

LETTER OF TRANSMITTAL

TO: Mr. Barney Chan, Hazardous Materials Specialist
Alameda County Department of Environmental Health
80 Swan Way, Room 200, Oakland, CA 94621

FROM: Sarah J. Battelle, Project Manager

DATE: June 4, 1992

SUBJECT: Oakland TRACON Facility (FAA) Site Investigation

REFERENCE NO: ASI File: 9788-4900

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Signed

Sarah J. Battelle

cc: CRWQCB



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FINAL

**OAKLAND INTERNATIONAL AIRPORT
TERMINAL RADAR APPROACH
CONTROL (TRACON) FACILITY
SITE INVESTIGATION**

June 1992

prepared for:

**Federal Aviation Administration
Western-Pacific Region
FAA AWP-464.10
P.O. BOX 92007, WWPC
Los Angeles, California 90009**

prepared by:

**Advanced Sciences, Inc.
4909 Murphy Canyon Road, Suite 500
San Diego, California 92123**

Under Contract

DTFA 08-88-C-00048
MODIFICATION 0049

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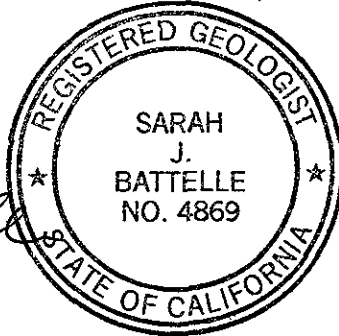
**OAKLAND INTERNATIONAL AIRPORT
TERMINAL RADAR APPROACH CONTROL (TRACON) FACILITY
SITE INVESTIGATION**

This report has been prepared by the staff of Advanced Sciences, Inc., under the professional supervision of the undersigned.

Geochemistry, hydrogeology, and the geotechnical sciences are inexact sciences. Groundwater conditions and the behavior of contaminants are highly variable in nature. The results regarding concentrations of various constituents are based upon limited sampling and analyses.

The services provided, judgments rendered, findings, recommendations, specifications or professional opinions are presented, within the limits prescribed by the client, after being prepared in accordance with generally accepted professional engineering and geologic practices. There is no warranty or guarantee of site conditions, either expressed or implied.

Sarah J. Battelle
Sarah J. Battelle, R.G. #4869
Project Manager



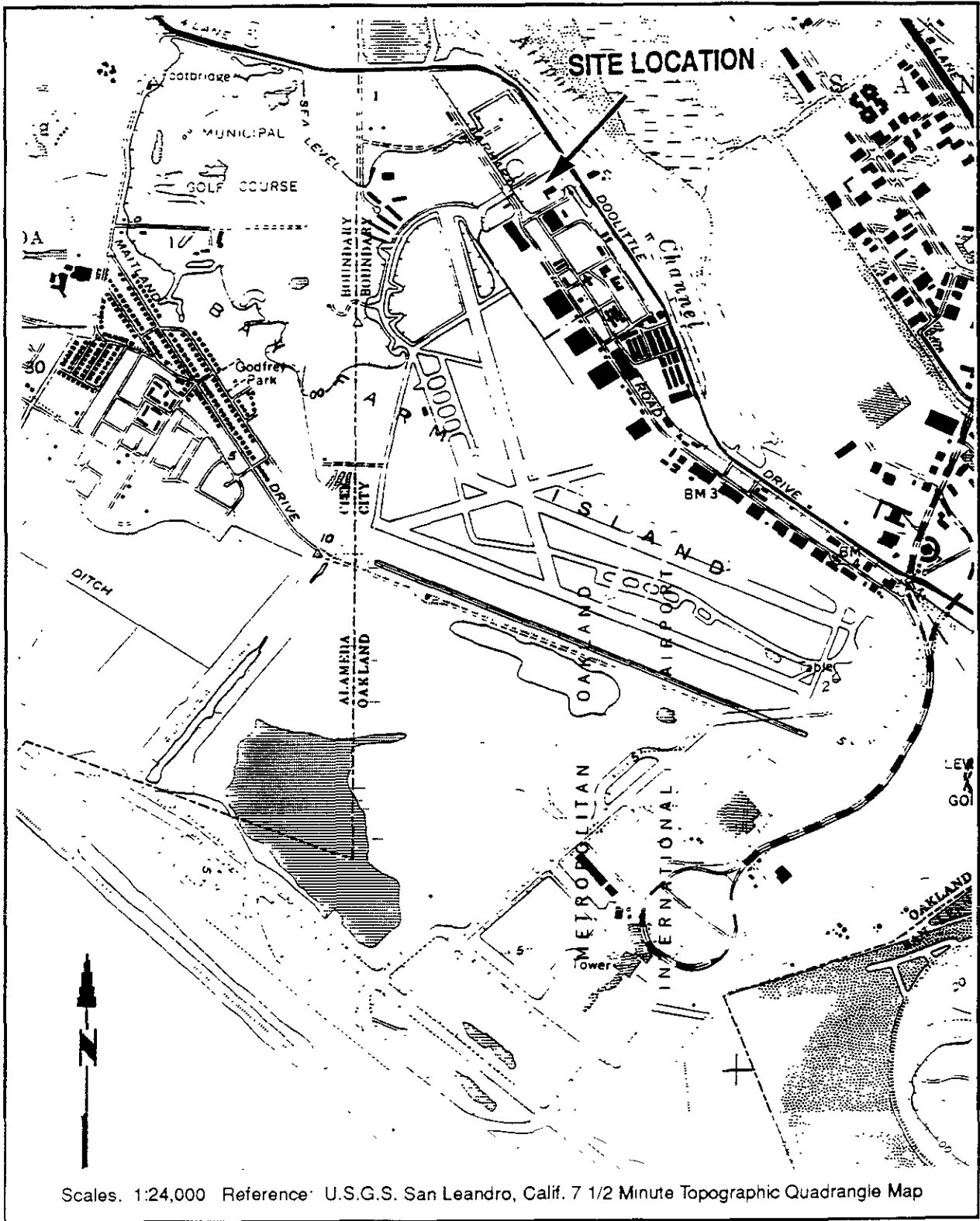
1. INTRODUCTION

1.1 SITE HISTORY

The Federal Aviation Administration (FAA) Oakland International Airport Terminal Radar Approach Control (TRACON) facility is located at 1029 Grumman St., Oakland, in the northeast quarter of the southwest quarter of Section 20, Township 2 South, Range 3 West of the San Leandro 7.5 Minute Quadrangle, Alameda County, California (Figure 1). The FAA Oakland International Airport TRACON facility consists of a control building with an emergency generator and a former underground 1,000-gallon-capacity diesel tank (Figure 2). The land is located in a portion of a former U.S. Navy fuel storage area, owned by Alameda County, administered by the Port of Oakland, and leased by the FAA. The facility is at an elevation of approximately 7 feet above mean sea level (MSL).

The FAA contracted with Advanced Sciences, Inc. (ASI), to conduct soil sampling following the removal of the tank by the FAA. The 1,000-gallon-capacity diesel tank was removed by the FAA on May 2, 1991, under a permit issued by the Alameda County Department of Environmental Health (DEH). Upon excavation, the tank appeared intact with no visible leaks or holes. ASI field personnel observed no soil staining and detected no hydrocarbon odors adjacent to or in the soil beneath the tank. In addition, total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and xylenes (BTEX) were not detected in soil samples collected beneath the tank. A soil sample collected in the tank backfill stockpile (sample TRACON-5) was received by the laboratory in a broken container; thus, sample integrity had been compromised and the analytical results, 375 milligrams per kilogram (mg/kg), may not be valid. Soil analytical results of the May 2, 1991, sampling are presented in Table 1, and laboratory analytical reports are presented in Appendix A.

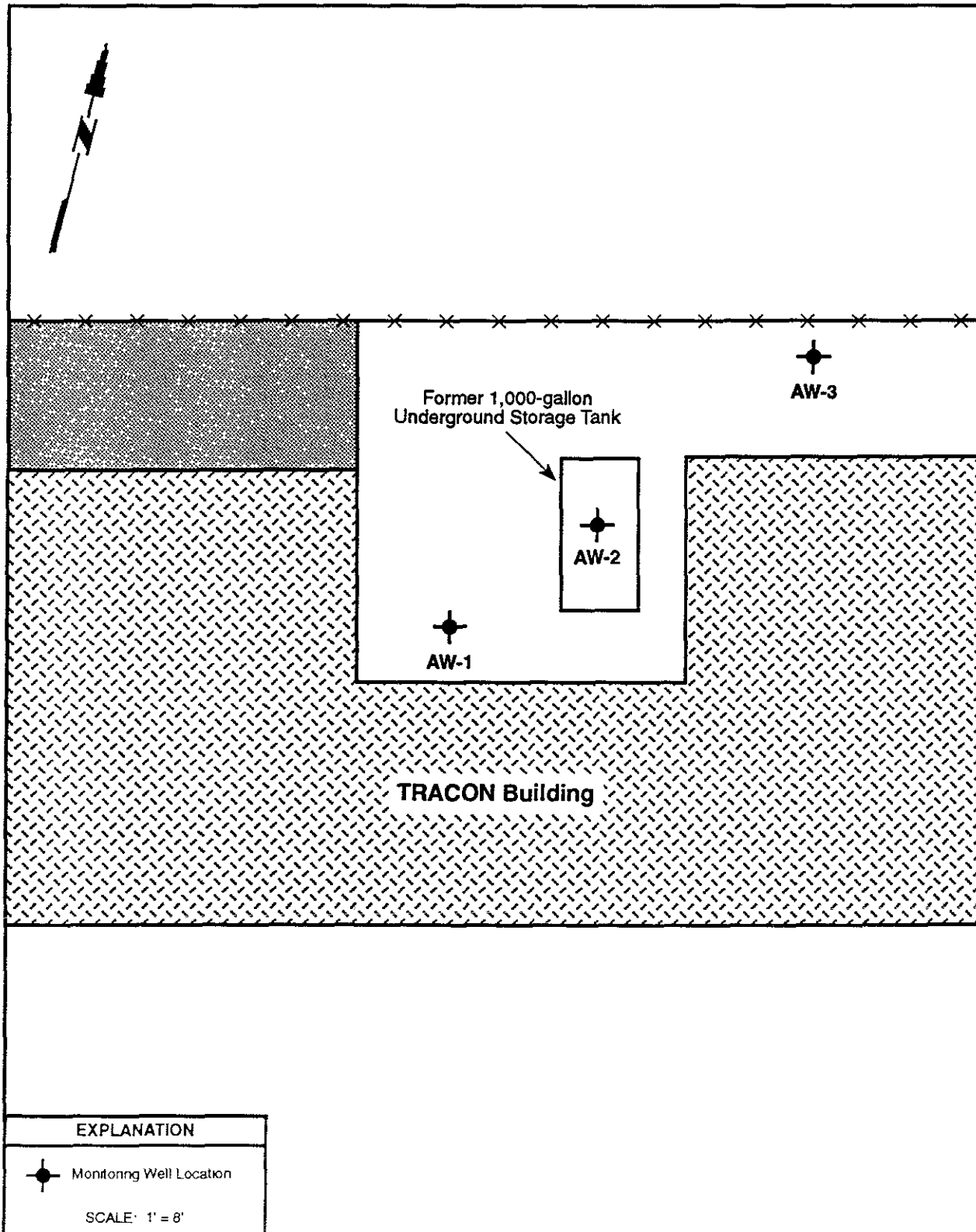
Groundwater was observed and sampled in the tank pit excavation at a depth of approximately 5 feet below ground surface following tank removal activities on May 2, 1991. A groundwater sample (TRACON-1) had a TPH concentration of 36.6 milligrams per liter (mg/l) with the majority of hydrocarbons slightly less than, at, and greater than C₂₃, indicating the presence of



Site Location
Federal Aviation Administration
Oakland International Airport TRACON Facility
Site Investigation

PROJECT NO. 9788-49

FIGURE 1



Site Plan
Federal Aviation Administration
Oakland TRACON Facility
Site Investigation

PROJECT NO. 9788-49

FIGURE 2

Table 1
Soil analytical results
FAA Oakland TRACON facility

Date Collected	Sample I.D.	Site Location	TPH (mg/kg) ^a	Benzene (µg/kg) ^b	Toluene (µg/kg)	Ethylbenzene (µg/kg)	Xylenes (µg/kg)
5/2/91	TRACON-3	tank pit north end	< 10.0	< 1.0	< 1.0	< 1.0	< 3.0
5/2/91	TRACON-4	tank pit south end	< 10.0	< 1.0	< 1.0	< 1.0	< 3.0
5/2/91	TRACON-5	soil stockpile	375.0	< 1.0	< 1.0	< 1.0	< 3.0
3/4/92	SS-1	tank pit center	580.0	< 17.0	< 17.0	< 17.0	100.0

^aMilligrams per kilogram.
^bMicrograms per kilogram.

hydrocarbons heavier than the diesel fuel previously stored in the FAA tank. The analytical results of groundwater sample TRACON-2 did not indicate the presence of detectable concentrations of BTEX. These petroleum hydrocarbons may represent fuel associated with 12 concrete tanks believed to be abandoned in place by the U.S. Navy and located beneath the FAA TRACON parking lot. Groundwater analytical results are presented in Table 2, and laboratory analytical reports are presented in Appendix B. ASI reported these results to Mr. Barney Chan, Hazardous Materials Specialist, Alameda County DEH, in a letter dated August 30, 1991. In this letter, ASI requested site closure from the Alameda County DEH.

In a letter dated July 26, 1991, to Mr. Charley Chamness of the FAA, Mr. Chan of the Alameda County DEH stated that the site had experienced an unauthorized release of petroleum hydrocarbons. He requested a work plan to assess the impact to soil and/or groundwater and to assess the extent of any such impact.

Table 2
Groundwater analytical results
FAA Oakland TRACON facility
May 2, 1991

Sample ID	TPH (mg/l) ^a	Benzene (µg/l) ^b	Toluene (µg/l)	Ethyl-benzene (µg/l)	Xylenes (µg/l)
TRACON-1	36.6	NA ^c	NA	NA	NA
TRACON-2	NA	< 0.5	< 0.5	< 0.5	< 1.5

^aMilligrams per kilogram.
^bMicrograms per kilogram.
^cNot analyzed.

In a letter to Mr. Jim Williams of the FAA dated September 16, 1991, Mr. Chan denied the site closure request contained in the August 30, 1991, letter from ASI. In addition, Mr. Chan requested additional chromatograms, evidence of an upgradient source of the fuel oil, and a history of fuel contents used in the FAA TRACON tank.

A review of FAA records was conducted at the TRACON site and at the Los Angeles Western Regional office in early December 1991. The FAA supplied a plot plan of the FAA TRACON facility, which had been prepared prior to the construction of the TRACON. The plot plan indicates the locations of the 12 abandoned concrete underground tanks under the current TRACON parking lot, approximately 200 to 250 feet east of the former FAA TRACON tank. The final deposition of these tanks is unknown. A copy of the plot plan indicating the location of these tanks was sent to Mr. Chan.

To assess TPH concentrations within the soil backfill, ASI proposed to collect three soil samples within the soil backfill at depths of approximately 5, 6, and 7 feet below ground surface. The soil samples were to be analyzed for TPH and BTEX concentrations, and if TPH concentrations

were above 100 mg/kg, then the type of petroleum hydrocarbons within the soil was to be identified by the laboratory using fuel fingerprint (carbon-chain breakdown) methodology.

The FAA contends that TPH concentrations detected in groundwater beneath the former tank location are primarily the result of abandoned U.S. Navy underground fuel tanks or other preexisting tanks at or near the site. Soil samples collected on May 2, 1991, indicated that soils in and adjacent to the tank pit do not contain hydrocarbons with the exception of one tank backfill sample (possibly invalid), which indicates that the surrounding soil may not be the source of hydrocarbons detected in the groundwater. To assess the TPH concentrations in the groundwater, ASI proposed to install and sample at least one monitoring well within or adjacent to the former tank location. Collected groundwater samples were to be analyzed for TPH and BTEX concentrations and, if TPH concentrations were above 1 mg/l, then the type of petroleum hydrocarbons within the groundwater were to be identified (fuel fingerprint).

Based on a discussion with Mr. Chan, if the groundwater beneath the site is tidally influenced, then the FAA will not be required to demonstrate upgradient sources of hydrocarbons other than diesel, but rather potential adjacent sources. Also, Mr. Chan indicated that at least three wells must be installed at the site to be in compliance with the California Regional Water Quality Control Board (CRWQCB) Triregional guidelines.

1.2 SCOPE OF SERVICES

In accordance with the ASI Groundwater Monitoring Plan submitted to Mr. Chan of the Alameda County DEH dated February 10, 1992, and in accordance with the FAA Contract DTFA 08-88-C-00048 Modification 0049, ASI provided the following services to the FAA at the Oakland International Airport TRACON facility:

- notified Underground Service Alert (USA) of our intention to drill,
- contracted with a California C-57 licensed driller,
- completed three soil borings (borings AB-1 through AB-3),
- collected a soil sample from boring AB-2,
- installed and developed three groundwater investigation wells (wells AW-1 through AW-3), one in each soil boring,

- collected groundwater samples from each of the three new groundwater investigation wells,
- arranged for laboratory analysis of the soil and groundwater samples,
- temporarily installed a Stevens water level recording device in one of the wells,
- determined the elevations of the wells, and
- produced this report.

2. DATA COLLECTION METHODS

2.1 INTRODUCTION

This section presents descriptions of the methods used to locate underground utilities; assess sample locations and methods of soil and groundwater sample collection; conduct groundwater investigation well installation and development and Stevens water level indicator installation and measurements; and describe the analytical methods to analyze the soil and groundwater samples collected during this investigation of the Oakland International Airport TRACON facility.

2.2 UTILITIES LOCATION

USA, a public utility locator service, was notified of the intent to drill on the site. In response to our request, communications and electrical utility personnel visited the site. Additional private utilities were verified by the FAA. The results of this information indicated that the areas adjacent to the proposed boring locations were free of obstructions that would interfere with drilling operations.

2.3 SOIL BORINGS AND SOIL SAMPLE COLLECTION

On March 4, 1992, three soil borings (borings AB-1 through AB-3) were drilled and completed as groundwater investigation wells by Hogate Exploration Drilling Co. of Loomis, California (C-57 License #401530), using a B-40L drilling rig equipped with 8-inch, outside-diameter hollow-stem augers. The soil borings were advanced to a depth of 15 feet. Clean augers were used in each boring. Soil boring logs are presented in Appendix C. The augers and the drilling rig were pressure-washed at the completion of drilling activities.

A soil sample was collected from Boring AB-2 (soil sample SS-1) at a depth of approximately 5.0 to 5.5 feet below ground surface within the former tank location. The soil sample was collected using a modified California split-spoon sampler. Due to the visible presence of hydrocarbon-affected soil in soil sample SS-1, additional soil samples were not deemed necessary and were not collected from this boring. Once the sample barrel was removed from the boring,

the soil sample was placed into two 250-milliliter (ml) glass jars. The 250-ml glass jars were sealed with Teflon-lined caps, labeled, logged, placed in a sealable plastic bag, and placed into an insulated cooler with ice. The sample was carried by ASI personnel under strict chain-of-custody protocol to Terra Tech Labs, Inc., of Santa Ana, California, for analysis. The chain-of-custody form is presented in Appendix A. Soil sample SS-1 was analyzed for TPH with a carbon-chain breakdown (fuel fingerprint) using modified EPA Method 8015, and BTEX using EPA Method 8020.

2.4 GROUNDWATER INVESTIGATION WELL INSTALLATION

Following the completion of each boring, the boreholes were completed as groundwater investigation wells (wells AW-1 through AW-3) under Permit #92041 issued by the Alameda County Flood Control and Water Conservation District. Each groundwater investigation well was installed with 2-inch, inside-diameter, flush-threaded polyvinylchloride (PVC) casings with approximately 10 feet of 0.020-inch factory-slotted screens based on the observed water level (approximately 5 feet) during the tank removal. The screens were installed from a depth of approximately 4.5 feet to 14.5 feet below ground surface with No. 3 Lonestar sand as the filter pack. The sand filter packs extend from approximately 4 feet to 15 feet below ground surface. A granular bentonite seal, approximately 2 feet thick, was placed above the sand filter at 4.0 to 2.0 feet in depth. The seal in well AW-1 extends from approximately 2.2 to 1.0 feet in depth. Water was added to aid in the hydration of the bentonite seal. The area above the bentonite seal was then filled with Type I-II cement to ground surface. A lockable, stainless-steel, flushmount, watertight traffic vault was cemented in place over the well head and padlocked to prevent entry. Well construction details for wells AW-1 through AW-3 are presented as Appendix D.

2.5 WELL DEVELOPMENT AND GROUNDWATER SAMPLING

On March 5, 1992, the three new groundwater investigation wells (AW-1 through AW-3) were developed. Groundwater levels were measured in each well prior to development with a Solinst water level indicator (Table 3) and recorded to aid in evaluating hydrologic conditions. Well elevations are presented in Appendix E and were measured by Altamont Land Surveyors, Inc., of Pleasanton, California, on April 22, 1992.

Table 3
Groundwater level measurements
FAA Oakland TRACON facility
March 26 and April 22, 1992

Well No.	Date	Depth to Groundwater (ft) from TOC*	TOC Elevation (ft)	Groundwater Elevation (ft)
AW-1	3/26/92	2.51	11.28	8.77
AW-2	3/26/92	1.97	10.74	8.77
AW-3	3/26/92	1.73	10.92	9.19
AW-1	4/22/92	2.90	11.28	8.38
AW-2	4/22/92	2.36	10.74	8.38
AW-3	4/22/92	2.49	10.92	8.43

*Depth to groundwater expressed in feet from top of casing.

An air-powered double-diaphragm pump was used to purge each well of at least three borehole volumes. The pH, temperature, and conductivity of the purged water were recorded periodically as the wells were developed. Disposable tubing was used for purging to avoid cross-contamination of the wells. The purged groundwater was pumped to 55-gallon drums on-site.

On March 26, 1992, groundwater samples were collected from each of the three new wells. Prior to sampling, groundwater levels were measured and recorded. Due to slow recharge conditions, a stainless-steel bailer was used to purge each well of at least three casing volumes prior to sample collection. Development was not vigorous due to the fine-grained nature of the surrounding Bay Mud.

Following purging, the groundwater samples were collected with disposable Teflon bailers. Each groundwater sample was placed into a laboratory-prepared liter amber glass jar, two 40-ml glass vials, and a 250-ml plastic bottle. The 40-ml glass vials were sealed with Teflon-lined caps with

no headspace. The jars, vials, and bottles were labeled, logged, placed in sealable plastic bags, and placed into an insulated cooler with ice. The samples were then shipped to Terra Tech Labs, Inc., of Santa Ana, California, under strict chain-of-custody protocol. The chain-of-custody form is presented in Appendix B.

The groundwater sample from each well in the liter glass jar was analyzed for TPH with a carbon-chain breakdown using California DHS methodology. The sample in the two 40-ml vials was analyzed for BTEX using EPA Method 602, and the sample in the plastic bottle was analyzed for total dissolved solids (TDS) using EPA Method 160.1 .

2.6 STEVENS WATER LEVEL RECORDER INSTALLATION

A Stevens Type F water level recorder was installed in well AW-2 on March 27, 1992, and was removed on April 9, 1992, as a means of assessing tidal influence on water levels in the vicinity of the former Oakland International Airport TRACON tank. The water level recorder was set to record water level fluctuations as much as ± 4 feet.

3. DATA PRESENTATION AND INTERPRETATION

3.1 SITE GEOLOGY

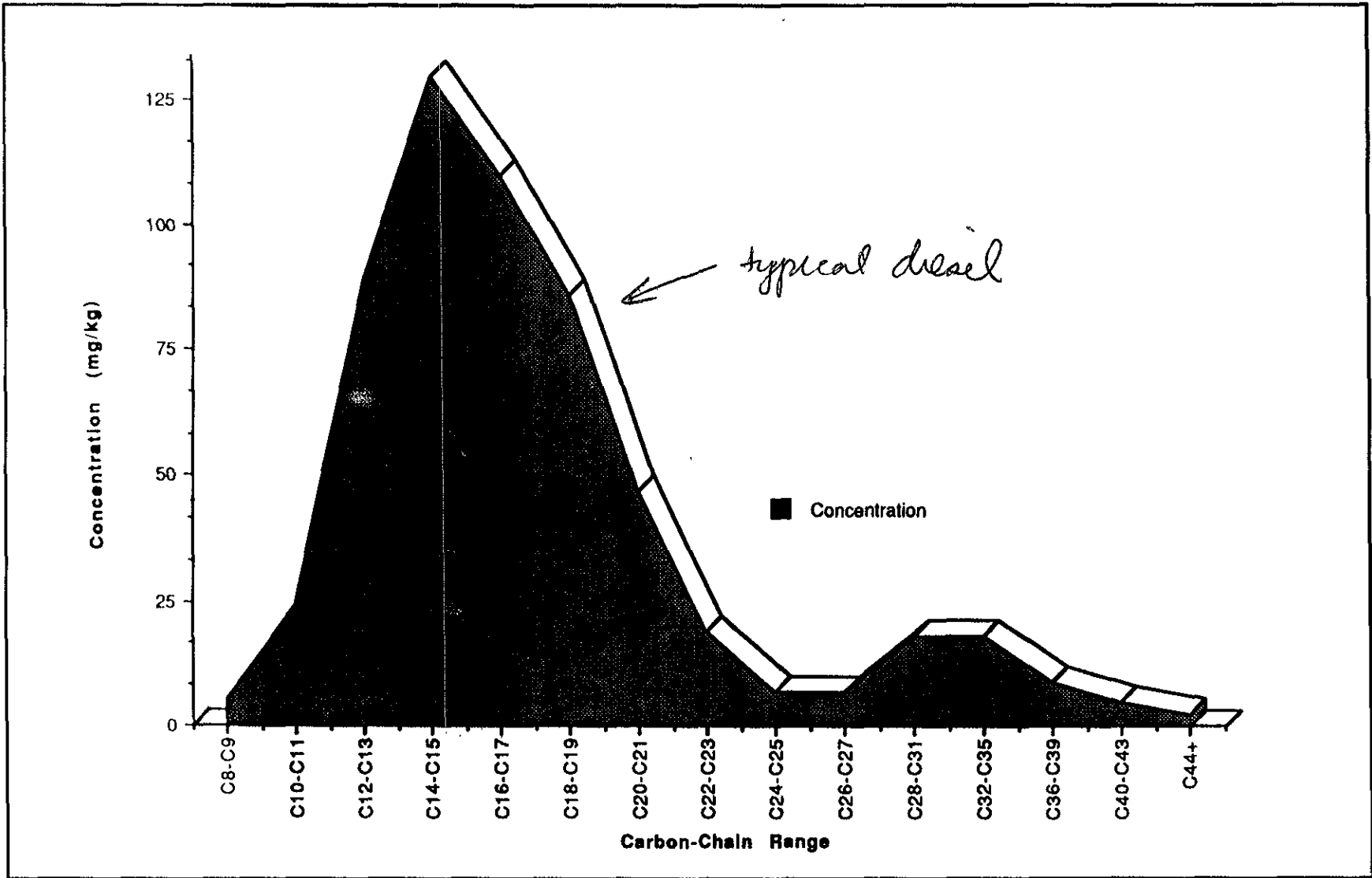
The Oakland International Airport TRACON facility is generally underlain by brown, moist, poorly graded medium sand (SP) to a depth of approximately 3 to 5 feet below ground surface. Beneath this unit is the Bay Mud consisting of a black to bluish-gray, very plastic, massive clay with lenses of organic matter (peat). The Bay Mud may grade into the overlying sandy unit over a vertical thickness of approximately 2 feet (boring AB-2). This gradational unit was observed to contain marine mollusc fossils.

3.2 SOIL ANALYTICAL RESULTS

Soil sample SS-1, collected from a depth of 5.0 to 5.5 feet below ground surface in boring AB-2, had a TPH concentration of 580 mg/kg (Table 1). BTEX was not detected in soil sample SS-1, with the exception of a concentration of 0.10 mg/kg total xylenes. A carbon-chain breakdown of soil sample SS-1 indicates two peaks; one in the diesel range and a second peak above the range of C₂₈ (above the diesel range). The second peak indicates the presence of heavier fuels in the soil, although carbon-chains in the diesel range are predominant. Because the FAA only stored diesel fuel in the Oakland TRACON tank, it must be assumed that an additional source of petroleum hydrocarbons has contributed to soil TPH values (up to 52 mg/kg) in the vicinity of the former tank pit. Figure 3 is an area graph indicating the carbon-chain breakdown of soil sample SS-1.

3.3 GROUNDWATER ANALYTICAL RESULTS

Groundwater samples were collected from groundwater investigation wells AW-1, AW-2, and AW-3 on March 26, 1992. TPH concentrations were not detected in samples AW-1, AW-2, and AW-3. BTEX concentrations were not detected in samples AW-1 and AW-3. Sample AW-2 contained 3.6 micrograms per liter (µg/l) of toluene, 5.5 µg/l ethylbenzene, and 5.0 µg/l total xylenes. Total dissolved solids concentrations were 26,800 mg/l, 8,440 mg/l, and 8,650 mg/l in samples AW-1, AW-2, and AW-3, respectively. Groundwater analytical results are presented in



**Soil Sample SS-1 Histogram
Federal Aviation Administration
Oakland TRACON Facility
Site Investigation**

PROJECT NO. 9788-49

FIGURE 3

Table 4. Groundwater laboratory data sheets and the chain-of-custody form are presented in Appendix B. Groundwater pH, temperature, and conductivity measurements are given in Table 5.

<p style="text-align: center;">Table 4 Soil analytical results FAA Oakland TRACON facility March 26, 1992</p>						
Sample ID	TPH (mg/l) ^a	Benzene (µg/l) ^b	Toluene (µg/l)	Ethylbenzene (µg/l)	Xylenes (µg/l)	TDS (mg/l)
AW-1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	26,800
AW-2	< 1.0	< 1.0	3.6	5.5	5.0	8,440
AW-3	< 1.0	< 1.0	< 1.0	< 1.0	< 3.0	8,650

^aMilligrams per liter.
^bMicrograms per liter.

Well screen placement was specified based on information obtained during tank removal activities of May 2, 1991, at which time groundwater was observed at a depth of approximately 5 feet below ground surface. Observations made at the FAA TRACON facility following well installation and during the initial groundwater sampling suggest a higher groundwater table in March and April 1992, possibly as a result of seasonal precipitation. As such, the present groundwater table is approximately 3 feet above the top of the well screen in each of the three wells.

3.4 SITE HYDROGEOLOGY

Well elevations were surveyed on April 22, 1992, by Altamont Land Surveyors of Pleasanton, California. Groundwater levels were recorded in wells AW-1 through AW-3 on March 26 and April 22, 1992, and were integrated with well elevation data. These elevations are given in

Table 5
Groundwater pH, temperature, and conductivity measurements
FAA Oakland TRACON facility
March 26, 1992

Well	Temperature (°F)	pH	Conductivity*
AW-1	63.8	7.02	> 20,000
AW-2	63.0	7.95	> 20,000
AW-3	64.1	7.02	> 20,000

*Conductivity expressed in microsiemens.

Table 3. Groundwater elevations indicate that the local groundwater gradient may be to the northwest. The groundwater gradient may be influenced by a combination of the depth to groundwater and the proximity of the wells to the FAA TRACON building.

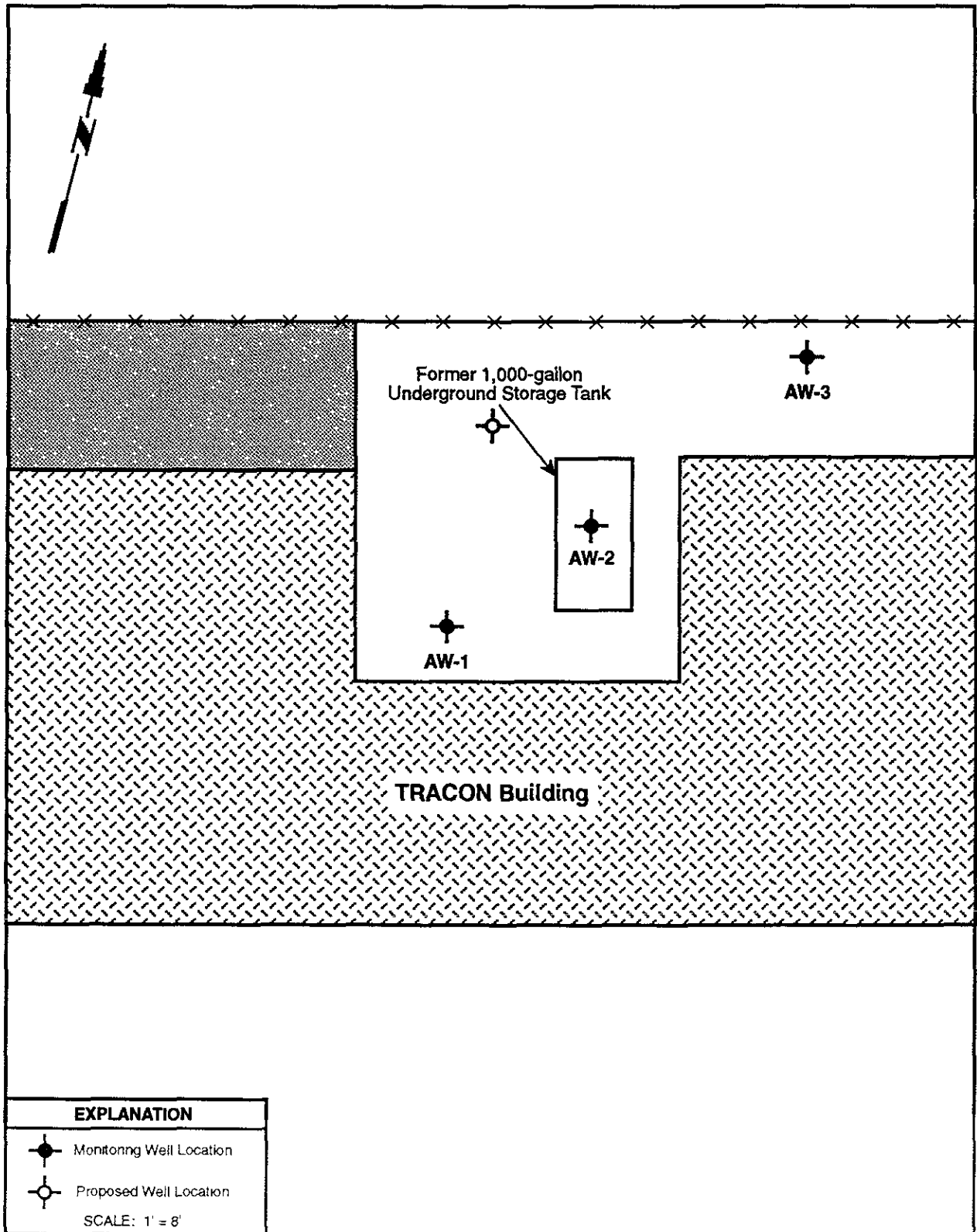
The Stevens water level recorder was installed in well AW-2 for the period commencing 8:30 a.m., March 27, 1992, and ending at 10:00 a.m., April 9, 1992 (Appendix F). During this two-week period, tidal influences were not observed to affect groundwater levels at the FAA TRACON facility. Rather, a steady decline in groundwater level from 2.06 feet below ground surface to 2.28 feet below ground surface was recorded.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 CONCLUSIONS AND RECOMMENDATIONS

As part of this Site Investigation, a soil sample was collected during the advancement of soil boring AB-2. Groundwater samples were collected from the three investigation wells installed in the three boreholes. Tidal influences were evaluated with the aid of data obtained from well AW-2 during a two-week period. Based on the data collected during the site investigation, the following conclusions and recommendations can be made:

- Depth to groundwater was approximately 2 feet below ground surface, probably associated with the seasonal precipitation. Water level measurements obtained on March 26 and April 22, 1992, suggest that the local groundwater flow direction is approximately to the northwest.
- Based on groundwater level measurements, well AW-3 is considered to have been installed cross-gradient of the former tank location.
- TPH and BTEX concentrations were not detected in wells AW-1 and AW-3, suggesting that hydrocarbon-affected soil and groundwater are restricted to the vicinity of the former tank location.
- TPH was not detected in well AW-2, although the sample contained low concentrations of BTEX (less than 15 µg/l total BTEX). Groundwater levels above the top of the installed well screen may account for the absence of TPH in this sample.
- Total dissolved solids analytical results of samples AW-1 through AW-3 suggest that the FAA Oakland TRACON site is underlain by brackish to saline water.
- Soil sample SS-1 contained a TPH concentration of 580 mg/kg with additional hydrocarbons occurring above C_{28} , suggesting an off-site contribution of hydrocarbons heavier than diesel. Based on the analytical results of soil sample SS-1, it is recommended that hydrocarbon-affected soil in the immediate vicinity of the former tank location be excavated to a depth of approximately 6 feet. Soil removal and treatment at a licensed recycling facility is considered the best remediation alternative for the anticipated small volume of soil in the excavation.
- Well AW-2, which would be removed during remediation, should be replaced with a new well outside of the remediation area and screened to provide for a seasonal high water table beneath the site. Figure 4 indicates the approximate position for a new well. In addition, wells AW-1 and AW-3 may be retrofitted with higher well screens at that time.



Proposed Well Location
 Federal Aviation Administration
 Oakland TRACON Facility
 Site Investigation

PROJECT NO. 9788-49

FIGURE 4

Written comments to the findings of this report are requested from the CRWQCB and the Alameda County DEH. Please forward the response to:

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APPENDIX A

**SOIL LABORATORY DATA SHEETS
AND
CHAIN-OF-CUSTODY FORMS**

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ADVANCED SCIENCES, INC.
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DATE OF REPORT MAY 17, 1991
DATE RECEIVED MAY 3, 1991
DATE OF SAMPLE MAY 2, 1991
DATE COMPLETED MAY 16, 1991
ANALYZED BY VJ
SAMPLE TYPE 2 WATER
PROJECT NAME FAA TANKS
PROJECT NUMBER 9788-22

ANALYSES RESULTS

ANALYSIS	METHOD	UNITS	LOG NUMBER:	6123-91	6124-91
			SAMPLE ID:	TRACON 1	TRACON 2
TPH	DHS	MG/L		36.6 *	
BENZENE	EPA 602	UG/L			<0.5
TOLUENE	EPA 602	UG/L			<0.5
ETHYLBENZENE	EPA 602	UG/L			<0.5
XYLENE	EPA 602	UG/L			<1.5

TPH - TOTAL PETROLEUM HYDROCARBONS

DHS - RECOMMENDED PROCEDURE FROM LEAKING UNDERGROUND FUEL TANK FIELD
MANUAL, MAY 1988

TOTAL PETROLEUM HYDROCARBON ANALYSES RESULTING IN HYDROCARBONS
OF THE RANGE C10-C23

* CONTAINS OTHER HEAVY MOLECULAR WEIGHT COMPOUNDS

PETER SHEN
LABORATORY DIRECTOR

PS/ft

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 6605 NANCY RIDGE DRIVE
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 SAN DIEGO, CA 92123

DATE OF REPORT	JULY 9, 1991
DATE RECEIVED	MAY 3, 1991
DATE OF SAMPLE	MAY 2, 1991
DATE COMPLETED	MAY 16, 1991
ANALYZED BY	VJ
SAMPLE TYPE	6 SOIL
PROJECT NAME	FAA TANKS
PROJECT NUMBER	9788-22

ANALYSES RESULTS

LOG NUMBER	SAMPLE ID	ANALYSIS:	TPH	BENZENE	TOLUENE	ETHYLBENZENE	XYLENE
		METHOD:	DHS	EPA 8020	EPA 8020	EPA 8020	EPA 8020
		UNITS:	MG/KG DF	UG/KG	UG/KG DF	UG/KG DF	UG/KG DF
6125-91	TRACON 3		<10.0	<1.0	<1.0	<1.0	<3.0
6126-91	TRACON 4		<10.0	<1.0	<1.0	<1.0	<3.0
6127-91	TRACON 5 "STOCKPILE"		375*	<1.0	<1.0	<1.0	<3.0
6128-91	ARS 1		24,000*	100 1.9	<125 125	1,060 125	961 125
6129-91	ARS 2		15.1*	<1.0	<1.0	<1.0	<3.0
6130-91	ARS 3 "STOCKPILE"		144*	<1.0	<1.0	<1.0	<3.0

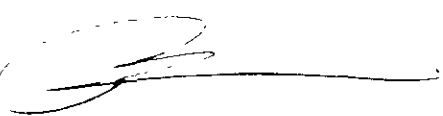
TPH - TOTAL PETROLEUM HYDROCARBONS

DHS - RECOMMENDED PROCEDURE FROM LEAKING UNDERGROUND FUEL TANK FIELD MANUAL, MAY 1988

* TOTAL PETROLEUM HYDROCARBON ANALYSES RESULTING IN HYDROCARBONS OF THE RANGE C10-C23

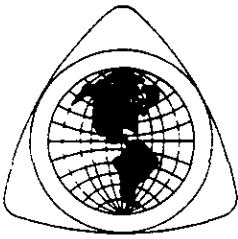
DF = DILUTION FACTOR. THE DETECTION LIMITS AND ANALYSIS RESULTS WERE CORRECTED ACCORDINGLY.

SAMPLE LOG # 6127-91 WAS RECEIVED IN A BROKEN CONTAINER. ENOUGH SOIL WAS OBTAINED FOR ANALYSES TO BE PERFORMED ON REMAINING SAMPLE OUT OF THE BROKEN CONTAINER. SAMPLE INTEGRITY MAY HAVE BEEN COMPROMISED



PETER SHEN
 LABORATORY DIRECTOR

PS/ft



QUALITY ASSURANCE LABORATORY

QUALITY CONTROL DATA REPORT

MAY 20, 1991

ADVANCED SCIENCES, IUNC. (ASI)
LOG #6123-91 THROUGH 6130-91
DATE ANALYZED: MAY 9, 1991

ANALYSES	METHOD	CCCV %RECOVERY	SPIKE %RECOVERY	DUPLICATE RPD
BENZENE	602	103%	56%*	4%
TOLUENE	602	99%	86%	23%
ETHYLBENZENE	602	99%	91%	39%*
XYLENES	602	94%	87%	38%*
TPH	DHS	106%	99%	2%

* SPIKE RECOVERY AND DUPLICATE RPD WERE HIGH DUE TO SAMPLE MATRIX EFFECT.

Lisa MacCellellan ms
LISA MACCLELLAN
QA/QC DIRECTOR

QUALITY CONTROL TERMINOLOGY

*CCCV-CONTINUING CALIBRATION CURVE VERIFICATION REPORTED AS % RECOVERY OF AN INDEPENDENT STANDARD TO VERIFY LINEARITY OF THE OPERATING STANDARD CURVE. ACCEPTABLE RANGE IS 80%-120% RECOVERY
*SPIKE-ENVIRONMENTAL SAMPLE IS MATRIX SPIKED WITH METHOD COMPOUNDS AND % RECOVERY OF CONCENTRATION SPIKED INTO SAMPLE IS CALCULATED REPORTED AS % RECOVERY ACCEPTABLE RANGE FOR "NORMAL MATRIX SAMPLES" IS 75%-125% RECOVERY
*SURROGATES-COMPOUNDS REPRESENTATIVE OF A GROUP OF COMPOUNDS. SURROGATES ARE SPIKED INTO ENVIRONMENTAL SAMPLES AND % RECOVERY OF CONCENTRATION SPIKED IS CALCULATED AND REPORTED ACCEPTABLE RANGE VARIES DEPENDING UPON SAMPLE MATRIX AND ANALYSES METHOD

FOR A MORE DETAILED EXPLANATION OF QC DATA, PLEASE REFER TO QUALITY ASSURANCE LABORATORY'S "QUALITY ASSURANCE PLAN" OR "UNDERSTANDING YOUR QUALITY CONTROL DATA". BOTH PUBLICATIONS ARE AVAILABLE FROM QAL.

QUALITY CONTROL REPORT, CONTINUED
MAY 20, 1991

ADVANCED SCIENCES, IUNC. (ASI)
LOG #6123-91 THROUGH 6130-91
DATE ANALYZED: MAY 14, 1991

ANALYSES	METHOD	CCCV %RECOVERY	SPIKE %RECOVERY	DUPLICATE RPD
BENZENE	602	99%	56%*	4%
TOLUENE	602	101%	86%	23%
ETHYLBENZENE	602	108%	91%	39%*
XYLENES	602	104%	87%	38%*
TPH	DHS	105%	98%	2%

* SPIKE RECOVERY AND DUPLICATE RPD WERE HIGH DUE TO SAMPLE MATRIX EFFECT.

Lisa MacClellan MS
LISA MACCLELLAN
QA/QC DIRECTOR

QUALITY CONTROL TERMINOLOGY

*CCCV-CONTINUING CALIBRATION CURVE VERIFICATION REPORTED AS % RECOVERY OF AN INDEPENDENT STANDARD TO VERIFY LINEARITY OF THE OPERATING STANDARD CURVE. ACCEPTABLE RANGE IS 80%-120% RECOVERY
*SPIKE-ENVIRONMENTAL SAMPLE IS MATRIX SPIKED WITH METHOD COMPOUNDS AND % RECOVERY OF CONCENTRATION SPIKED INTO SAMPLE IS CALCULATED REPORTED AS % RECOVERY ACCEPTABLE RANGE FOR "NORMAL MATRIX SAMPLES" IS 75% 125% RECOVERY
*SURROGATES-COMPOUNDS REPRESENTATIVE OF A GROUP OF COMPOUNDS SURROGATES ARE SPIKED INTO ENVIRONMENTAL SAMPLES AND % RECOVERY OF CONCENTRATION SPIKED IS CALCULATED AND REPORTED. ACCEPTABLE RANGE VARIES DEPENDING UPON SAMPLE MATRIX AND ANALYSES METHOD

TERRA TECH LABS Inc.

ENVIRONMENTAL TESTING

1920 E. Doolittle Ave.
 Suite 130
 Santa Ana
 California
 92705
 Tel 714.757.7022
 Fax 714 757.7274

LABORATORY REPORT

Client: Advanced Sciences Inc.
 Client Address: 4909 Murphy Canyon Rd, Ste 500
 San Diego, CA 92123

Report Date: 3/17/92
 Lab P.N.: 3036
 Client P.N.: 9788-49

Contact: Len Sinfield

Project Name: FAA Oakland Airport TRACON Facility
 Project Address: Grumman St - North Field

Date Sampled: 3/4/92
 Date Received: 3/5/92
 Date Analyzed: 3/13/92
 Physical State: Solid

Quality Assurance/Quality Control Summary

<u>Parameter (Method)</u>	<u>QC Type</u>	<u>Percent Recovery</u>	<u>Acceptable Range</u>	<u>Relative Percent Difference</u>	<u>Acceptable Range</u>
Benzene (EPA 8020)	M	96	39-150	3	0-25
Toluene (EPA 8020)	M	92	46-148	2	0-25
Ethylbenzene (EPA 8020)	M	89	32-160	5	0-25
Xylenes, Total (EPA 8020)	M	93	46-148	1	0-25
TPH, Extractable (CA DHS)	M	97	40-140	1	0-20

NOTE: This report was amended on 3/18/92 to qualify the carbon chain identification.

M = Matrix Spike / Spike Duplicate

L = Laboratory Control Sample Spike / Spike Duplicate

Ruth Willson

Reviewed

Len Sinfield

Approved

The samples were received by TERRA TECH LABS, Inc. in a chilled state, intact and accompanied by the Chain-of-Custody Record. Acceptance of samples by Terra Tech Labs, Inc. is not an indication of condition upon receipt. Laboratory Results apply only to the sample matrix analyzed and may not apply to an apparently identical or similar sample. The Laboratory Report is the property of the client to whom it is addressed. The Laboratory Results are only a portion of the Laboratory Report.

TERRA TECH LABS Inc.

ENVIRONMENTAL TESTING

LABORATORY RESULTS

Client: Advanced Sciences Inc.
Client Address: 4909 Murphy Canyon Rd, Ste 500
San Diego, CA 92123

Report Date: 3/17/92
Lab P.N.: 3036
Client P.N.: 9788-49

Project Name: FAA Oakland Airport TRACON Facility
Project Address: Grumman St - North Field

Date Sampled: 3/4/92
Date Analyzed: 3/13/92
Physical State: Solid

<u>Sample ID</u>	<u>Benzene</u> EPA 8020 <u>mg/kg</u>	<u>Toluene</u> EPA 8020 <u>mg/kg</u>	<u>Ethylbenzene</u> EPA 8020 <u>mg/kg</u>	<u>Xylenes,</u> Total EPA 8020 <u>mg/kg</u>
SS-1	ND	ND	ND	0.10
Detection Limit, mg/kg	0.017	0.017	0.017	0.017

TERRA TECH LABS Inc.

ENVIRONMENTAL TESTING

LABORATORY RESULTS

Client: Advanced Sciences Inc.
Client Address: 4909 Murphy Canyon Rd, Ste 500
San Diego, CA 92123

Report Date: 3/17/92
Lab P.N.: 3036
Client P.N.: 9788-49

Project Name: FAA Oakland Airport TRACON Facility
Project Address: Grumman St - North Field

Date Sampled: 3/4/92
Date Analyzed: 3/13/92
Physical State: Solid

Total Petroleum Hydrocarbons w/ Carbon Chain, EPA Method (Modified) 8015

<u>Sample ID</u>	<u>SS-1</u>	Detection
<u>Carbon Range</u>	<u>Conc.</u>	<u>Limits</u>
	<u>mg/kg</u>	<u>mg/kg</u>
C8-C9	5.2	1.0
C10-C11	24	1.0
C12-C13	89	1.0
C14-C15	130	1.0
C16-C17	110	1.0
C18-C19	86	1.0
C20-C21	47	1.0
C22-C23	19	1.0
C24-C25	7.0	1.0
C26-C27	6.8	1.0
C28-C31	18	1.0
C32-C35	18	1.0
C36-C39	8.7	1.0
C40-C43	5.0	1.0
C44+	2.6	1.0
Total	580	

NOTE: The chromatographic pattern eluting between C8 to C26 is indicative of diesel fuel. The peaks eluting after C26 suggests the presence of a heavier petroleum hydrocarbon.

APPENDIX B
GROUNDWATER LABORATORY DATA SHEETS
AND
CHAIN-OF-CUSTODY FORMS

TERRA TECH LABS Inc.

ENVIRONMENTAL TESTING

Suite 130
 Santa Ana
 California
 92705
 Tel 714 757.7022
 Fax 714 757.7274

LABORATORY REPORT

Client: Advanced Sciences Inc.
 Client Address: 4909 Murphy Canyon Rd, Ste 500
 San Diego, CA 92123

Report Date: 4/3/92
 Lab P.N.: 3148
 Client P.N.: 9788-49

Contact: Jeff Waldman

Project Name: FAA Oakland TRACON
 Project Address: N/A

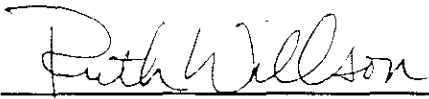
Date Sampled: 3/26/92
 Date Received: 3/27/92
 Date Analyzed: 3/29/92-3/31/92
 Physical State: Liquid

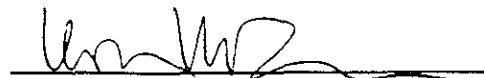
Quality Assurance/Quality Control Summary

Parameter (Method)	QC Type	Percent Recovery	Acceptable Range	Relative Percent Difference	Acceptable Range
Benzene (EPA 8020)	M	92	39-150	1	0-20
Toluene (EPA 8020)	M	91	46-148	2	0-20
Ethylbenzene (EPA 8020)	M	89	32-160	0	0-20
Xylenes, Total (EPA 8020)	M	91	46-148	0	0-20
TPH, Extractable (CA DHS)	M	98	40-140	6	0-15

M = Matrix Spike / Spike Duplicate

L = Laboratory Control Sample Spike / Spike Duplicate


 Reviewed


 Approved

The samples were received by TERRA TECH LABS, Inc. in a chilled state, intact and accompanied by the Chain-of-Custody Record
 Acceptance of samples by Terra Tech Labs, Inc. is not an indication of condition upon receipt
 Laboratory Results apply only to the sample matrix analyzed and may not apply to an apparently identical or similar sample
 The Laboratory Report is the property of the client to whom it is addressed
 The Laboratory Results are only a portion of the Laboratory Record

TERRA TECH LABS Inc.

ENVIRONMENTAL TESTING

LABORATORY RESULTS

Client: Advanced Sciences Inc.
 Client Address: 4909 Murphy Canyon Rd, Ste 500
 San Diego, CA 92123

Report Date: 4/3/92
 Lab P.N.: 3148
 Client P.N.: 9788-49

Project Name: FAA Oakland TRACON
 Project Address: N/A

Date Sampled: 3/26/92
 Date Analyzed: 3/29/92
 Physical State: Liquid

<u>Sample ID</u>	Benzene EPA 8020 <u>µg/l</u>	Toluene EPA 8020 <u>µg/l</u>	Ethylbenzene EPA 8020 <u>µg/l</u>	Xylenes, Total EPA 8020 <u>µg/l</u>
AW-1	ND	ND	ND	ND
AW-3	ND	ND	ND	ND
AW-2	ND	3.6	5.5	5.0
Quantitation Limit, µg/l	1.0	1.0	1.0	1.0

TERRA TECH LABS Inc.

ENVIRONMENTAL TESTING

LABORATORY RESULTS

Client: Advanced Sciences Inc.
 Client Address: 4909 Murphy Canyon Rd, Ste 500
 San Diego, CA 92123

Report Date: 4/3/92
 Lab P.N.: 3148
 Client P.N.: 9788-49

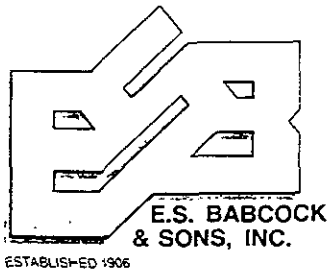
Project Name: FAA Oakland TRACON
 Project Address: N/A

Date Sampled: 3/26/92
 Date Analyzed: 3/31/92
 Physical State: Liquid

Total Petroleum Hydrocarbons w/ Carbon Chain

<u>Sample ID</u>	<u>AW-1</u>	<u>AW-3</u>	<u>AW-2</u>	<u>Quantitation</u>
<u>Carbon Range</u>	<u>Conc.</u>	<u>Conc.</u>	<u>Conc.</u>	<u>Limits</u>
	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>	<u>mg/l</u>
C8-C9	ND	ND	ND	1.0
C10-C11	ND	ND	ND	1.0
C12-C13	ND	ND	ND	1.0
C14-C15	ND	ND	ND	1.0
C16-C17	ND	ND	ND	1.0
C18-C19	ND	ND	ND	1.0
C20-C21	ND	ND	ND	1.0
C22-C23	ND	ND	ND	1.0
C24-C25	ND	ND	ND	1.0
C26-C27	ND	ND	ND	1.0
C28-C31	ND	ND	ND	1.0
C32-C35	ND	ND	ND	1.0
C36-C39	ND	ND	ND	1.0
C40-C43	ND	ND	ND	1.0
C44+	ND	ND	ND	1.0
Total	ND	ND	ND	

BACTERIOLOGY
WATER TESTING
HAZARDOUS WASTE TESTING
CALIF. DHS CERTIFIED



714/684-1881
FAX 714/684-9738

LABORATORIES
3215 CHICAGO AVENUE, RIVERSIDE

P.O. BOX 432
RIVERSIDE, CA 92502

04/13/92

To: Terra Tech Labs
1920 E. Deere Ave. Ste. 130
Santa Ana, CA 92705
Attn:

Lab No.	920327-445
Invoice No.	80883

Sample Marked:
FAA Oakland Tracon
AW-1 Aqueous Liquid

Submitted	Sampled
TR 03/27/92 11:40	

Chain of Custody on file: Y

Parameter Name	Results	Parameter Name	Results
Total Filterable Residue	26800 mg/L		

Date analysis completed: 04/03/92

Notes:

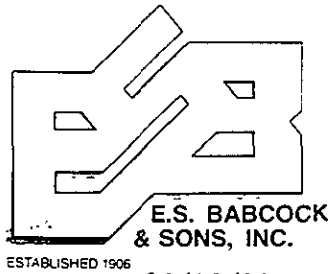
cc:

Edward S. Babcock & Sons, Inc.

Lauren Crystal

BACTERIOLOGY
WATER TESTING
HAZARDOUS WASTE TESTING
CALIF. DHS CERTIFIED

LABORATORIES
3215 CHICAGO AVENUE, RIVERSIDE



714/684-1881
FAX 714/684-9738

P.O. BOX 432
RIVERSIDE, CA 92502

AMENDED REPORT

Lab No.	920327-446
Invoice No.	80883

To: Terra Tech Labs
1920 E. Deere Ave. Ste. 130
Santa Ana, CA 92705
Attn:

Sample Marked:
FAA Oakland Tracon
AW-2 Aqueous Liquid

Submitted	Sampled
TR 03/27/92 11:40	

Chain of Custody on file: Y

Parameter Name	Results	Parameter Name	Results
Total Filterable Residue	8440 mg/L		

Date analysis completed: 04/03/92

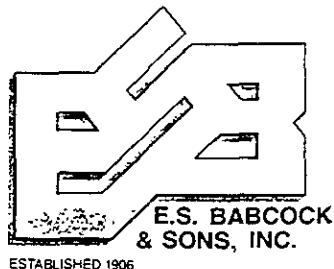
Notes:

cc:

Edward S. Babcock & Sons, Inc.

Lawrence J. Chynel

BACTERIOLOGY
WATER TESTING
HAZARDOUS WASTE TESTING
CALIF. DHS CERTIFIED



714/684-1881
FAX 714/684-9738

LABORATORIES
3215 CHICAGO AVENUE, RIVERSIDE

P.O. BOX 432
RIVERSIDE, CA 92502

04/13/92

To: Terra Tech Labs
1920 E. Deere Ave. Ste. 130
Santa Ana, CA 92705
Attn:

Lab No.	920327-447
Invoice No.	80883

Sample Marked:
FAA Oakland Tracon
AW-3 Aqueous Liquid

Submitted	Sampled
TR 03/27/92 11:40	

Chain of Custody on file: Y

Parameter Name	Results	Parameter Name	Results
Total Filterable Residue	8650 mg/L		

Date analysis completed: 04/03/92

Notes:

cc:

Edward S. Babcock & Sons, Inc.

Lamont & Crystal

Chain-Of-Custody Record

Client
Advanced Sciences, Inc.

Project Name
FAA Oakland TRACOM

Project Address
4909 Murphy Canyon Rd, Suite 500
San Diego, CA 92123

Project Contact
Jeff Waldman / Sarah Battelle

Date
3-26-92

Client Project #
9788-49

Turn Around Requested:

Immediate Attention
 Rush 24-48 Hours
 Rush 72-96 Hours
 Normal
 Mobile Lab

TTL Project #
3148

Page
1 of 1

Lab Use Only
Sample Condition as Received:
Chilled yes no
Sealed yes no

Sample ID	Sample Location	Date	Time	Laboratory Sample Number	Sample Matrix: Soil (S), Sludge (SL), Aqueous (A)	TPH	Carbon	BTEX	Chain Breakdown	TDS	Analysis Requested	Number of Containers	Container/Comments
AW-1		3/26/92	1605	π10477	A	X	X	X				4	TPH - 1 liter Amber glass BTEX - 2 vials, TDS - Plastic
AW-3		3/26/92	1628	π10478	A	X	X	X				4	↓
AW-2		3/26/92	1645	π10479	A	X	X	X				4	

① Relinquished by (signature) <i>Jeff Waldman</i>	Date 3/26/92	② Received by (signature)	Date 3/27/92	Total Number of Containers 12
Company Advanced Sciences, Inc.	Time 1800	Company	Time	Additional Comments Try to achieve: TPH = 50 ppb BTEX = .5 ppb for RWQC regulations Please return ice chest ASAP
③ Relinquished by (signature)	Date	④ Received by Laboratory (signature) <i>Jg [Signature]</i>	Date 3/27/92 TR 3/28/92	
Company	Time	Company TTL	Time 1030	

APPENDIX C
SOIL BORING LOGS

MAJOR DIVISIONS		LETTER	HATCHING	NAME	
COARSE-GRAINED SOILS	GRAVEL AND GRAVELY SANDS	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 gravels, gravel-sand-clay mixtures.	
	SAND AND SANDY SOILS	SW		Well-graded sands or gravelly sands, little or no fines.	
		SP		Well-graded sands or gravelly sands, little or no fines.	
		SM		Silty sands, sand-silt mixtures.	
		SC		Clayey sands, sand-clay mixtures.	
	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 clatimaceous fine sandy or silty soils, elastic soils.	
		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.		

SAMPLE TYPE

S - Drive Sample 2.5" ID Split-spoon sampler driven with a 140 lb. weight, 30" drop.



C - BAT Groundwater Sample Groundwater Sample collected with BAT Enviro Probe.



H - Hand Auger Sample



TEST TYPE

CHEMICAL

Total Petroleum Hydrocarbons by Modified EPA Method 8015. Concentration in milligrams per kilogram (mg/kg) for soil and micrograms per liter(µg/L) for water.

TPH (500)

Benzene, Toluene, Ethylbenzene and Xylene by Modified EPA Method 602/8020.

BTEX

Organic Vapor Meter Photo-ionization Detector (10.2 electron-volt potential). Parts-per-million vapor concentration.

0 ppmv

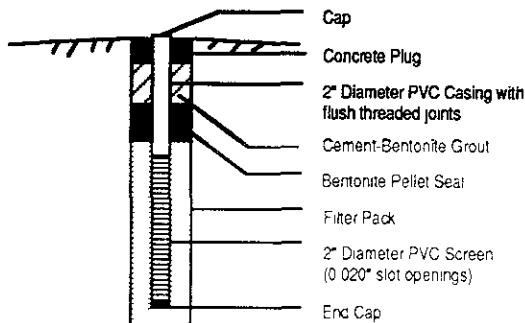
Water level on date noted



Not Detected

(ND)

PIEZOMETER WELL CONSTRUCTION



UNIFIED SOIL CLASSIFICATION SYSTEM AND BORING LOG SYMBOLS



Federal Aviation Administration
Oakland Airport TRACON Facility
Site Investigation

PROJECT NO 9788-49
FIGURE A-1

LOG OF BORING No. AB-1

DATE DRILLED: 3/4/92 EQUIPMENT: Mobile Drill B-40L
 DESCRIPTION: 8" HSA ELEVATION: - 10' MSL

TESTS

DRILLING CONTRACTOR HOGATE EXPLORATION DRILLING
 DRILLER BILL HOGATE

BY LEN SINFIELD/JEFF WALDMAN
 DATE 3/4/92 CHK'D BY

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT. N	INCHES DRIVEN INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	
					1	/	Asphaltic Concrete	
					2	/	Class II Road Base	
					3	/	Brown, moist, poorly-graded medium sand (SP)	
					4	/	3.5 feet	
					5	/	Bay Mud Black, very plastic, massive clay (CH), with some organic matter	
					6	/		
					7	/		
					8	/		
					9	/		
					10	/		
					11	/		
					12	/		
					13	/		
					14	/		
					15	/	T.D. = 15.0 feet	

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED ARE A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.



Federal Aviation Administration
 Oakland Airport TRACON Facility
 Site Investigation

PROJECT NO 9788-49
 DRAWING NO SB-1

DRILLING CONTRACTOR HOGATE EXPLORATION DRILLING
 DRILLER BILL HOGATE

BY LEN SINFIELD/JEFF WALDMAN
 DATE 3/4/92
 CHK'D BY

SAMPLE NO. SAMPLE TYPE	BLOWS PER 6 INCHES	SPT. N	INCHES DRIVEN INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	LOG OF BORING No. AB-2		TESTS
								DATE DRILLED: 3/4/92	EQUIPMENT: Mobile Drill B-40L	
								DESCRIPTION: 8" HSA		ELEVATION: - 10' MSL
					1			Pea gravel, loose (GW)		
					2					
					3					
					4					
					5			5 feet		
					6			Medium sand with black clay, marine shells, massive, wet, unconsolidated (SC)		
					7			7 feet		
					8			Bay Mud		
					9			Black, very plastic, massive clay (CH), with some organic matter		
					10					
					11					
					12					
					13					
					14					
					15			T D = 15.1 feet		

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED ARE A SIMPLIFICATION OF ACTUAL CONDITIONS ENCOUNTERED.



Federal Aviation Administration
 Oakland Airport TRACON Facility
 Site Investigation

PROJECT NO 9788-49
 DRAWING NO. SB-2

LOG OF BORING No. AB-3

DATE DRILLED: 3/4/92 EQUIPMENT: Mobile Drill B-40L
 DESCRIPTION: 8" HSA ELEVATION: - 10' MSL

TESTS

DRILLING CONTRACTOR: HOGATE EXPLORATION DRILLING
 DRILLER: BILL HOGATE

BY: LEN SINFIELD/JEFF WALDMAN
 DATE: 3/4/92 CHK'D BY:

SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6 INCHES	SPT. N	INCHES DRIVEN	INCHES RECOVERED	NUMBER OF RINGS	DEPTH IN FEET	WELL OR PIEZOMETER CONSTRUCTION	GRAPHIC LOG	TESTS
							1		Asphaltic Concrete	
							2		Class II Road Base	
							3		Brown, moist, poorly-graded medium sand (SP)	
							4		4 feet	
							5		Bay Mud	
							6		Black, very plastic, massive clay (CH), with some organic matter	
							7			
							8			
							9			
							10			
							11			
							12			
							13			
							14			
							15		T.D. = 150 feet	

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED ARE A REPRESENTATION OF ACTUAL CONDITIONS ENCOUNTERED.



Federal Aviation Administration
 Oakland Airport TRACON Facility
 Site Investigation

PROJECT NO 9788-49
 DRAWING NO SB-3

APPENDIX D

WELL CONSTRUCTION LOGS

CONSTRUCTION LOG OF WELL NO. AW-1

Date: 3-18-92

Prepared By: Jeff Waldman

Date: 3-18-92

Well Type: Monitoring

Casing Type: Schedule 40 PVC

Casing Dia: 2-inch

Casing Lengths: 5 feet slotted
3.8 feet blank

Screen Size: Factory slotted 0.020-inch PVC

Screen Length: 10 feet (3.8 to 13.8 feet)

Screen Depth: 3.8 feet

Tailpipe Length: 0.4 feet

Locking Cover Type: Flushmount

Locking Cover Stickup (+)/Depression (-): _____

Filter Material: No. 3 Lonestar sand - 2.25 bags

Filter Depth: 2.2 to 15.0 feet

Seal Material: Granular bentonite

Seal Depth: 1.0 to 2.2 feet

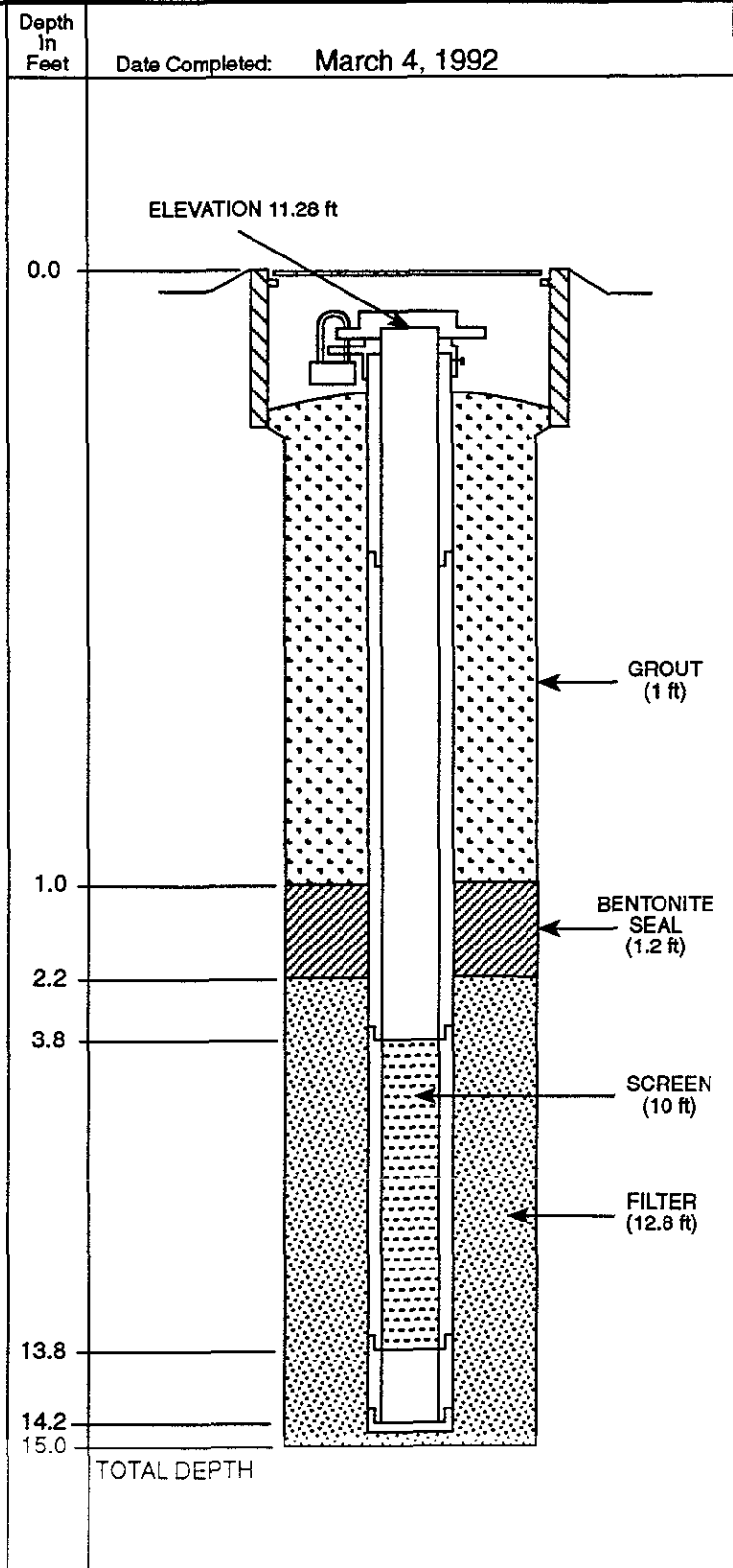
Grout Material: Type I-II cement

Grout Depth: 0.0 to 1.0 feet

Borehole Diameter: 8-inch

Total Depth: 15 feet

Comments: Flushmount locking, stainless
steel protective well cover



THE DATA PRESENTED ARE A SIMPLIFICATION OF ACTUAL CONDITIONS. THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS WELL AT THE TIME OF CONSTRUCTION. CONDITIONS SHOWN MAY CHANGE WITH THE PASSAGE OF TIME.



ADVANCED SCIENCES, INC.

Federal Aviation Administration
Oakland Airport TRACON Facility
Site Investigation

PROJECT NO
9788-49
DRAWING NO.
WL-1

CONSTRUCTION LOG OF WELL NO. AW-2

Date: 3-18-92

Prepared By: Jeff Waldman

Date: 3-18-92

Well Type: Monitoring

Casing Type: Schedule 40 PVC

Casing Dia: 2-inch

Casing Lengths: 5 feet slotted

4.7 feet blank

Screen Size: Factory slotted 0.020-inch PVC

Screen Length: 10 feet (4.7 to 14.7 feet)

Screen Depth: 4.7 feet

Tailpipe Length: 0.4 feet

Locking Cover Type: Flushmount

Locking Cover Stickup (+)/Depression (-): _____

Filter Material: No. 3 Lonestar sand - 2.5 bags

Filter Depth: 4.0 to 15.1 feet

Seal Material: Granular bentonite

Seal Depth: 2.0 to 4.0 feet

Grout Material: Type I-II cement

Grout Depth: 0.0 to 2.0 feet

Borehole Diameter: 8-inch

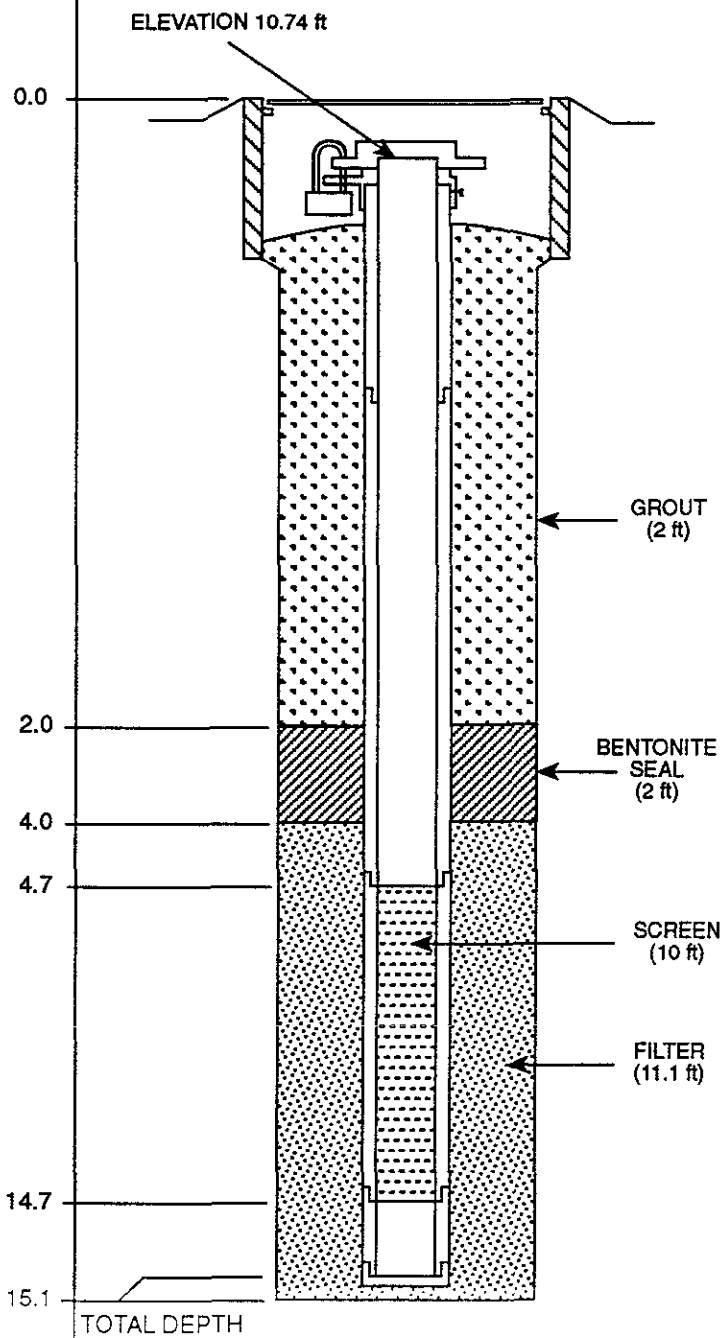
Total Depth: 15.1 feet

Comments: Flushmount locking, stainless

steel protective well cover

Depth
In
Feet

Date Completed: March 4, 1992



THE DATA PRESENTED ARE A SIMPLIFICATION OF ACTUAL CONDITIONS. THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS WELL AT THE TIME OF CONSTRUCTION. CONDITIONS SHOWN MAY CHANGE WITH THE PASSAGE OF TIME.



Federal Aviation Administration
Oakland Airport TRACON Facility
Site Investigation

PROJECT NO
9788-49

DRAWING NO.
WL-2

CONSTRUCTION LOG OF WELL NO. AW-3

Date: 3-18-92

Prepared By: Jeff Waldman

Well Type: Monitoring

Casing Type: Schedule 40 PVC

Casing Dia: 2-inch

Casing Lengths: 5 feet slotted
4.6 feet blank

Screen Size: Factory slotted 0.020-inch PVC

Screen Length: 10 feet (4.6 to 14.6 feet)

Screen Depth: 4.6 feet

Tailpipe Length: 0.4 feet

Locking Cover Type: Flushmount

Locking Cover Stickup (+)/Depression (-): _____

Filter Material: No. 3 Lonestar sand - 2.5 bags

Filter Depth: 4.0 to 15.0 feet

Seal Material: Granular bentonite

Seal Depth: 2.0 to 4.0 feet

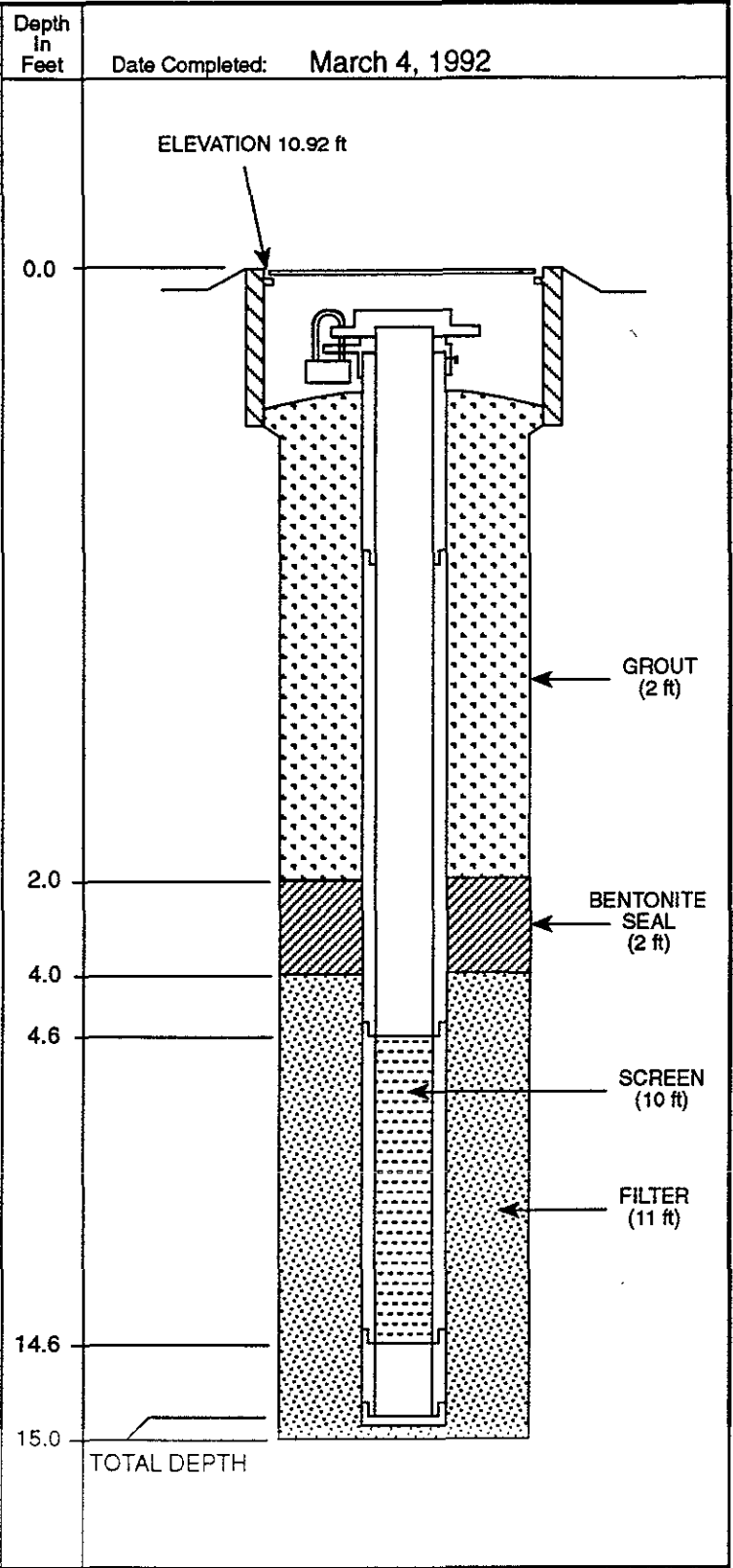
Grout Material: Type I-II cement

Grout Depth: 0.0 to 2.0 feet

Borehole Diameter: 8-inch

Total Depth: 15.0 feet

Comments: Flushmount locking, stainless steel protective well cover



THE DATA PRESENTED ARE A SIMPLIFICATION OF ACTUAL CONDITIONS. THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS WELL AT THE TIME OF CONSTRUCTION. CONDITIONS SHOWN MAY CHANGE WITH THE PASSAGE OF TIME.

APPENDIX E

ALTAMONT LAND SURVEYORS ELEVATION DATA

COMMITTED TO PROFESSIONAL EXCELLENCE

April 22, 1992
426001

Mr. Jeff Waldman
Advance Sciences, Inc.
4909 Murphy Canyon Road, Ste. 500
San Diego, CA 92123-4301

**RE: MONITORING WELL ELEVATIONS
OAKLAND AIRPORT COMPLEX
OAKLAND, CA
YOUR PO #9878**

Dear Mr. Waldman:

It was a pleasure to meet with you this morning. Please find enclosed copies of our field notes for the subject monitoring well elevations (F.B. 205, pages 62-67).

The elevations were established on the southerly side of the top of the 2-inch diameter PVC pipe inside the steel observation monitoring wells. For future reference, our field crew set a punch mark on the top of the PVC pipe at the actual location that the elevation was established. Elevations established were based upon bench marks provided by the Port of Oakland survey department. All elevations are on Port of Oakland Datum; to convert to Mean Sea Level add 3.20 to the elevations shown.

Thank you again for selecting Altamont Land Surveyors, Inc., to perform this service. We look forward to working with you on future projects,

If you have any questions concerning this project, please do not hesitate to call.

Sincerely,

ALTAMONT LAND SURVEYORS, INC.

Michael J. Foley

Michael J. Foley, L.S.
Associate Surveyor

MJF/kh

	<u>well Elevations</u>	
	<u>TRACON</u>	<u>ASR # 9</u>
AW-1	11.28'	8.36'
AW-2	10.74'	8.64'
AW-3	10.92'	8.36

205 62

ADVANCE SCIENCES, INC.
ELEVATIONS ON
MONITORING WELL
3 AT TRACON SITE
NEAR GRUMMAN STREET
4
3 ON SOUTHWEST SIDE
OF MAIN RUNWAY
OAKLAND AIRPORT
PROJECT # 426001

APRIL 22 1982
M FOLEY
A ROYCE

ADVANCE SCIENCES INC.
MONITORING WELL ELEVATIONS
OAKLAND AIRPORT
1029 GRUMMAN

STN	+	H	-	ELEV	ALL ELEV
NF7	5.54				6.848
		55	5.19	7.198	(7.197)
NF7					6.849
TP1	6.34	13.19	✓	4.49	8.70 ✓
TP2	5.02	13.72	✓	5.31	8.41 ✓
AW-3	4.80	13.21	✓	5.49	7.72 ✓ 7.72
AW-2	5.49	13.21	✓	5.67	7.54 ✓ 7.54
AW-1	5.49	13.03	✓		
AW-1	5.79	13.87		4.95	8.08 ✓ 8.08

(CONT)

426001
U, 2 52096
CHICAGO

205 03
April 22 1992
PCT M POLEY
CIT A ROYCE

BENCH MARK NF7 AND MARK SHINER
@ INTERSECTION OF GRUMMAN STREET
AND LOCKHEED STREET ON E1 GAUMMAN
STREET PER PORT OF OAKLAND FIELD
NOTES BOOK T538 PG 76-79
11/22/91 EL = 6.848 PORT OF OAKLAND
DATUM - POINT NF7 ON POINT

NF5 AND SCRIBED + IN SIDEWALK CENTER
ON N1 SIDE OF LOCKHEED STREET 75'
EAST OF E OF HILLER ST PER PORT
OF OAKLAND AIR T538 PG 76-79
EL 7.197 PORT OF OAKLAND DATUM

NF5

TP1 SIDE ENTRANCE

TP2

TOP 2" PVC IN 9" Ø OBSERVATION HOLES
WEST NO "AW-3" S17 SIDE 2" PVC PUNCH MARK
IN POINT

TOP 2" PVC S17 SIDE PUNCH MARK IN
9" Ø WELL DESE ABOVE "AW-2"
IN GRAVEL

TOP 2" PVC S17 SIDE PUNCH MARK IN
9" Ø WELL DESE ABOVE IN POINT "AW-1"
ADPT

	ADVANCE MONITORING ONAKAWA	SCIENCES INC. WELL AIRPORT	1029 GRAMMAN AV. ELEV	ELEVATION AS LW
ETA	+	13.87		
TP 6		3.47	14.07 ✓	3.29 10.58 ✓
TP 7		4.49	13.11 ✓	5.45 8.62 ✓
NF 7				6.25 6.86 ✓ 6.88
Σ		40.91		
			Σ 40.90	

END RUN

426001
N12
CHICKEN

DECK

TOP FH

TC N14 SIDE PORT/GATE

BENCH MARK N15 SEE PG 63 THIS BOOK

205 64

April 22 1992

M. FOLEY
A. ROYCE

ELEVATIONS ARE ON PORT
OF OAKLAND DATUM - TO
CONVERT TO MEAN SEA LEVEL
ADD 3.20 FEET TO ELEVATIONS
SHOWN

ADVANCE SCIENCES, INC
MONITORING WELL ELEVATIONS

STATION	+	H:	-	ELEV	NOJ F.S.
SD-D					12.95
	573	18.65 ✓			
		10.68	3.79	14.99 ✓	
	366	18.55 ✓			
			11.25	7.30 ✓	
	55	18.86 ✓			
			3.67	<u>5.11</u> ✓	5.16
	513	10.30 ✓			
			4.85	<u>5.41</u> ✓	5.44
	515	10.60 ✓			
			5.43	<u>5.17</u> ✓	5.16
	105	17.23 ✓			
			6.25	13.93 ✓	
	331	17.79 ✓			
			3.79	14.00 ✓	
	383	17.83 ✓			
			3.02	14.81 ✓	

CONT

426001
M12
(R.C.G. 800)

205 65

April 22 1992
M FOLEY
A ROYCE

BM PORT OF OAKLAND 3" DIA ALUMINUM
DISK WITH Δ ON WLY SIDE DIRT ROAD
WITH SURVEY WIRELESS POST
MARKED SD-D EL= 12.95 PORT OF
OAKLAND DATUM

Top CONC/ROCK

PAINTED □ SW CORNER KEENE ROOFING 3 STORY
STEEL OBSERVATION TOWER - SW LEG
PAINTED "TPI4" EL 7.38

Top 2" Ø PVC PUNCH 547 SIDE IN 9" Ø
STEEL MONITORING WELL OBSERVATION WELL
ALU-3

Top 2" Ø PVC PUNCH 547 SIDE IN 9" Ø W/PL
DISC ABOVE

Top 2" Ø PVC PUNCH 547 SIDE IN 9" Ø W/PL
DISC ABOVE

Top CONC

Top CONC

Top CONC

ADVANCE SCIENCES INC
MONITORING WELL ELEVATIONS

426001
N.1
C. 100 ROD

205 66

April 22 92
M. FOLEY
A. ROYCE

SOUTHWEST OF MAIN RUNWAY NEAR 1515'

STA	+	-	ELEV	AL.
	2.93	17.74 ✓		
SD C			464 13.10	(13.08)
Σ	43.36	Σ 43.71		

✓
✓
+0.15'

BEIN BM EL 17.95
Δ EL + 0.15
13.10
END BM EL (13.08)

CLOSURE ERROR +0.02
ADJUSTMENT
+0.02 ÷ 9 TURNS = -0.0022/TURN

END RUN

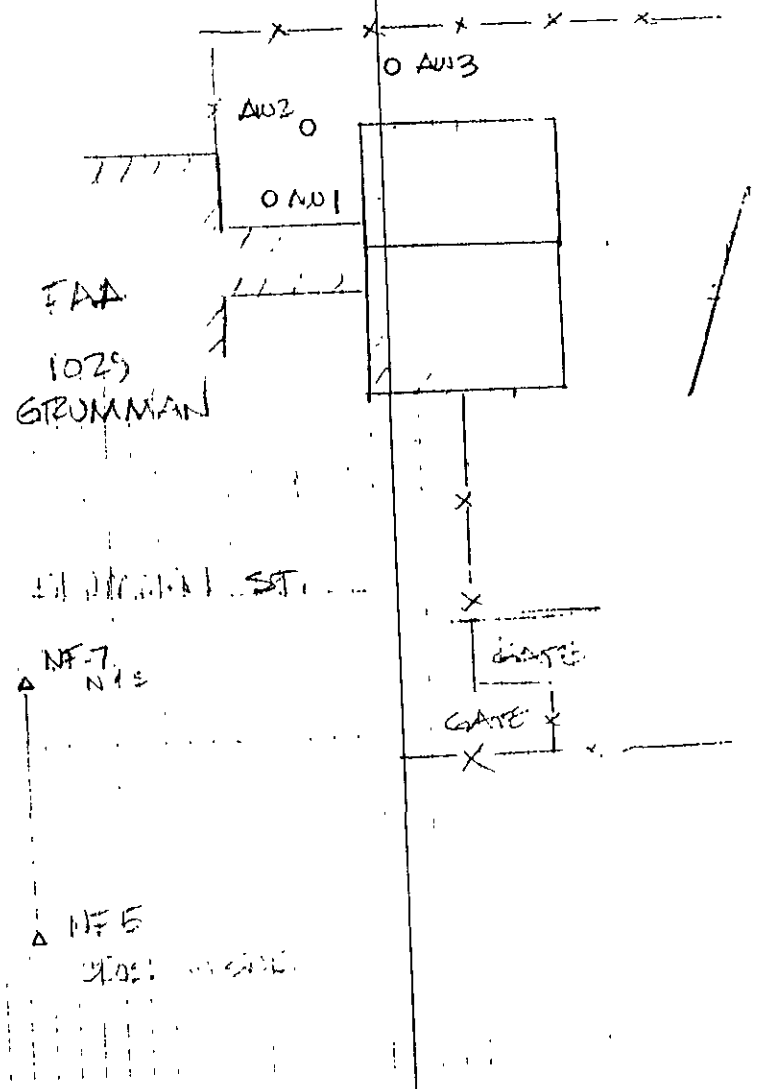
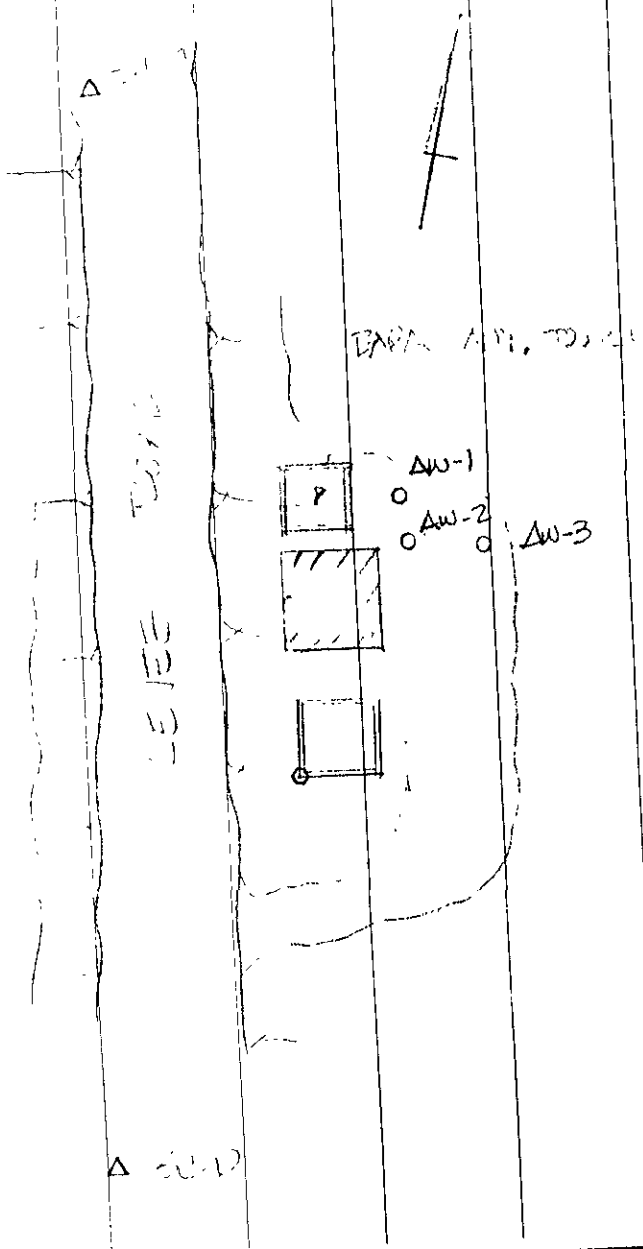
BM - PORT OF OAKLAND 3" Ø ALUMINIUM DSK
WITH Δ ON W/4 SIDE DIRT ROAD WITH
SURVEY MARKER WITNESS POST
MARKED SD-C EL = 13.08 PORT OF
OAKLAND DATUM

ELEVATIONS ARE ON PORT
OF OAKLAND DATUM -- TO
CONVERT TO MEAN SEA LEVEL
ADD 3.20 FEET TO ELEVATIONS
SHOWN

ADVANCE SCIENCES INC
 MONITORING WELL LOCATIONS
 CARLETON AIRPORT

426001

205 67
 APR 22 92
 M FOLEY
 A POICE



APPENDIX F

STEVENS WATER LEVEL RECORDER DATA SHEETS

FAA Oakland TRACON Facility
Stevens Water Level Recorder Data
March 27 to April 9, 1992

