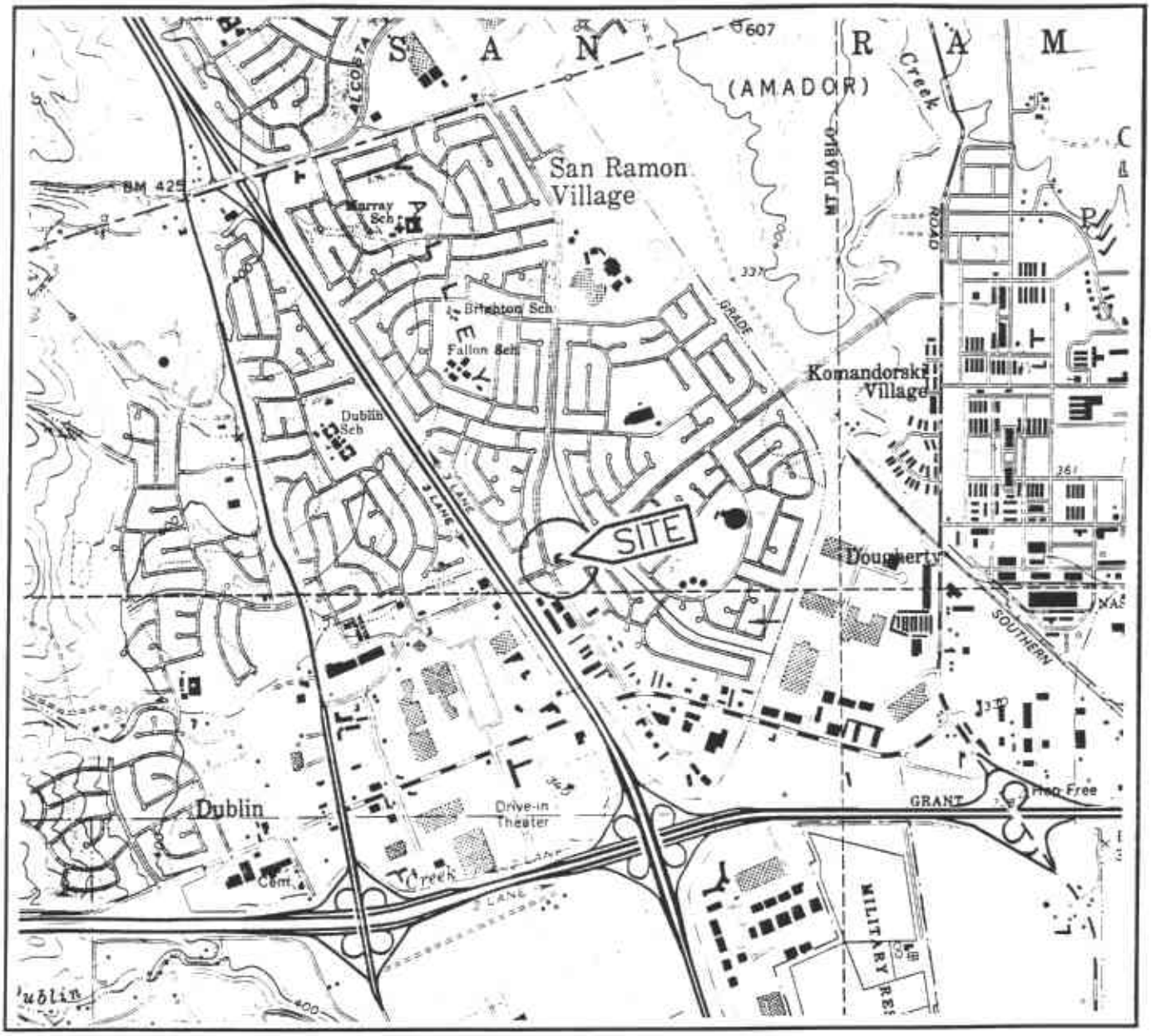
RESNA. August 30, 1991. Site Safety Plan.RESNA 60002.02S.



Base: U.S. Geological Survey
7.5-Minute Quadrangle
Dublin, California
Photorevised 1980

N

LEGEND

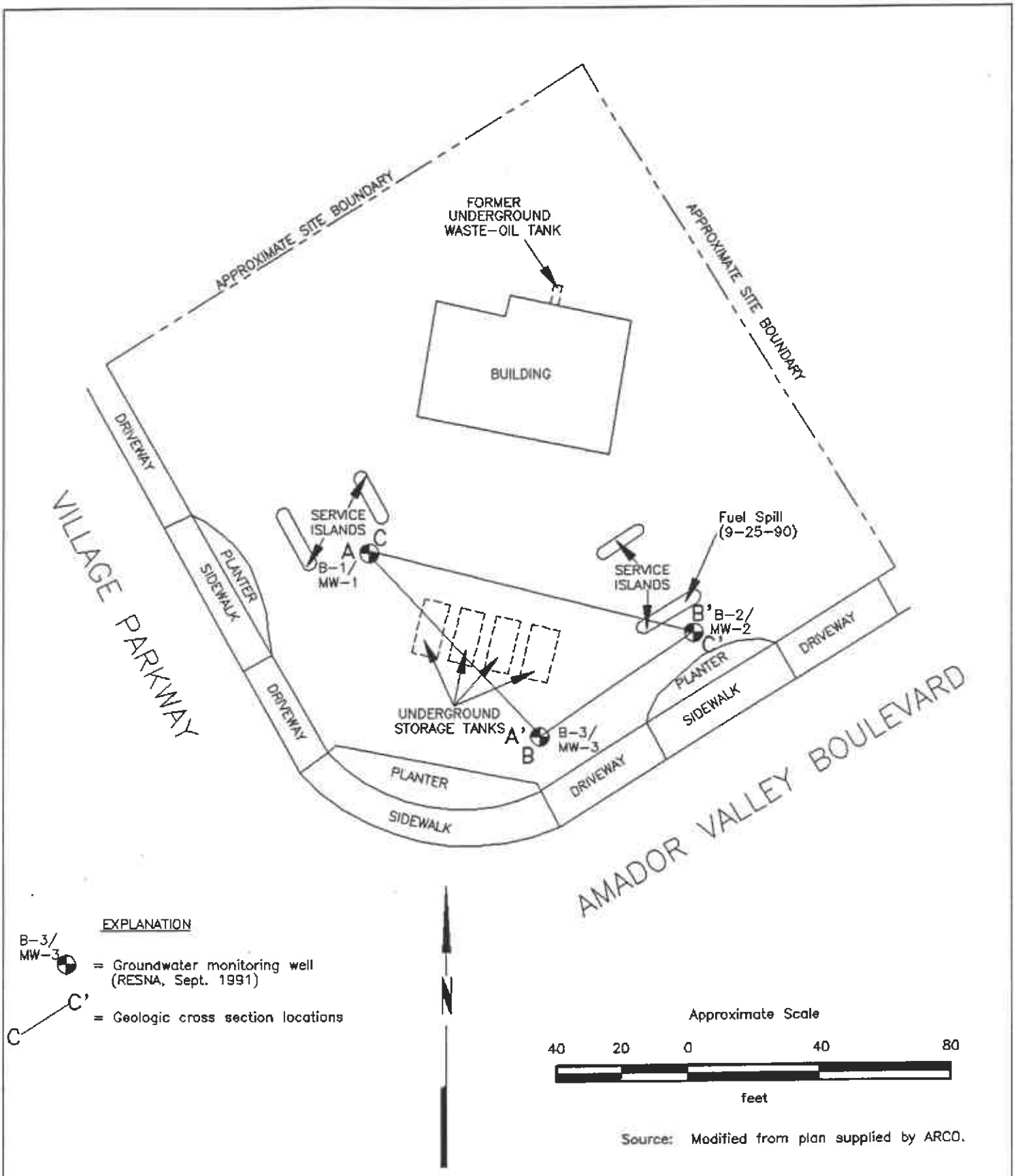
⊙ = Site Location

Approximate Scale

2000 1000 0 2000 4000

feet

RESNA	**SITE VICINITY MAP** **ARCO Service Station 6041** **7249 Village Parkway** **Dublin, California**	**PLATE** **1**
PROJECT 60006.02		



Source: Modified from plan supplied by ARCO.

RESNA	**GENERALIZED SITE PLAN** **ARCO Service Station 6041** **7249 Village Parkway** **Dublin, California**	**PLATE** **2**
PROJECT 60006.02		

UNIFIED SOIL CLASSIFICATION SYSTEM

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

MAJOR DIVISION		LTR	DESCRIPTION
FINE-GRAINED SOILS	SILTS AND CLAYS LL<50	ML	Inorganic Silts and very fine sands, rock flour, Silty or Clayey fine Sands, or Clayey Silts with slight plasticity.
		CL	Inorganic Clays of low to medium plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
		OL	Organic Silts and Organic Silt-Clays of low plasticity.
	SILTS AND CLAYS LL>50	MH	Inorganic Silts, micaceous or diatomaceous fine Sandy or Silty Soils, Elastic Silts.
		CH	Inorganic Clays of high plasticity, fat Clays.
		OH	Organic Clays of medium to high plasticity, organic Silts.
HIGHLY ORGANIC SOILS		PT	Peat and other highly Organic Soils.

Depth through which sampler is driven

Relatively undisturbed sample

No sample recovered

Static water level observed in well/boring

Initial water level observed in boring

S-10 Sample number

Sand pack

Bentonite

Neat cement

Caved native soil

Blank PVC

Machine-slotted PVC

P.I.D. Photoionization detector

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

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

RESNA	**UNIFIED SOIL CLASSIFICATION SYSTEM AND SYMBOL KEY** **ARCO Service Station 6041** **7249 Village Parkway** **Dublin, California**	**PLATE** **3**
PROJECT **60006.02**		

Depth of boring: 22-1/2 feet Diameter of boring: 10 inches Date drilled: 09/12/91

Well depth: 17-1/2 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 14 to 17-1/2 feet Slot size: 0.020-inch

Drilling Company: Kvilhaug Drilling Driller: Rod and Brian

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

Signature of Registered Professional: Diane M. Barclay

Registration No.: CEG 1366 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Paved area.	
0					Asphalt (6 inches).	
				GP	Gravel, with some sand and clay, brown, damp, dense; baserock.	
2				CL	Sandy clay, with gravel, dark gray, damp, medium plasticity, hard.	
4	S-4.5	10 28 28	34			
				SM	Silty sand, gray, damp, very dense; noticeable product odor.	
6						
8					Moist at 9 feet.	
	S-9.5	9 22 28	101	CL	Silty clay, black, damp, medium plasticity, hard; obvious product odor.	
10				▼		
12						
14	S-14.5	4 5 10	52	▽	With gypsum crystals.	
				SC	Clayey sand, fine-grained, gray, wet, medium dense; noticeable product odor.	
16						
	S-17.5	9 15 20	19	CL	Sandy clay, with some gravel, brownish-gray, damp, medium plasticity, hard.	
18						
20					(Section continues downward)	

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LOG OF BORING B-1/MW-1

ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 4

Depth	Sample No.	BLOWS	P.I.D.	USCS Code	Description	Well Const.
22	S-21.5	5 15 35	5	CL	Sandy clay, with some gravel, brownish-gray, damp, medium plasticity, hard.	
					Total depth = 22-1/2 feet.	
24						
26						
28						
30						
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

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LOG OF BORING B-1/MW-1

ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 5

Depth of boring: 16-1/2 feet Diameter of boring: 10 inches Date drilled: 09/13/91

Well depth: 14 feet Material type: Sch 40 PVC Casing diameter: 4 inches

Screen interval: 10-1/2 to 14 feet Slot size: 0.020-inch

Drilling Company: Kvilhaug Drilling Driller: Rod and Brian

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

Signature of Registered Professional: Diane M. Barclay

Registration No.: CEG 1366 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Concrete slab.	
0					Concrete (4 inches).	
				CH	Clay, black, damp, high plasticity, stiff.	
2				CL	Sandy clay, dark brown, damp, medium plasticity, hard.	
4	S-4.5	10 24 32	160			
6				SP	Sand, medium-grained, gray, damp, very dense; obvious product odor.	
8				CL	Silty clay, with fine gravel, dark gray, damp, medium plasticity, very stiff; obvious product odor.	
10	S-9.5	7 9 13	66		Change to black, moist.	
	S-11	3 5 5	137	SC	Clayey sand, fine-grained, dark gray, wet, loose; obvious product odor.	
12	S-12.5	3 4 6	7	CL	Sandy clay, with gravel, brownish-gray, wet, medium plasticity, stiff.	
14	S-14	8 10 18	0		Less sand and gravel, damp.	
	S-15.5	10 24 30	0		Hard.	
16					Total depth = 16-1/2 feet.	
18						
20						

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LOG OF BORING B-2/MW-2

ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE 6

Depth of boring: 20-1/2 feet Diameter of boring: 10 inches Date drilled: 09/12/91

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

Screen interval: 12 to 15 feet Slot size: 0.020-inch

Drilling Company: Kvilhaug Drilling Driller: Rod and Brian

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

Signature of Registered Professional: Diane M. Barclay

Registration No.: CEG 1366 State: CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
					Paved area.	
0					Asphalt (6 inches).	
				GP	Gravel with sand and clay, brown, damp, medium dense; baserock.	
2				CL	Sandy clay, dark gray, damp, medium plasticity, hard.	
4	S-4.5	7 12 30	3			
6						
				SM	Silty sand, dark gray, damp, medium dense.	
8						
	S-9.5	9 11 15	515	CL	Silty clay, black, damp, medium plasticity, hard; obvious product odor.	
10				▽		
12				SC	Clayey sand, fine-grained, dark gray, wet, loose; obvious product odor.	
	S-13.5	3 6 8	75			
14				CL	Sandy clay, with gravel, brownish-gray, wet, medium plasticity, stiff; noticeable product odor.	
	S-15	4 6 10	25			
16					Moist at 16 feet.	
18						
	S-19.5	8 12 20	5			
20					Less gravel and sand, damp, very stiff.	
					Total depth = 20-1/2 feet.	

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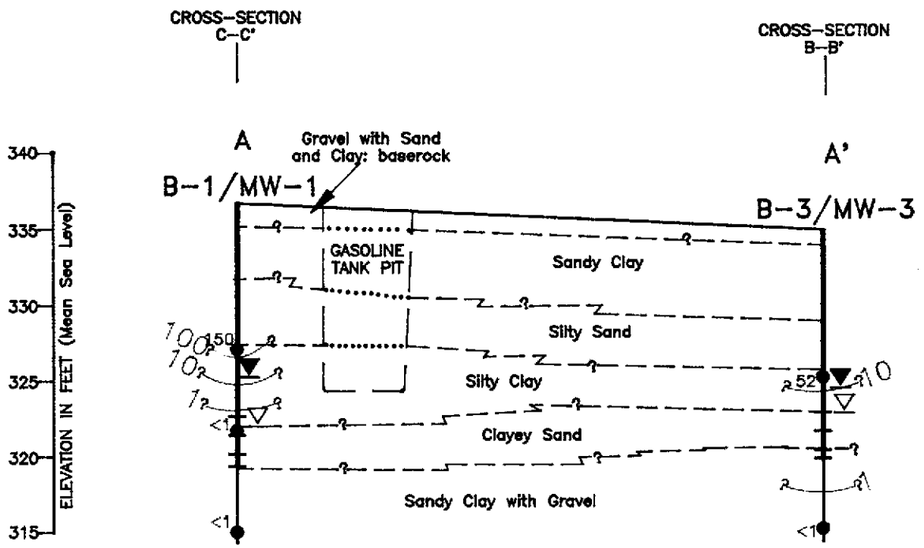
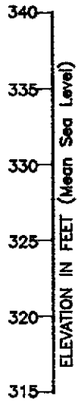
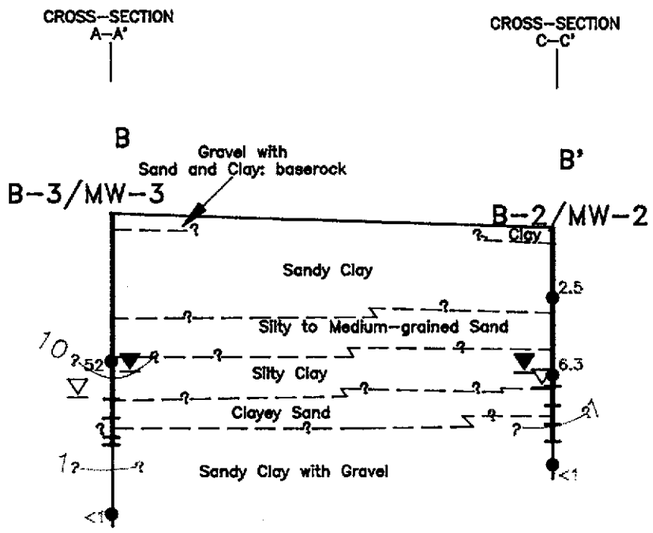
LOG OF BORING B-3/MW-3

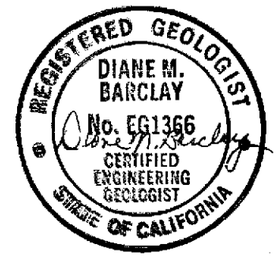
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

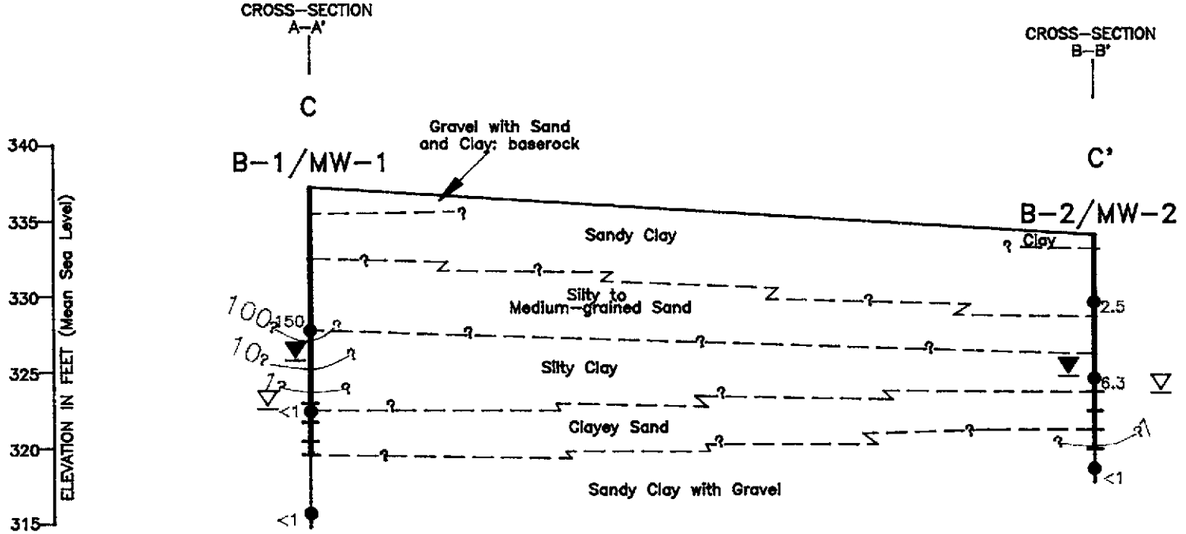
PLATE 7











EXPLANATION

100 — = Line of equal concentration of TPHg in soil, in parts per million

150 = Laboratory analyzed soil sample showing concentration of TPHg in parts per million

= Well casing

= Well screen

= Boring

= Initial water level in boring

= Static water level in well (September 20, 1991)

Approximate Horizontal Scale

20 10 0 20 40

feet

Approximate Vertical Scale

10 5 0 10 20

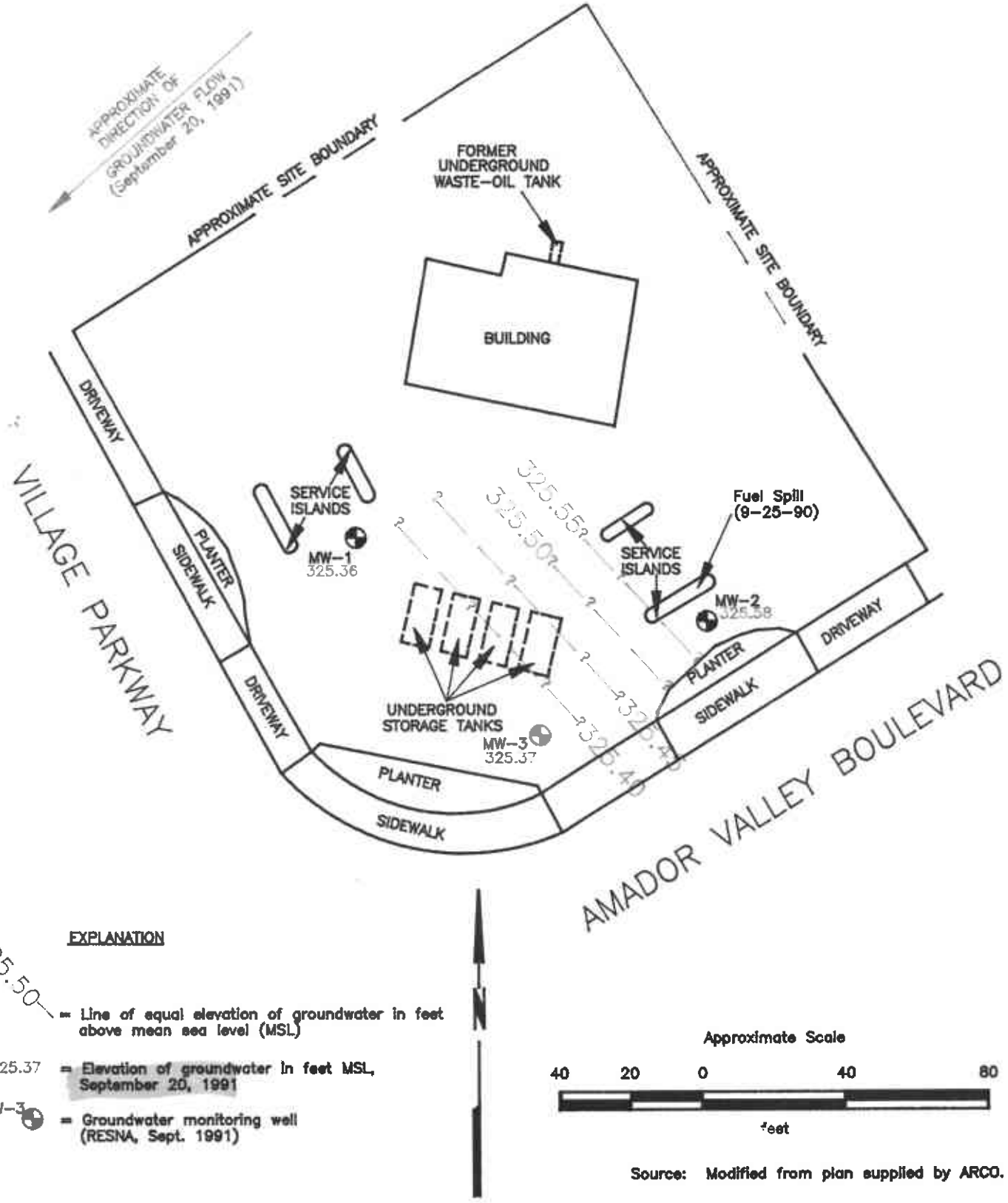
feet

RESNA

PROJECT 60006.02

GEOLOGIC CROSS SECTIONS A-A', B-B', AND C-C'
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
8



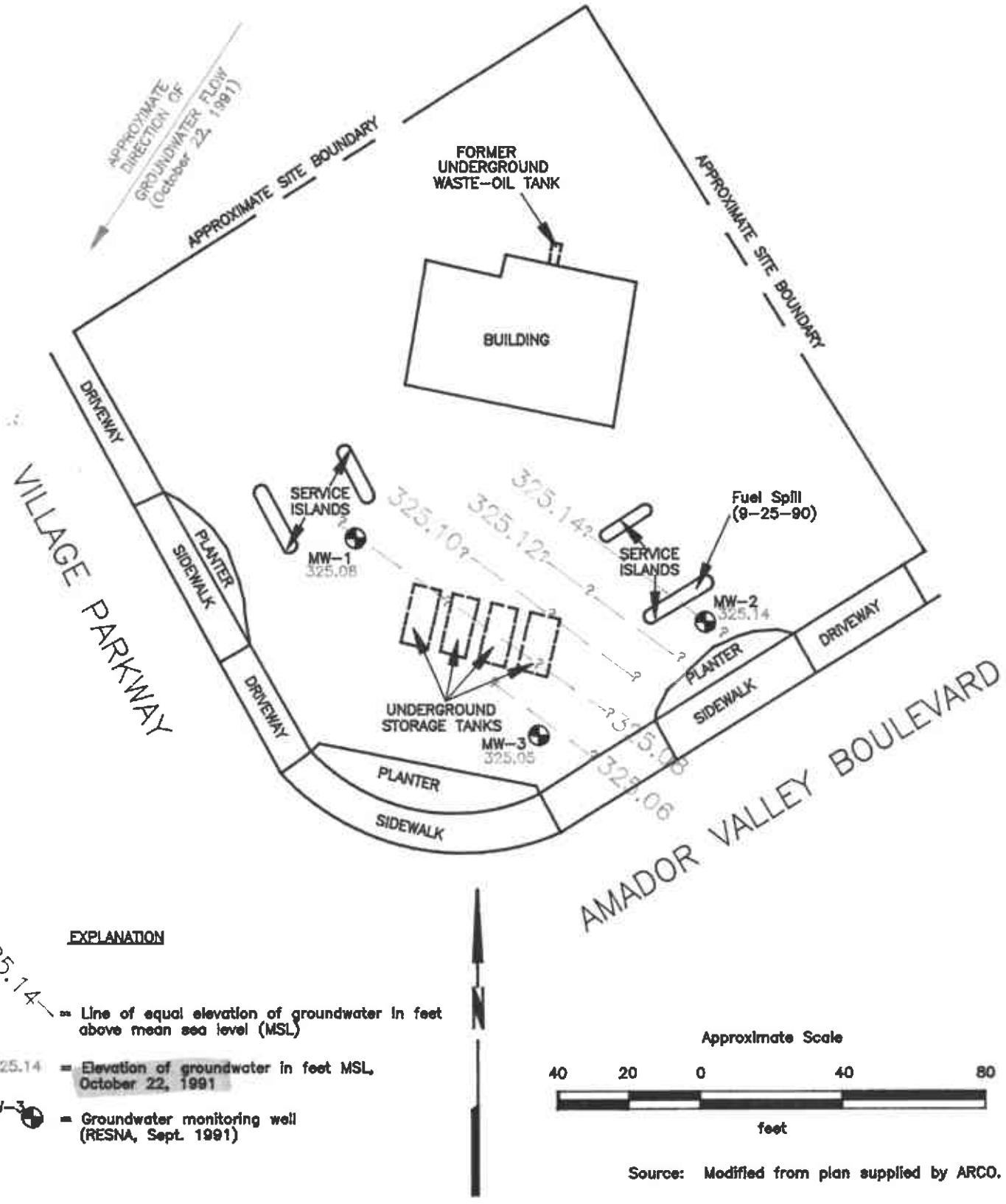
Source: Modified from plan supplied by ARCO.

RESNA

PROJECT 60006.02

GROUNDWATER GRADIENT MAP
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
9



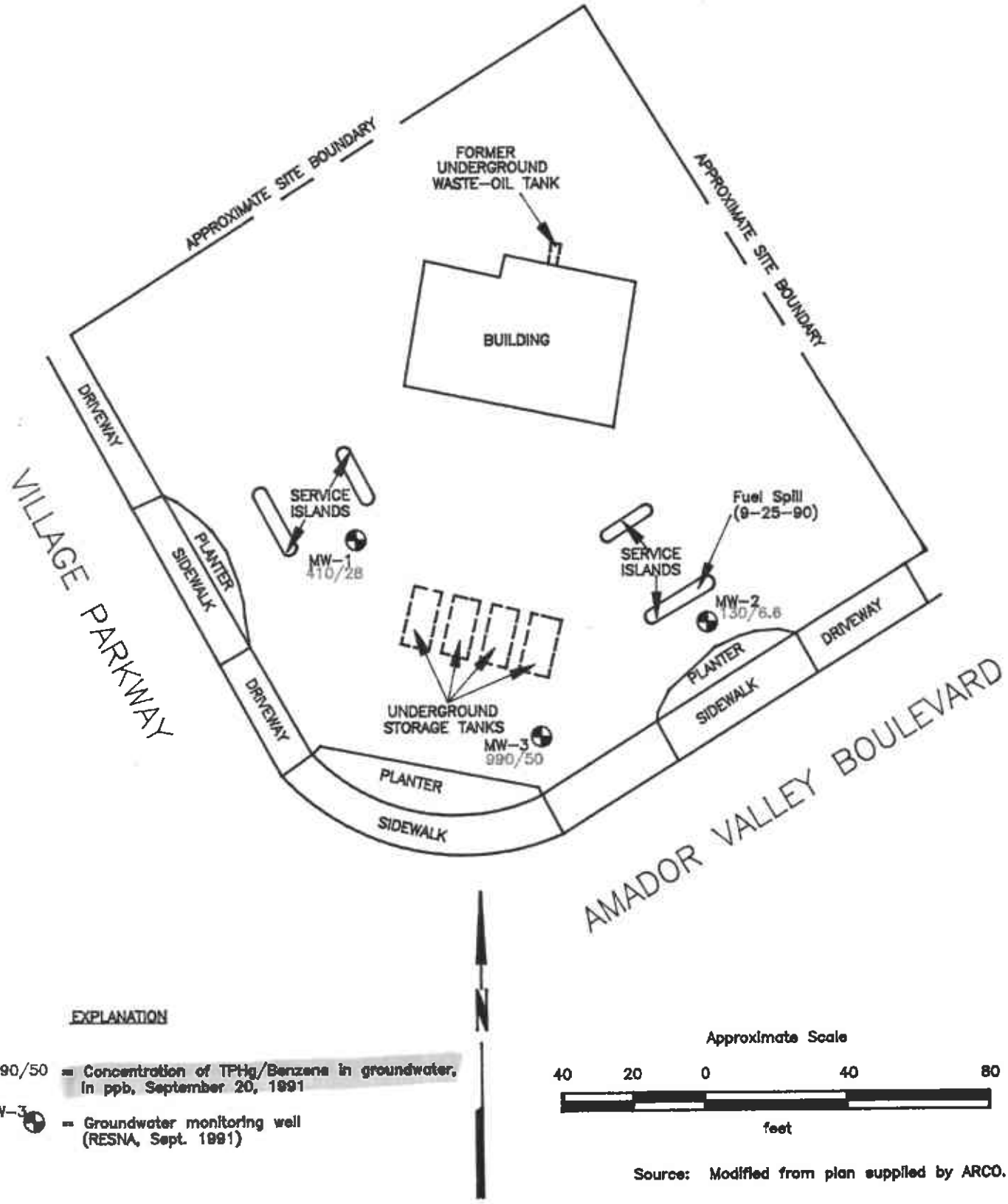
Source: Modified from plan supplied by ARCO.

RESNA

PROJECT 60006.02

GROUNDWATER GRADIENT MAP
ARCO Service Station 6041
7249 Village Parkway
Dublin, California

PLATE
10



RESNA	TPHg/BENZENE CONCENTRATIONS IN GROUNDWATER ARCO Service Station 6041 7249 Village Parkway Dublin, California	PLATE 11
PROJECT 60006.02		

TABLE 1
GROUNDWATER MONITORING DATA
ARCO Station 6041
Dublin, California

Date Well Measured	Well Elevation	Depth to Water	Water Elevation	Floating Product	Adjusted Water Elevation
MW-1					
9-20-91	336.56	11.20	325.36	None	---
10-22-91		11.48	325.08	None	---
MW-2					
9-20-91	334.80	9.22	325.58	None	---
10-22-91		9.66	325.14	None	---
MW-3					
9-20-91	335.53	10.16	325.37	None	---
10-22-91		10.48	325.05	None	---

Measurements in feet.
Wells surveyed on October 11, 1991. Datum is City of Dublin = (USGS)

TABLE 2
RESULTS OF LABORATORY ANALYSES OF SOIL SAMPLES
ARCO Station 6041
Dublin, California
September 12-13, 1991

Sample Identification	TPHg	B	T	E	X
S-9-1/2-B1	150	0.90	4.2	2.4	13
S-14-1/2-B1	<1.0	0.0060	0.019	0.0090	0.060
S-21-1/2-B1	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-4-1/2-B2	2.5	0.071	<0.0050	0.093	0.017
S-9-1/2-B2	6.3	0.30	0.011	0.30	0.060
S-15-1/2-B2	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
S-9-1/2-B3	52	1.2	2.5	1.4	8.5
S-19-1/2-B3	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
SP1-A-D*	1.9	0.027	<0.0050	0.035	0.0070
SP2-A-D*	18	0.045	0.43	0.29	1.8

Results measured in part per million (ppm).
TPHg: Total petroleum hydrocarbons as gasoline (analyzed by EPA Method 5030/8015/8020).
B: benzene; T: toluene; E: ethylbenzene; X: total xylenes.
BTEX: Analyzed by EPA Method 5030/8015/8020.
*: Composite sample of four soil samples obtained from stockpiled soil.
<: Less than the laboratory detection limit.

Sample Identification: S-19-1/2-B3
- S-19: Boring number
- 1/2: Depth in feet
- B3: Soil sample

TABLE 3
RESULTS OF LABORATORY ANALYSES OF GROUNDWATER SAMPLES
ARCO Station 6041
Dublin, California

Sample ID	TPHg	Benzene	Toluene	Ethyl-benzene	Total xylenes
MW-1					
9-20-91	410	28	36	4.3	89
MW-2					
9-20-91	130	6.6	0.96	1.4	1.5
MW-3					
9-20-91	990	50	100	11	200
MCL	---	1	---	680	1,750
DWAL	---	---	100	---	---

Results in parts per billion (ppb)
Benzene, toluene, ethylbenzene, and total xylenes analyzed by EPA Method 5030/8015/8020.
TPHg: Total petroleum hydrocarbons as gasoline (analyzed by EPA Method 5030/8015/8020).
MCL: Maximum contaminant level in drinking water (DHS, July 1989).
DWAL: Recommended drinking water action level (DHS, January 1990).

Sample Identification: MW-3
└— Monitoring well number

APPENDIX A

PREVIOUS WORK

PREVIOUS WORK

June 1990

On June 6 and 7, 1990, one 550-gallon waste-oil tank of single wall steel construction was excavated and removed from its location adjacent to the northern wall of the station building at the site. A RESNA geologist examined the outer surface of the tank for signs of leakage, holes, pitting, and areas of weakness. The tank appeared to be in very good condition; the geologist observed light localized rusting on the surface of the tank, but no pitting, holes or cracks were observed. No signs of overfill staining were observed on the top and sides of the tank (Applied GeoSystems, September, 1990). Information supplied by the station manager indicated that the tank was at least 13 years old.

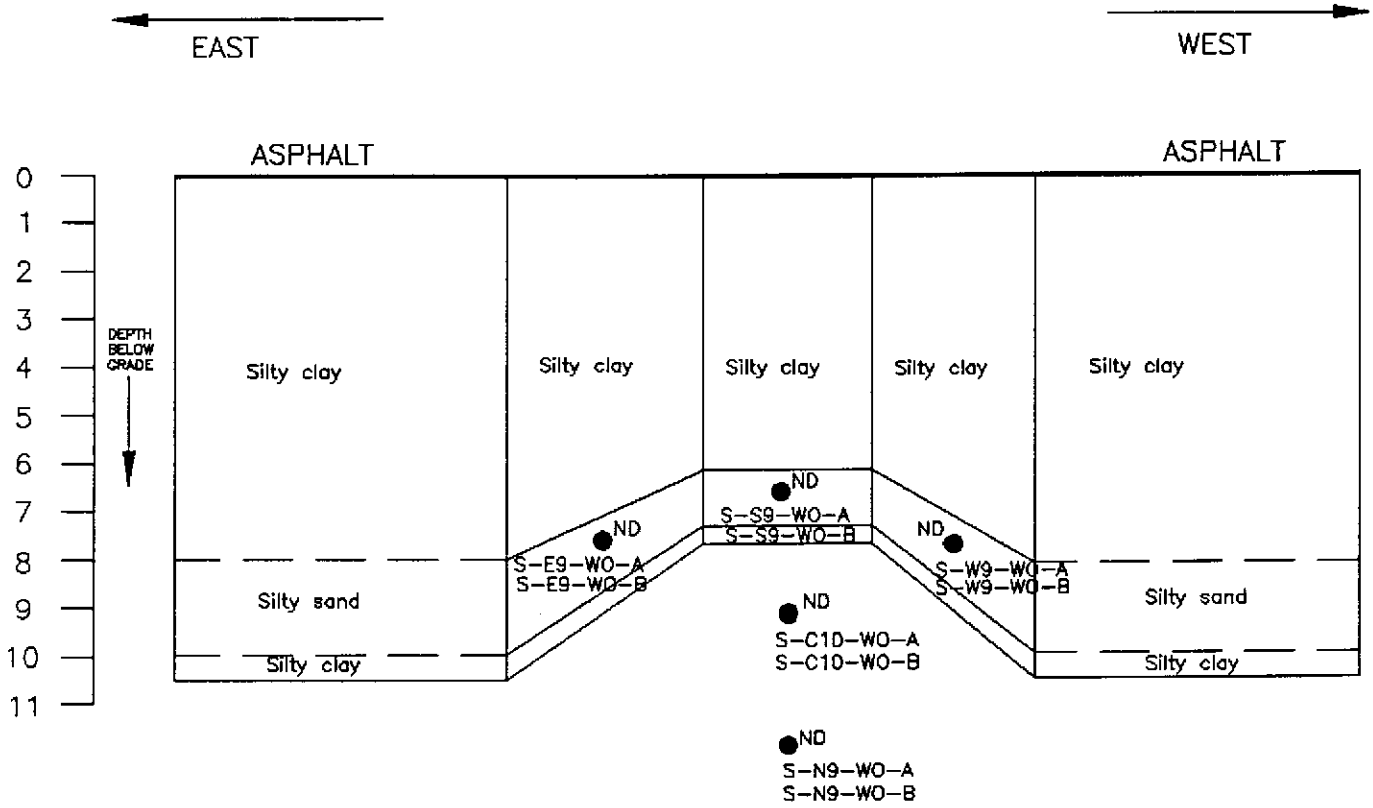
Soil excavated from the tank pit was screened for evidence of volatile hydrocarbons compounds, both visually and with a portable Organic Vapor Meter (OVM). Initial random screening of backfill material excavated from around the tank yielded OVM readings ranging from nondetectable to 0.8 parts per million (ppm). Upon removal of the tank, random grab samples of soil excavated from tank pit cavity yielded OVM readings ranging from nondetectable to 8.5 ppm. Excavation proceeded beneath the former tank location to a final depth of approximately 10-1/2 feet. At the limits of the excavation, random grab samples yielded nondetectable readings from the north, south, east and west walls and an OVM reading of 3.25 ppm from the center of the tank pit. No subjective evidence of hydrocarbons such as product odor or soil discoloration was noted in the backfill material or native soil during the excavation process.

Ten soil samples were collected from the tank pit excavation. Two samples were collected from each of the four sidewalls of the tank pit, and two samples were collected from the center of the tank pit floor at the limits of the excavation. The sample locations and laboratory results are shown on Plate A-1, Tank Pit Sampling Locations. The samples were divided into two sets, A and B, each set consisting of five samples: one from each of the sidewalls, and one from the floor of the tank pit. The samples in set A were analyzed for total oil and grease (TOG) and halogenated volatile organic compounds (HVOCs). The samples in set B were analyzed for total petroleum hydrocarbons as gasoline (TPHg), total petroleum hydrocarbons as diesel (TPHd), and the gasoline constituents benzene, toluene, ethylbenzene, and total xylenes (BTEX). Four soil samples for compositing and laboratory analyses were collected from the soil stockpile. Analyses of the soil samples collected from the waste-oil tank pit indicated nondetectable levels of TOG, HVOCs, TPHg, TPHd, and BTEX. Results of laboratory analyses of the composite sample collected from the stockpiled soil indicated TOG at 110 ppm, TPHd at 180 ppm, TPHg at 10 ppm, total xylenes at 0.25 ppm, and nondetectable concentrations of organic lead, benzene, toluene and ethylbenzene. Soil samples analytical results are shown in Table A1, Analytical Results of

Soil Samples from Waste-Oil Tank Pit. Approximately 15 to 20 cubic yards of soil were excavated from the tank pit. According to information obtained from ARCO, the soil stockpile was removed from the site by Dillard Trucking, Inc. of Hayward, California and admitted to Chem-Waste Management's facility in Kettleman City on June 12, 1990. On the basis of field observation and the results of analyses of tank pit soil samples, RESNA concluded that no further excavation in the vicinity of the former waste-oil tank was necessary.

September 1990

On September 25, 1990, a RESNA geologist attempted to collected a soil sample at a reported fuel spill beneath a dispenser pump in the southeastern portion of the site at the approximate location shown on Plate 2. We understand that the spill occurred when a station customer failed to remove the hose from the vehicle after use. The vehicle drove off pulling the hose from the pump. This in turn caused a filter in the pump to fail resulting in a relatively small release of gasoline from the pump. The dispenser pump made collection of a soil sample impractical; however, removal of pea gravel beneath the pump was performed. The OVM reading for the pea gravel sample collected from the depth of ½-foot beneath the pump where the spillage occurred was 750 ppm. Mr. Tom Hathcox of the Dogherty Regional Fire Department estimated that approximately 10 gallons of fuel spilled on the ground. We understand from the station manager that the pump was turned off shortly after the hose was pulled off the pump.



SIDE VIEW

EXPLANATION

● = Soil sample
S-S9-WO-A (RESNA, June 1990)

ND = Not detected (TPHg, TPHd, BTEX, TOG, and HVOCs)

Approximate Horizontal Scale

6 3 0 6 12

feet

RESNA	**TANK PIT SAMPLING LOCATIONS** **ARCO Service Station 6041** **7249 Village Parkway** **Dublin, California**	**PLATE** **A-1**
PROJECT 60006.02		

TABLE A1
ANALYTICAL RESULTS OF SOIL SAMPLES
FROM WASTE-OIL TANK PIT
ARCO Station 6041
7249 Village Parkway
Dublin, California

Sample	TPHg	TPHd	B	T	E	X	TOG	HVOCs	OL
S-N9-WOB	<2.0	<10	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
S-S9-WOB	<2.0	<10	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
S-E9-WOB	<2.0	<10	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
S-W9-WOB	<2.0	<10	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
S-C10-WOB	<2.0	<10	<0.050	<0.050	<0.050	<0.050	NA	NA	NA
S-N9-WOA	NA	NA	NA	NA	NA	NA	<50	<0.005	NA
S-S9-WOA	NA	NA	NA	NA	NA	NA	<50	<0.005	NA
S-E9-WOA	NA	NA	NA	NA	NA	NA	<50	<0.005	NA
S-W9-WOA	NA	NA	NA	NA	NA	NA	<50	<0.005	NA
S-C10-WOA	NA	NA	NA	NA	NA	NA	<50	<0.005	NA
S-0607-SP	10	180	<0.050	<0.050	<0.050	0.25	110	NA	<0.08
MDL	2.0	10	0.050	0.050	0.050	0.050	50	0.005	0.08

Results are in parts per million (ppm).
TPHg: Total petroleum hydrocarbons as gasoline.
TPHd: Total petroleum hydrocarbons as diesel.
B: Benzene, T: Toluene, E: Ethylbenzene, X: Total Xylene Isomers.
TOG: Total oil and grease.
HVOCs: Halogenated volatile organic compounds.
OL: Organic lead.
<: Below the reporting limits of the analytical method.
NA: Not analyzed.
MDL: Method detection limit

APPENDIX B

FIELD PROTOCOL
WELL PURGE DATA SHEETS

FIELD PROTOCOL

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

Site Safety Plan

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

Sampling of Stockpiled Soil

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

Soil Borings

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

The borings are drilled by a truck-mounted drill rig equipped with 8- or 10-inch-diameter, hollow-stem augers. The augers are steam-cleaned prior to drilling each boring to minimize the

possibility of cross-contamination. After drilling the borings, monitoring wells are constructed in the borings, or neat-cement grout with bentonite is used to backfill the borings to the ground surface.

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

Drill Cuttings

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

Soil Sampling in Borings

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

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

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

Logging of Borings

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

Monitoring Well Construction

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

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

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

Groundwater Monitoring Well Development

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

Groundwater Sampling

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

Wells which do not contain floating product are purged using a submersible pump. The pump, cables, and hoses are cleaned with Alconox® and water prior to use in each well. The wells are purged until withdrawal is of sufficient duration to result in stabilized pH, temperature, and electrical conductivity of the water, as measured using portable meters calibrated to a standard buffer and conductivity standard. If the well becomes dewatered, the water level is allowed to recover to approximately 80 percent of the initial water level. Prior to the collection of each groundwater sample, the Teflon® bailer is cleaned with Alconox® and rinsed with tap water and deionized water, and the latex gloves worn by the sampler changed. Hydrochloric acid is added to the sample vials as a preservative (when applicable). A sample method blank is collected by pouring distilled water into the bailer and then into sample vials. A sample of the formation water is then collected from the surface of the water in each of the wells using the Teflon® bailer. The water samples are then gently poured into laboratory-cleaned, 40-milliliter (ml) glass vials, 500 ml plastic bottles or 1-liter glass bottles (as required for specific laboratory analysis) and sealed with Teflon®-lined caps, and inspected for air bubbles to check for headspace, which would allow volatilization to occur. The samples are then labeled and promptly placed in iced storage. A field log of well evacuation procedures and parameter monitoring is maintained. Water generated by the purging of wells is stored in 17E DOT 55-gallon drums onsite and remains the responsibility of the client.

Sample Labeling and Handling

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

WELL PURGE DATA SHEET

Project Name: ARCO 6041 Job No. 60006.02

Date: 9/20/91 Page 1 of 1

Well No. MW-1 Time Started 8:39

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromho)
8:39	Begin purging well MW-1			
8:40	0.25	65.6	NM	2.73
8:43	1	67.1	NM	2.82
8:46	2	67.8	NM	2.81
8:50	3	67.9	NM	2.75
8:59	5	67.1	NM	2.58
9:07	7	67.0	NM	2.58
9:16	9	66.8	NM	2.45
9:25	11	66.7	NM	2.56
9:35	13	66.5	NM	2.53
9:45	15	66.5	NM	2.53
9:46	Stop purging MW-1			

Notes:

Well diameter (inches) : 4
Depth to Bottom (feet) : 17.5
Depth to Water - initial (feet) : 11.20
Depth to Water - final (feet) : 11.20
% recovery : 100
Time Sampled : 11:45
Gallons per Well Casing Volume : 3.8
Gallons Purged : 15
Well Casing Volumes Purged : 3.9
Approximate Pumping Rate (gpm) : 0.2
pH not measured due to equipment malfunction : NM

RESNA

WELL PURGE DATA SHEET

Project Name: ARCO 6041 Job No. 60006.02

Date: 9/20/91 Page 1 of 1

Well No. MW-2 Time Started 10:14

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromho)
10:14	Begin purging well MW-2			
10:17	1	69.1	NM	3.68
10:24	3	71.3	NM	3.51
10:31	5	71.4	NM	3.44
10:40	7	70.6	NM	3.37
10:47	9	71.2	NM	3.39
10:53	11	70.7	NM	3.39
11:02	13	71.1	NM	3.39
11:03	13	Stop purging MW-2		

Notes:

Well diameter (inches) : 4
Depth to Bottom (feet) : 14
Depth to Water - initial (feet) : 9.22
Depth to Water - final (feet) : 9.30
% recovery : 98
Time Sampled : 11:53
Gallons per Well Casing Volume : 2.9
Gallons Purged : 13
Well Casing Volumes Purged : 4.5
Approximate Pumping Rate (gpm) : 0.3
pH not measured due to equipment malfunction: NM

RESNA

WELL PURGE DATA SHEET

Project Name: ARCO 6041 Job No. 60006.02

Date: 9/20/91 Page 1 of 1

Well No. MW-3 Time Started 8:13

Time (hr)	Gallons (cum.)	Temp. (F)	pH	Conduct. (micromho)
8:13	Begin purging well MW-3			
8:14	2	67.1	7.64	2.37
8:17	4	67.9	7.56	2.38
8:17	4	Well dewatered, Stop purging MW-3		

Notes:

Well diameter (inches)	4
Depth to Bottom (feet)	15
Depth to Water - initial (feet)	10.16
Depth to Water - final (feet)	11.73
% recovery	68
Time Sampled	11:55
Gallons per Well Casing Volume	2.9
Gallons Purged	4
Well Casing Volumes Purged	1.4
Approximate Pumping Rate (gpm)	1.0

RESNA

APPENDIX C

WELL CONSTRUCTION PERMIT

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 (415) 484-2600

5 September 1991

Resna/Applied GeoSystems
3315 Almaden Expressway, Ste. 34
San Jose, CA 95118

Gentlemen:

Enclosed is Drilling permit 91503 for a monitoring well construction project at 7249 Village Parkway in Dublin for Arco Products Company.

Please note that permit condition A-2 requires that a well construction report be submitted after completion of the work. The report should include drilling and completion logs, location sketch, and permit number.

If you have any questions, please contact Wyman Hong or me at 484-2600.

Very truly yours,

Craig A. Mayfield

Craig A. Mayfield
Water Resources Engineer

WH:mm
Enc.

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE ♦ PLEASANTON, CALIFORNIA 94588 ♦ (415) 484-2600

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT ARCO Station 6041
7249 Village Parkway
Dublin, California

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

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

TYPE OF PROJECT

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

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

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

DRILLER'S LICENSE NO. C57 ~~596545~~ 482390

WELL PROJECTS
Drill Hole Diameter 10 in. Maximum
Casing Diameter 4 in. Depth 75 ft.
Surface Seal Depth 60 ft. Number 3
+ 1 soil boring 8 inch in diameter, 60 feet deep

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

ESTIMATED STARTING DATE 9/12/91
ESTIMATED COMPLETION DATE 9/13/91

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

APPLICANT'S SIGNATURE Barbara Sieminski Date 8/29/91

FOR OFFICE USE

PERMIT NUMBER 91503
LOCATION NUMBER ___

PERMIT CONDITIONS

Circled Permit Requirements Apply

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

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

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

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

E. WELL DESTRUCTION. See attached.

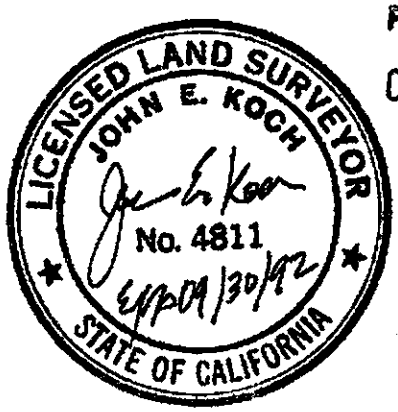
Approved Wyman Hong Date 3 Sep 91
Wyman Hong

51991

APPENDIX D

WELLHEAD SURVEY

JOHN E. KOCH
Land Surveyor
CA. State Lic. No. LS4811
5427 Telegraph Ave., Suite A
Oakland, CA 94609
(415)655-9956
FAX(415)655-9745



10/15/91

Applied GeoSystems
3315 Almaden Expressway, Suite 24
San Jose, CA 95118
(408) 264-7723
FAX(408) 264-2435

Tabulation of Elevations as of
1:30 a.m. 10/11/91

Job #91068
ASE Project 50006.02
Project Geologist:Joel Coffman
Site: ARCO Station # 6041
7515 Village Parkway
@ Amador Valley Boulevard
Dublin, CA

BENCHMARK: A standard Bronze Disk in westerly center island of Amador Valley Boulevard @ Village Parkway, 15 feet from post and 8 feet +/- from northerly curb. Stamped "VL-PK-AM-VV 1977" (El. = 337.02').

MONITOR WELL DATA TABLE

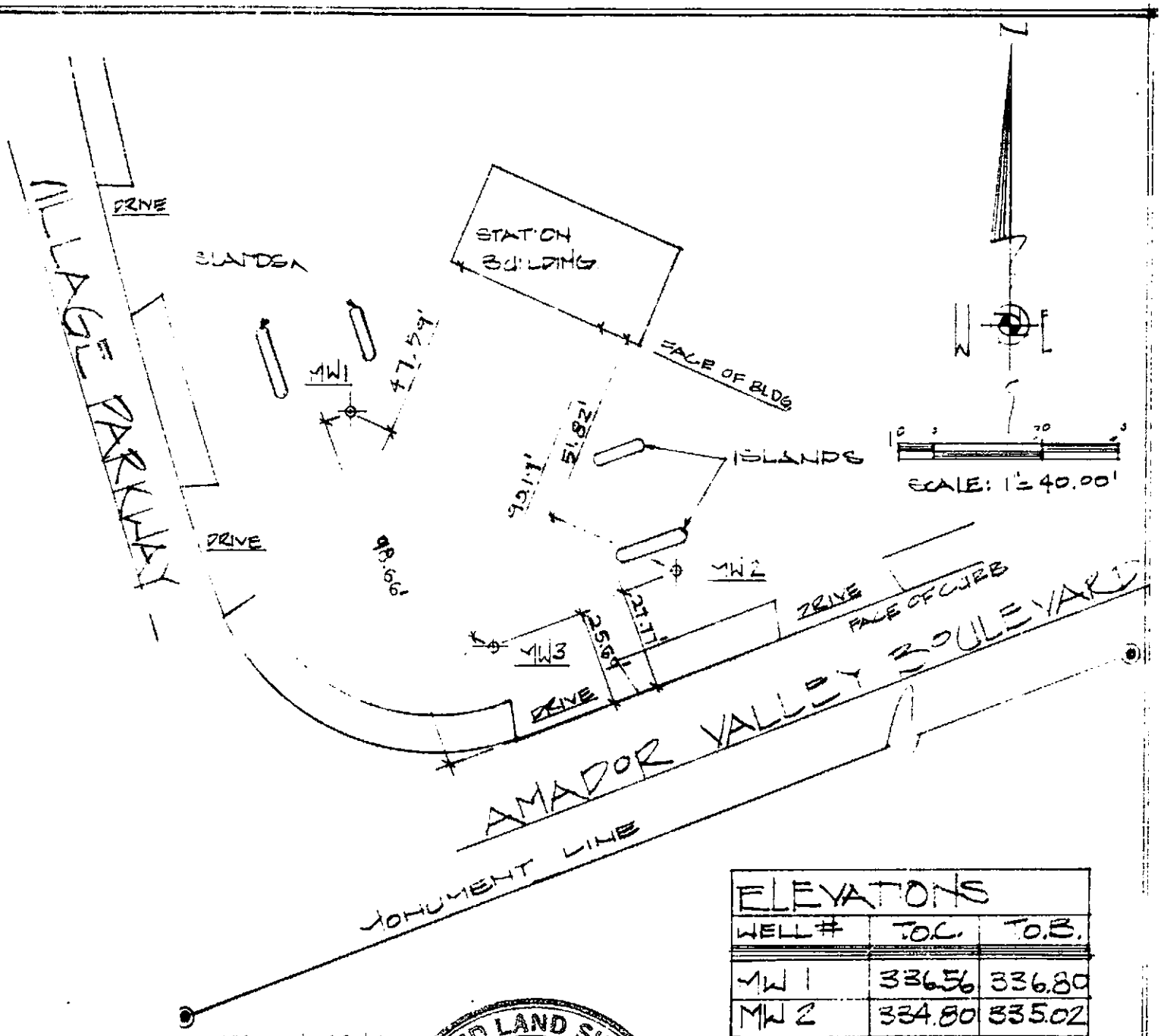
Well Designation	Elevation	Description
MW-1	336.36	Top of PVC Casing
	336.80	Top of Box
MW-2	334.20	Top of PVC Casing
	333.03	Top of Box
MW-3	335.57	Top of PVC Casing
	335.35	Top of Box

NOTES:

1. Datum is City of Dublin = (USGS)

2. Top of PVC Casing Elevation is at mark at top of 4" PVC for all wells. Mark bearing North for wells MW-2 & MW-3. Mark on MW-1 on East side.

3. Top of Box Elevation is at mark on rim for all wells. Mark bearing North for wells MW-2 & MW-3. Mark on MW-1 on East side.



ELEVATIONS		
WELL #	T.O.C.	T.O.B.
MW 1	336.56	336.80
MW 2	334.80	335.02
MW 3	335.53	335.85

LICENSED LAND SURVEYOR
JOHN E. KOCH
No. 4811
STATE OF CALIFORNIA

JEK dos # 91063
DATE: 10.16.91

SITE: ARCO STATION #6041
7249 VILLAGE PARKWAY
@AMADOR VALLEY BOULEVARD
DUBLIN, CA

CLIENT:
AGS/REGNA
JOB# 60006.02

JOHN E KOCH
LAND SURVEYOR
CA STATE LIC. NO. LS 4811
5427 TELEGRAPH AVE. SUITE A
OAKLAND, CA. 94609
PHONE (415) 655 9956
FAX (415) 655 9745

APPENDIX E

CHAIN OF CUSTODY RECORDS
LABORATORY ANALYSES REPORTS

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 6041-91-2

Chain of Custody

ARCO Facility no. 6041	City (Facility) Dublin	Project manager (Consultant) Joel Coffman	Laboratory name SEQUOIA ANALYTICAL
ARCO engineer Chuck Carmel	Telephone no. (ARCO) (415) 571-2434	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264-2435
Consultant name RESNA / Applied Geosystems	Address (Consultant) 3315 Almaden Expy, Suite 34; San Jose, CA 95118		Contract number 07-073

Method of shipment: SEQUOIA COURIER

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Water	Other	Preservation: Ice	Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
09/13-SP1-A	1	1	✓			✓			09/13/91		✓								1092280			
09/13-SP1-B	1	1	✓			✓			09/13/91		✓											
09/13-SP1-C	1	1	✓			✓			09/13/91		✓											
09/13-SP1-D	1	1	✓			✓			09/13/91		✓											
09/13-SP2-A	1	1	✓			✓			09/13/91		✓								1092281			
09/13-SP2-B	1	1	✓			✓			09/13/91		✓											
09/13-SP2-C	1	1	✓			✓			09/13/91		✓											
09/13-SP2-D	1	1	✓			✓			09/13/91		✓											

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

Condition of sample: Good

Temperature received: Cool

	Date	Time	
Relinquished by sampler: Barbara Sieminski	9/16/91	1145 AM	Received by: Joe Jenckes
Relinquished by: Joe Jenckes	9/16/91	1:00 PM	Received by:
Relinquished by:	Date	Time	Received by laboratory: Elaine Lin — Date 9/16/91 — Time 1:00 PM

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

APPC-3292 (2-91)

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 6041-91-2

Chain of Custody

ARCO Facility no. 6041	City (Facility) Dublin	Project manager (Consultant) Joel Coffman	Laboratory name SEQUOIA ANALYTICAL
ARCO engineer Chuck Carmel	Telephone no. (ARCO) (415)571-2434	Telephone no. (Consultant) (408)264-7723	Fax no. (Consultant) (408)264-2435
Consultant name RESNA / Applied Geosystems	Address (Consultant) 3315 Almaden Exp; Suite 34; San Jose, CA 95118		Contract number 07-073

Method of shipment: SEQUOIA COURIER

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	
S-9½-B1		1	✓			✓		09/12/91			✓								109228		2
S-14½-B1		1	✓			✓		09/12/91			✓										3
S-21½-B1		1	✓			✓		09/12/91			✓										4
S-4½-B2		1	✓			✓		09/13/91			✓										5
S-9½-B2		1	✓			✓	BS	09/13/91			✓										6
S-15½-B2		1	✓			✓	BS	09/13/91			✓										7
S-9½-B3		1	✓			✓	BS	09/12/91			✓										8
S-14½-B3		1	✓			✓	BS	09/12/91			✓										9

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

Condition of sample:

Temperature received:

	Date	Time	
Relinquished by sampler: Barbara Sieminski	9/16/91	11:45 AM	Received by: Joe Jenckes
Relinquished by: Joe Jenckes	9/16/91	1:05PM	Received by:
Relinquished by:	Date	Time	Received by laboratory: Flora Lin — Date 9/16/91 — Time 1:05 PM

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

APPC-3292 (2-91)

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Project: ARCO 6041, Dublin

Enclosed are the results from 10 soil samples received at Sequoia Analytical on September 16,1991. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1092280	Soil, composite, SP1 A-D	9/13/91	EPA 5030/8015/8020
1092281	Soil, composite, SP2 A-D	9/13/91	EPA 5030/8015/8020
1092282	Soil, S-9½-B1	9/12/91	EPA 5030/8015/8020
1092283	Soil, S-14½-B1	9/12/91	EPA 5030/8015/8020
1092284	Soil, S-21½-B1	9/12/91	EPA 5030/8015/8020
1092285	Soil, S-4½-B2	9/13/91	EPA 5030/8015/8020
1092286	Soil, S-9½-B2	9/13/91	EPA 5030/8015/8020
1092287	Soil, S-15½-B2	9/13/91	EPA 5030/8015/8020
1092288	Soil, S-9½-B3	9/12/91	EPA 5030/8015/8020
1092289	Soil, S-19½-B3	9/12/91	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

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 6041, Dublin	Sampled:	Sep 13, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil, composite	Received:	Sep 16, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Sep 17, 1991
Attention: Joel Coffman	First Sample #:	109-2280 A-D	Reported:	Sep 18, 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)
109-2280	SP1 A-D	1.9	0.027	N.D.	0.035	0.0070
109-2281	SP2 A-D	18	0.045	0.43	0.29	1.8
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

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 6041, Dublin	Sampled:	9/ 12-13 /91
3315 Almaden Expwy., Suite 34	Matrix Descript:	Soil	Received:	Sep 16, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Sep 17, 1991
Attention: Joel Coffman	First Sample #:	109-2282	Reported:	Sep 18, 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)
109-2282	S-9½-B1	150	0.90	4.2	2.4	13
109-2283	S-14½-B1	N.D.	0.0060	0.019	0.0090	0.060
109-2284	S-21½-B1	N.D.	N.D.	N.D.	N.D.	N.D.
109-2285	S-4½-B2	2.5	0.071	N.D.	0.093	0.017
109-2286	S-9½-B2	6.3	0.30	0.011	0.30	0.060
109-2287	S-15½-B2	N.D.	N.D.	N.D.	N.D.	N.D.
109-2288	S-9½-B3	52	1.2	2.5	1.4	8.5
109-2289	S-19½-B3	N.D.	N.D.	N.D.	N.D.	N.D.
Detection Limits:		**1.0**	**0.0050**	**0.0050**	**0.0050**	**0.0050**

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

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 1092280, 83-88

Reported: Sep 18, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	D. Dreblow	D. Dreblow	D. Dreblow	D. Dreblow
Reporting Units:	µg/kg	µg/kg	µg/kg	µg/kg
Date Analyzed:	Sep 17, 1991	Sep 17, 1991	Sep 17, 1991	Sep 17, 1991
QC Sample #:	GBLK091791	GBLK091791	GBLK091791	GBLK091791
Sample Conc.:	N.D.	12	N.D.	6.0
Spike Conc. Added:	200	200	200	600
Conc. Matrix Spike:	190	200	190	550
Matrix Spike % Recovery:	95	94	95	91
Conc. Matrix Spike Dup.:	200	200	190	580
Matrix Spike Duplicate % Recovery:	100	94	95	96
Relative % Difference:	5.1	0.0	0.0	5.3

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

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

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

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 1092281-82, 89

Reported: Sep 18, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	M. Nipp	M. Nipp	M. Nipp	M. Nipp
Reporting Units:	µg/kg	µg/kg	µg/kg	µg/kg
Date Analyzed:	Sep 17, 1991	Sep 17, 1991	Sep 17, 1991	Sep 17, 1991
QC Sample #:	GBLK091791	GBLK091791	GBLK091791	GBLK091791
Sample Conc.:	N.D.	11	N.D.	6.0
Spike Conc. Added:	200	200	200	600
Conc. Matrix Spike:	170	180	180	530
Matrix Spike % Recovery:	85	85	90	87
Conc. Matrix Spike Dup.:	180	190	190	540
Matrix Spike Duplicate % Recovery:	90	90	95	89
Relative % Difference:	5.7	5.4	5.4	1.9

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

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

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 6041-91-2

Chain of Custody

ARCO Facility no. 6041-6000602	City (Facility) DUBLIN	Project manager (Consultant) JOEL COFFMAN/LOU LEET	Laboratory name SEQUOIA
ARCO engineer CHUCK CARMEL	Telephone no. (ARCO)	Telephone no. (Consultant) (408) 264-7723	Fax no. (Consultant) (408) 264	Contract number 37-373
Consultant name RESNA	Address (Consultant) 3315 ALMADEN EXPRESSWAY, SUITE 34 SAN JOSE, CA		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐
W-RINSATE	1			X		X		9-20-91	11:40	HOLD										
W-11-MW3	3			X		X	X		11:55		X					1094095				
W-11-MW1	3			X		X	X		11:45		X					4096				
W-9-MW2	3			X		X	X		11:53		X					4097				

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

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

Condition of sample: good

Temperature received: 00

	Date	Time		Date	Time
Relinquished by sampler: L. J. Leet	9-20-91	4:00	Received by: Ben Follett		
Relinquished by: Ben Follett	9-20-91	4:50	Received by:		
Relinquished by:			Received by laboratory: K. Walker	9/20	4:50pm

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

APPC-3292 (2-91)

SEQUOIA ANALYTICAL

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

Rec. 10/4/91

Applied GeoSystems
3315 Almaden Expressway
Suite 34
San Jose, CA 95118

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Project: ARCO 6041, Dublin

Enclosed are the results from 3 water samples received at Sequoia Analytical on September 20,1991. The requested analyses are listed below:

SAMPLE #	SAMPLE DESCRIPTION	DATE OF COLLECTION	TEST METHOD
1094095	Water, W-11-MW3	9/20/91	EPA 5030/8015/8020
1094096	Water, W-11-MW1	9/20/91	EPA 5030/8015/8020
1094097	Water, W-11-MW2	9/20/91	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

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA	Client Project ID:	ARCO 6041, Dublin	Sampled:	Sep 20, 1991
3315 Almaden Expwy., Suite 34	Matrix Descript:	Water	Received:	Sep 20, 1991
San Jose, CA 95112	Analysis Method:	EPA 5030/8015/8020	Analyzed:	Sep 30, 1991
Attention: Joel Coffman	First Sample #:	109-4095	Reported:	Oct 2, 1991

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

Sample Number	Sample Description	Low/Medium B.P. Hydrocarbons µg/L (ppb)	Benzene µg/L (ppb)	Toluene µg/L (ppb)	Ethyl Benzene µg/L (ppb)	Xylenes µg/L (ppb)
109-4095	W-11-MW3	990	50	100	11	200
109-4096	W-11-MW1	410	28	36	4.3	89
109-4097	W-11-MW2	130	6.6	0.96	1.4	1.5
Detection Limits:		**30**	**0.30**	**0.30**	**0.30**	**0.30**

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

Elizabeth W. Hackl
Project Manager

SEQUOIA ANALYTICAL

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

RESNA
3315 Almaden Expwy., Suite 34
San Jose, CA 95112
Attention: Joel Coffman

Client Project ID: ARCO 6041, Dublin

QC Sample Group: 1094095-97

Reported: Oct 2, 1991

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethly-benzene	Xylenes
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Analyst:	K. Gill	K. Gill	K. Gill	K. Gill
Reporting Units:	µg/L	µg/L	µg/L	µg/L
Date Analyzed:	Sep 30, 1991	Sep 30, 1991	Sep 30, 1991	Sep 30, 1991
QC Sample #:	GBLK093091	GBLK093091	GBLK093091	GBLK093091
Sample Conc.:	N.D.	N.D.	N.D.	N.D.
Spike Conc. Added:	10	10	10	30
Conc. Matrix Spike:	9.4	9.4	9.3	28
Matrix Spike % Recovery:	94	94	93	93
Conc. Matrix Spike Dup.:	10	10	10	30
Matrix Spike Duplicate % Recovery:	100	100	100	100
Relative % Difference:	6.2	6.2	7.2	6.9

SEQUOIA ANALYTICAL

Elizabeth W. Hackl
Project Manager

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