ARCO Petroleum Products Company
515 South Flower Street
Mailing Address: Box 2679 - T.A.
Los Angeles, California 90051
Telephone 213 486 3511

February 5, 1988

Mr. Larry Seto
Alameda County Department of Health Care
470 27th Street, Room 6040
Oakland, CA. 94612

Re: ARCO Service Station #608, 17601 Hesperian Blvd.
San Lorenzo, California

Dear Mr. Seto:

Please find enclosed an initial site assessment report performed by Emcon Associates and an additional site assessment work scope to be performed by Applied Geosystems.

The proposed work plan will be implemented immediately. Soil and groundwater data will be collected and results will be compiled in a final report which will be submitted to your office as soon as possible.

If you have any questions and/or comments please notify me at (213) 486-1824.

Sincerely

T. T. Potter
Environmental Engineering

TTP:kp

Enclosure

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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1-19-88

WORK PLAN
SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
ARCO Station No. 608
17601 Hesperian Boulevard
San Lorenzo, California

AGS Job No. 87131-1W

Report prepared for

ARCO Petroleum Products Company
Post Office Box 5811
San Mateo, California 94403

by
Applied GeoSystems

John T. Lambert
Project Geologist

Gillian Holmes
G.E. 2023

January 19, 1988

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

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January 19, 1988
87131-1

Mr. Chris Windsor
ARCO Petroleum Products Company
515 South Flower Street
Los Angeles, California 90071

Subject: Transmittal of Work Plan No. 87131-1 Subsurface Environmental Investigation at ARCO Station No. 608, 17601 Hesperian Boulevard, San Lorenzo, California.

Mr. Windsor:

This Work Plan summarizes the results of previous environmental investigations performed at the above-referenced site and proposes additional work necessary to evaluate hydrocarbon contamination of soil and ground water.

The proposed work includes drilling four soil borings, constructing a 4-inch-diameter ground-water monitoring well in one boring, developing the well and sampling water from this well and three other wells on site for laboratory analysis, and evaluating the ground-water gradient. We will also prepare a comprehensive report that documents field methodology and presents our findings, conclusions, and recommendations. In our opinion, this work is necessary to evaluate the lateral and vertical extent of hydrocarbon contamination in the soil and ground-water at the site.

We recommend that ARCO submit a copy of this work plan to Mr. Larry Seto of the Alameda County Department of Health Care, Hazardous Materials Division, 470 27th Street, Room 322, Oakland, California 94612, and to Mr. Greg Zentner of the Regional Water Quality Control Board, San Francisco Bay Region, 1111 Jackson Street, Room 6040, Oakland, California 94607. Please do not hesitate to call if you have any questions regarding the contents of this work plan.

Sincerely,
Applied GeoSystems

John T. Lambert
Project Geologist

Applied GeoSystems
43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906
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WORK PLAN
SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
ARCO Station No. 608
17601 Hesperian Boulevard
San Lorenzo, California

Prepared for: ARCO Petroleum Products Company

INTRODUCTION

This Work Plan outlines an onsite subsurface environmental investigation at ARCO Station No. 608 located at 17601 Hesperian Boulevard in San Lorenzo, California, to evaluate the extent of hydrocarbon contamination in the soil and ground water at the site. The Work Plan is required by the Alameda County Department of Health Care Services, Hazardous Materials Division, after an underground storage tank, used to store regular leaded gasoline, had failed its Petro-tite hydrostatic tank test. ARCO requested that Applied GeoSystems prepare this Work Plan to comply with Alameda County's request.

This work plan includes the following: a Site Vicinity Map, Plate P-1; a Generalized Site Plan, Plate P-2, showing the approximate locations of underground storage tanks, previous boring and soil sample locations, and the location of existing

monitoring wells; and a site plan, Plate P-3, showing proposed locations for soil borings and an additional ground-water monitoring well. Examples of Field Report Logs of Borings and a Chain-of-Custody form are also included.

BACKGROUND AND PREVIOUS WORK

The ARCO Station No. 608 is located at 17601 Hesperian Boulevard in San Lorenzo, California. The station is located approximately 1 mile south of the intersection of Hesperian and U.S. Highway 101, as shown on the Site Vicinity Map, Plate P-1. The locations of the five underground storage tanks at the site are shown on the Generalized Site Plan, Plate P-2. We understand that three tanks, each of 6,000-gallon capacity, are located in one pit (east pit) and are used to store regular leaded and unleaded gasoline. Another 6,000-gallon capacity tank, located in a separate tank pit (west pit) is used to store super-unleaded gasoline. A fifth tank, of 550-gallon capacity is used to store waste oil.

At the request of ARCO, a geologist from Applied GeoSystems visited the site on November 6, 1987, to examine soil for possible hydrocarbon contamination after an underground storage tank used to store regular leaded gasoline failed a pressure

test. Prior to the geologist's arrival at the site, Becker Industries, Incorporated, had excavated a trench and the upper portion of the east tank pit to expose vapor lines and the tops of the three gasoline tanks. Soil samples collected from the wall of the excavation at each end of the regular leaded gasoline tank were tested for total volatile hydrocarbons (TVH). The approximate extent of the excavation and locations where the samples were taken are shown on Plate P-2.

The laboratory results showed the sample collected from the north wall of the excavation contained a hydrocarbon contamination level of 420 parts per million (ppm) and the sample collected from the south wall contained a nondetectable level of hydrocarbon contamination below detection limits for the method of analysis. The results of the laboratory analyses and our recommendations were presented to ARCO in a letter report (reference number 87131-1) dated November 12, 1987. Based on these results, Applied GeoSystems recommended that ARCO undertake a limited subsurface investigation to evaluate the soil and ground-water quality at the site.

After submitting the November 12, 1987, letter report, Applied GeoSystems received a copy of a field investigation report by EMCON Associates, dated November 12, 1985, which describes a

limited subsurface investigation that was undertaken at the site on October 1, 1985. The report describes sampling and laboratory analyses of soil collected from five exploratory boreholes, and the installation of a ground-water monitoring well in one of the boreholes at the site. The approximate locations of the boreholes and the monitoring well are shown on Plate P-2. The results of laboratory analyses of soil samples and of a ground-water sample collected from the monitoring well by EMCON are presented in Table 1.

The laboratory results presented in EMCON's report indicate moderate to high levels of hydrocarbon contamination (590 to 2,800 parts per million) in the soil samples collected near the gasoline tanks and 32 ppm of dissolved gasoline constituents in the ground-water sample. The soil samples collected near the waste oil tank showed levels of hydrocarbon contamination between 9,500 and 10,000 ppm. EMCON also indicated that the ground-water table was at a depth of approximately 12 feet and the inferred ground-water flow direction was toward the west. The borehole logs indicated that the soil at the site is predominately sandy clay and silty clay interbedded with lenses of sand.

During another visit to the site on January 18, 1988, a geologist from Applied GeoSystems located two additional wells. Each of these wells is constructed of 8-inch-diameter corrugated casing. One well has a total depth of 11.6 feet, and the other was 14.0 feet deep. The locations of these wells are shown on Plate P-2. Subjective analyses of water samples collected from these two wells and from the well installed by EMCON showed no floating product, sheen, or emulsion.

ARCO is presently arranging to replace the underground storage tanks at the site. The tank replacement operation is tentatively scheduled to begin in February 1988. It is our understanding that the waste oil tank is to be replaced and the four 6,000-gallon-capacity gasoline tanks are to be replaced by three 12,000-gallon-capacity tanks.

SAFETY PLAN

In accordance with requirements of the Alameda County Department of Health Care, Hazardous Materials Division, we are submitting this Safety Plan for the proposed drilling at the ARCO Station.

Underground Service Alert (USA) will be notified of our intent to

drill and underground utility lines and structures will be appropriately marked prior to drilling operations.

TABLE 1
RESULTS OF LABORATORY ANALYSES
(from EMCON report dated November 12, 1985)
ARCO Station No. 608
San Lorenzo, California

SOIL

BORING	DEPTH (feet)	GASOLINE CONCENTRATION	WASTE OIL CONCENTRATION
A-A	7.0 to 8.5		10,000
	10.5 to 12.0		9,500
A-B	12.5 to 14.0	1,500	
A-C	4.0 to 5.5	880	
	7.0 to 8.5	1,900	
	12.5 to 14.0	2,800	
A-D	12.5 to 14.0	590	

WATER

Sample: A1, Date Sampled: 10/07/85, Laboratory No. E85-0813

Benzene	1.000
Toluene	0.690
Xylene and Ethylbenzene	1.500
Gasoline	32.000

Results in parts per million (ppm)

A Foxboro Organic Vapor Analyzer (OVA-128) will be on site to evaluate organic vapors emitted from soil and water during drilling operations. The OVA-128 is capable of detecting organic vapors from less than 1 part per million organic vapors to concentrations indicative of explosive environments.

Appropriate protective clothing will be worn by field personnel. Clothing will include (but will not be limited to) hard hats, safety-glasses, proper Tyvek coveralls and steel-toed rubber boots. Neoprene gloves will be worn by field personnel who will be in contact with soil and water samples. Vapor respirators will be available at the site if strong hydrocarbon vapors are encountered during drilling.

A first aid kit will be available at the site. If emergency care is needed, the nearest medical facility is Eden Hospital, 20103 Lake Chabot Road, Castro Valley. This facility is less than 4 miles from the site.

Prior to initiation of the field program, a Health and Safety Officer will be assigned to the site. The officer will ensure that the site is properly barricaded during the field work, and will arrange a safety meeting with field personnel to inform personnel on safety procedures.

DELINEATION OF HYDROCARBON CONTAMINATION

In our opinion, further delineation of soil and ground-water hydrocarbon contamination is warranted at the site. We propose to drill three soil borings to an approximate depth of 15 feet and a fourth boring to an approximate depth of 30 feet. A 4-inch-diameter ground-water monitoring well will be installed in the deep boring. These borings will be used to gather data on the type and distribution of soil underlying the site and to evaluate the extent of hydrocarbon contamination in the soil. The ground-water monitoring well will be used in conjunction with existing wells on the site to evaluate hydrocarbon contamination of the ground-water. The location of the proposed ground-water monitoring well is shown on Plate P-3. The following work elements will be implemented at the site:

1) Observe the drilling of three borings, each to a depth approximately 15 feet.

2) Collect and classify relatively undisturbed soil samples taken at 2.5-foot intervals from the surface to total depth in these three borings.

3) Observe the drilling of one boring to a depth approximately 20 feet below the water table.

4) Collect and classify relatively undisturbed soil samples taken at 5.0-foot intervals from the surface to total depth in this boring.

5) Describe subsurface conditions at the site as revealed in the borings.

6) Submit the soil sample with the highest organic vapor analyzer (OVA) reading and the deepest unsaturated soil sample collected from each borehole to a State certified laboratory to be analyzed for hydrocarbon constituents.

7) Construct and develop a 4-inch-diameter ground-water monitoring well.

8) Develop the newly constructed well, purge the wells on the site, and collect water samples.

9) Calculate local ground-water gradient using relative ground-water elevations in the wells.

10) Submit one water sample from each well to a State-certified laboratory to be analyzed for total petroleum hydrocarbons (TPH) and the hydrocarbon constituents benzene, ethylbenzene, toluene and total xylene isomers (BETX).

11) Interpret field and laboratory data and prepare a report summarizing our findings, conclusions, and recommendations.

Soil Borings

Borings will be drilled with a 8- to 10-inch-diameter, hollow stem auger using a Mobile B-57 (or equivalent) truck-mounted drill rig. Augers will be steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. Three of the borings will be drilled to a maximum depth of 15 feet. The fourth boring, the boring in which a monitoring well is to be installed, will be drilled until first ground water is

encountered and extended into the aquifer either 20 feet or to a competent clay layer or aquitard. To test the competence of the aquitard or clay layer, the borehole will be drilled up to 5 feet into the clay. The excess hole shall be backfilled with either bentonite or neat cement placed using a tremie method and the monitoring well will be completed in the aquifer above this backfill. Should the first saturated material be greater than 20 feet thick, the well will be completed at a depth of 20 feet below the top of the saturated material. A geologist will log materials encountered in the borings during drilling, and a sample field borehole log is attached. Logs of borings will be provided in our report.

Drill cuttings subjectively evaluated as having hydrocarbon contamination levels greater than 100 parts per million (ppm) will be separated from those subjectively evaluated as having hydrocarbon contamination levels less than 100 ppm. Subjective evaluation will be based on the presence of soil discoloration and organic vapor analyzer (OVA) measurements. Field instruments such as the OVA are capable of evaluating relative concentrations of vapor content but cannot be used to give absolute levels of contamination. Drill cuttings will be aerated on site and disposed of at an appropriate facility (landfill).

Soil Sampling

Soil samples will be collected at 2.5-foot intervals from ground surface to total depth in the shallow soil borings and at 5-foot intervals in the boring in which the monitoring well will be constructed. The relative vapor content of the soil samples will be measured using an OVA and recorded on the Boring Logs. Earth materials encountered in the borings will be logged as drilled and described on boring logs which will be included in the final report. Soil samples will be collected by advancing the boring to a point immediately above the sampling depth and then driving a California-modified split-spoon sampler into the soil through the hollow center of the auger. The sampler will be driven 18 inches with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive 6 inches will be counted and recorded to evaluate the relative consistency of the soil.

The samples will be removed from the sampler, immediately sealed in their brass sleeves with aluminum foil, plastic caps, and airtight tape. They will then be labeled and placed in iced storage. Samples will be delivered to a laboratory that is certified to perform the types of analyses requested. Chain of Custody Records for samples tested will be included in the

Appendix of the final report. A sample Chain of Custody Record is attached.

Monitoring Well Construction and Development

A 4-inch-diameter well will be constructed in one soil boring to evaluate and monitor ground-water conditions at the site. The well will be completed to a depth of approximately 20 feet below the first occurrence of ground water. The well will be constructed of thread-jointed, polyvinyl chloride (PVC) casing. No chemical cements, glues, or solvents will be used in the well construction. The bottom of the casing will have a threaded end plug and the top will have a slip cap. The screened portion of the well will consist of factory-perforated slotted casing with 0.020-inch-wide slots. The well screen will extend from total depth of the well to approximately 5 feet above the upper zone of saturation to allow for monitoring during seasonal fluctuations of ground-water levels. The annular space will be packed with sorted and washed sand to approximately 2 feet above the perforations. A 1- to 2-foot-thick bentonite plug will be placed above the sand as a seal against cement entering the sand pack. The remaining annulus will be backfilled with a neat cement/bentonite slurry to approximately 1 foot below grade. A

graphical log of the well construction will be provided on the Log of Boring in the final report.

An aluminum utility box with a PVC apron will be placed over the well head and concreted into place flush with the surrounding ground surface. The well head cover will have a watertight seal to protect the ground-water monitoring well against surface-water infiltration and will require a specially-designed spanner wrench to open. This design reduces the possibility of either vandalism to or accidental disturbance of the well. The well will be developed by air-jetting or surge pumping.

Ground-Water Sampling

The newly constructed well will be allowed to equilibrate after developing. A bailer will then be used first to obtain a sample from the surface of the water in each well on the site for subjective evaluation prior to purging. If floating hydrocarbon product is detected, the thickness of the product will be measured and the well will not be purged. If floating product is not observed, the well will then be purged of approximately four well volumes before collecting a water sample for analysis. Following ground-water recovery to static conditions, a water sample will be retrieved from each well that does not contain

floating product by using a Teflon bailer. The bailer will be cleaned with distilled water and Alconox between each sampling to prevent cross-contamination. Water samples will be sealed in laboratory-cleaned glass containers with Teflon-lined lids, labeled, and immediately placed in iced storage. Chain of Custody Records will be initiated by the sampler and will accompany the samples to a State-certified analytical laboratory. Copies of the Chain of Custody Records will be included in our final report. A sample Chain of Custody Record is attached.

EVALUATION OF GROUND-WATER GRADIENT

If the four wells do not contain free product, ground-water elevations will be measured to evaluate the ground-water gradient. Evaluation of the ground-water gradient across the site will be made through the use of a Wild NA-24 Auto Level or similar instrument, stadia rod, and electric water level indicator. The leveling instrument and stadia rod will be used to measure the differences in elevation between the instrument and the top of the casing for each of the monitoring wells. Measurements will be recorded to the nearest 0.001-foot. The elevation differences will be combined with depths below casing of static water levels, measured with the water-level indicator to the nearest 0.01-foot, to calculate the water level elevation

differences between the wells. The elevation differences will be used to construct a ground-water potentiometric surface map across the site. The ground-water gradient and direction of ground-water flow will be measured from this map.

ANALYTICAL METHODS

Soil and water samples selected for testing will be analyzed for total petroleum hydrocarbons (TPH) and the hydrocarbon constituents, benzene, ethylbenzene, toluene, and total xylene isomers (BTEX) following EPA methods 8015 and 8020/602, respectively. Detection limits suitable for the tests requested will be stated on the laboratory report. Analyses will be facilitated through solvent extraction, gas chromatography separation, and photo- and flame-ionization detection.

REPORT PREPARATION

A report will be provided to ARCO Petroleum Company to summarize the following: the soil stratigraphy; field and laboratory procedures; well construction details; laboratory results; our interpretations regarding the nature, source, and estimated volume of released contaminants; and recommendations for further work. Information gathered during this phase will be considered

confidential and released only upon the authorization of ARCO Petroleum Products Company.

PROJECT STAFF

Ms. Gillian S. Holmes, a Registered Civil Engineer (C.E. 34812) and Registered Geotechnical Engineer (G.E. 2023) in the State of California, will be in overall charge of this project. Mr. John Lambert, Project Geologist, will manage field and office operations of the project. Applied GeoSystems employs a staff of geologists and technicians who will be used as needed to see the project to completion.

SOURCE: U.S. GELOGICAL SURVEY
SAN LEANDRO/HAYWARD
7.5-MINUTE QUADRANGLES

N

APPROXIMATE SCALE

2000 1000 0 2000 4000

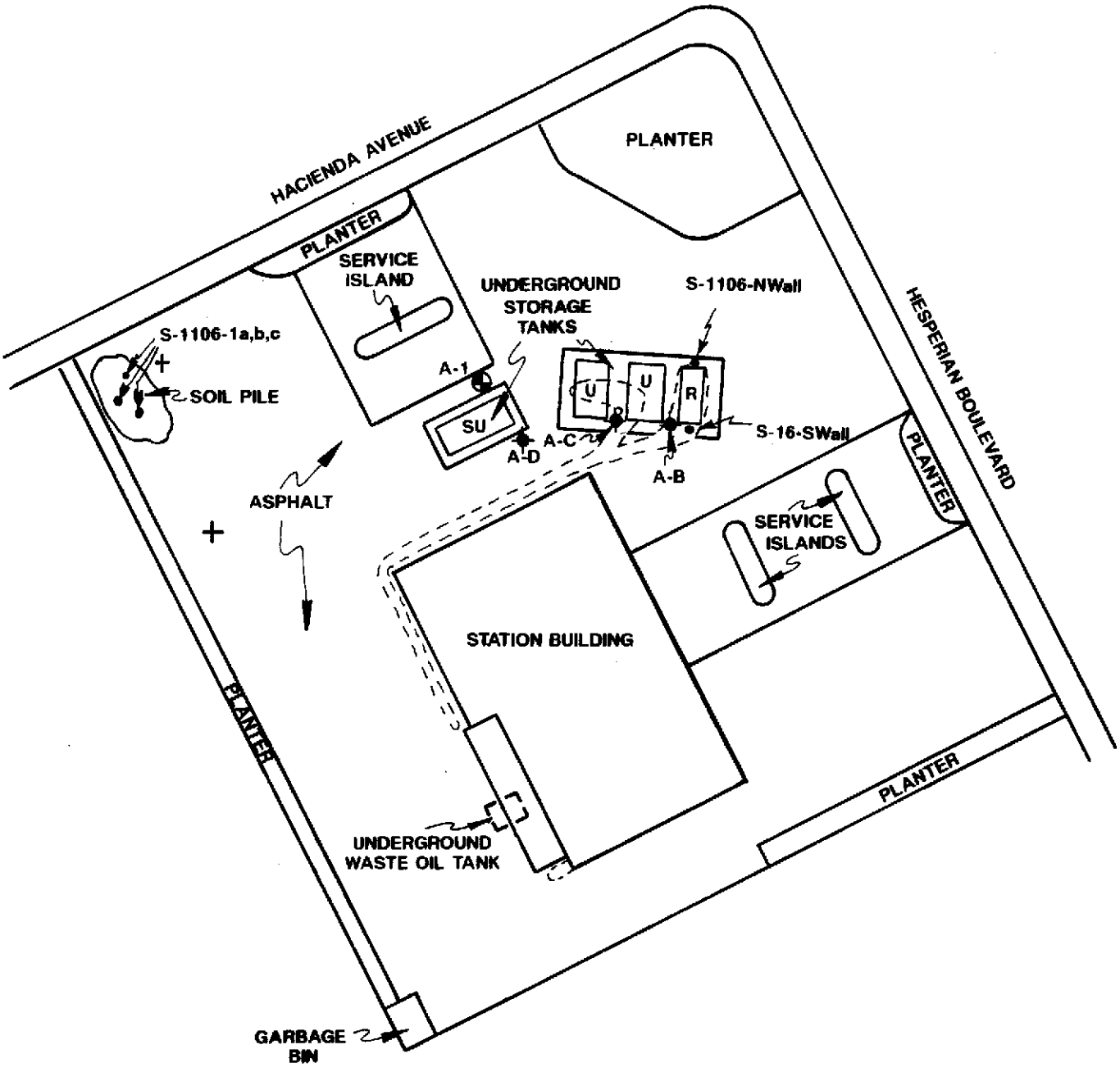
feet

Applied GeoSystems
43255 Mission Blvd Suite B Fremont, CA 94539 (415) 651-1906

PROJECT NO. 87131-1

SITE VICINITY MAP
Arco Service Station
17601 Hesperian Boulevard
San Lorenzo, California

PLATE
P - 1



MEASURED BY TAPE AND COMPASS

+ MONITORING WELL (ORIGIN UNKNOWN)

EXTENT OF EXCAVATION } NOVEMBER 6, 1987

SOIL SAMPLE LOCATION }

SOIL BORING } EMCON, NOVEMBER 1985

MONITORING WELL }

R REGULAR

U REGULAR UNLEADED

SU SUPER UNLEADED

N

APPROXIMATE SCALE

30 15 0 30 60

feet

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PROJECT NO. 87131-1

GENERALIZED SITE PLAN

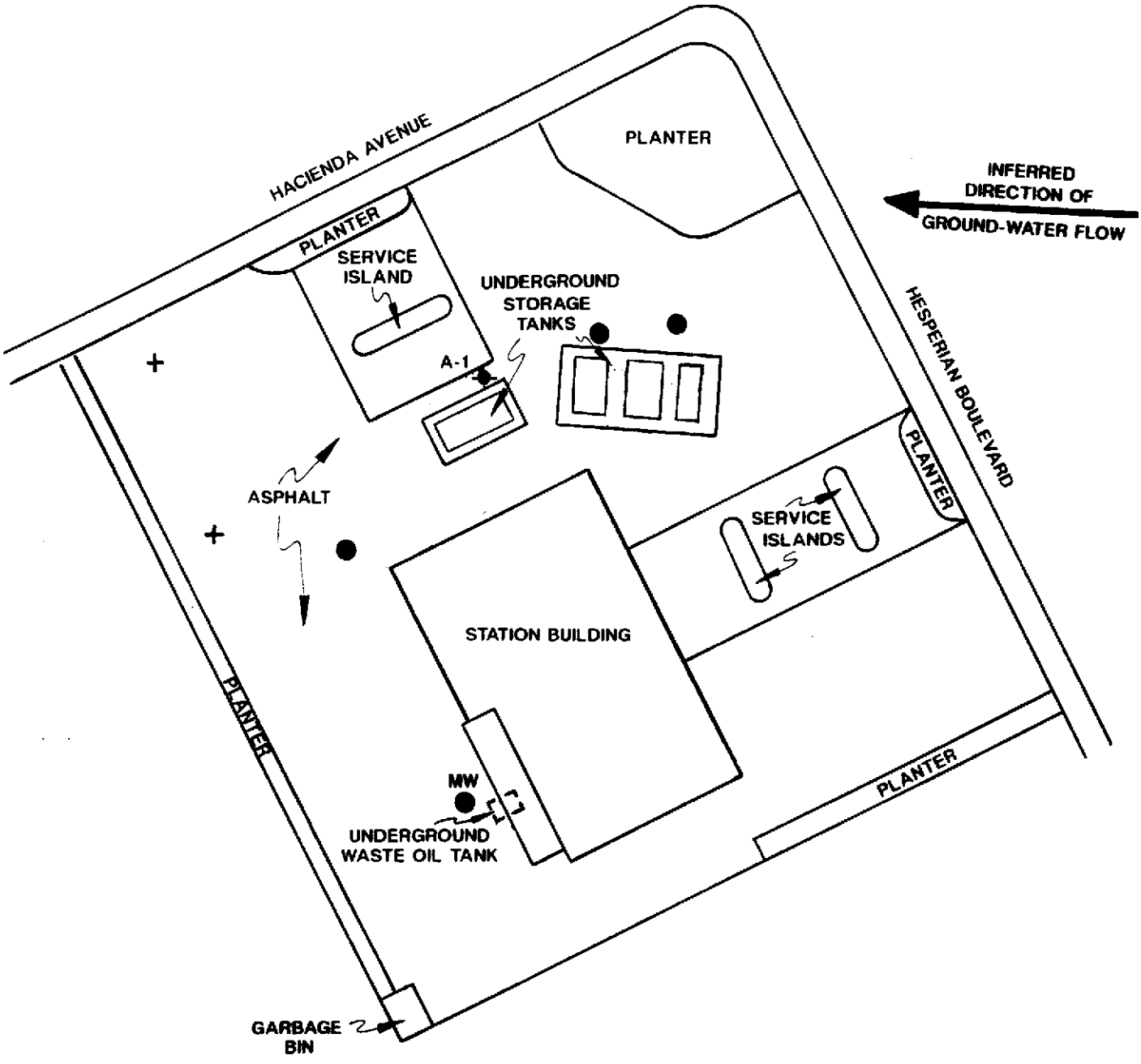
Arco Service Station

17601 Hesperian Boulevard

San Lorenzo, California

PLATE

P - 2



MEASURED BY TAPE AND COMPASS

+ EXISTING MONITORING WELL (ORIGIN UNKNOWN)

✦ EXISTING MONITORING WELL (EMCON, NOVEMBER 1985)

● APPROXIMATE LOCATION OF PROPOSED BORING

MW PROPOSED MONITORING WELL

N

APPROXIMATE SCALE

30 15 0 30 60

feet

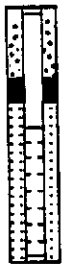
Applied GeoSystems

PROJECT NO. 87131-1

PROPOSED BORING AND MONITORING WELL LOCATIONS
Arco Service Station
17601 Hesperian Boulevard
San Lorenzo, California

PLATE
P - 3

Applied GeoSystems



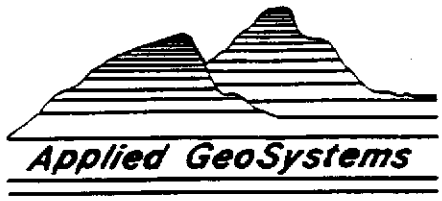
Job No:	Client:	Location:
Drilling Method:		Boring No.:
Drilling Company:		Sheet No.:
Drilling Crew:		
Geologist:		Drilling Time:
Sampling Method:		Start / Finish
Water Level:		Time / Time
Time:		
Date:		Date: / Date:
Casing Depth		

Datum: Elevation:

Recovery	Sample Type	Sample Depth	Blows Per 6in.	Moisture Content	Product Odor	Depth in Feet	USCS Code	Surface Conditions:
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

FIELD BOREHOLE LOG

CHAIN OF CUSTODY RECORD



43255 Mission Blvd. Suite B Fremont, CA 94539 (415) 651-1906

SAMPLER (signature): _____

Phone: _____

LABORATORY:

_____

_____

_____

TURNAROUND TIME: _____

Attention: _____

Phone No. _____

SHIPPING INFORMATION:

Shipper _____

Address _____

Date Shipped _____

Service Used _____

Airbill No. _____ Cooler No. _____

Relinquished by: (signatures)	Received by: (signatures)	Date	Time
	Received for laboratory by:		

LABORATORY SHOULD SIGN UPON RECEIPT AND RETURN A COPY OF THIS FORM WITH THE LABORATORY RESULTS

Sample No.	Site Identification	Date Sampled	Analyses Requested	Sample Condition Upon Receipt

SAMPLE