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Sacramento, CA 95827
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LETTER OF TRANSMITTAL

To:	Alameda County EHS 1131 Harbor Bay Parkway, Ste.250 Alameda, CA 94502-6577	Date: Project No.:	February 6, 2001 6908-112.310

Attention: Mr. Barney Chan

We are enclosing:

Copies:	Description:
1	REPORT TITLED: Third Quarter 2000 Groundwater Monitoring Report And Request for "No Further Action" Oakland International Airport United Airlines Bldg. M-110 1100 Airport Drive Oakland, California

Sent By: **Alan Klein**

	Regular Mail
	Express Mail
	Certified Mail
X	Overnight Courier

Remarks:

Signed: AK

Cc: Dale Klettke, Port of Oakland Environmental Compliance Department
Dennis Moulton, United Airlines
Steven Sulgit, United Airlines
Ted Wells, United Airlines
Brian Finnell, ENSR

ENVIRONMENTAL PROTECTION
00 FEB -7 AM 9:37

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February 6, 2001
Project: 6908-112.310

Mr. Barney Chan
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway, 2nd Floor
Alameda, California, 94502

Subject: **Third Quarter 2000 Groundwater Monitoring Report**
And Request for No Further Action
Oakland International Airport
United Airlines Building M-110
1100 Airport Drive, Oakland, California
StID # 1049

Dear Mr. Chan:

ENSR International (ENSR), on behalf of United Airlines, is pleased to provide this report documenting the results of the third quarter 2000 groundwater monitoring event and request for no further action, for the Oakland International Airport, United Airlines Building M-110 (Site), 1100 Airport Drive, Oakland, California.

The third quarter 2000 groundwater monitoring event represents the completion of one year or four quarters of groundwater monitoring at the Site. In ENSR's opinion, the results of the four quarters of monitoring indicate the source has been removed, the plume has stabilized, and there is no apparent threat to human health or the environment. Therefore, ENSR requests a "No Further Action" from Alameda County Environmental Health Services. We would appreciate if you would respond to this request with a letter of concurrence with the "No Further Action."

If you have any questions or comments regarding this report, please call the undersigned at (916) 362-7100.

Sincerely,
ENSR International

Alan J. Klein, REA II
Sr. Environmental Scientist

Peter G. Minkel, RG
Project Geologist

REGISTERED GEOLOGIST
PETER G. MINKEL
No. 7003
exp 3/31/01
STATE OF CALIFORNIA

cc: Mr. Dennis Moulton, United Air Lines, Inc.
Mr. Steve Sulgit, United Air Lines, Inc.
Mr. Ted Wells, United Air Lines, Inc.
Mr. Dan Klettke, Port of Oakland Environmental Compliance
Mr. Brian Finnell, ENSR – Acton, MA.

THIRD QUARTER GROUNDWATER MONITORING REPORT AND REQUEST FOR "NO FURTHER ACTION"

OAKLAND INT'L AIRPORT
UNITED AIRLINES BLDG. M-110
1100 Airport Drive
Oakland, California

February 2001

Prepared For:
United Airlines

Submitted To:
Alameda County
Department of Environmental Health

Prepared By:
ENSR Corporation
10324 Placer Lane, Suite 200
Sacramento, California 95827

ENSR Project No: 6908-112.310

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EXECUTIVE SUMMARY

This report documents the results of the third quarter 2000 groundwater monitoring event performed at the Oakland International Airport, United Airlines Building M-110 (Site), 1100 Airport Drive, Oakland, California. In addition a request for "no further action" is submitted based on source removal, plume stabilization and no apparent threat to human health or the environment.

During the last three consecutive groundwater monitoring events the presence of TPH-g has not been detected. During the last two consecutive groundwater monitoring events the presence of benzene has been below the California drinking water standards maximum contaminant levels (MCLs) of 1.0 ug/L. The presence of TPH-d in groundwater has stabilized at concentrations less than 100 ug/L. The presence of MtBE appears to have stabilized at concentrations less than 200 ug/L.

Based on the trends represented by the constituent concentrations versus time graphs, the concentrations of TPH-d, TPH-g and benzene have stabilized and/or decreased over time. The concentrations of MtBE in groundwater have fluctuated between monitoring events, although the overall concentrations of MTBE in groundwater have decreased over time.

Based upon the sensitive receptor survey, no drinking water wells or public schools are located within a 2,000-foot radius of the project site. The San Francisco Bay and a seasonal wetland are located approximately 1,900 feet from the project site. In ENSR's opinion, the San Francisco Bay and the seasonal wetland would not be impacted based on the relatively low concentrations of the plume and the distance between them. Based on the utility survey, there are no apparent avenues of constituent migration.

The affected area is covered by asphalt, concrete and buildings, therefore ingestion and dermal contact with soil is considered incomplete. There are no drinking water wells within a 2,000-foot radius of the former UST location, and the closest identified body of surface water is located approximately 1,900-feet northwest (wetland area) and 1,900-feet south (Bay) of the subject area. Therefore, ingestion, inhalation, and dermal contact with groundwater and surface water are considered incomplete. Inhalation from volatilization is considered an incomplete exposure pathway, due to relatively low concentrations of TPH-d and MtBE in groundwater, their physical characteristics of being relatively nonvolatile, and the building located adjacent and south of the subject area does not contain a basement.

Concentrations of total dissolved solids (TDS) at the subject site have ranged from 5,300 mg/L to 6,600 mg/L. Therefore, this site appears to be excluded from the California State Water Board "Sources of Drinking Water" policy, based on the relatively high levels of TDS (greater than 3,000 mg/L).

This sampling event represents the last of four quarterly groundwater monitoring events (one year) required by the Alameda County Department of Environmental Health. In ENSR's opinion, the source has been removed, the plume has stabilized, and there is no apparent threat to human health or the environment. Therefore, ENSR requests a "No Further Action" from Alameda County Environmental Health Services.

1. INTRODUCTION

This report documents the results of the third quarter 2000 groundwater monitoring event and a request for "no further action", at the Oakland International Airport, United Airlines Building M-110 (Site), 1100 Airport Drive, Oakland, California **(Figure 1-1)**.

The third quarter 2000 groundwater monitoring event represents the completion of one year or four quarters of groundwater monitoring at the Site. Groundwater monitoring consisted of the collection of depth to groundwater measurements and groundwater samples from monitoring wells MW-1, MW-2, and MW-3 **(Figure 1-2)**.

The request for "no further action" is based on source removal, plume stabilization and no apparent threat to human health or the environment.

1.1 Background

On January 15, 1999, one 10,000-gallon diesel fuel underground storage tank (UST) and one 10,000-gallon unleaded gasoline UST were removed from the Site, along with a dispenser island and associated piping. Approximately 758 cubic-yards of soil were removed and properly disposed of during over-excavation activities. Confirmation soil samples were collected from the excavation sidewalls. Based on laboratory analytical results, it appears that the extent of petroleum hydrocarbon impacted soil has been removed, with exception of the southeast corner of the excavation outline. Additional excavation in this direction was discontinued due to the close proximity of the United Airlines hangar. An over-excavation detail is presented as **Figure 1-3**, and the analytical results are presented as **Table 1-1**. De-watering activities commenced during over-excavation activities. Approximately 12,000 gallons of groundwater were pumped from the excavation pit into a 20,000-gallon storage tank prior to offsite disposal. The results of the UST removal activities are documented in ENSR's report titled, "*Underground Storage Tanks Closure Report*", dated March 1999.

On July 21, 1999, three 4-inch-diameter groundwater monitoring wells (MW-1, MW-2, and MW-3) were completed to a depth of approximately 25 feet below ground surface (bgs), and developed per the guidelines stipulated by the California Code of Regulations, Title 23, Subchapter 16, Article 4, Sections 2647 and 2648. The groundwater wells were sampled on July 28, 1999. The results of the well installations and sampling are documented in ENSR's report titled, "*Results Report: Installation of Groundwater Monitoring Wells*", dated September 1999.

From December 27, 1999 to October 4, 2000, quarterly groundwater monitoring activities have been performed at the subject site. The results of the groundwater monitoring events are reported in this document and ENSR's reports titled, *Fourth Quarter 1999 Groundwater*

Monitoring Report, dated April 5, 2000; *First Quarter 2000 Groundwater Monitoring Report,* dated May 23, 2000; *and Second Quarter 2000 Groundwater Monitoring Report,* dated October 18, 2000.

TABLE 1-1
ANALYTICAL RESULTS - SOIL SAMPLES
Oakland International Airport
United Airlines Building M-110

Sample ID	Date Collected	Total Petroleum Hydrocarbons		MTBE (µg/Kg)	Volatile Organic Compounds			
		Diesel (mg/kg)	Gasoline (mg/kg)		Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)
SW-1-6'	1/15/99	16,000	530	ND(<100)*	1.9	0.71	0.74	1.9
SW-2-10'	1/15/99	ND	ND	49	ND	ND	ND	ND
SW-3-6'	1/15/99	ND	ND	5.5	ND	ND	ND	ND
SW-4-10'	1/15/99	ND	ND	ND	ND	ND	ND	ND
EW-1-8'	1/15/99	ND	2.4	7.8	0.65	0.033	0.12	0.13
EW-2-9.5'	1/18/99	ND	ND	22	ND	ND	ND	ND
WW-1-8'	1/15/99	ND	ND	ND	ND	ND	ND	ND
WW-2-9'	1/18/99	ND	ND	ND	ND	ND	ND	ND
NW-1-9'	1/18/99	ND	ND	ND	ND	ND	ND	ND
NW-2-9.5'	1/18/99	ND	ND	ND	ND	ND	ND	ND
Reporting Limit		1.0	1.0	5.0	0.005	0.005	0.005	0.005

Notes:

MTBE = Methyl tert-Butyl Ether, reported in micrograms per Kilogram (µg/Kg)

ND = Not Detected above laboratory reporting limit

* = Sample diluted due to high organic content

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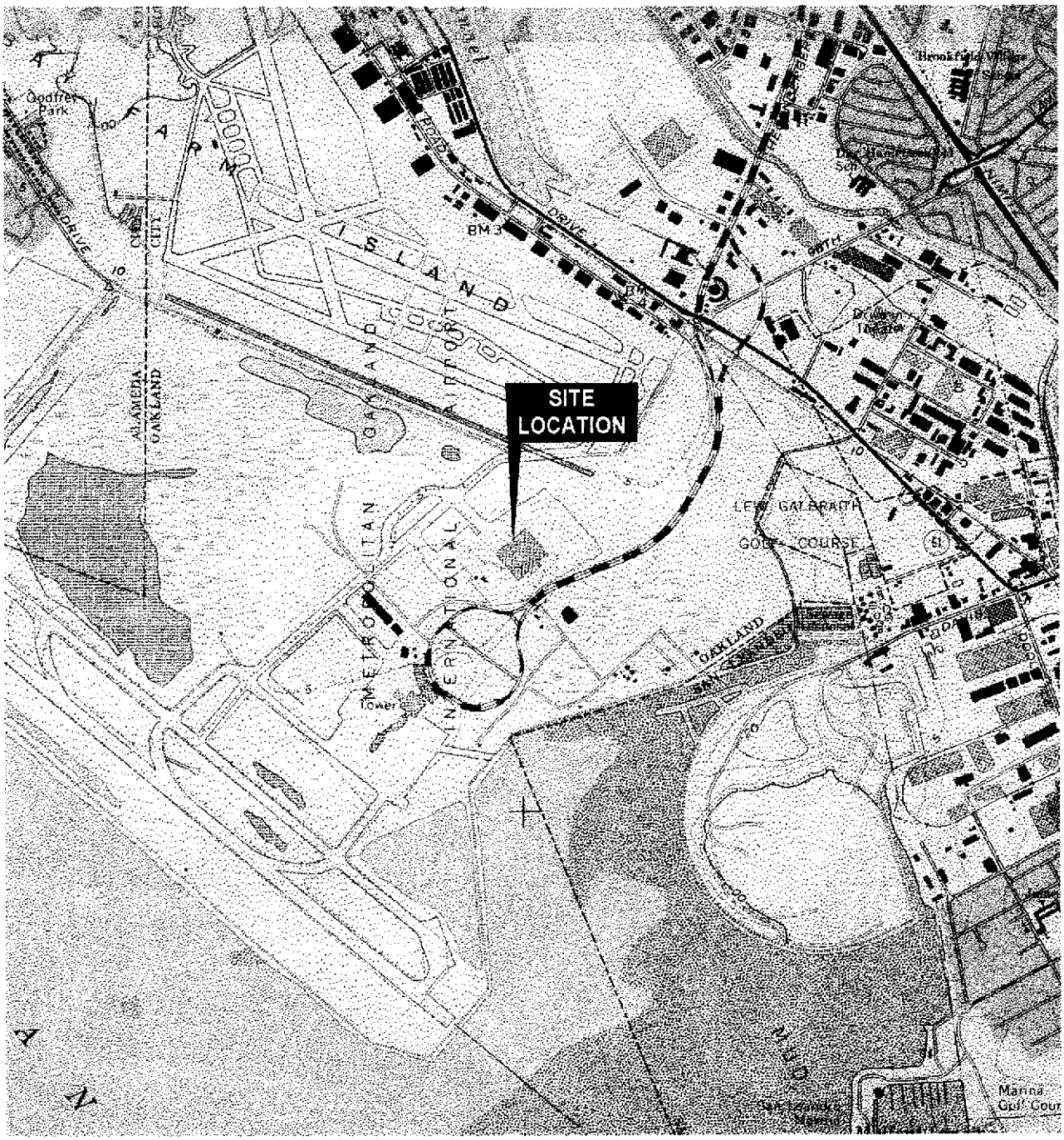


USGS 7.5 MINUTE
SAN LEANDRO, CA QUADRANGLE
1959, PHOTOREVISED 1980

NORTH

0 1000 2000

FEET

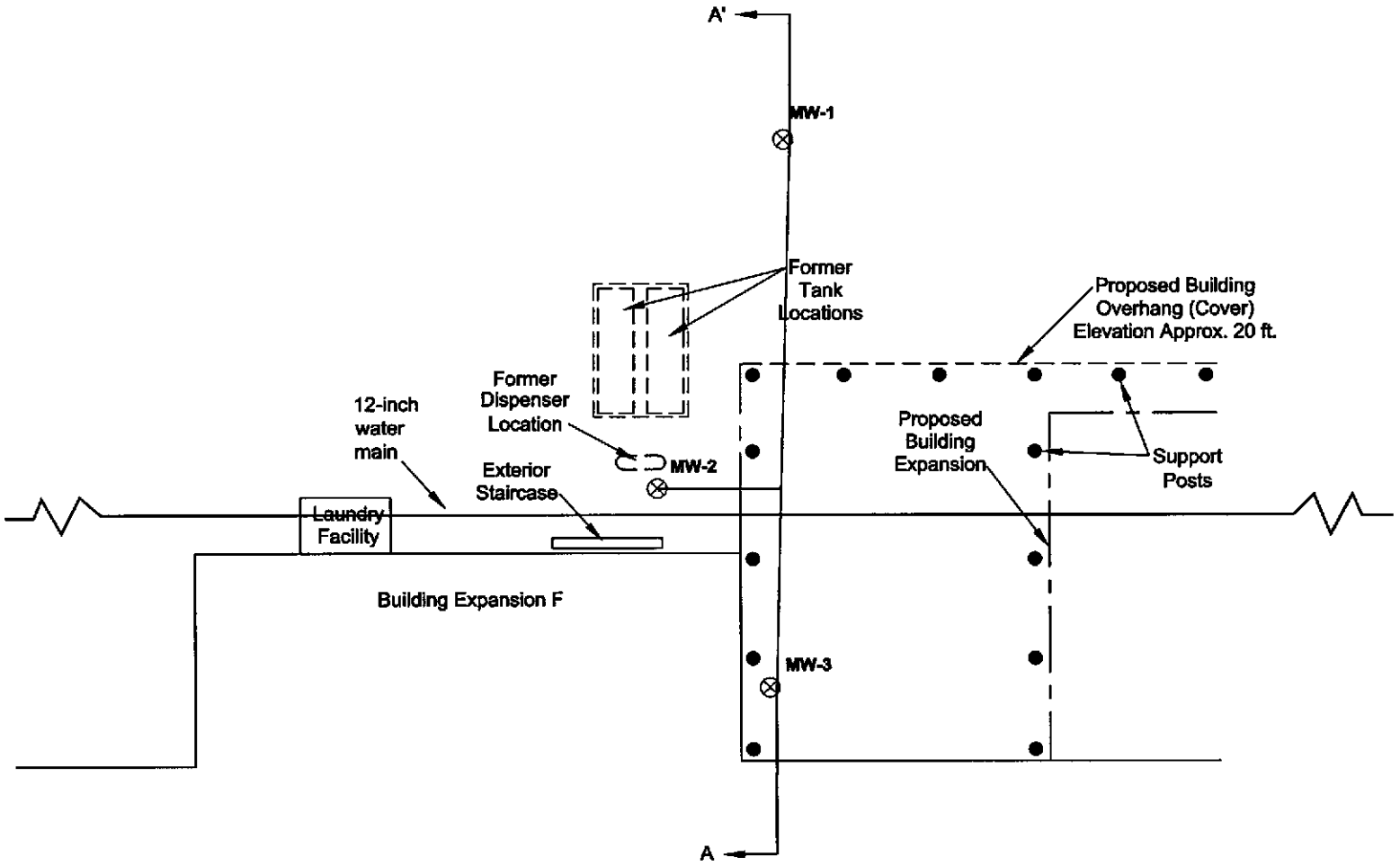
ENSR

FIGURE 1-1

SITE LOCATION MAP

United Airlines
Oakland International Airport
Oakland, CA

DRAWN: J. Glerek	DATE: 9/22/98	PROJECT NO: 6908-112-310	REV.
FILE: Ensr\6908\050\UAL_inf.dwf			



LEGEND

⊗ MW-2 = Monitoring Well

A A' = Cross Section Line for Figure 2-1

NORTH

0 20 40

APPROX. SCALE IN FEET

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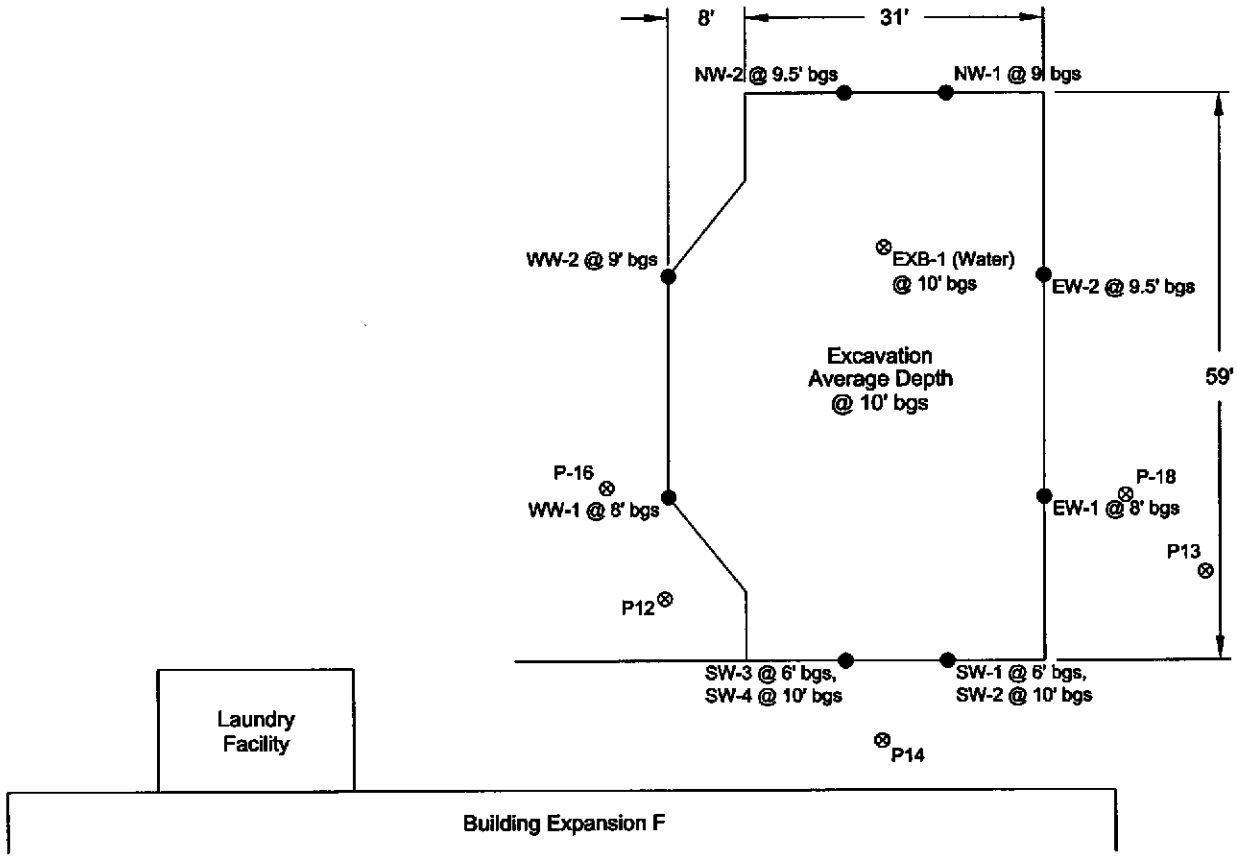
FIGURE 1-2

SITE MAP

United Airlines
Oakland International Airport
Oakland, CA

DRAWN: J.Hopeck	DATE: 4/26/00	PROJECT NO: 6908-112-310	REV.
FILE: Ensr\6908\112/A-A'			



LEGEND

WW-1 @ 8' bgs — Soil Samples Collected by ENSR, January 1999

P13 — Geoprobe Locations by Burns & McDonnell, 1997

NORTH

0 10 20

FEET

ENSR.

FIGURE 1-3

OVER-EXCAVATION DETAIL

United Airlines
Oakland International Airport
Oakland, CA

DRAWN: J. Gierek	DATE: 2/23/99	PROJECT NO: 6908-050-200	REV.
FILE: Ensr\6908\050\UAL_Plan3.dwg			

2.0 SITE DESCRIPTION

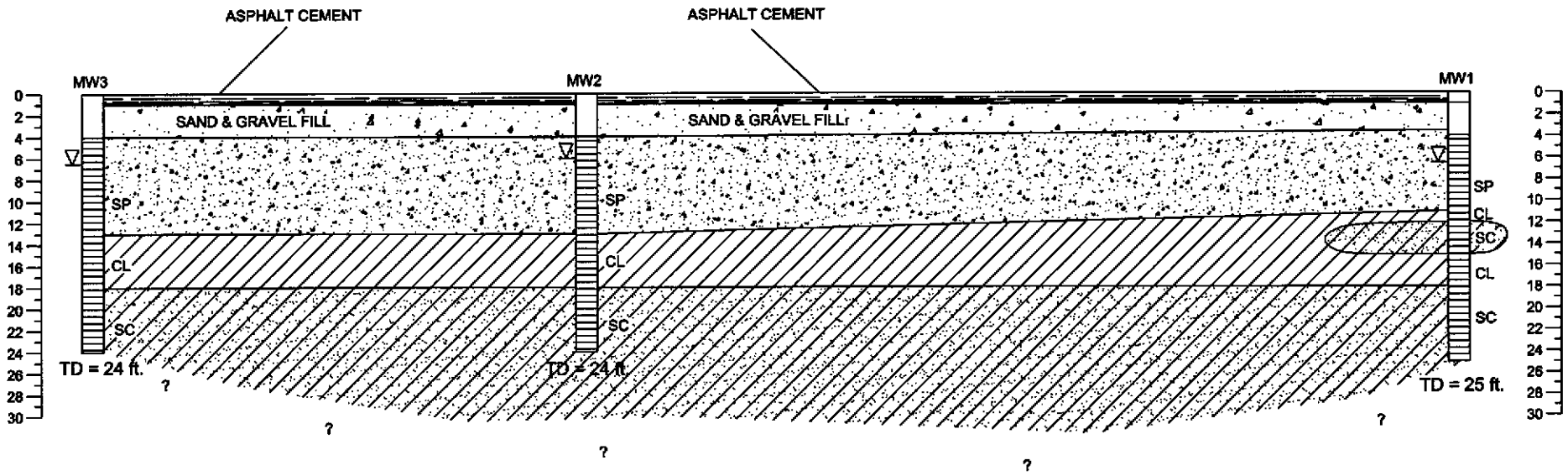
The San Francisco Bay Area lies within the Coast Ranges geomorphic province, which is characterized by a series of nearly parallel mountain ranges that trend obliquely to the coast in a northwesterly direction. Generally, the bedrock underlying San Francisco Bay is composed of sandstone, siltstone, chert and greenstone of the Franciscan Formation. Sediments within the Bay consist of "older bay mud", overlain by either a sand unit or "younger bay mud". Younger Bay Mud consists of a soft, uniform, gray, silty clay containing silt, minor fine sand and fragments of shells (Geology of San Francisco Bay, California Division of Mines and Geology).

The subject area is located on the northwest side of United Airlines Building M-110, which is used for airplane maintenance. The surrounding surface area is a graded, relatively flat area paved with asphalt concrete. The site exists at an approximate elevation of five feet above mean sea level. The nearest body of water is the San Francisco Bay located approximately 0.5 miles south of the Site (U.S.G.S. San Leandro Quadrangle, Photo-revised 1980).

Soils encountered during well installation consisted of sand (SP) to depths of approximately 13-feet below ground surface (bgs), clay (CL) to depths of 13 to 18 feet bgs; and clayey sand (SC) to depths of 25 feet bgs. A geologic cross-section is presented as **Figure 2-1**. A copy of the well logs is presented in **Appendix A**. Groundwater is present at approximately six to eight feet bgs. The groundwater flow direction is variable and appears to be under tidal influence.

2.1 Site Conceptual Model

The affected area is covered by asphalt, concrete and buildings, therefore ingestion and dermal contact with soil is considered incomplete. There are no drinking water wells within a 2,000-feet radius of the former UST location, and the closest identified body of surface water is located approximately 1,900-feet northwest (wetland area) and 1,900-feet south (Bay) of the subject area. Therefore, ingestion, inhalation, and dermal contact with groundwater and surface water are considered incomplete. Inhalation from volatilization is considered an incomplete exposure pathway, due to relatively low concentrations of TPH-d and MtBE in groundwater, their physical characteristics of being relatively nonvolatile, and the building located adjacent and south of the subject area does not contain a basement.



LEGEND

SP - POORLY-GRADED SAND

SC - CLAYEY SAND

CL - CLAY

TD - TOTAL DEPTH

▽ - DEPTH TO WATER

NORTH

0 15'

APPROXIMATE SCALE

ENSR INTERNATIONAL

FIGURE 2-1

CROSS SECTION A TO A'

United Airlines
Oakland International Airport
Oakland, California

Drawn By: J. Payne	Date: 1/13/01	PROJECT NO. 6908-112-310	REV.
Revised By:	Date:		

3.0 THIRD QUARTER 2000 GROUNDWATER MONITORING

3.1 Groundwater Levels

On October 4, 2000, depth to groundwater measurements were collected from monitoring wells MW-1, MW-2, and MW-3 prior to purging and sampling. The measurements were recorded to the nearest 0.01-foot from the referenced (top-of-casing) elevations. The depth to groundwater ranged from 6.52 to 8.14 feet bgs. Groundwater level data is summarized in **Table 3-1.**

The inferred groundwater flow direction was toward the east at a hydraulic gradient of approximately 0.003 ft/ft. **Figure 3-1** is a potentiometric surface map generated from the groundwater data collected.

The groundwater monitoring wells were surveyed by Tronoff Associates of Emeryville, California, a California licensed land surveyor. A copy of the well survey is presented in **Appendix A**.

3.2 Sampling Activities

On October 4, 2000 groundwater samples were collected from monitoring wells MW-1, MW-2, and MW-3. Prior to sampling, each monitoring well was purged of approximately two to three well casing volumes using a submersible pump. Physical properties, including temperature, pH, and conductivity, were monitored during purging activities. The groundwater samples were collected after these parameters showed relative stability (e.g., less than 10% change), and the water level in each well recharged 80% of the depth measured prior to purging.

Generated purge water and wash water was containerized onsite in 55-gallon drums. A total of three drums of water were generated. The wastewater was characterized, transported and recycled at Bay Soil Remediation, located in Richmond.

Groundwater samples were collected using a new disposable bailer for each well. The groundwater samples were transferred to the appropriate sample containers and stored in a cooler containing ice for preservation. The samples were delivered under chain-of-custody to McCampbell Analytical, Inc. of Pacheco, California, a California certified laboratory. Field documentation forms and ENSR standard operating procedures (SOPs) are presented in **Appendix B**.

Groundwater samples were submitted for the following chemical analysis:

- Total Petroleum Hydrocarbons as diesel (TPH-d) fuel by DHS Luft;
- Total Petroleum Hydrocarbons as gasoline (TPH-g) by DHS Luft;

- Benzene, toluene, ethylbenzene and total xylenes (BTEX) by EPA Method 8020; and
- Oxygenates including Methyl tert-butyl ether (MtBE), Di-isopropyl Ether (DIPE), Ethyl tert-Butyl Ether (ETBE), tert-Amyl Methyl Ether (TAME), and tert-butanol by EPA Method 8260.

One groundwater sample (from MW-1) was also submitted for the following water quality analysis:

- General Mineral by EPA 6000/7000 Series Method; and
- Total Dissolved Solids (TDS) by EPA Method 160.1.

3.3 Laboratory Results

The chemical analytical results of groundwater samples collected from monitoring wells MW-1, MW-2, and MW-3 are summarized in **Table 3-2**. A distribution map of TPH-d, TPH-g, Benzene and MtBE in groundwater is presented in **Figure 3-2**. An iso-contour map of TPH-d in groundwater is presented in **Figure 3-3**. An iso-contour map of MtBE in groundwater is presented in **Figure 3-4**. Copies of the laboratory analytical report are included in **Appendix C**.

The following is a summary of the analytical results:

- TPH-d was detected in groundwater samples MW-2 at 62 micrograms per Liter (µg/L) and MW-3 at 90 µg/L;
- Benzene was detected in groundwater sample MW-3 at 0.52 µg/L; and
- MtBE was detected in groundwater samples MW-2 at 160 µg/L, and MW-3 at 23 µg/L.

Water quality analyses were performed on a groundwater sample collected from monitoring well MW-1. The results are summarized in **Table 3-3** and the laboratory analytical report is presented in **Appendix C**. The analytical results indicated the following:

- TDS was 5,400 milligrams per Liter (mg/L);
- Total Hardness/CaCO3 was 863 mg/L;
- Alkalinity was 740 mg/L; and
- Chloride was 3,000 mg/L.

3.4 Cumulative Groundwater Monitoring Data

Groundwater level data vs. time indicates that groundwater elevations have not significantly fluctuated during the one year monitoring period (**Graph 3-1**). Concentrations of TPH-d in groundwater vs. time indicate that concentrations have stabilized at levels less than 100 µg/l (**Graph 3-2**). Concentrations of TPH-g in groundwater vs. time indicate that TPH-g has not

been detected during the last three monitoring events (**Graph 3-3**). Concentrations of benzene in groundwater vs. time indicate that benzene has not been detected above the maximum contaminant level (MCL) of 1.0 µg/L, during the last two monitoring events (**Graph 3-4**). Concentrations of MtBE in groundwater vs. time indicate that concentrations have fluctuated, while decreasing overtime (**Graph 3-5**).

TABLE 3-1
GROUNDWATER LEVEL DATA
Oakland International Airport
United Airlines Building M-110

Well	Date	Reference Level (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
MW-1	7/28/99	10.91	6.12	4.79
	12/27/99		6.37	4.54
	3/14/00		5.48	5.43
	06/15/00		5.85	5.06
	10/04/00		6.52	4.39
MW-2	7/28/99	12.30	7.47	4.83
	12/27/99		7.83	4.47
	3/14/00		7.05	5.25
	06/15/00		7.26	5.04
	10/04/00		7.85	4.45
MW-3	7/28/99	12.51	7.67	4.84
	12/27/99		8.05	4.46
	3/14/00		7.30	5.21
	06/15/00		7.59	4.92
	10/04/00		8.14	4.37

TABLE 3-2
ANALYTICAL RESULTS – GROUNDWATER
Oakland International Airport
United Airlines Building M-110

Sample ID	Date Collected	Total Petroleum Hydrocarbons		MTBE	Volatile Organic Compounds			
		Diesel (µg/L)	Gasoline (µg/L)	(µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)
MW-1	7/28/99	ND	ND	ND	ND	ND	ND	ND
	12/27/99	ND	ND	ND	ND	ND	ND	ND
	3/14/00	ND	ND	ND	ND	ND	ND	ND
	6/15/00	ND	ND	ND	ND	ND	ND	ND
	10/04/00	ND	ND	ND	ND	ND	ND	ND
MW-2	7/28/99	160	ND	190	ND	ND	ND	ND
	12/27/99	180	110	110	43	ND	ND	ND
	3/14/00	63	ND	350	ND	ND	ND	ND
	6/15/00	73	ND	17	0.57	ND	ND	ND
	10/04/00	62	ND	160	ND	ND	ND	ND
MW-3	7/28/99	ND	ND	270	ND	ND	ND	ND
	12/27/99	90	ND	270	ND	ND	0.54	ND
	3/14/00	120	ND	72	7.1	ND	ND	ND
	6/15/00	78	ND	280	ND	ND	ND	ND
	10/04/00	90	ND	23	0.52	ND	ND	ND
Reporting Limit		50	50	1.0	0.5	0.5	0.5	0.5

Notes:

MTBE Methyl tert-Butyl Ether by EPA 8260
ND Not detected above laboratory reporting limits
µg/L micrograms per Liter

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TABLE 3-3
ANALYTICAL RESULTS - GROUNDWATER QUALITY
Oakland International Airport
United Airlines Building M-110

Sample ID	Date Collected	Total Dissolved Solids (mg/L)	Total Hardness/ CaCO3 (mg/L)	Total Alkalinity (mg/L)	Bicarbonate (mg/L)	Chloride (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Calcium (mg/L)	Manganese (mg/L)	Iron (mg/L)	Copper (mg/L)	Zinc (mg/L)
MW-1	7/28/99	6,600	NA	NA	NA	NA	210	2,300	81	180	2.4	55	0.066	103
	12/27/99	6,130	935	800	800	2,650	140	1,780	52	144	1.75	9.3	< 0.05	< 0.05
	3/14/00	6,350	775	700	684	2,650	140	1,780	65	80	0.09	< 0.1	< 0.05	< 0.05
	6/15/00	5,300	714	750	750	1,650	109	1,700	61	107	1.5	1.2	<0.05	<0.05
	10/04/00*	5,400	863	740	740	3,000	NA	NA	NA	NA	NA	NA	NA	NA
Reporting Limit	---	10	1	10	10	1.0	1.0	1.0	1.0	1.0	0.01	0.1	0.05	0.05

Notes:

mg/L milligrams per Liter
NA Not analyzed
* sample was also analyzed for carbonate, sulfate, and MBAS (see Appendix C)

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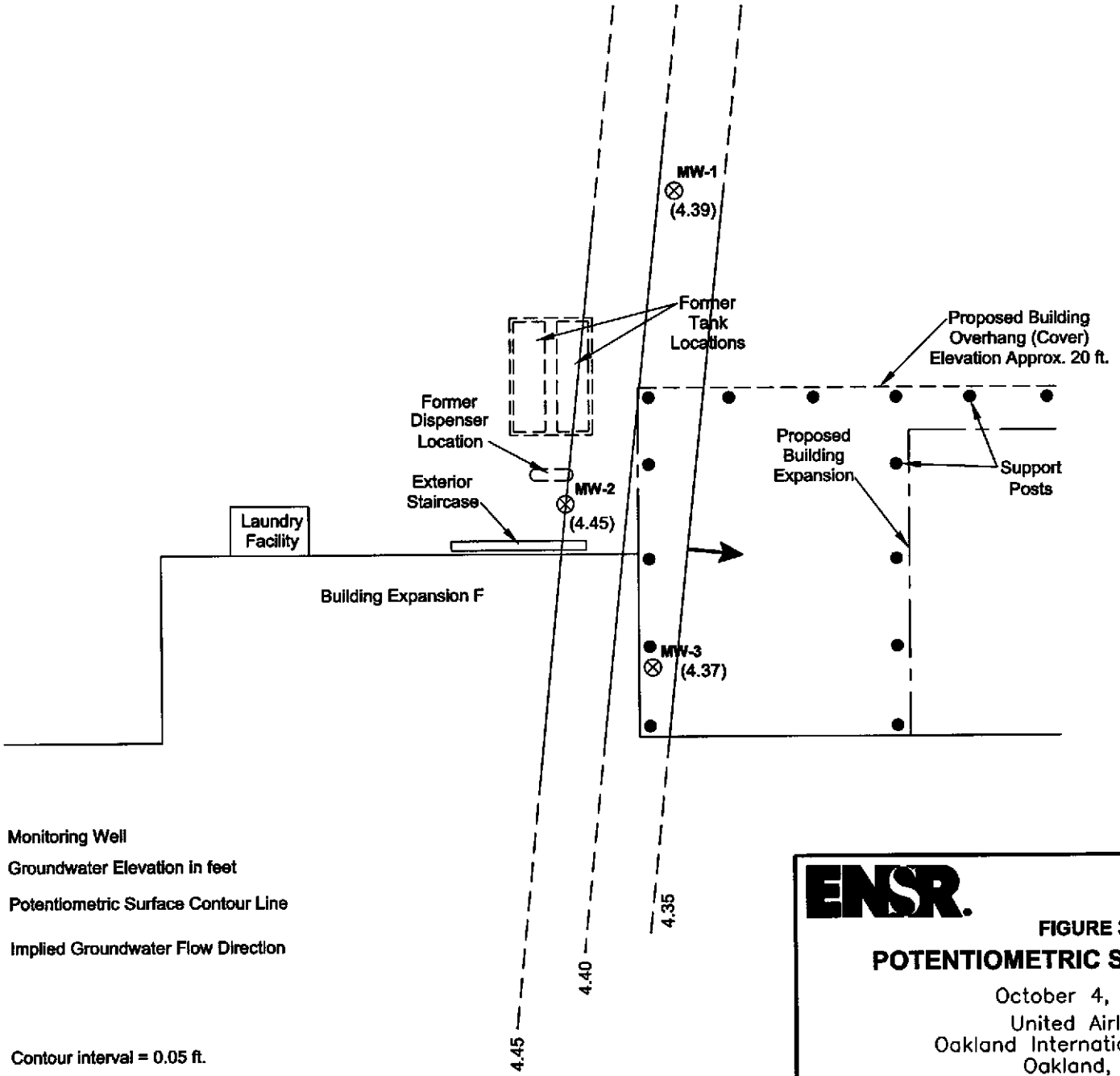

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MW-1 (4.39) — Monitoring Well; Groundwater Elevation in feet

Potentiometric Surface Contour Line

Implied Groundwater Flow Direction

Contour interval = 0.05 ft.

Hydraulic gradient = 0.003 ft/ft

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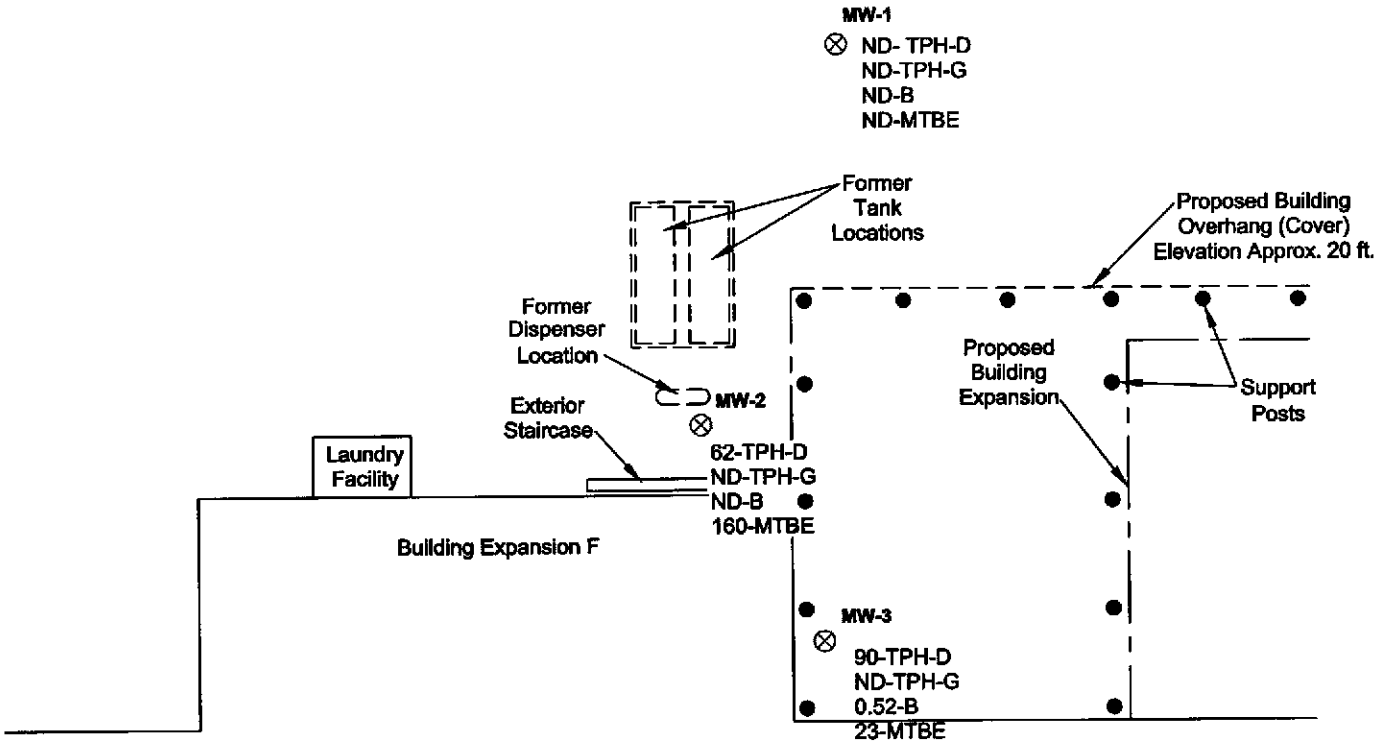
FIGURE 3-1

POTENTIOMETRIC SURFACE MAP

October 4, 2000

United Airlines
Oakland International Airport
Oakland, CA

DRAWN: J.Hopeck	DATE: 3/14/00	PROJECT NO: 6908-112-310	REV.
REVISED: J. Payne	DATE: 10/5/00		



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⊗ MW-2	=	Monitoring Well	
TPH-D	=	TPH as Diesel	(ug/L)
TPH-G	=	TPH as Gasoline	(ug/L)
B	=	Benzene	(ug/L)
MTBE	=	Methyl tert-Butyl Ether	(ug/L)
ND	=	Non-detect	

NOTE: All measurements in parts per billion.

NORTH

0 20 40

APPROX. SCALE IN FEET

ENSR.

FIGURE 3-2

DISTRIBUTION OF TPH-D, TPH-G, BENZENE, & MTBE IN GROUNDWATER

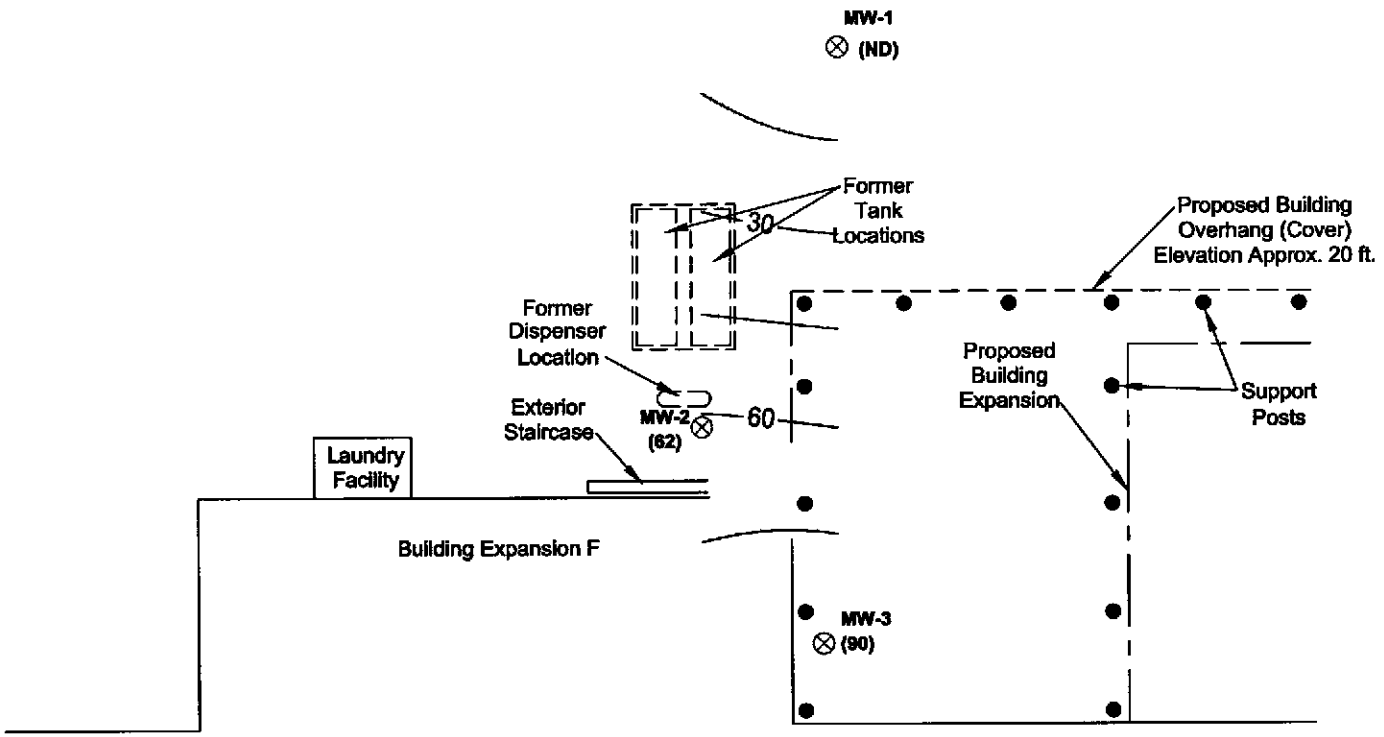
October 4, 2000

United Airlines

Oakland International Airport

Oakland, CA

DRAWN: J.Hopeck	DATE: 4/26/00	PROJECT NO: 6908-112-310	REV.
FILE: Ensr\6908\112/310			



LEGEND:

MW-2 (23) ⊗	=	Monitoring Well (Diesel Concentration in ug/L)
~	=	Iso-Contour Line (Contour Interval = 15 ug/L)
ND	=	Non-detect

NOTE: All measurements in parts per billion.

NORTH

0 20 40

APPROX. SCALE IN FEET

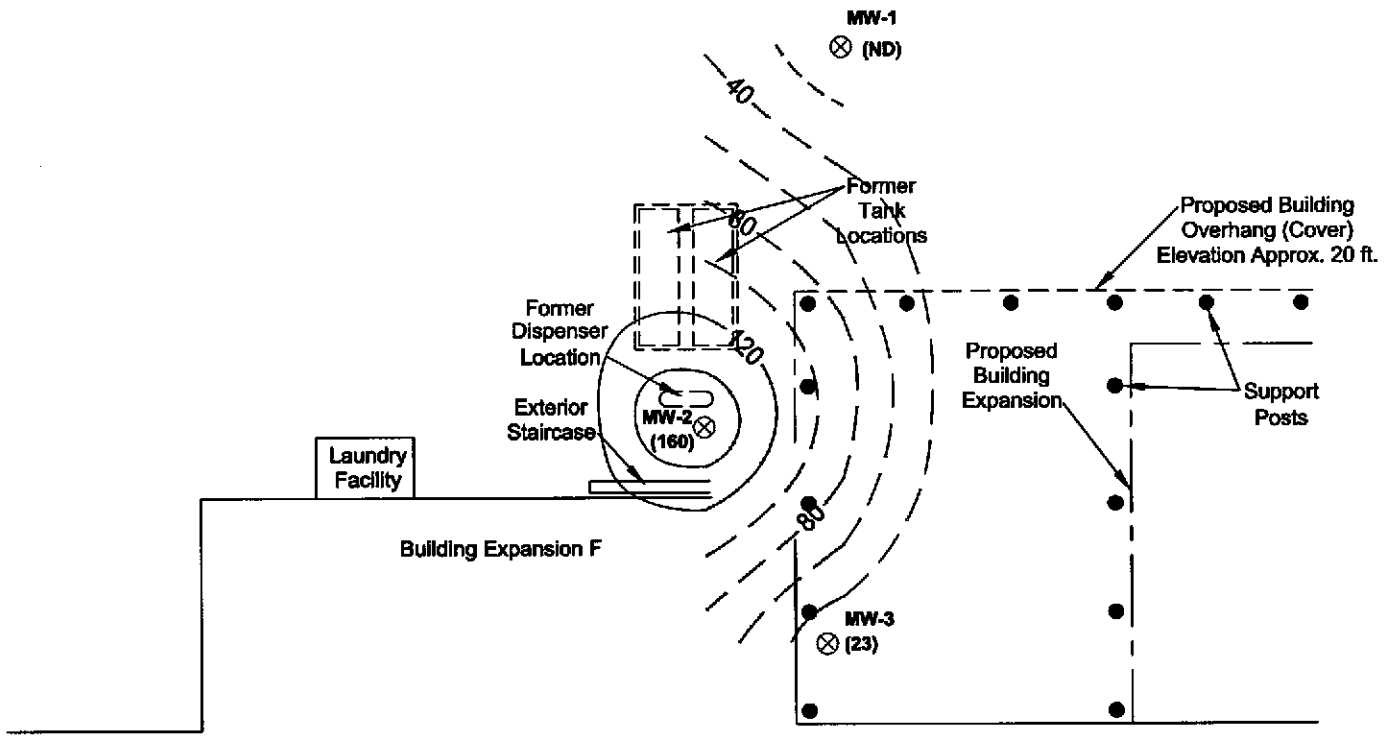
ENSR.

FIGURE 3-3

DIESEL ISO-CONTOUR MAP
October 4, 2000

United Airlines
Oakland International Airport
Oakland, CA

DRAWN: A. Churchill	DATE: 1/29/01	PROJECT NO: 6908-112-310	REV.
FILE: Ensr\6908\112/310			



LEGEND:

MW-2 (23) ⊗	=	Monitoring Well (MTBE Concentration in ug/L)
~	=	Iso-Contour Line (Contour Interval = 20 ug/L)
MTBE	=	Methyl tert-Butyl Ether
ND	=	Non-detect

NOTE: All measurements in parts per billion.

NORTH

0 20 40

APPROX. SCALE IN FEET

ENSR.

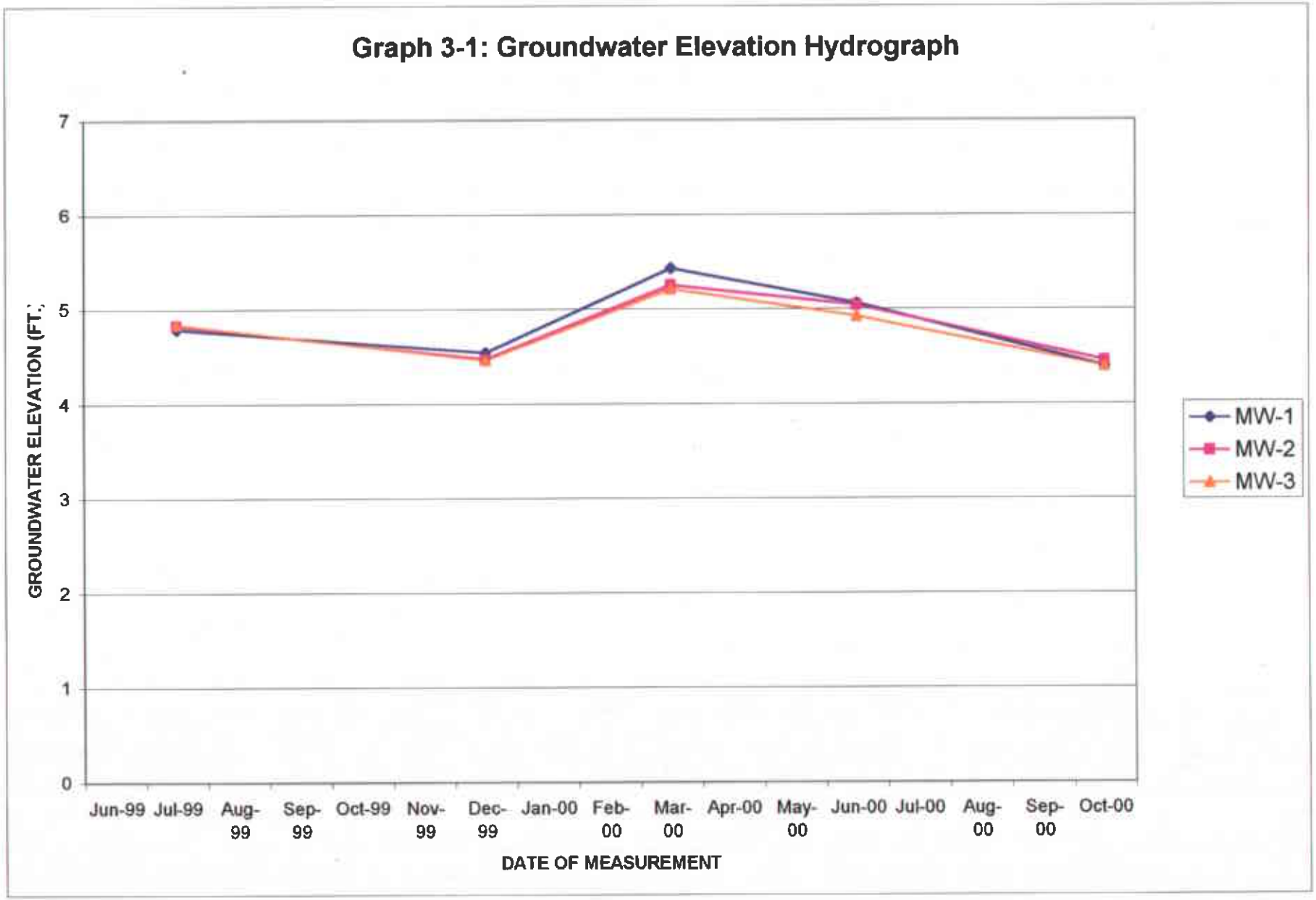
FIGURE 3-4

MTBE ISO-CONTOUR MAP
October 4, 2000

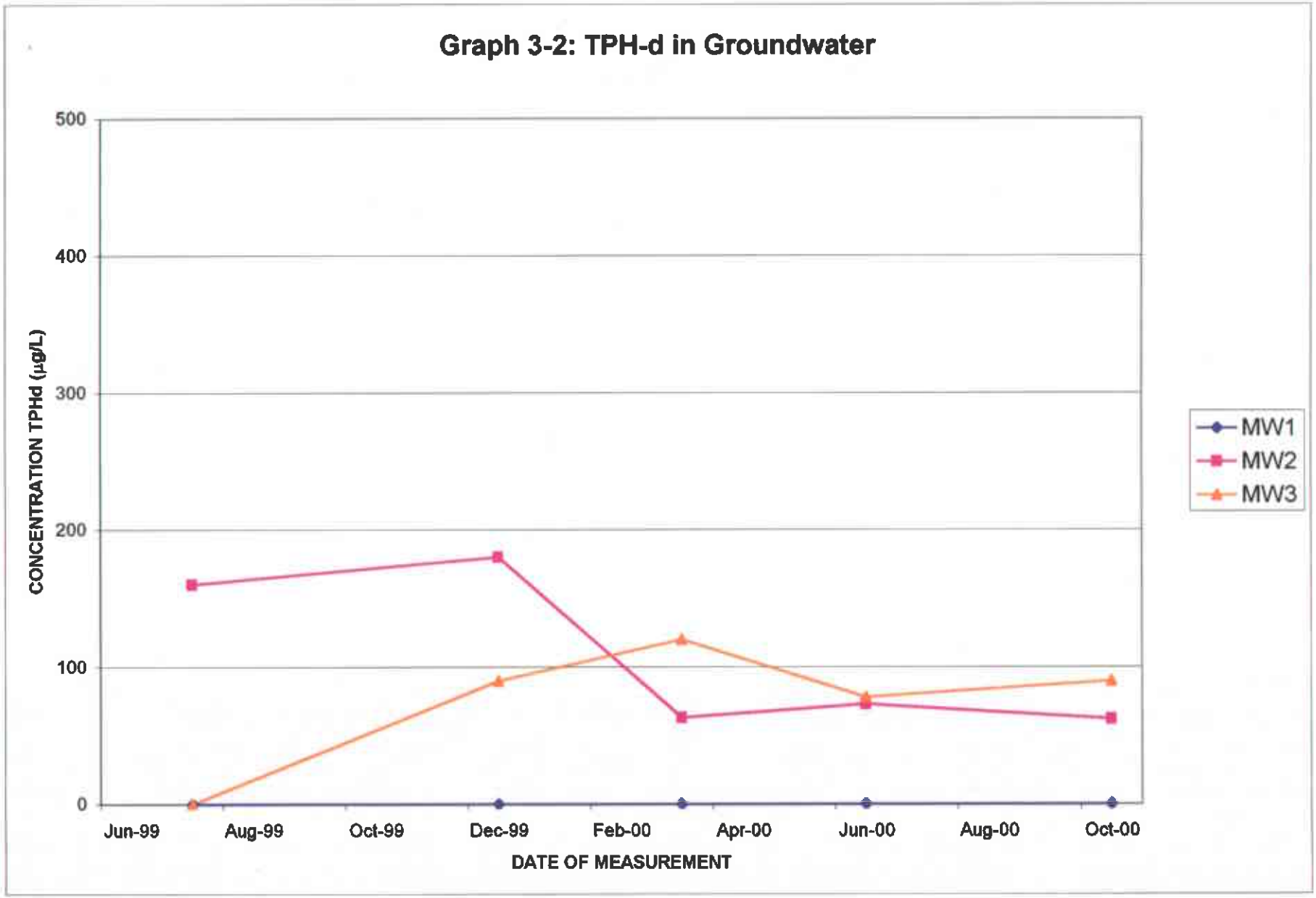
United Airlines
Oakland International Airport
Oakland, CA

DRAWN: A. Churchill	DATE: 1/29/01	PROJECT NO: 6908-112-310	REV.
FILE: Ensr\8908\112/310			

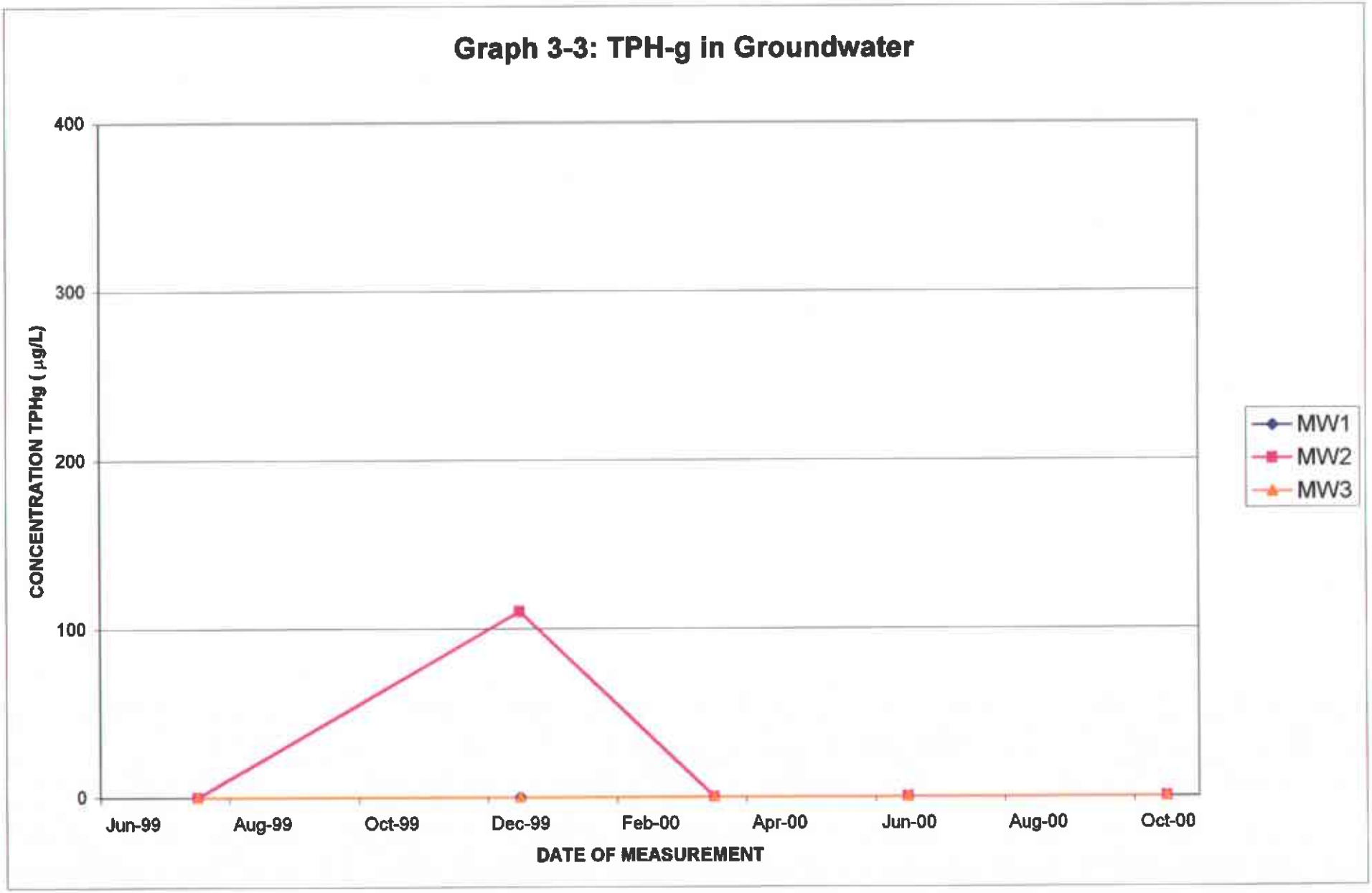
Graph 3-1: Groundwater Elevation Hydrograph



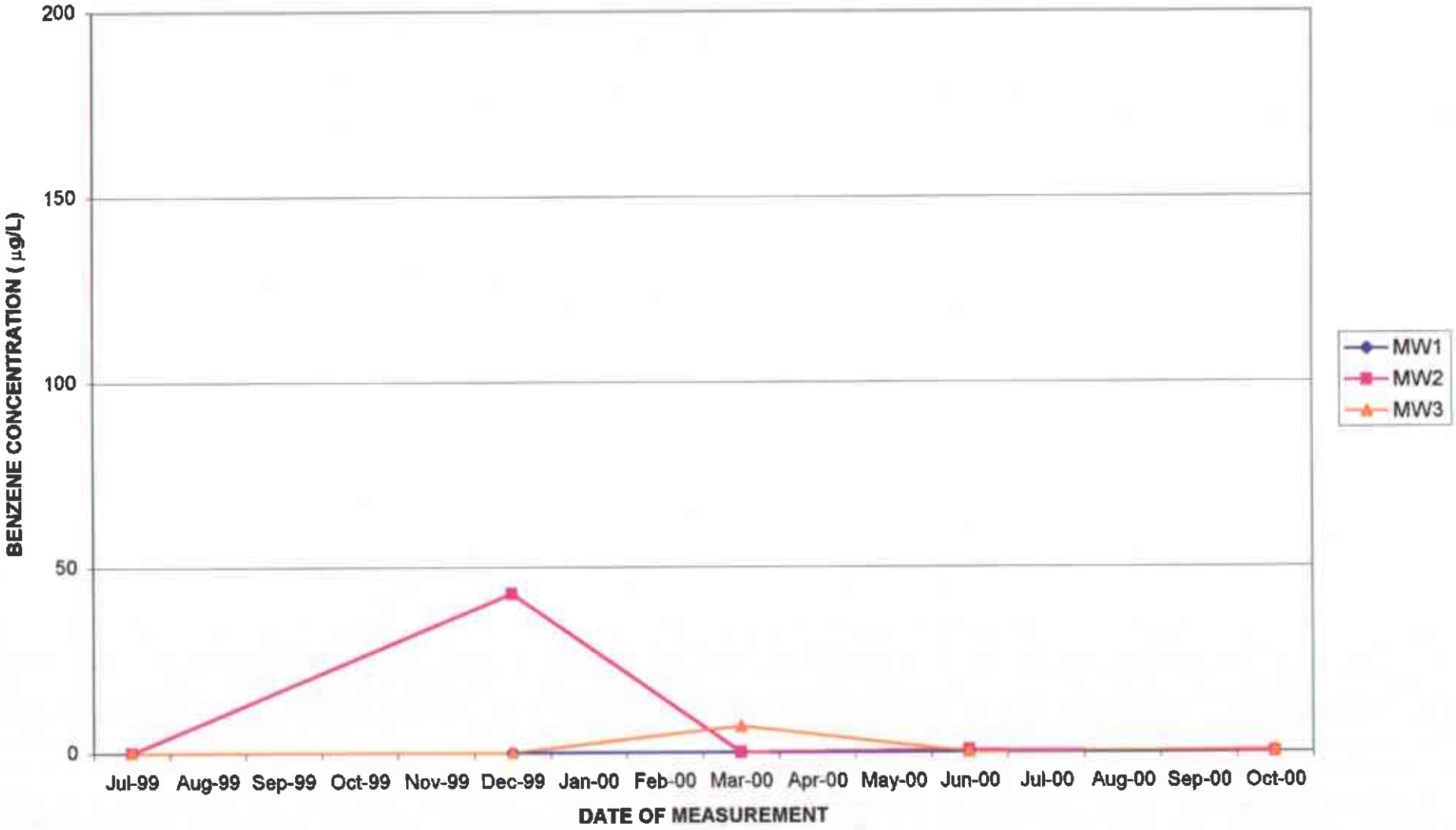
Graph 3-2: TPH-d in Groundwater



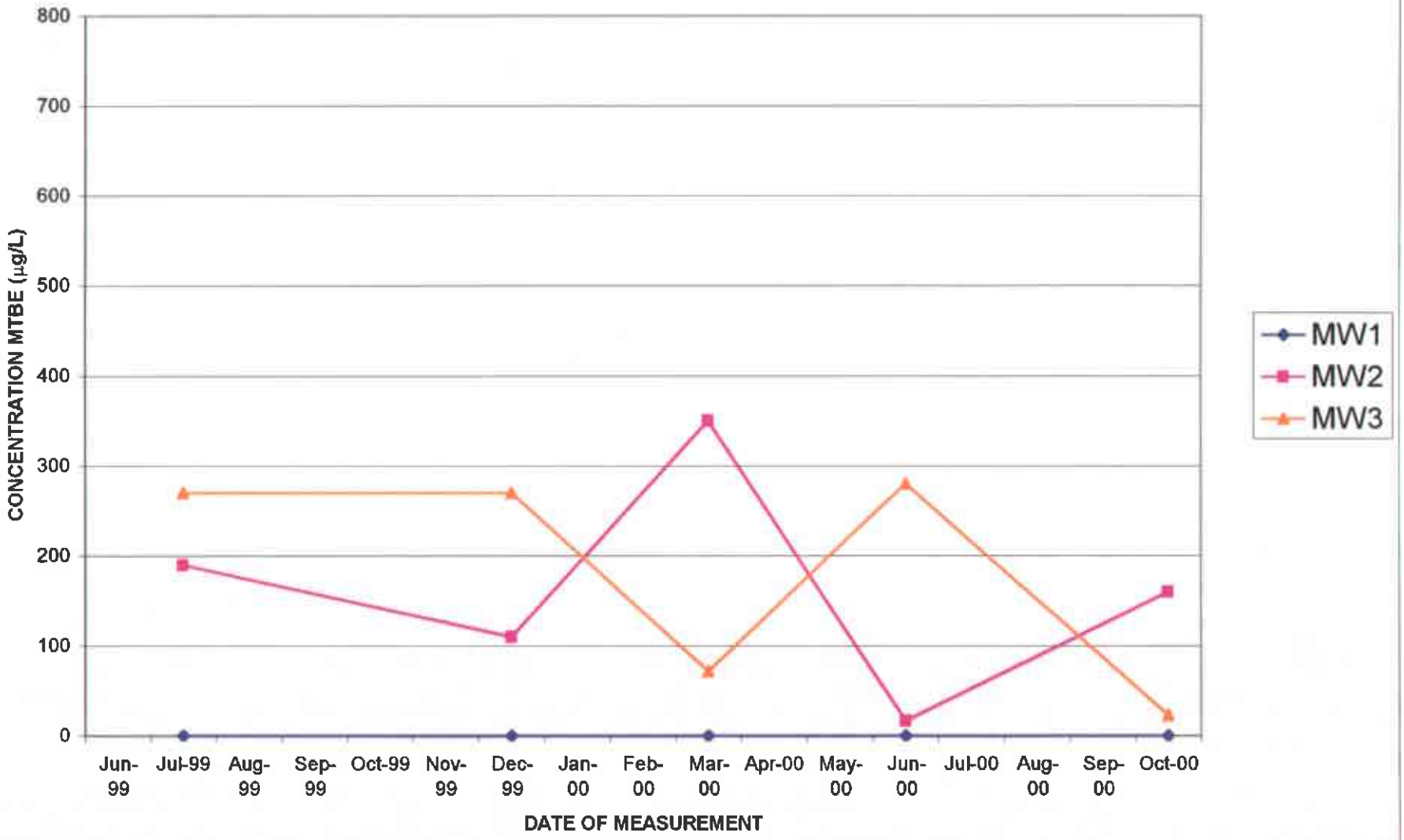
Graph 3-3: TPH-g in Groundwater



Graph 3-4: Benzene in Groundwater



Graph 3-5: MtBE in Groundwater



4.0 SENSITIVE RECEPTOR SURVEY

– What about the other well?

ENSR has performed a Sensitive Receptor Survey for drinking water wells, surface water bodies and public schools located within a 2,000-foot radius of the United Airlines Oakland Maintenance Center (UAL-OMC) at 1100 Airport Drive in Oakland, California.

4.1 Port of Oakland Department of Environmental Health and Safety Compliance. ENSR reviewed records at the Port of Oakland Department of Environmental Health and Safety Compliance (PODEHSC), 530 Water Street, Oakland, California for water wells in the vicinity of the UAL-OMC. Records indicate that eight groundwater monitoring wells were installed by Harding Lawson Associates within the Economy Parking Lot located 200 feet west of the United Maintenance Hangar in July 2000. In addition, Innovative Technical Solutions, Inc. installed three monitoring wells in August 1996 along the taxiway, 250 feet northwest of the United Maintenance Hangar. These wells were for monitoring purposes only. Mr. Dale Klettke of the PODEHSC indicated that he believes there are no drinking water wells at the Metropolitan Oakland International Airport or its vicinity as the shallowest fresh water aquifer is located at a depth of 600 feet below the ground surface.

4.2 Department of Water Resources. ENSR reviewed records at the Department of Water Resources (DWR), 3251 S Street, Sacramento, California for well permits issued within township 2 south, range 3 west, sections 28, 29, 32, and 33, in order to search a 2,000-foot radius of the UAL-OMC. Records indicate the installation of the following groundwater monitoring wells:

- Two monitoring wells installed on May 14, 1992 by Uribe and Associates in an area located 250 feet southwest of the UAL-OMC;
- Three monitoring wells were installed in the Avis parking lot (approximately 600 feet southwest of the UAL-OMC) for Avis Rent-A-Car System, Inc.; and
- Environmental Science and Engineering, Inc. installed six monitoring wells in August 1991 in the Hertz parking lot (approximately 400 feet southwest of the UAL-OMC).

These wells were installed for monitoring purposes only, and no other records of wells were found within a 2,000-foot radius of the UAL-OMC.

4.3 County of Alameda Public Works Agency. ENSR also submitted a request for a well search to the County of Alameda Public Works Agency. The well search results were faxed to ENSR and indicated the presence of two monitoring wells belonging to Hertz Corporation approximately 500 feet south of the UAL-OMC. No drinking water wells were found within a 2,000-foot radius of the UAL-OMC.

4.4 7.5 Minute Topographic Map. ENSR reviewed the 7.5 minute topographic map of San Leandro, California dated 1959, photorevised 1980. According to the topographic map, San Francisco Bay is located approximately 1,900 feet south of the UAL-OMC, and a seasonal wetland is located approximately 1,900 feet northwest of the UAL-OMC. No other surface water bodies were noted within a 2,000-foot radius of the project site.

4.5 Drive By Reconnaissance. ENSR performed a drive by reconnaissance of the project site vicinity and did not observe any public schools or surface water bodies other than the surface water bodies noted above. Based upon available information, no drinking water wells or public schools are located within a 2,000-foot radius of the project site. San Francisco Bay and a seasonal wetland are located at a distance of approximately 1,900 feet from the project site. In ENSR's opinion, the presence of the San Francisco Bay and the seasonal wetland would not be considered a concern due to the relatively low concentrations of petroleum hydrocarbons detected in the monitoring wells by the former UST at the UAL-OMC, and the distance from the former USTs.

Site location maps of the wells mentioned above are included as **Appendix D**.

5.0 UTILITY SURVEY

ENSR reviewed available as-built drawings of underground utilities, provided by United Airlines. There is a 12-inch water main line that is located southeast of the former tank locations (refer to **Figure 1-2**). This line was exposed during excavation activities associated with the USTs removal. The line runs in a southwest to northeast direction, parallel to the building. The top of the line is at a depth of approximately five-feet bgs, and the material surrounding the pipeline was observed to be the same (sand) as the native material at that same depth. Therefore, this utility line does not appear to be a conduit for contaminant migration. Electrical lines were also identified in the vicinity of the former USTs. These lines are typically shallow and would also be located in the native material (sand), and therefore would not act as conduits for contaminant migration.

ENSR marked the proposed well locations and notified Underground Service Alert (USA), prior to installing groundwater monitoring wells MW-1, MW-2 and MW-3. In addition, a geophysical survey was performed by NORCAL Geophysical Consultants, Inc. of Petaluma, CA, on July 20, 1999 (prior to beginning drilling activities) using electromagnetic field inductions and ground penetrating radar, to locate potential underground utility hazards at the proposed well locations. An electrical line was identified in the vicinity of monitoring well MW-3. These lines are typically shallow and would also be located in the native material (sand), and therefore would not act as conduits for contaminant migration. A copy of the borehole survey is presented in **Appendix E.**

While surveying the site in preparation for construction of a new ground air compressor building, United Airlines came across an old monitoring well (old well south) covered with a steel plate. A second old well (old well north) was also observed at the rear of the facility. The locations of these wells are presented in **Appendix D.** According to Mr. Dennis Moulton with United Airlines, these wells were installed prior to United leasing the property in 1988. Mr. Moulton contacted the Port of Oakland, regarding their presence and purpose. The Port of Oakland did not have any record of the wells. Because the well identified as "old well south", was in the way of the new compressor building, the Port of Oakland agreed to have the well abandoned. Because of the uncertainty of the construction, condition and purpose of "old well north", United Airlines has declined to include the well in its groundwater monitoring program.

6.0 CONCLUSIONS AND RECOMMENDATIONS

During the last three consecutive groundwater monitoring events the presence of TPH-g has not been detected. During the last two consecutive groundwater monitoring events the presence of benzene has been below the California drinking water standards maximum contaminant levels (MCLs) of 1.0 µg/L. The presence of TPH-d in groundwater has stabilized at concentrations less than 100 µg/L. The presence of MtBE appears to have stabilized at concentrations less than 200 µg/L.

Based on the trends represented by the constituent concentrations versus time graphs, the presence of TPH-d, TPH-g and benzene have stabilized and or decreased over time. The presence of MtBE in groundwater monitoring has fluctuated between monitoring events, although the overall presence of MTBE in groundwater is decreasing over time.

Based upon the sensitive receptor survey, no drinking water wells or public schools are located within a 2,000-foot radius of the project site. The San Francisco Bay and a seasonal wetland are located approximately 1,900-feet from the project site. In ENSR's opinion, the San Francisco Bay and the seasonal wetland would not be impacted based on the relatively low concentrations of the plume and the distance between them. Based on the utility survey, there are no apparent avenues of constituent migration.

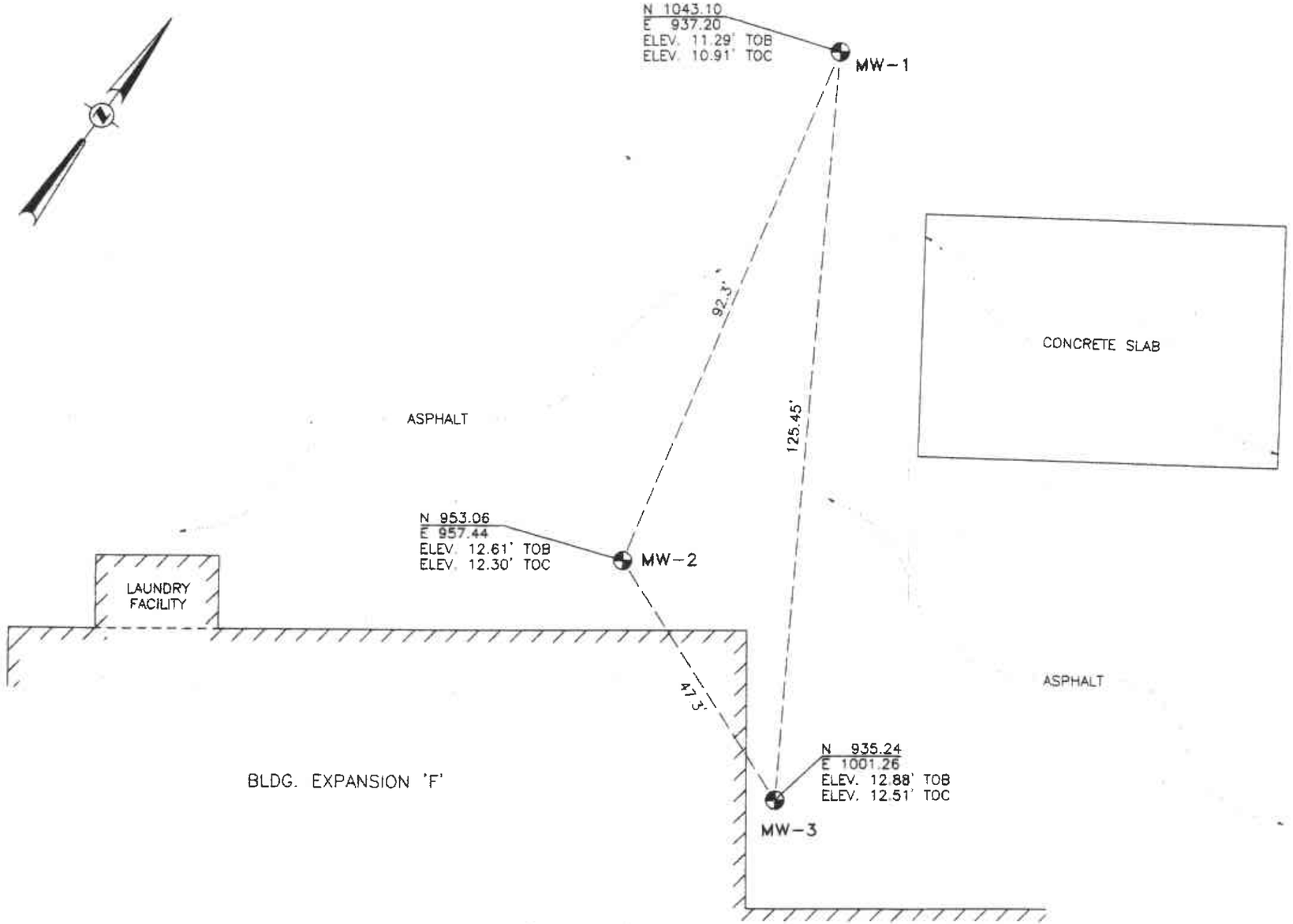
The site conceptual model does not identify any complete exposure pathways. The affected area is covered by asphalt, concrete and buildings, therefore ingestion and dermal contact with soil is considered incomplete. There are no drinking water wells within a 2,000-foot radius of the former UST location, and the closest identified body of surface water is located approximately 1,900-feet northwest (wetland area) and 1,900-feet south (Bay) of the subject area. Therefore, ingestion, inhalation, and dermal contact with groundwater and surface water are considered incomplete. Inhalation from volatilization is considered an incomplete exposure pathway, due to relatively low concentrations of TPH-d and MtBE in groundwater, their physical characteristics of being relatively nonvolatile, and the building located adjacent and south of the subject area does not contain a basement.

Concentrations of total dissolved solids at the subject site have ranged from 5,300 mg/L to 6,600 mg/L. Therefore, this site appears to be excluded from the California State Water Board "Sources of Drinking Water" policy, based on the relatively high levels of TDS (greater than 3,000 mg/L).

This sampling event represents the last of four quarterly groundwater monitoring events (one year) required by the Alameda County Department of Environmental Health. In ENSR's opinion, the source has been removed, the plume has stabilized, and there is no apparent threat to human health or the environment. Therefore, ENSR requests a "No Further Action" from Alameda County Environmental Health Services.

APPENDIX A

WELL LOGS AND WELL SURVEY DATA



NOTES

1. VERTICAL DATUM: ASSUMED TO BE CITY OF OAKLAND PER GRADING PLAN DRAWING SP-2D, PORT FILE AA-1285, 10/16/77.
2. COORDINATE BASIS: LOCAL
3. TOB = SET PUNCH MARK N'LY SIDE WELL BOX.
4. TOC = MARK N'LY SIDE TOP 4" PVC CASING.

GROUNDWATER MONITORING WELL SURVEY
UNITED AIRLINES FACILITY
OAKLAND INTERNATIONAL AIRPORT

ALAMEDA COUNTY, CALIFORNIA

PREPARED FOR

ENSR

BY

TRONOFF ASSOCIATES - LAND SURVEYORS

5850 SHELLMOUND WAY, SUITE 300 EMERYVILLE, CA.

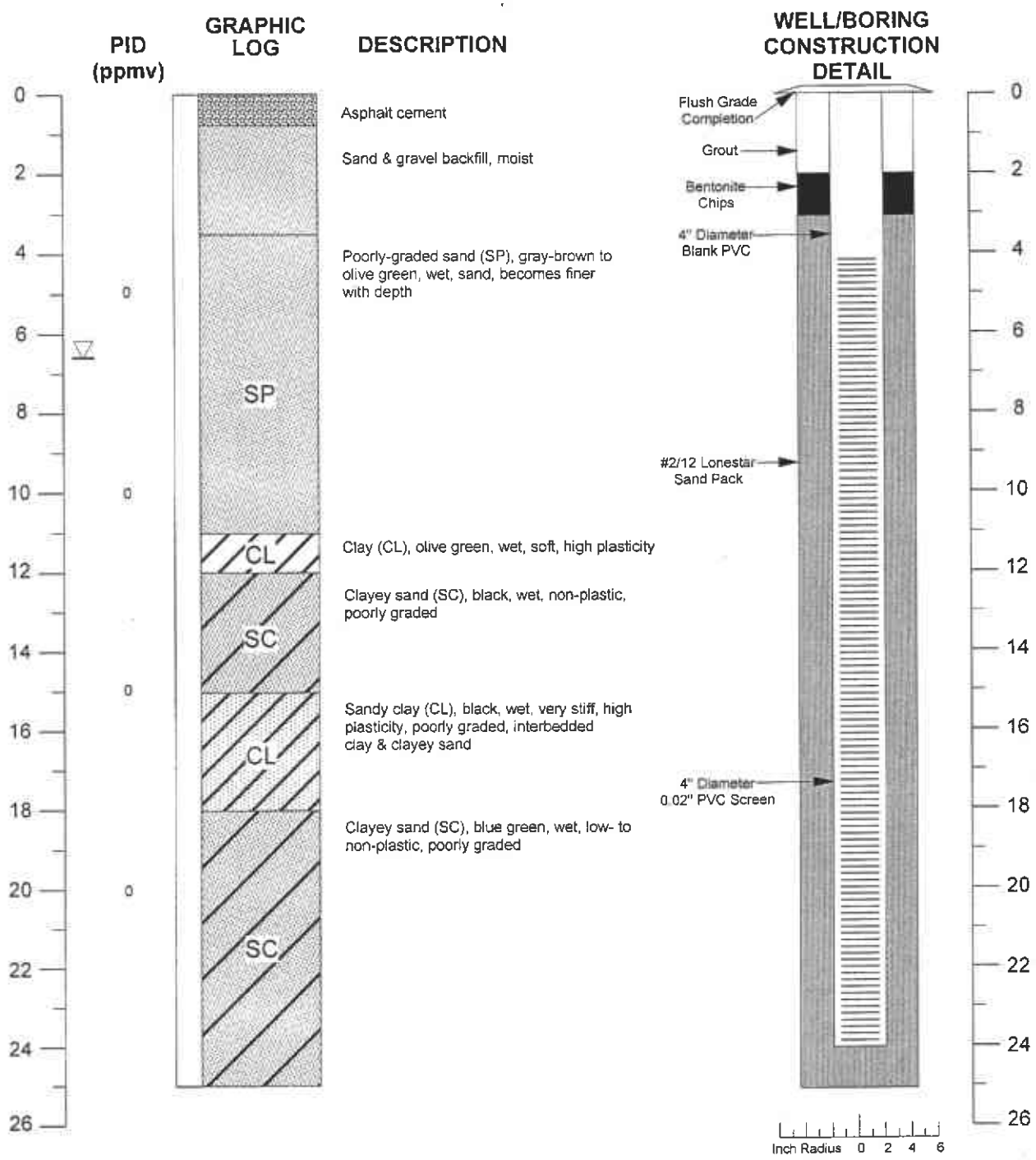
(510) 428-1515

SCALE 1"= 20' AUGUST 23, 1999

SURVEY NO. 4194

LICENSED LAND SURVEYOR
BRUCE T. TRONOFF
NO. 6415
STATE OF CALIFORNIA

BRUCE T. TRONOFF, LAND SURVEYOR NO. 6415 (RENEWAL DATE 12/31/02)



Driller:	Gregg Drilling	End Date:	7/21/99	Type of Sampler:	Split spoon
Drilling Method:	Hollow Stem Auger	Groundwater:	6.5 ft. bgs	TD (Total Depth):	25 ft. bgs
Start Date:	7/21/99	Sampler:	Jeff Wendt		

Legend

- Water level in completed well
- First water found during drilling
- Location of recovered drill sample
- Location of sample sealed for chemical analysis
- Contact: Solid where certain
- Contact: Dotted where approximate
- Contact: Dashed where uncertain

Monitoring Well MW-1

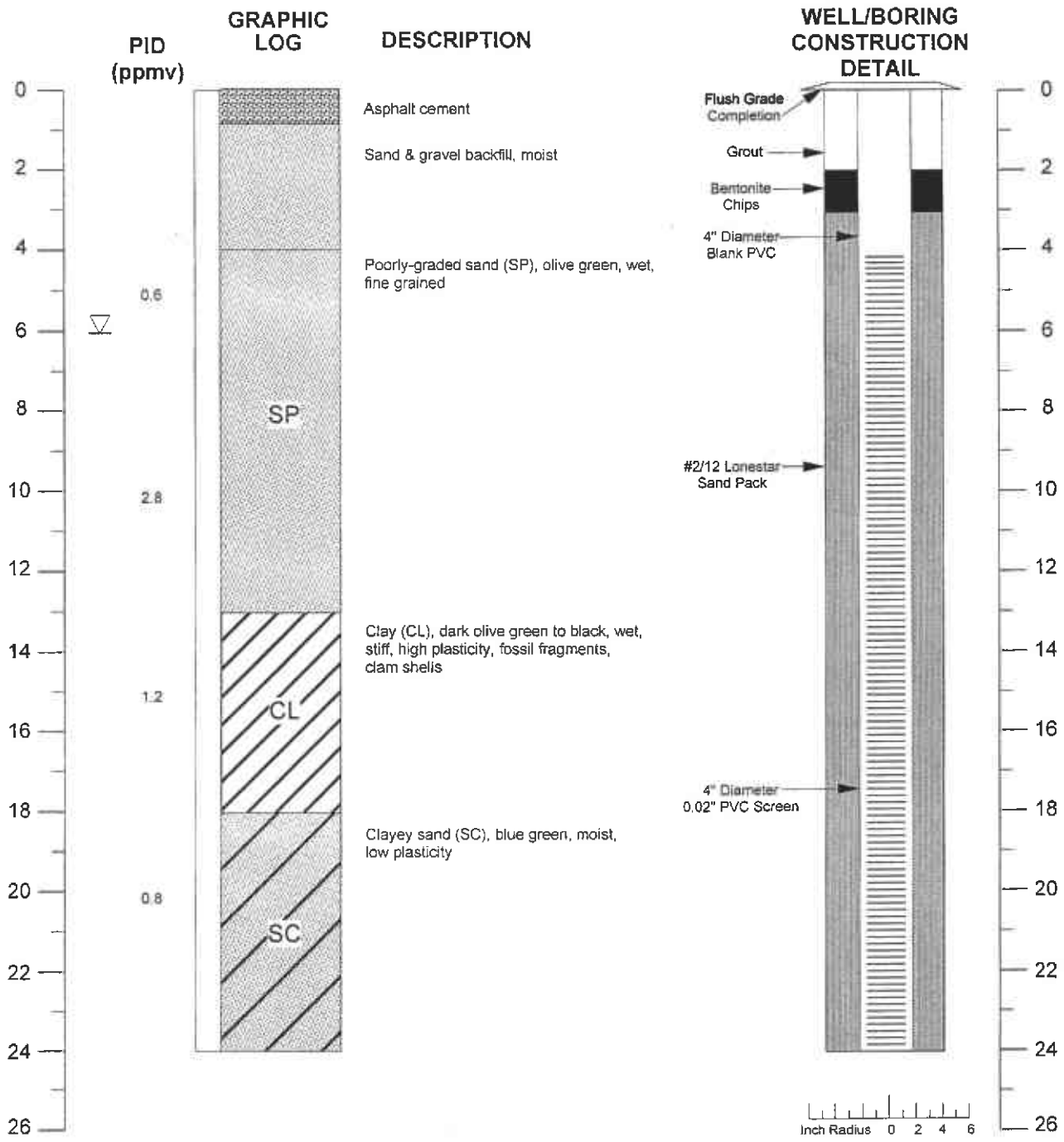
United Airlines
1100 Airport Drive
Oakland, CA

ENSR®

Page: 1 of 1

Drawn By:	J. Gierek	Date:	7/28/99	Job Number:
Revised By:	J. Gierek	Date:	8/10/99	6908-112.310

Ensr\6908\050\borings.dsf



Driller:	Gregg Drilling	End Date:	7/21/99	Type of Sampler:	Split spoon
Drilling Method:	Hollow Stem Auger	Groundwater:	6 ft. bgs	TD (Total Depth):	24 ft. bgs
Start Date:	7/21/99	Sampler:	Jeff Wendt		

Legend

- Water level in completed well
- First water found during drilling
- Location of recovered drill sample
- Location of sample sealed for chemical analysis
- Contact: Solid where certain
- Contact: Dotted where approximate
- Contact: Dashed where uncertain

Monitoring Well MW-2

United Airlines
1100 Airport Drive
Oakland, CA

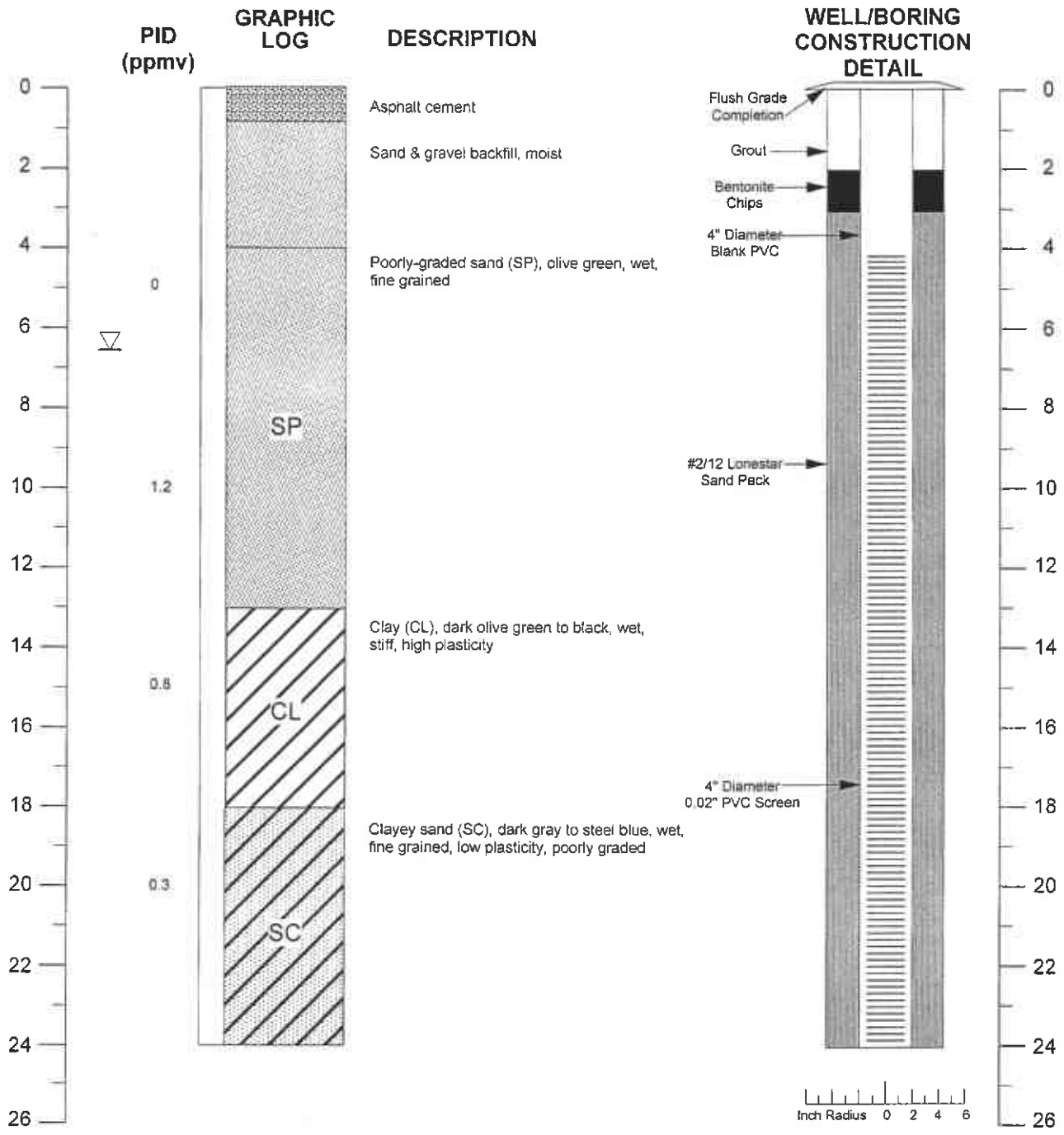
ENSR®

Page: 1 of 1

Drawn By:	J. Gierek	Date:	7/28/99
Revised By:	J. Gierek	Date:	8/10/99

Job Number: 6908-112.310

Ensr\6908\050\borings.dsf



Driller:	Gregg Drilling	End Date:	7/21/99	Type of Sampler:	Split spoon
Drilling Method:	Hollow Stem Auger	Groundwater:	6.5 ft. bgs	TD (Total Depth):	24 ft. bgs
Start Date:	7/21/99	Sampler:	Jeff Wendt		

Legend

- Water level in completed well
- First water found during drilling
- Location of recovered drill sample
- Location of sample sealed for chemical analysis
- Contact: Solid where certain
- Contact: Dotted where approximate
- Contact: Dashed where uncertain

Monitoring Well MW-3

United Airlines
1100 Airport Drive
Oakland, CA

ENSR®

Page: 1 of 1

Drawn By:	J. Gierek	Date:	7/28/99
Revised By:	J. Gierek	Date:	8/10/99

Job Number: 6908-112.310

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APPENDIX B

FIELD SHEETS AND ENSR STANDARD OPERATING PROCEDURES

ENSR

GROUNDWATER/LIQUID LEVEL DATA

(measurements in feet)

Project Address: 1100 Airport Drive Bldg-110,Oakland,CA. **Date:** 10/4/00

Recorded by: T.RANKIN **Project No.:** 6908-112.310

Well No.	Time	Well Elev	Measured Total Depth	Depth to Gr. Water	Depth to Product	Product Thickness	Comments (TOC/TOB) (product skimmer in well)
MW-1	0611		23.30	6.52	N/A	N/A	
MW-2	0614		22.05	7.85	N/A	N/A	
MW-3	0612		22.70	8.14	N/A	N/A	

Notes:

MONITORING WELL SAMPLING INFORMATION SHEET

ENSR

Client: UNITED AIRLINES Project No: 6908-112.310

Site: 1110 AIRPORT DR. BLDG 110, OAKLAND, CA Well Designation: MW-1

Is setup of traffic control devices required?: (NO) YES Setup & Takedown time: _____ hours

Is there standing water in well box?: NO (YES) (Above TOC) (Below TOC)

Is Top of Casing cut level?: NO (YES) (If NO please explain in remarks)

Is well cap sealed and locked?: NO (YES) (If NO please explain in remarks)

Height of Well Casing Riser (in inches): 6-8

General condition of Wellhead assembly: (Excellent) Good Fair Poor (Explain in remarks)

Purging Equipment: _____ 2" Disposable bailer X Submersible pump

_____ 2" PVC bailer _____ Dedicated bailer

_____ 4" PVC bailer

Sampled with: Disposable bailer: X Teflon bailer: _____

Well diameter:	2"	3"	4"	6"	8"	
Purge Vol. Multiplier:	0.163	0.367	0.653	1.47	2.61	gal/ft.

Initial Measurement

Time: 0611

Depth of well: 23.30

Depth to water: 6.52

Recharge Measurement

Time: 0653

Depth to water: 8.22

Calculated purge: 32.8

Actual purge: 33

Start purge: 0631 Sampling time: 0655 Sampling Date: 10/4/00

Time	Temp (F)	E.C.	pH	Turbidity	0 (ppm)	Volume (Gal.)
0635	71.1	7.69mS	7.16			11
0639	74.0	7.26	7.12			22
0643	73.4	9.5 ↓	7.20			33

Sample appearance: CLEAR

QC samples collected at his well: NONE Lock: DOLPHIN

Equipment replaced: (Check all that apply) Note condition of replaced item.

2" Locking Cap: Lock #2357: Lock #0909:

3" Locking Cap: Lock #3753: Lock-Dolphin:

4" Locking Cap: Chevron Lock:

Remarks: _____

Signature: JR Review: _____

MONITORING WELL SAMPLING INFORMATION SHEET

ENSR

Client: UNITED AIRLINES — Project No: 6908-112.310

Site: 1110 AIRPORT DR BLDG 110, OAKLAND, CA — Well Designation: MW-2

Is setup of traffic control devices required?:	NO	YES	Setup & Takedown time:	hours
Is there standing water in well box?:	NO	YES	(Above TOC	Below TOC)
Is Top of Casing cut level?:	NO	YES	(If NO please explain in remarks)	
Is well cap sealed and locked?:	NO	YES	(If NO please explain in remarks)	

Height of Well Casing Riser (in inches): _____

General condition of Wellhead assembly: Excellent Good Fair Poor (Explain in remarks)

Purging Equipment: _____ 2" Disposable bailer — X — Submersible pump

_____ 2" PVC bailer _____ Dedicated bailer

_____ 4" PVC bailer

Sampled with: Disposable bailer: X Teflon bailer: _____

Well diameter:	2"	3"	4"	6"	8"	
Purge Vol. Multiplier:	0.163	0.367	0.653	1.47	2.61	gal/ft.

Initial Measurement
Time: 0614
Depth of well: 22.05
Depth to water: 7.85

Recharge Measurement
Time: 0813
Depth to water: 9.44

Calculated purge: 27.8
Actual purge: 28

Start purge: 0755 Sampling time: 0815 Sampling Date: 10/4/00

Time	Temp (F)	E.C.	pH	Turbidity	0 (ppm)	Volume (Gal.)
0800	68.9	3.49mS	7.04			9
0805	69.7	5.94 ↓	7.09			20
0809	69.2	6.05 ↓	7.14			28

Sample appearance: SEMI-CLEAR / CLEAR

QC samples collected at his well: NONE Lock: DOLPHIN

Equipment replaced: (Check all that apply) Note condition of replaced item.

2" Locking Cap:	Lock #2357:	Lock #0909:
3" Locking Cap:	Lock #3753:	Lock-Dolphin:
4" Locking Cap:	Chevron Lock:	

Remarks: _____

Signature: JR Review: _____

MONITORING WELL SAMPLING INFORMATION SHEET

ENSR

Client: UNITED AIRLINES — Project No: 6908-112.310

Site: 1110 AIRPORT DR. BLDG 110, OAKLAND, CA — Well Designation: MW-3

Is setup of traffic control devices required?:	NO	YES	Setup & Takedown time: _____ hours
Is there standing water in well box?:	NO	YES	(Above TOC Below TOC)
Is Top of Casing cut level?:	NO	YES	(If NO please explain in remarks)
Is well cap sealed and locked?:	NO	YES	(If NO please explain in remarks)

Height of Well Casing Riser (in inches): _____

General condition of Wellhead assembly: Excellent Good Fair Poor (Explain in remarks)

Purging Equipment: ____ 2" Disposable bailer; X Submersible pump; ____ 2" PVC bailer; ____ Dedicated bailer; ____ 4" PVC bailer

Sampled with: Disposable bailer: X Teflon bailer: ____

Well diameter:	2"___	3"___	4" X	6"___	8"___
Purge Vol. Multiplier:	0.163	0.367	0.653	1.47	2.61 gal/ft.

Initial Measurement
Time: 0612
Depth of well: 22.70
Depth to water: 8.14

Recharge Measurement
Time: 0737
Depth to water: 9.98

Calculated purge: 28.5
Actual purge: 29

Start purge: 0717 Sampling time: 0740 Sampling Date: 10/4/00

Time	Temp (F)	E.C.	pH	Turbidity	0 (ppm)	Volume (Gal.)
0721	65.6	5.35 mS	7.42			9
0726	66.2	6.74	7.34			20
0730	66.2	6.79 ↓	7.35			29

Sample appearance: CLEAR

QC samples collected at his well: NONE Lock: DOLPHIN

Equipment replaced: (Check all that apply) Note condition of replaced item.

2" Locking Cap:	Lock #2357:	Lock #0909:
3" Locking Cap:	Lock #3753:	Lock-Dolphin:
4" Locking Cap:	Chevron Lock:	

Remarks: _____

Signature: JR Review: _____

M901376

ENSR — CHAIN OF CUSTODY RECORD

Page 1 of 1

Client/Project Name: UAL | MW SAMPLING, BLDG 110

Project Location: 1100 ALAMEDA DE LAS PULGAS BLDG 110 OAKLAND, CA.

Project Number: 6908-112.310

Field Logbook No.:

Sampler: (Print Name) /Affiliation: TRACE RAMEIN | ENSR

Chain of Custody Tape No.:

Signature:

Send Results/Report to: ALAN KLEIN
10324 PLACER LN #200 SACRAMENTO, CA. 95827
PH (916) 362-7100 | FAX (916) 362-8100

Analysis Requested

Field Sample No./ Identification	Date	Time	Grab	Comp	Sample Container (Size/Matl)	Sample Type (Liquid, Sludge, Etc.)	Preservative	Field Filtered	TPH as Diesel	MTBE	Oxygenates (5) by 8260	Gasoline Hydrocarbons by 8260	TDS	TPH-d	Lab I.D.	Remarks
MW1	10/4/00	0655	X		1x1L GLASS HCl 1x1L AMBER 3x40mL VOA	H_2O	ICE/HCL	N	X	X	X	X	X			
MW3	10/4/00	0740	X		1x1L GLASS HCl 3x40mL VOA	H_2O	ICE/HCL	N	X	X			X			
MW2	10/4/00	0815	X		1x1L GLASS HCl 3x40mL VOA	H_2O	ICE/HCL	N	X	X			X			

STANDARD TAT

Relinquished by: (Print Name)	Date:	Received by: (Print Name)	Date:
TRACE RAMEIN	10/4/00	S. Valles	10/4
Signature:	Time: 0735	Signature: S. Valles	Time:
Relinquished by: (Print Name)	Date:	Received by: (Print Name)	Date:
Signature:	Time:	Signature:	Time:
Relinquished by: (Print Name)	Date:	Received by: (Print Name)	Date:
Signature:	Time:	Signature:	Time:

Analytical Laboratory (Destination):
McCAMPBELL ANALYTICAL
110 2nd AVE SOUTH #D7
PACHECO, CA. 94553
PH (925) 798-1620
FAX (925) 798-1622

Serial No. 30845

SAMPLE IDENTIFICATION AND CHAIN-OF-CUSTODY PROCEDURES

SOP-4

Sample identification and chain-of-custody procedures ensure sample integrity, and document sample possession from the time of collection to its ultimate disposal. Each sample container submitted for analysis is labeled to identify the job number, date, time of sample collection, a sample number unique to the sample, any name(s) of on-site personnel and any other pertinent field observations also recorded on the field excavation or boring log.

Chain-of-custody forms are used to record possession of the sample from time of collection to its arrival at the laboratory. During shipment, the person with custody of the samples will relinquish them to the next person by signing the chain-of-custody form(s) and noting the date and time. The sample-control officer at the laboratory will verify sample integrity, correct preservation, confirm collection in the proper container(s), and ensure adequate volume for analysis.

If these conditions are met, the samples will be assigned unique laboratory log numbers for identification throughout analysis and reporting. The log numbers will be recorded on the chain-of-custody forms and in the legally-required log book maintained in the laboratory. The sample description, date received, client's name, and any other relevant information will also be recorded.

LABORATORY ANALYTICAL QUALITY ASSURANCE AND CONTROL

SOP-5

In addition to routine instrument calibration, replicates, spikes, blanks, spiked blanks, and certified reference materials are routinely analyzed at method-specific frequencies to monitor precision and bias. Additional components of the laboratory Quality Assurance/Quality Control program include:

1. Participation in state and federal laboratory accreditation/certification programs;
2. Participation in both U.S. EPA Performance Evaluation studies (WS and WP studies) and inter-laboratory performance evaluation programs;
3. Standard operating procedures describing routine and periodic instrument maintenance;
4. "Out-of-Control"/Corrective Action documentation procedures; and,
5. Multi-level review of raw data and client reports.

GROUNDWATER PURGING AND SAMPLING

SOP-7

Prior to water sampling, each well is purged by evacuating a minimum of three wetted well-casing volumes of groundwater. When required, purging will continue until either the discharge water temperature, conductivity, or pH stabilize to within 10% of previously measured values; and a maximum of ten wetted casing volumes of groundwater have been recovered, or the well is bailed dry. When practical, the groundwater sample should be collected when the water level in the well recovers to at least 80 percent of its static level. Field measurements, observations and procedures are noted.

The sampling equipment consists of a clean bailer, or stainless steel bladder pump with a "Teflon" bladder. If the sampling system is dedicated to the well, then the bailer is usually "Teflon," but the bladder pump may be PVC with a polypropylene bladder. Sample container type, preservation, and volume depends on the intended analyses.

The groundwater sample is decanted into each VOA vial in such a manner that there is no meniscus at the top of the vial. A cap is quickly secured to the top of the vial. The vial is then inverted and gently tapped to see if air bubbles are present. If none are present, the vial is labeled and refrigerated for delivery, under strict chain-of-custody, to the analytical laboratory. Label information should include a unique sample identification number, job identification number, date, time, and the sampler's initials.

For quality control purposes, a duplicate water sample may be collected from a well. When required, a trip blank is prepared at the laboratory and placed in the transport cooler. It is labeled similar to the well samples, remains in the cooler during transport, and is analyzed by the laboratory along with the groundwater samples. In addition, a field blank may be prepared in the field when sampling equipment is not dedicated. The field blank is prepared after a pump or bailer has been either steam cleaned or properly washed, prior to use in the next well, and is analyzed along with the other samples. The field blank analysis demonstrates the effectiveness of in-field cleaning procedures to prevent cross-contamination.

To minimize the potential for cross-contamination between wells, all well development and water sampling equipment not dedicated to a well is either steam cleaned or properly washed between use. As a second precautionary measure, wells are sampled in order of lowest to highest concentrations as established by available previous analytical data.

In the event the water samples cannot be submitted to the analytical laboratory on the same day they are collected (e.g., due to weekends or holidays), the samples are temporarily stored until the first opportunity for submittal either on ice in a cooler, such as when in the field, or in a refrigerator.

MEASURING LIQUID LEVELS USING A WATER LEVEL INDICATOR OR INTERFACE PROBE

SOP-12

Field equipment used for liquid-level gauging typically includes the measuring probe (water level or interface) and a clean product bailer(s). The field kit also includes cleaning supplies (buckets, TSP, spray bottles, and deionized water) to be used in cleaning the equipment between wells.

Prior to measurement, the probe tip is lowered into the well until it touches bottom. Using the previously established top-of-casing or top-of-box (i.e., wellhead vault) point, the probe cord (or halyard) is marked and a measuring tape (graduated in hundredths of a foot) is used to determine the distance between the probe end and the marking on the cord. This measurement is then recorded on the liquid-level data sheet as the "Measured Total Depth" of the well.

When necessary in using the interface probe to measure liquid levels, the probe is first electrically grounded to either the metal stove pipe or another metal object nearby. When no ground is available, reproducible measurements can be obtained by clipping the ground lead to the handle of the interface probe case.

The probe tip is then lowered into the well and submerged in the groundwater. An oscillating (beeping) tone indicates the probe is in water. The probe is slowly raised until either the oscillating tone ceases or becomes a steady tone. In either case, this is the depth-to-water (DTW) indicator and the DTW measurement is made accordingly. The steady tone indicates floating hydrocarbons. In this case, the probe is slowly raised until the steady tone ceases. This is the depth-to-product (DTP) indicator and the measurement of DTP is recorded. A corrected depth to groundwater to account for floating hydrocarbons can be calculated by using the following formula:

CDTW = DTW - (SP.G x LHT).
CDTW = Corrected depth to groundwater.
DTW = Measured depth to groundwater.
SP.G = Specific gravity: unweathered gasoline = 0.75; diesel = 0.80
LHT = Measured liquid hydrocarbon thickness.

The corresponding groundwater elevation is the difference between a previously determined well reference elevation and either the depth to groundwater or the corrected depth to groundwater.

The process of lowering and raising the probe must be repeated several times to ensure accurate measurements. The DTW and DTP measurements are recorded on the liquid-level data sheet. When floating product is indicated by the probe's response, a product bailer is lowered partially through the product-water interface to confirm the product on the water surface, and as further indication of product thickness, particularly in cases where the product layer is quite thin. Either this measurement or the difference between DTW and DTP is recorded on the data sheet as "product thickness."

In order to avoid cross-contamination of wells during the liquid-level measurement process, wells are measured in the order of "clean" to "dirty" (where such information is available). In addition, all measurement equipment is cleaned with TSP or similar solution and thoroughly rinsed with deionized water before use, between measurements in respective wells, and at the completion of the day's activities.

APPENDIX C

LABORATORY ANALYTICAL REPORT AND CHAIN OF CUSTODY DOCUMENTATION

McCAMPBELL ANALYTICAL INC.
110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
Telephone : 925-798-1620 Fax : 925-798-1622
http://www.mccampbell.com E-mail: main@mccampbell.com

ENSR 10324 Placer Lane, #200 Sacramento, CA 95827	Client Project ID: #6908-112.310; UAL/MW Sampling Bldg 110	Date Sampled: 10/04/00
		Date Received: 10/04/00
	Client Contact: Alan Klien	Date Extracted: 10/04/00
	Client P.O:	Date Analyzed: 10/04/00

10/11/2000

Dear Alan:

Enclosed are:

1). the results of **3** samples from your **#6908-112.310; UAL/MW Sampling Bldg 110** project,

2). a QC report for the above samples

3). a copy of the chain of custody, and

4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Yours truly,

Edward Hamilton, Lab Director

McCAMPBELL ANALYTICAL INC.
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ENSR 10324 Placer Lane, #200 Sacramento, CA 95827	Client Project ID: #6908-112.310; UAL/MW Sampling Bldg 110	Date Sampled: 10/04/00
		Date Received: 10/04/00
	Client Contact: Alan Klien	Date Extracted: 10/06-10/09/00
	Client P.O:	Date Analyzed: 10/06-10/09/00

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline*, with Methyl tert-Butyl Ether* & BTEX*

EPA methods 5030, modified 8015, and 8020 or 602; California RWQCB (SF Bay Region) method GCFID(5030)

Lab ID	Client ID	Matrix	TPH(g)+	MTBE	Benzene	Toluene	Ethylben-zene	Xylenes	% Recovery Surrogate
49419	MW 1	W	ND	---	ND	ND	ND	ND	102
49420	MW 3	W	ND	---	0.52	ND	ND	ND	104
49421	MW 2	W	ND	---	ND	ND	ND	ND	102
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit		W	50 ug/L	5.0	0.5	0.5	0.5	0.5	
		S	1.0 mg/kg	0.05	0.005	0.005	0.005	0.005	

* water and vapor samples are reported in ug/L, wipe samples in ug/wipe, soil and sludge samples in mg/kg, and all TCLP and SPLP extracts in ug/L

cluttered chromatogram; sample peak coelutes with surrogate peak

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (?); f) one to a few isolated peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen is present; i) liquid sample that contains greater than ~5 vol. % sediment; j) no recognizable pattern.

DHS Certification No. 1644

Edward Hamilton, Lab Director

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ENSR 10324 Placer Lane, #200 Sacramento, CA 95827	Client Project ID: #6908-112.310; UAL/MW Sampling Bldg 110	Date Sampled: 10/04/00
		Date Received: 10/04/00
	Client Contact: Alan Klien	Date Extracted: 10/04/00
	Client P.O:	Date Analyzed: 10/05/00

Diesel Range (C10-C23) Extractable Hydrocarbons as Diesel *

EPA methods modified 8015, and 3550 or 3510; California RWQCB (SF Bay Region) method GCFID(3550) or GCFID(3510)

Lab ID	Client ID	Matrix	TPH(d)+	% Recovery Surrogate
49419	MW 1	W	ND	107
49420	MW 3	W	90,b	112
49421	MW 2	W	62,b	104
Reporting Limit unless otherwise stated; ND means not detected above the reporting limit		W	50 ug/L	
		S	1.0 mg/kg	

* water and vapor samples are reported in ug/L, wipe samples in ug/wipe, soil and sludge samples in mg/kg, and all TCLP / STLC / SPLP extracts in ug/L

cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant); d) gasoline range compounds are significant; e) medium boiling point pattern that does not match diesel (?); f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen is present; i) liquid sample that contains greater than ~5 vol. % sediment.

DHS Certification No. 1644

Edward Hamilton, Lab Director

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ENSR 10324 Placer Lane, #200 Sacramento, CA 95827	Client Project ID: #6908-112.310; UAL/MW Sampling Bldg 110	Date Sampled: 10/04/00
		Date Received: 10/04/00
	Client Contact: Alan Klien	Date Extracted: 10/06/00
	Client P.O:	Date Analyzed: 10/06/00

Oxygenated Volatile Organics By GC/MS

EPA method 8260 modified

Lab ID	49419	49420	49421		Reporting Limit	
Client ID	MW 1	MW 3	MW 2			
Matrix	W	W	W		S	W
Compound	Concentration*				ug/kg	ug/L
Di-isopropyl Ether (DIPE)	ND	ND	ND		5.0	1.0
Ethyl tert-Butyl Ether (ETBE)	ND	ND	ND		5.0	1.0
Methyl-tert Butyl Ether (MTBE)	ND	23	160		5.0	1.0
tert-Amyl Methyl Ether (TAME)	ND	ND	ND		5.0	1.0
tert-Butanol	ND	ND	ND		25	5.0
Surrogate Recoveries (%)						
Dibromofluoromethane	99	96	80			
Comments:						

* water samples are reported in ug/L, soil and sludge samples in ug/kg, wipes in ug/wipe and all TCLP / STLC / SPLP extracts in ug/L

ND means not detected above the reporting limit; N/A means surrogate not applicable to this analysis

(h) lighter than water immiscible sheen is present; (i) liquid sample that contains greater than ~5 vol. % sediment; (j) sample diluted due to high organic content

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ENSR 10324 Placer Lane, #200 Sacramento, CA 95827	Client Project ID: #6908-112.310; UAL/MW Sampling Bldg 110	Date Sampled: 10/04/00
		Date Received: 10/04/00
	Client Contact: Alan Klien	Date Extracted: 10/04/00
	Client P.O:	Date Analyzed: 10/04-10/05/00

Analytical methods			**Total Dissolved Solids**
			EPA160.1, SM2540C
Lab ID	Client ID	Matrix	TDS
49419	MW 1	W	5400
Reporting Limit or Method Accuracy unless otherwise stated; ND means not detected above the reporting limit; N/A means not applicable		W	10 mg/L
		S	N/A
Reporting Units		---	mg/L

DHS Certification No. 1644

Edward Hamilton, Lab Director

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QC REPORT

Date: 10/05/00 Matrix: Water

Extraction: N/A

Compound	Concentration: ug/L				%Recovery		RPD
	Sample	MS	MSD	Amount Spiked	MS	MSD	
SampleID: 40793					Instrument: GC-3		
Surrogate1	0.000	98.0	101.0	100.00	98	101	3.0
Xylenes	0.000	297.0	293.0	300.00	99	98	1.4
Ethyl Benzene	0.000	100.0	98.0	100.00	100	98	2.0
Toluene	0.000	101.0	102.0	100.00	101	102	1.0
Benzene	0.000	104.0	105.0	100.00	104	105	1.0
MTBE	0.000	105.0	100.0	100.00	105	100	4.9
GAS	0.000	876.6	823.5	1000.00	88	82	6.2
SampleID: 10600					Instrument: GC-2 A		
Surrogate1	0.000	101.0	100.0	100.00	101	100	1.0
TPH (diesel)	0.000	273.0	257.0	300.00	91	86	6.0

$$\%\,\text{Recovery} = \frac{(MS - Sample)}{AmountSpiked} \cdot 100$$

$$\text{RPD} = \frac{(MS - MSD)}{(MS + MSD)} \cdot 2 \cdot 100$$

RPD means Relative Percent Deviation

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QC REPORT

Date: 10/06/00-10/07/00 Matrix: Water

Extraction: N/A

Compound	Concentration: ug/L				%Recovery		RPD
	Sample	MS	MSD	Amount Spiked	MS	MSD	
SampleID: 40793					Instrument: GC-3		
Surrogate1	0.000	103.0	101.0	100.00	103	101	2.0
Xylenes	0.000	305.0	294.0	300.00	102	98	3.7
Ethyl Benzene	0.000	101.0	98.0	100.00	101	98	3.0
Toluene	0.000	105.0	101.0	100.00	105	101	3.9
Benzene	0.000	106.0	101.0	100.00	106	101	4.8
MTBE	0.000	109.0	116.0	100.00	109	116	6.2
GAS	0.000	860.7	853.0	1000.00	86	85	0.9
SampleID: 10600					Instrument: MB-1		
Oil & Grease	0.000	20.0	20.2	20.00	100	101	1.0
SampleID: 10400					Instrument: GC-6 B		
Surrogate1	0.000	85.0	87.0	100.00	85	87	2.3
TPH (diesel)	0.000	352.0	341.0	300.00	117	114	3.2
SampleID: 10600					Instrument: IR-1		
Surrogate1	0.000	108.0	110.0	100.00	108	110	1.8
TRPH	0.000	24.4	25.1	23.70	103	106	2.8

$$\%\ \text{Recovery} = \frac{(MS - Sample)}{AmountSpiked} \cdot 100$$

$$\text{RPD} = \frac{(MS - MSD)}{(MS + MSD)} \cdot 2 \cdot 100$$

RPD means Relative Percent Deviation

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QC REPORT

VOCs (EPA 8240/8260)

Date: 10/06/00-10/07/00 Matrix: Water

Extraction: N/A

Compound	Concentration: ug/L				%Recovery		RPD
	Sample	MS	MSD	Amount Spiked	MS	MSD	
SampleID: 101000					Instrument: GC-10		
Surrogate	0.000	112.0	113.0	100.00	112	113	0.9
tert-Amyl Methyl Ether	0.000	87.0	90.0	100.00	87	90	3.4
Methyl tert-Butyl Ether	0.000	94.0	97.0	100.00	94	97	3.1
Ethyl tert-Butyl Ether	0.000	95.0	99.0	100.00	95	99	4.1
Di-isopropyl Ether	0.000	97.0	102.0	100.00	97	102	5.0

$$\%\ \text{Recovery} = \frac{(MS - Sample)}{AmountSpiked} \cdot 100$$

$$\text{RPD} = \frac{(MS - MSD)}{(MS + MSD)} \cdot 2 \cdot 100$$

RPD means Relative Percent Deviation

GeoAnalytical Laboratories, Inc.

1405 Kansas Avenue Modesto, CA 95351 Phone (209) 572-0900 Fax (209) 572-0916

CERTIFICATE OF ANALYSIS

Report # L279-04 **Date:** 10/17/00

McCampbell Analytical
110 2nd Avenue South
Pacheco CA 94553

Project: 22308

PO#

Date Rec'd: 10/05/00
Date Started: 10/05/00
Date Completed: 10/13/00

Date Sampled: 10/04/00
Time:
Sampler:

Sample ID: MW-1
Lab ID: L309868

Method	RL	Analyte	Results	Units
SM2340B	1.0	Hardness as CaCo3	863	mg/L
SM2320B	10	Alkalinity	740	mg/L
SM2320B	10	Carbonate	ND	mg/L
SM2320B	10	Bicarbonate	740	mg/L
SM2320B	10	Hydroxide Alkalinity	ND	mg/L
300.0	1.0	Chloride	3000	mg/L
300.0	1.0	Sulfate	465	mg/L
SM5540C	0.05	MBAS	ND	mg/L
SM2510B	1.0	Specific Conductance (EC)	8500	µmhos/cm

Ramiro Salgado
Chemist

Certification # 1157

Donna Keller
Laboratory Director

GeoAnalytical Laboratories, Inc.

1405 Kansas Avenue Modesto, CA 95351 Phone (209) 572-0900 Fax (209) 572-0916

Report# L279-04

QC REPORT

McCampbell Analytical
110 2nd Avenue South
Pacheco CA 94553

Dates Analyzed 10/05/00-10/13/00

Analyte	Batch #	Method			MS % Recovery	MSD % Recovery		RPD	Blank
Hardness as CaCo3	I09996	SM2340B			98.0	97.0		1.0	ND
Alkalinity	I09620	SM2320B			99.5	98.8		0.8	ND
Carbonate	I09620	SM2320B			99.5	98.8		0.8	ND
Bicarbonate	I09620	SM2320B			99.5	98.8		0.8	ND
Hydroxide Alkalinity	I09620	SM2320B			99.5	98.8		0.8	ND
Chloride	I10305	300.0			91.6	94.2		2.8	ND
Sulfate	I10308	300.0			92.6	90.2		2.6	ND
MBAS	I09615	SM5540C			100.4	100.8		0.4	ND
Specific Conductance (EC)	I09614	SM2510B	8480	8500			0.2		ND

Ramiro Salgado
Chemist

Certification # 1157

Donna Keller
Laboratory Director

GRO

L279-04

McCAMPBELL ANALYTICAL INC.

110 2nd AVENUE SOUTH, #D7
PACHECO, CA 94553-5560
Telephone: (925) 798-1620 Fax: (925) 798-1622

CHAIN OF CUSTODY RECORD

TURN AROUND TIME ☐ RUSH ☐ 24 HOUR ☐ 48 HOUR ☒ 5 DAY ☒ ROUTINE

Report To: Mana Venegas Bill To: WAI

Project #: 22308 Project Name: ENSR#6908-112.310

Project Location:

SAMPLE ID	LOCATION	SAMPLING Date	SAMPLING Time	# Containers	Type Containers	MATRIX: Water	Soil	Air	Sludge	Other	METHOD PRESERVED: Ice	HCl	HNO_3	Other	ANALYSIS REQUEST: Asbestos	BOD	Sulfide	Cyanide	Chlorine Residual RL<5 mg/L	Color (True Apparent)	DOC	TOC	Ammonia	TKN	Alkalinity	Turbidity	OTHER: Nitrate	Fish Bioassay	Fluoride	Coliform	Chloride	General Minerals *	EPA	COMMENTS
MW-1		10/04		1	X	X																									X		49419
																																	L3 098658

Relinquished By:	Date:	Time:	Received By:
Mana Venegas	10/04		Cal-Overnight
Cal overnight	10/5	900A	Priya Sahota

Remarks: Only for:
* Total Hardness, Alkalinity, (Carbonate, Bicarbonate, Hydroxide), Cl, SO4, MBAS, EC

Please Fax Asap!!

M901376 22308 ENSR #3

ENSR CHAIN OF CUSTODY RECORD

Page 1 of 1

Client/Project Name: UAL/MW SAMPLING BLAG LLD	Project Location: 1100 AIRPORT DRIVE BURLINGAME OAKLAND, CA.
Project Number: 6908-112.310	Field Logbook No.:
Sampler: (Print Name) /Affiliation: TRACE RAMLEN/ENSR	Chain of Custody Tape No.:
Signature:	Send Results/Report to: ALAN KLEIN 10324 PLACER LN #200 SACTO, CA. 95827 PH(916)362-7100 FAX(916)362-8100

Analysis Requested

STANDARD TAT

Field Sample No./ Identification	Date	Time	Grab	Comp	Sample Container (Size/Matl)	Sample Type (Liquid, Sludge, Etc.)	Preservative	Field Filtered	TPH BTEX / DIESEL	MTBE / OXYGENATES 8260	CHEMICAL NAMES EPA 8260	TDS EPA 160.1	Lab I.D.	Remarks
+ MW1	10/4/00	0835	X		1X1LGLAm 1X1L Poly 3x40mL VOA	H2O	ICE/HCL	N	X	X	X	X		49419
+ MW3	10/4/00	0740	X		1X1LGLAm 3x40mL VOA	H2O	ICE/HCL	N	X	X				49420
+ MW2	10/4/00	0815	X		1X1LGLAm 3x40mL VOA	H2O	ICE/HCL	N	X	X				49421

Relinquished by: (Print Name) TRACE RAMLEN Signature:	Date: 10/4/00 Time: 0935	Received by: (Print Name) S. Valles Signature: S. Valles	Date: 10/4 Time:	Analytical Laboratory (Destination): McCAMPBELL ANALYTICAL 110 2ND AVE SOUTH #D7 PACHECO, CA. 94553 PH(925)798-1620 FAX(925)798-1622
Relinquished by: (Print Name) Signature:	Date: Time:	Received by: (Print Name) Signature:	Date: Time:	
Relinquished by: (Print Name) Signature:	Date: Time:	Received by: (Print Name) Signature:	Date: Time:	Serial No. 30845

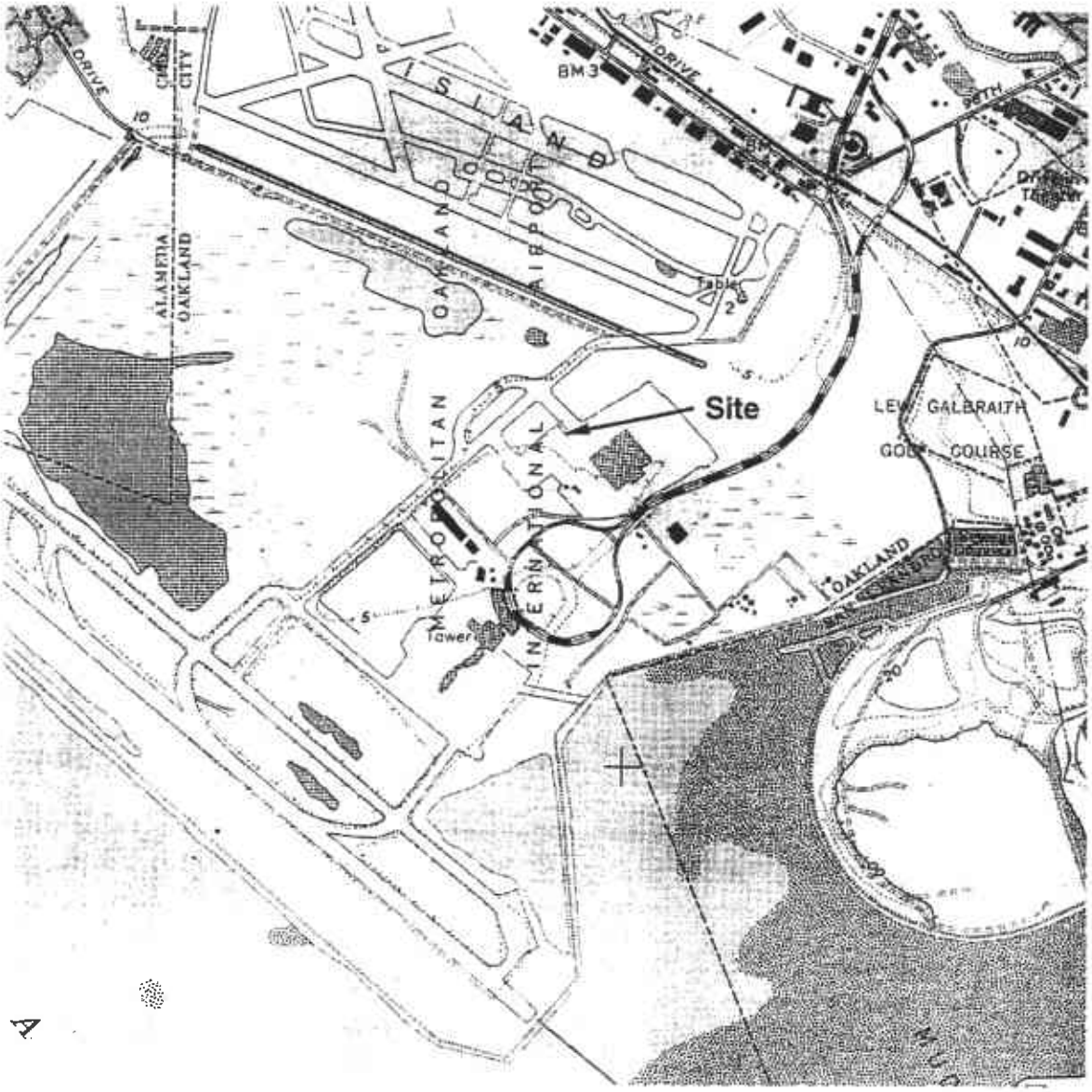
ICE/ GOOD CONDITION HEAD SPACE ABSENT VOAS O&G METALS OTHER PRESERVATION APPROPRIATE CONTAINERS

L:M

APPENDIX D

SENSITIVE SURVEY - WELL LOCATION MAPS

95-113 02/F 1-SiteLoc



0 1,000 Feet 2,000 Feet

Approximate Scale

Source: San Leandro, California 7.5-minute U.S.G.S. Quadrangle, dated 1959, and photorevised 1980.

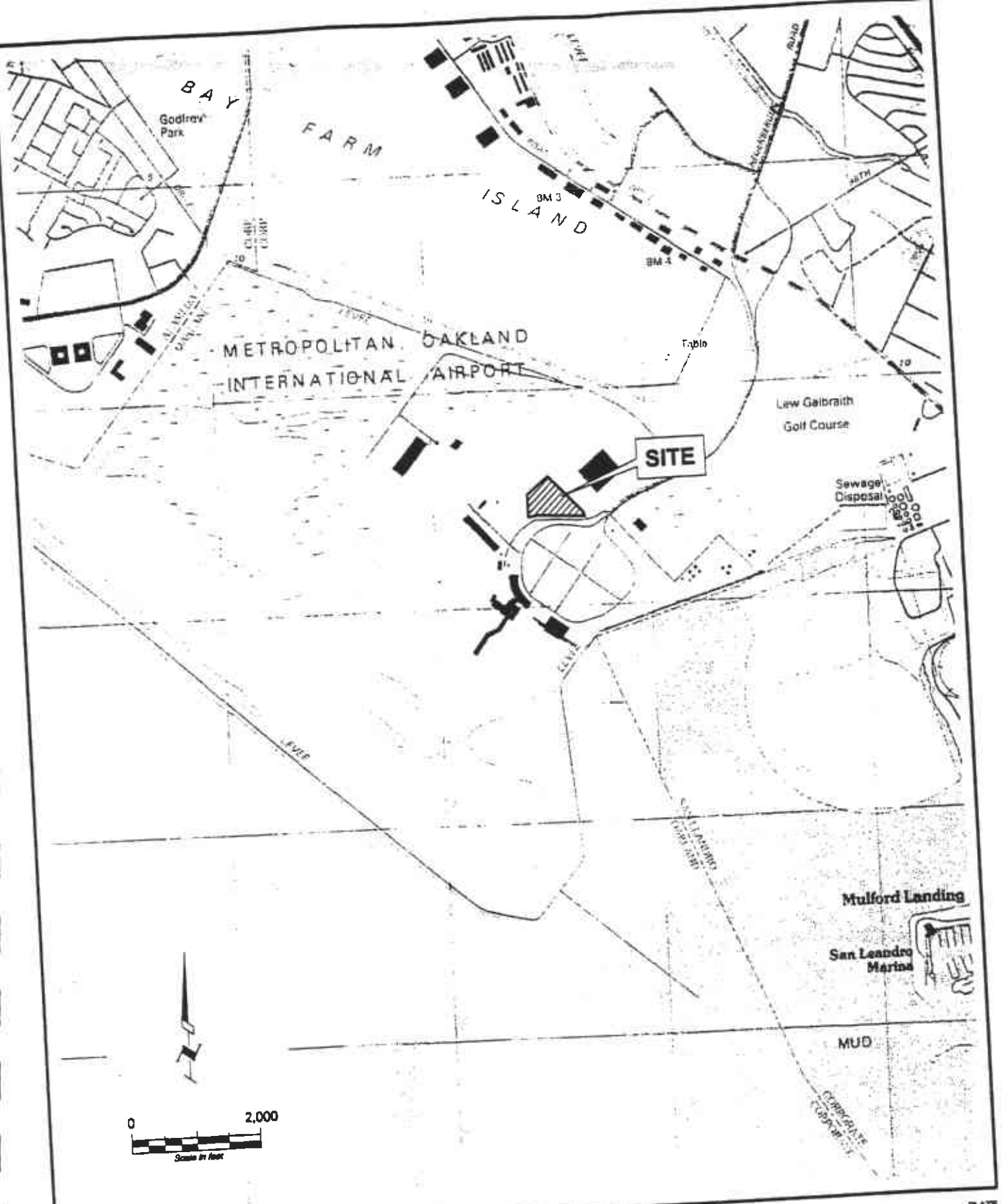
FIGURE 1

SITE LOCATION

United Airlines Hangar-Taxiway Site
Oakland International Airport
1100 Airport Drive

PORT OF OAKLAND

INNOVATIVE TECHNICAL SOLUTIONS, INC.



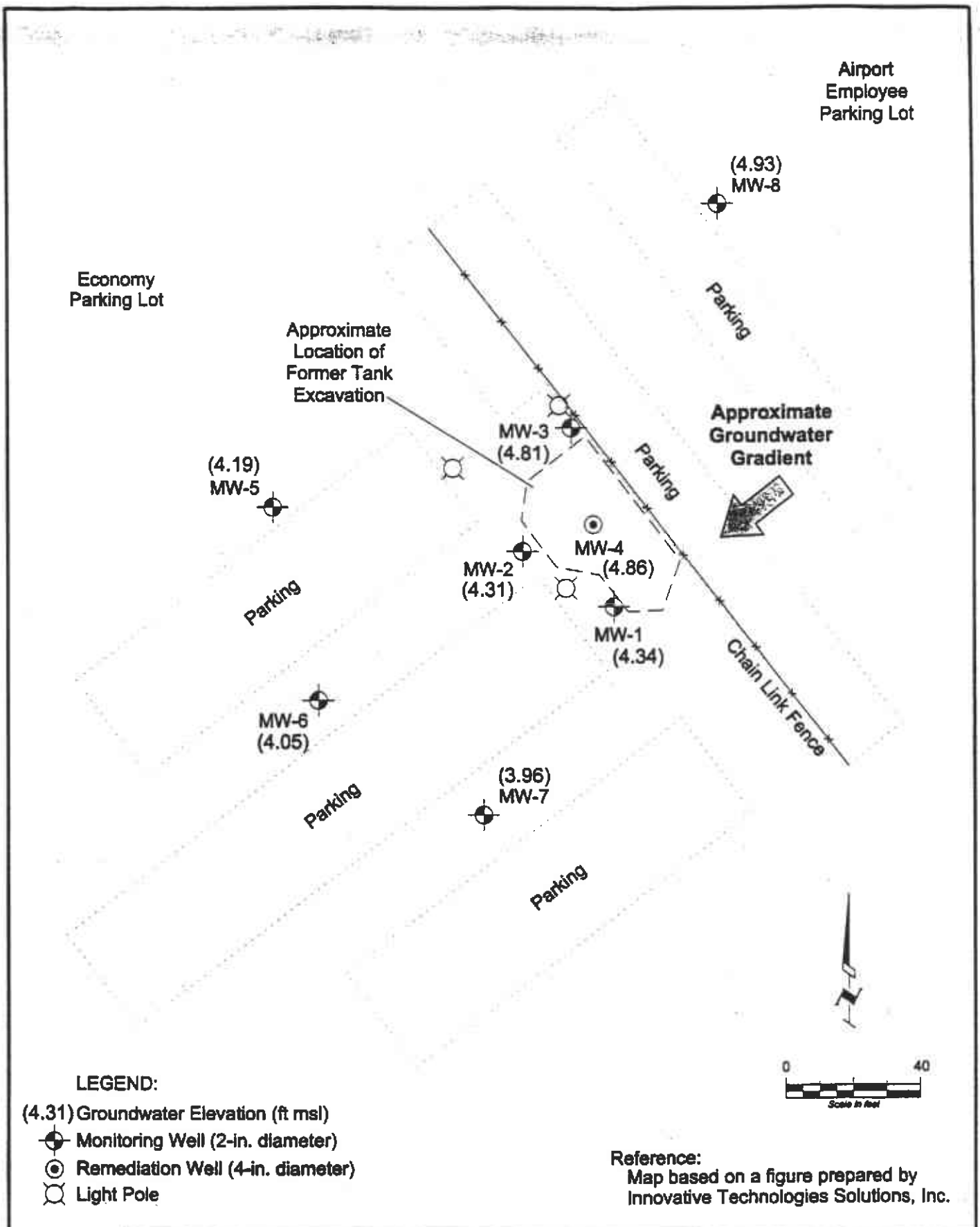
econpark0400.dwg

Harding Lawson Associates
Engineering and Environmental Services

Site Location Map
Economy Parking Lot - United Airlines Hanger Site
Oakland International Airport
1100 Airport Drive, Oakland, California

PLATE **1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AJW	43145.4	HDL	04/00	---



econpark0400.dwg

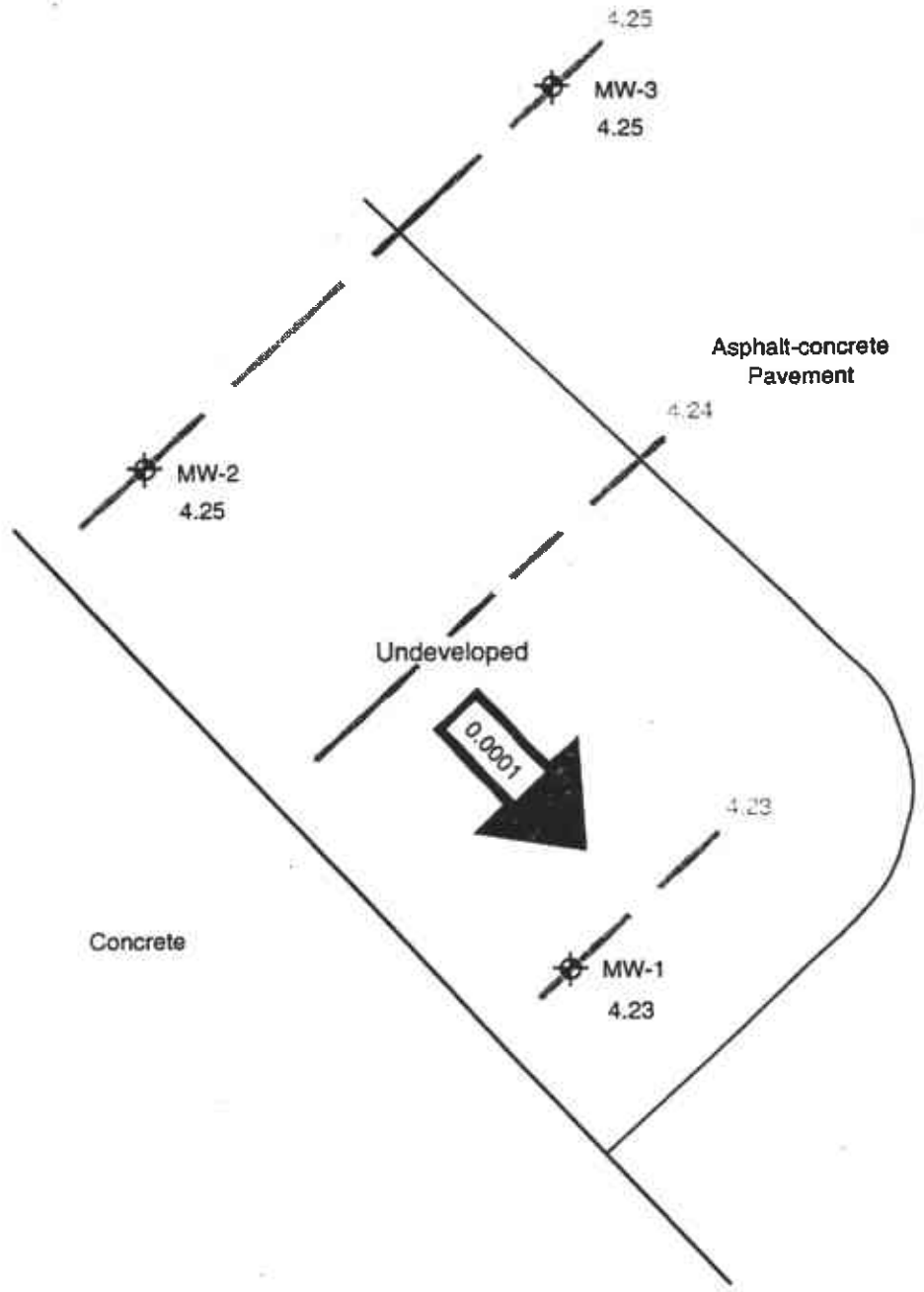
Harding Lawson Associates
Engineering and
Environmental Services

Groundwater Elevation Map
Economy Parking Lot - United Airlines Hanger Site
Oakland International Airport
1100 Airport Drive, Oakland, California

PLATE
3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AJW	43145.4	HDL	04/00	---

95-113.02/F 2-GWElev



0 20 Feet 40 Feet

Approximate Scale

Legend

Monitoring Well

4.23 Groundwater Elevation on 6/19/96

Groundwater Elevation Contour Lines

Groundwater Flow Direction and Gradient

Source: Adapted from Figure 2, Potentiometric Groundwater Elevation Contour Map, November 3, 1995, Alisto Engineering Group.

FIGURE 2

GROUNDWATER ELEVATIONS AND FLOW DIRECTION FOR JUNE 19, 1996

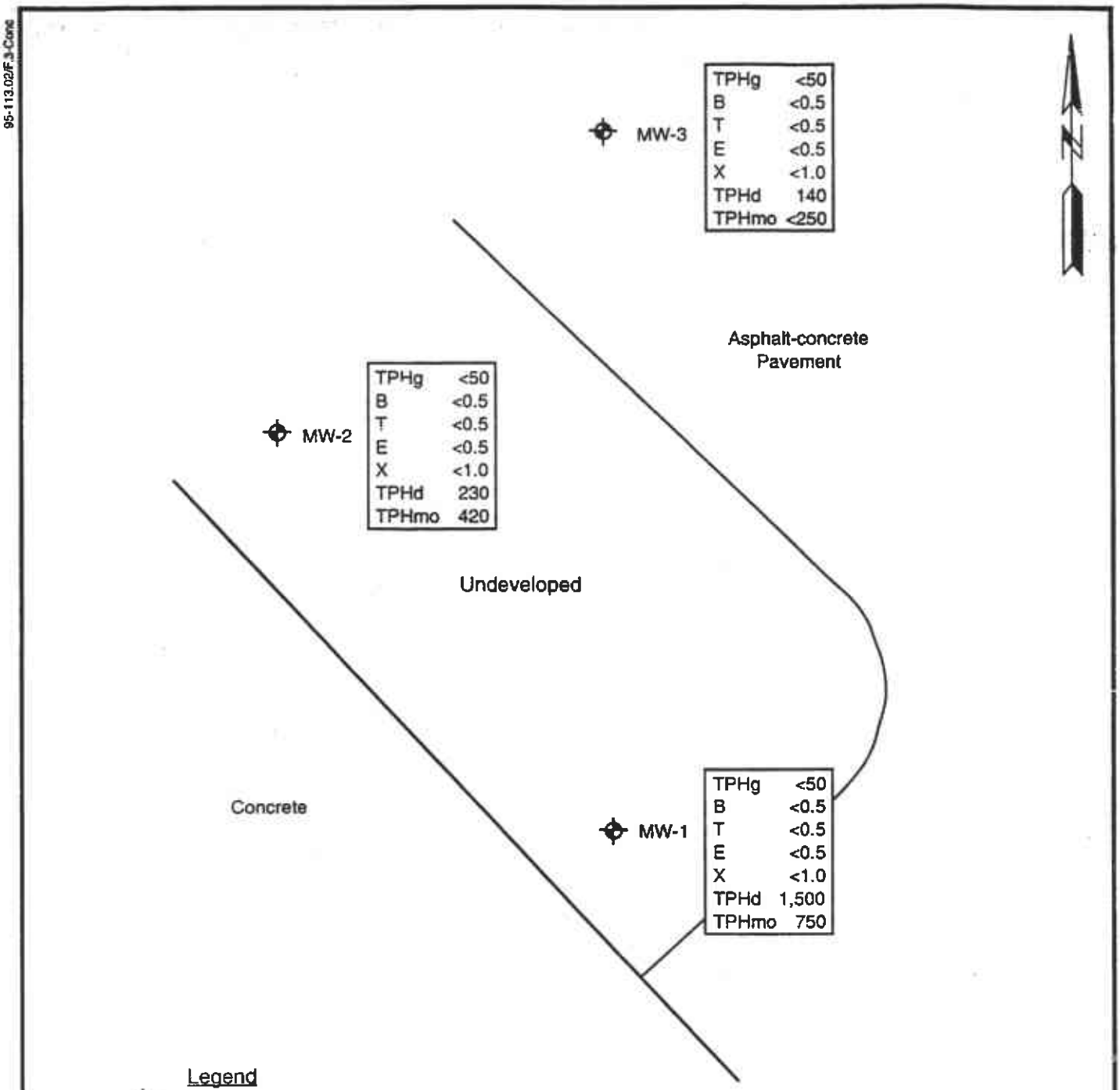
United Airlines Hangar-Taxiway Site
Oakland International Airport
1100 Airport Drive

PORT OF OAKLAND

ITSI

INNOVATIVE TECHNICAL SOLUTIONS, INC.

95-113.02/F-3-Conc



Legend

Monitoring Well

TPHg	<50
B	<0.5
T	<0.5
E	<0.5
X	<1.0
TPHd	1,500
TPHmo	750

Groundwater Concentrations in µg/l on 6/19/96

TPHg - TPH as gasoline
B - Benzene
T - Toluene
E - Ethylbenzene
X - Total xylenes
TPHd - TPH as diesel
TPHmo - TPH as motor oil

0 20 Feet 40 Feet

Approximate Scale

Source: Adapted from Figure 2, Potentiometric Groundwater Elevation Contour Map, November 3, 1995, Alisto Engineering Group.

FIGURE 3

CONCENTRATIONS OF PETROLEUM HYDROCARBONS IN GROUNDWATER ON JUNE 19, 1996

United Airlines Hangar-Taxiway Site
Oakland International Airport
1100 Airport Drive

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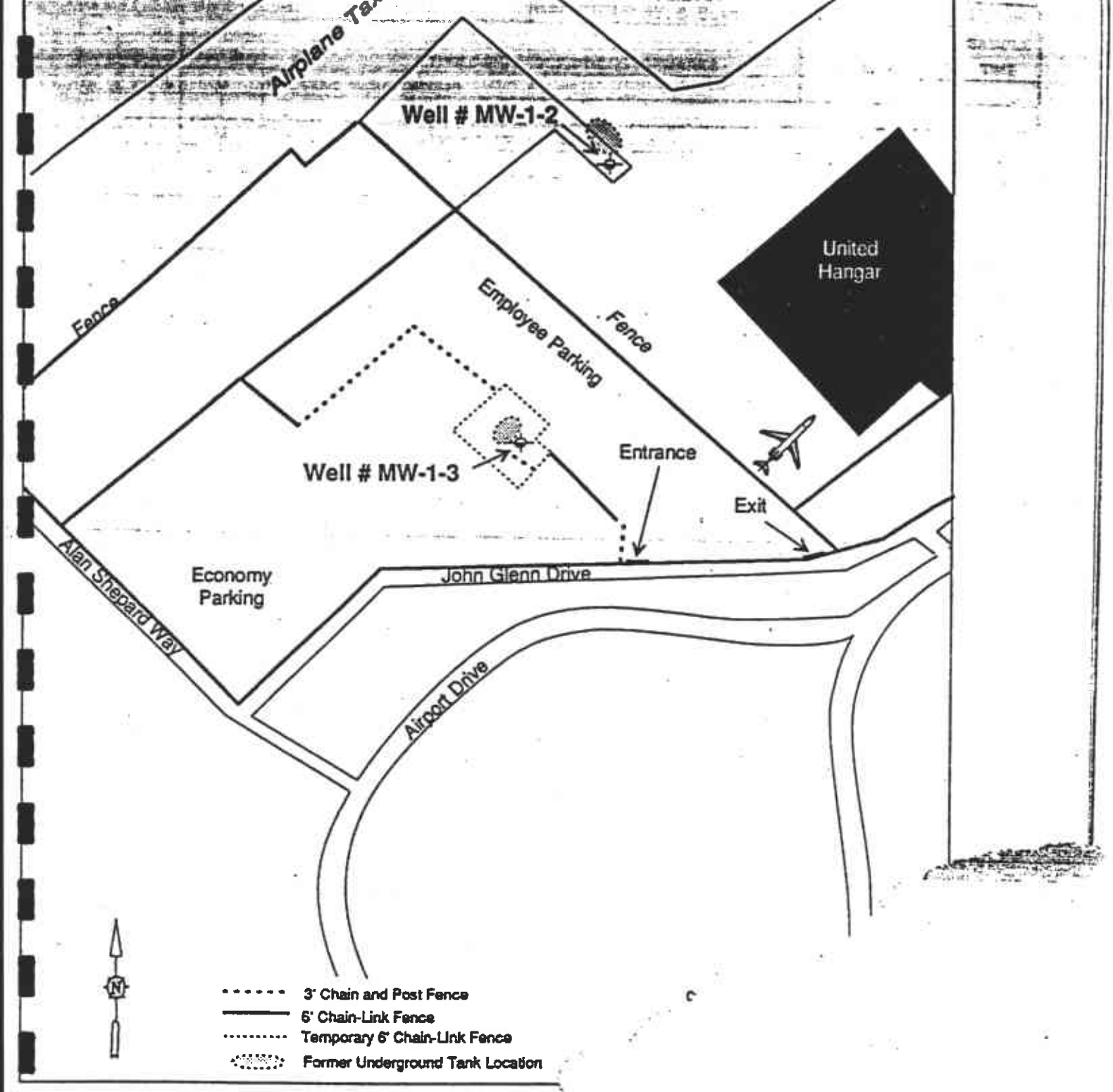
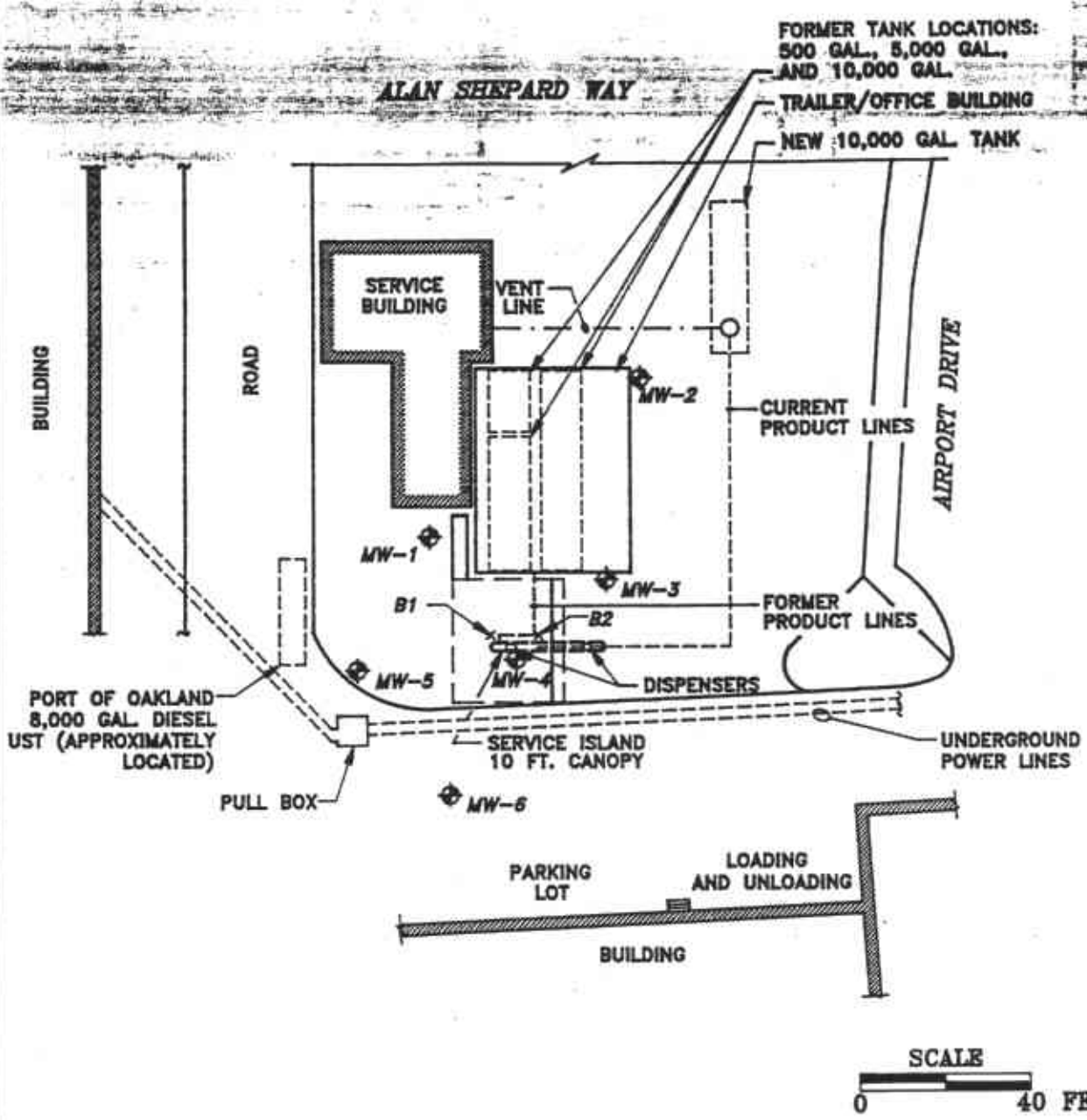


Figure 1: Site Plan Map of Monitoring Wells MW-1-

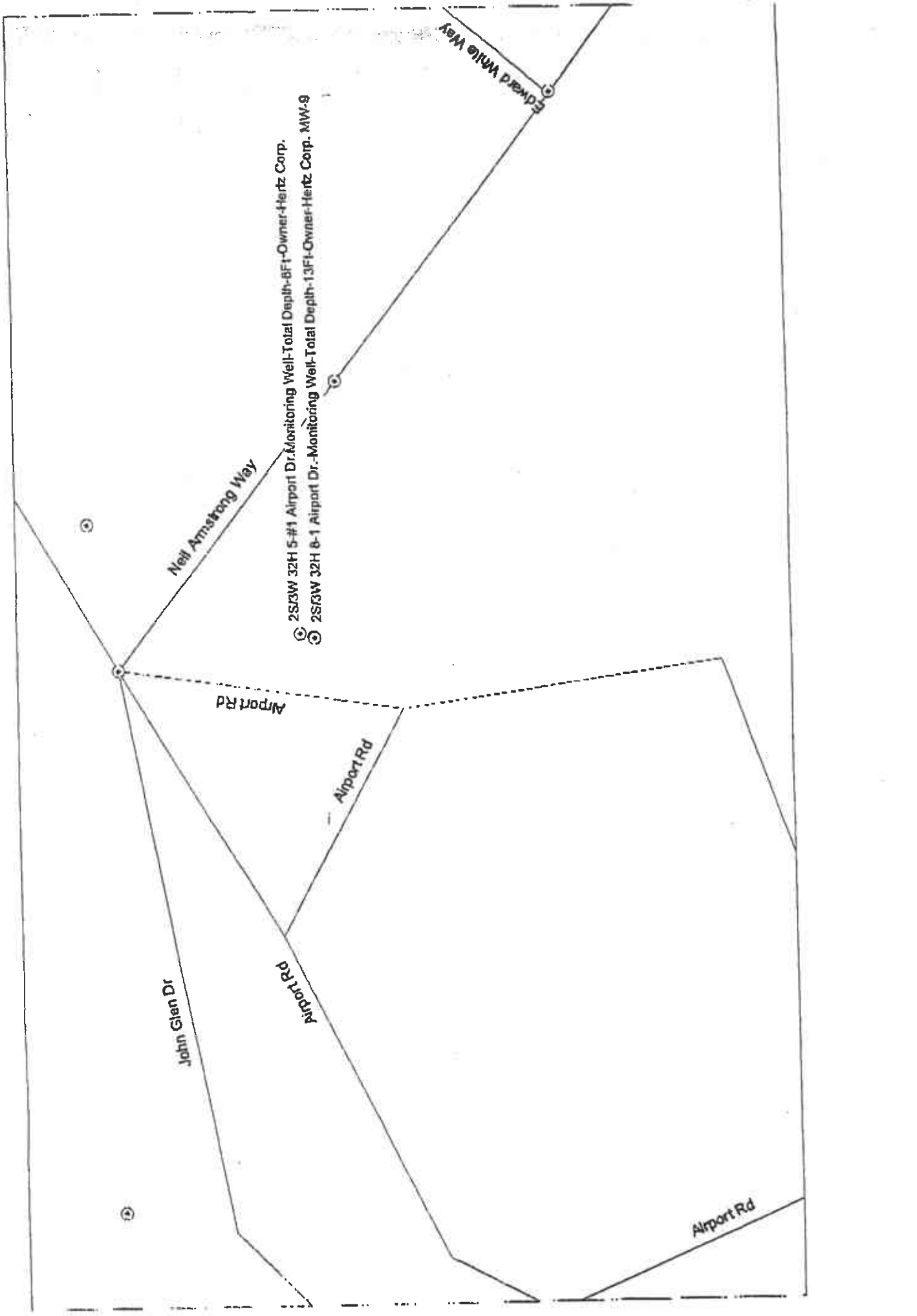
Uribe & Associates

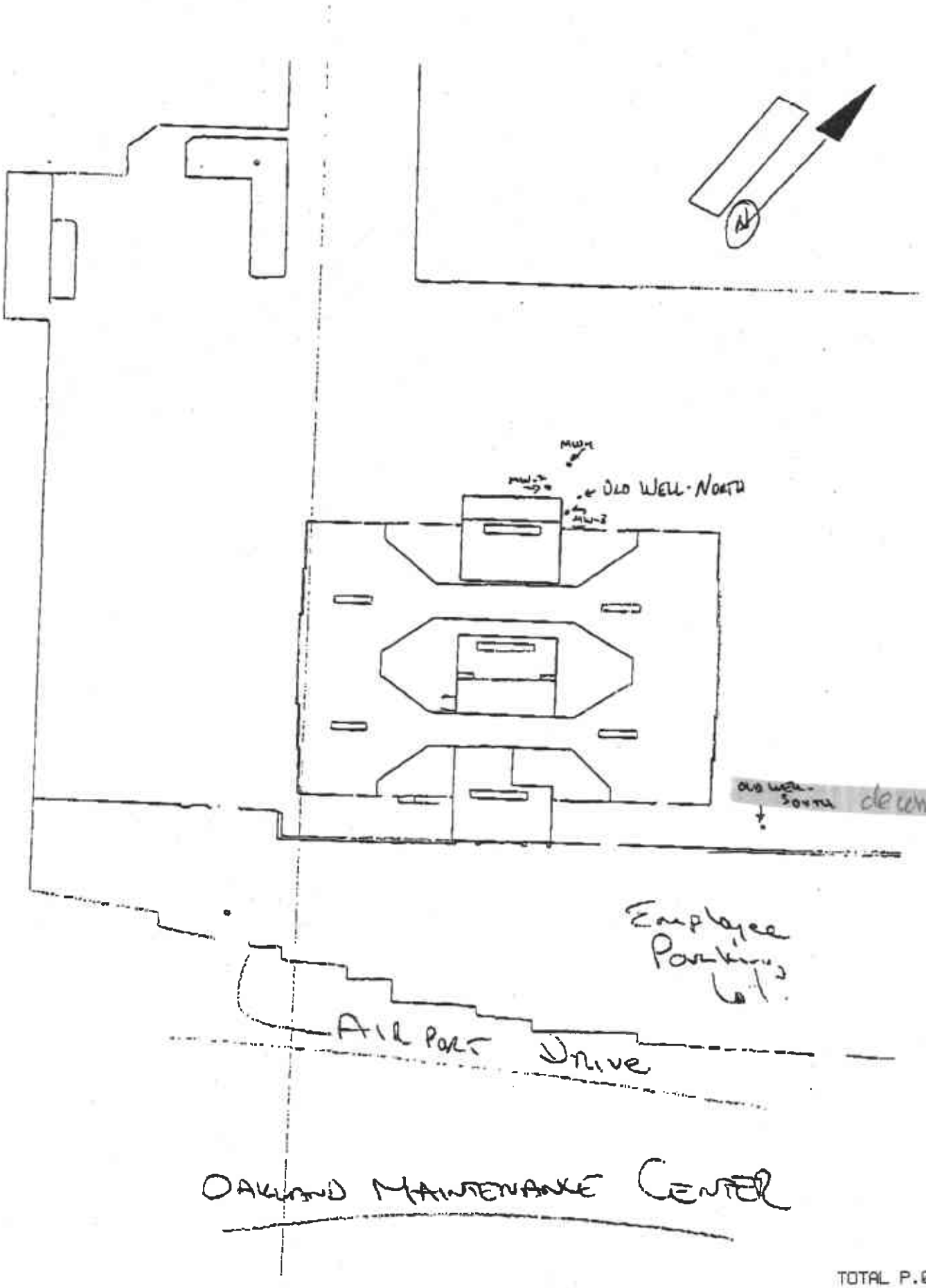


LEGEND

◈ EXISTING MONITORING WELLS (6)

ESE A GEOCOM COMPANY	Environmental Science & Engineering, Inc.
HERTZ/OAKLAND AIRPORT OAKLAND, CALIFORNIA	
FIGURE 1 SITE PLAN	
DRAWN BY: CVS	APPROVED BY:
REVISED: DWR 5/92	
DATE: 8/91	FILE NAME: 52284001
PROJ. NO.: 6-91-5228	


Edward Mhlia Way
2S/3W 32H 5-#1 Airport Dr.Monitoring Well-Total Depth-8Ft-Owner-Hertz Corp.
2S/3W 32H 8-1 Airport Dr.-Monitoring Well-Total Depth-13Ft-Owner-Hertz Corp. MW-9
Neil Armstrong Way
Airport Rd
Airport Rd
Airport Rd
John Glen Dr
Airport Rd


MW-4
MW-5
OLD WELL-NORTH
MW-3
OLD WELL-SOUTH
decommissioned
Employee Parking Lot
AIR PORT DRIVE
OAKLAND MAINTENANCE CENTER

APPENDIX E

BOREHOLE SITE SURVEY

NORCAL GEOPHYSICAL CONSULTANTS, INC.

August 12, 1999

Mr. Alan Klein
ENSR
10324 Placer Lane, Suite 200
Sacramento, CA 95827

Subject: Borehole Site Surveys
United Air Lines Maintenance Facility
Oakland International Airport
Oakland, CA

Dear Mr. Klein:

The purpose of this letter is to confirm that NORCAL Geophysical Consultants, Inc. has completed the work authorized for the proposal submitted May 11, 1999. The field work was conducted on July 20, 1999 by NORCAL Geophysicist David Bissiri. NORCAL investigated a total of three (3) proposed boring locations at the United Air Lines Maintenance Facility at Oakland International Airport for detectable underground obstructions to drilling. Expected obstructions included underground utilities and reinforced concrete.

The borehole site surveys were performed with specific equipment and according to established field procedures. Detailed descriptions of the equipment, methodology, field procedures, and survey documentation are included in Appendix A. In addition to Appendix A, we have enclosed two (2) copies of the Borehole Site Survey Logs and the Daily Field Reports that were used to document our work. The Borehole Site Survey Logs provide information regarding the proximity of detectable utilities and other possible obstructions to the proposed boring locations. The Daily Field Report summarizes the order in which the field activities were performed each day.

We appreciate the opportunity to provide you with this information.

Respectfully,

NORCAL Geophysical Consultants, Inc.

David J. Bissiri
Geophysicist, GP-1009
DJB/WEB/jh

Enclosures: Appendix A, GEOPHYSICAL METHODOLOGY, FIELD PROCEDURES, AND SURVEY DOCUMENTATION

REGIONAL OFFICE
17151 NEWHOPE ST., SUITE 101 • FOUNTAIN VALLEY, CA 92708
TELEPHONE (714) 708-7727• FAX (714) 708-7720

CORPORATE OFFICE
1350 INDUSTRIAL AVENUE, SUITE A • PETALUMA, CA 94952
TELEPHONE (707) 763-1312 • FAX (707) 762-5587

Appendix A

GEOPHYSICAL METHODOLOGY

NORCAL used electromagnetic line locating (EMLL) and ground penetrating radar (GPR) methods in an effort to detect underground utilities in the vicinity of proposed borehole locations as delineated by ENSR. Descriptions of the methods are provided below.

Electromagnetic Line Location

Electromagnetic line location techniques are used to locate the electromagnetic field resulting from an electric current flowing on a line. These fields can arise from currents already on the line (known as passive, or ambient signals) or currents applied to a line with a transmitter (active). The most common passive signals are generated by live electric lines, grounded water lines, and re-radiated radio signals. Active signals can be introduced onto conductive utilities by connecting the transmitter to the line at accessible locations. The transmitted signal will then travel along the specific utility. This is referred to as electromagnetic conduction (EMC). Additionally, a signal can be introduced onto a line through electromagnetic induction (EMI). This involves transmitting a high frequency electromagnetic field at, or above, the ground with either the transmitter placed in close proximity to the utility or by means of an induction clamp placed around specific metallic conduits. The transmitted field then induces a current into the line.

The detection of underground utilities is dependent upon the composition and construction of the line of interest. Utilities detectable with standard line location techniques include most continuously connected metal pipes, cables/wires or non-metallic utilities equipped with tracer wires. These generally include water, electric, natural gas, telephone, and other conduits related to facility operations. If there are no passive currents present, then these utilities must be exposed at the surface or accessible in utility vaults in order to have an active signal placed on them. Utilities that are not detectable using standard electromagnetic line location techniques include those made of non-electrically conductive materials such as PVC, fiberglass, vitrified clay, and metal pipes with insulating joints.

The EMLL instrumentation used for this investigation consisted of a Radiodetection RD-400 line locator and a Fisher TW-6 inductive pipe and cable locator.

Ground Penetrating Radar

Ground penetrating radar is a method that provides a continuous, high resolution cross-section depicting variations in the electrical properties of the shallow subsurface. The method is particularly sensitive to variations in electrical conductivity and electrical permittivity (the ability of a material to hold a charge when an electrical field is applied).

The system operates by repeatedly radiating an electromagnetic pulse into the ground from a transducer (antenna) as it is moved along a traverse. When the radar signal encounters an interface representing a change in permittivity (resulting in what is known as an impedance

contrast) some of the electromagnetic energy is reflected back to the surface. Notably, when the signal encounters a metal object, virtually all of the incident energy is reflected. The reflected signals are received by the transducer and are printed in cross-section form (time-depth) on a graphical recorder. The resulting records can provide information regarding the location of underground utilities and the shallow stratigraphy. Generally, electrically conductive materials, such as saturated clay can limit radar performance by reducing the depth of signal penetration.

For this investigation, we used a Geophysical Survey Systems, Inc. SIR-2 Subsurface Interface Radar System, equipped with a 500 megahertz (MHz) antenna. This frequency antenna is used to provide high resolution.

Equipment Functional Checks

At the beginning of the survey, NORCAL performed EMLL and GPR instrument checks, as recommended by the manufacturers, to ensure proper equipment function. These function checks included testing the batteries, as well as instrument response. Particular attention was paid to the GPR calibrations.

FIELD INVESTIGATION

We investigated a total of three (3) proposed borehole locations. The objective at each proposed location was to mark the locations of nearby underground utilities and other subsurface features that may be potential obstructions to the drilling operation. The investigation consisted of basically five tasks, as follows:

Task 1 — Site Reconnaissance: the vicinity of each proposed boring site area was inspected for surface evidence of underground utilities that may be within the general area.

Task 2 — EMLL Survey: We used the EMLL systems to investigate the areas of concern for potential subsurface obstructions such as utilities. The locations of any detected obstructions were marked with spray paint.

Task 3 — GPR Survey: We obtained GPR data over the proposed borehole locations along north-south and east-west trending traverses. Where possible, these traverses were approximately 20 feet long, and centered on the proposed borehole location. The GPR data were used to aid in confirming the locations of detected and suspected underground utility alignments. We examined the GPR records for patterns characteristic of underground utilities or variations in the subsurface material that may be associated with utility trenches. The locations of the utility alignments, and/or localized GPR anomalies were painted on the ground.

Task 4 Recommendations: Based on the findings of the above procedures, we determined whether the proposed boring locations had possible underground obstructions a safe distance away. If obstructions were in close proximity to the proposed boring locations, we recommended an alternative location . The cleared borehole locations were delineated by painting a white circle containing a fluorescent pink "N" (indicating that NORCAL had investigated that particular location) on the ground.

Task 5 Draft Borehole Site Survey Log: Upon completion of the borehole site survey, we prepared field sketches of the areas of investigation on Borehole Site Survey log forms.

Survey Documentation

We used the Daily Field Reports and the Borehole Site Survey Log forms to document our work. The Daily Field Report summarizes the day's activity. The Borehole Site Survey Logs present the pertinent information associated with each proposed borehole location. These logs are separated into three sections. The upper section of the log consists of the site specific information such as location, borehole number, etc. The center section of this log is a 1 inch equals 10 feet scale map showing the locations of the proposed borehole, the alternative location (if applicable), the GPR traverses, surface objects, anomaly locations, etc. The lower section of the log includes our explanations and remarks for each survey area. This includes a list of the equipment used and the procedures performed at each site. The blank area in the lower right hand corner of the log is used to list any site specific remarks that may be required to further explain the field activities or results.

NORCAL GEOPHYSICAL CONSULTANTS INC.

NORCAL

DAILY FIELD REPORT

Date: 7/20/94 Client/Location: ENSR / UAL - OAKLAND MAINT. FAC.

Personnel: D. BISSIRI Equipment: GPR / EMLL

TIME	NOTES
12:00	ARRIVE MAINGATE
12:15	MEET ALAN KLEIN
12:30	REVIEW AS BUILT PLANS
12:45	START FIELD WORK
	INVESTIGATE BORINGS: (MW-1), (MW-2), (MW-3)
14:30	START MAPPING FINDINGS / PACK EQUIPMENT
15:00	FINISH INVESTIGATION - LEAVE SITE

NOTE: RECOMMEND HAND-AUGERING ALL HOLES ESPECIALLY MW-3. THOUGH NO UTILITIES WERE DETECTED CLOSER THAN 4 FEET, SUB SURFACE IS HIGHLY DISTURBED AND MAY RENDER SOME UTILITIES UNDETECTABLE

FIELD DAY SUMMARY COMPLETED 3 HRS Field work

Signature

NORCAL Representative, DAVID BISSIRI

Signature

Representative Jeff Wendt

1350 INDUSTRIAL AVENUE SUITE A • PETALUMA, CA 94952
TELEPHONE (707) 763-1312 • FAX (707) 762-5587

PERSONNEL: DSB

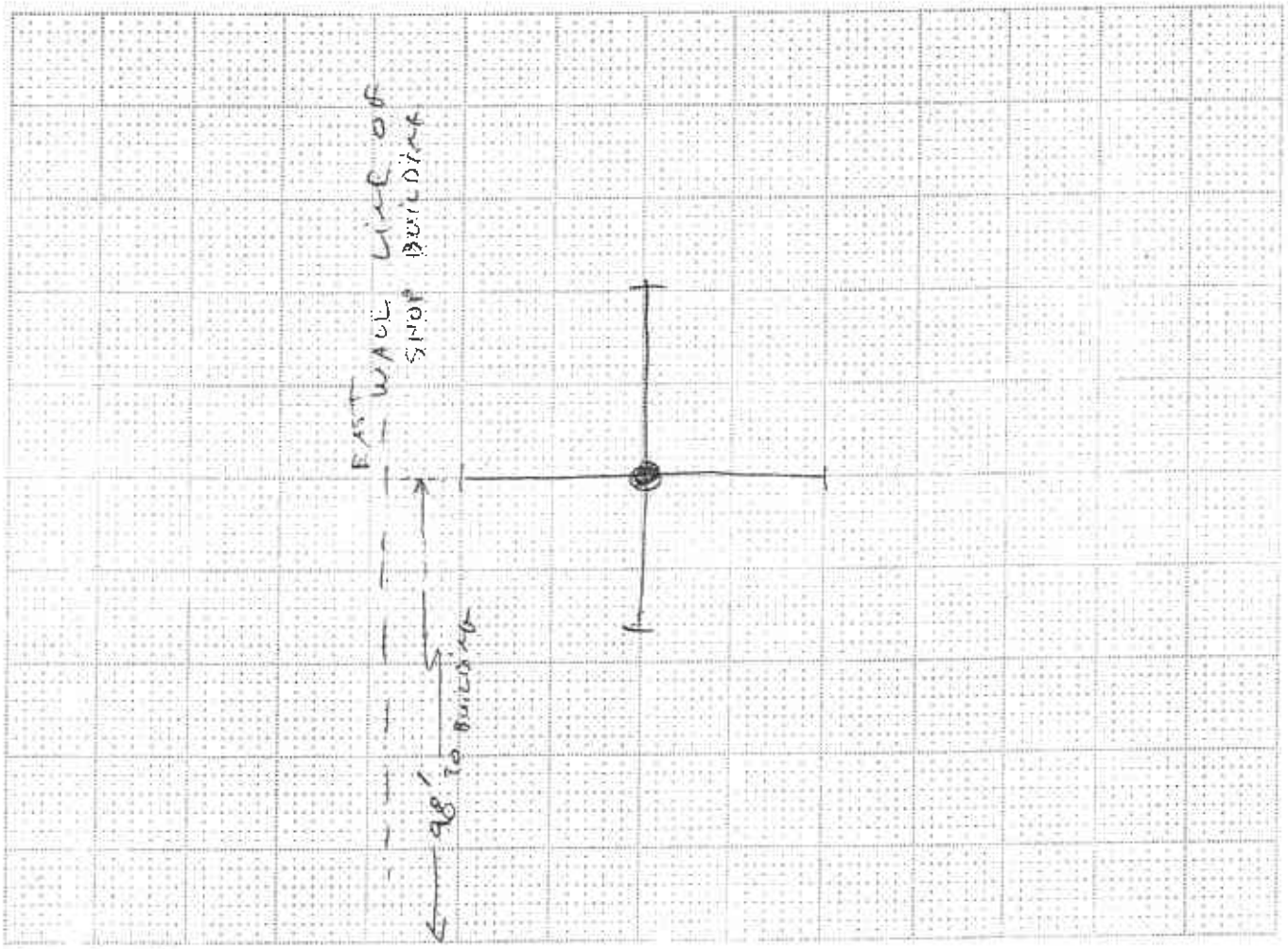
JOB: | DATE: 7/20/99

NORCAL GEOPHYSICAL CONSULTANTS INC.

CLIENT: ENSR

LOCATION: UAL – OAKLAND MAINT. FAC

BORING: MW-1



Scale: 1" = 10'

EXPLANATION

- ○ Original Boring Location
- ● Final Boring Location
- GPR Traverse
- OR Localized GPR Anomaly
- Utility Alignment

Utilities

- _ T (Telephone, Comm.)
- _ E (Electric)
- _ NG (Natural Gas)
- _ CA (Compressed Air)
- _ STM (Steam)
- _ SS (Sanitary Sewer)
- _ SD (Storm Drain)
- _ W (Water)
- _ FS (Fire Supression)
- _ UU (Undifferentiated Utility)

Surface

- _ RC (Reinforced Concrete)
- _ AC (Asphalt)
- _ C (Concrete)
- _ Soil
- _ Gravel
- _ other

NOTES

Equipment:
- _ GPR (Radar)
- _ RD 400
- ✓ M Scope
- _ other

Procedure:
- _ EMC (Conduction)
- ✓ EMI (Induction)
- _ Ambient
- ✓ GPR

Surface Conditions:
- _ Wet
- ✓ Dry
- _ other

REMARKS

PERSONNEL: DJB

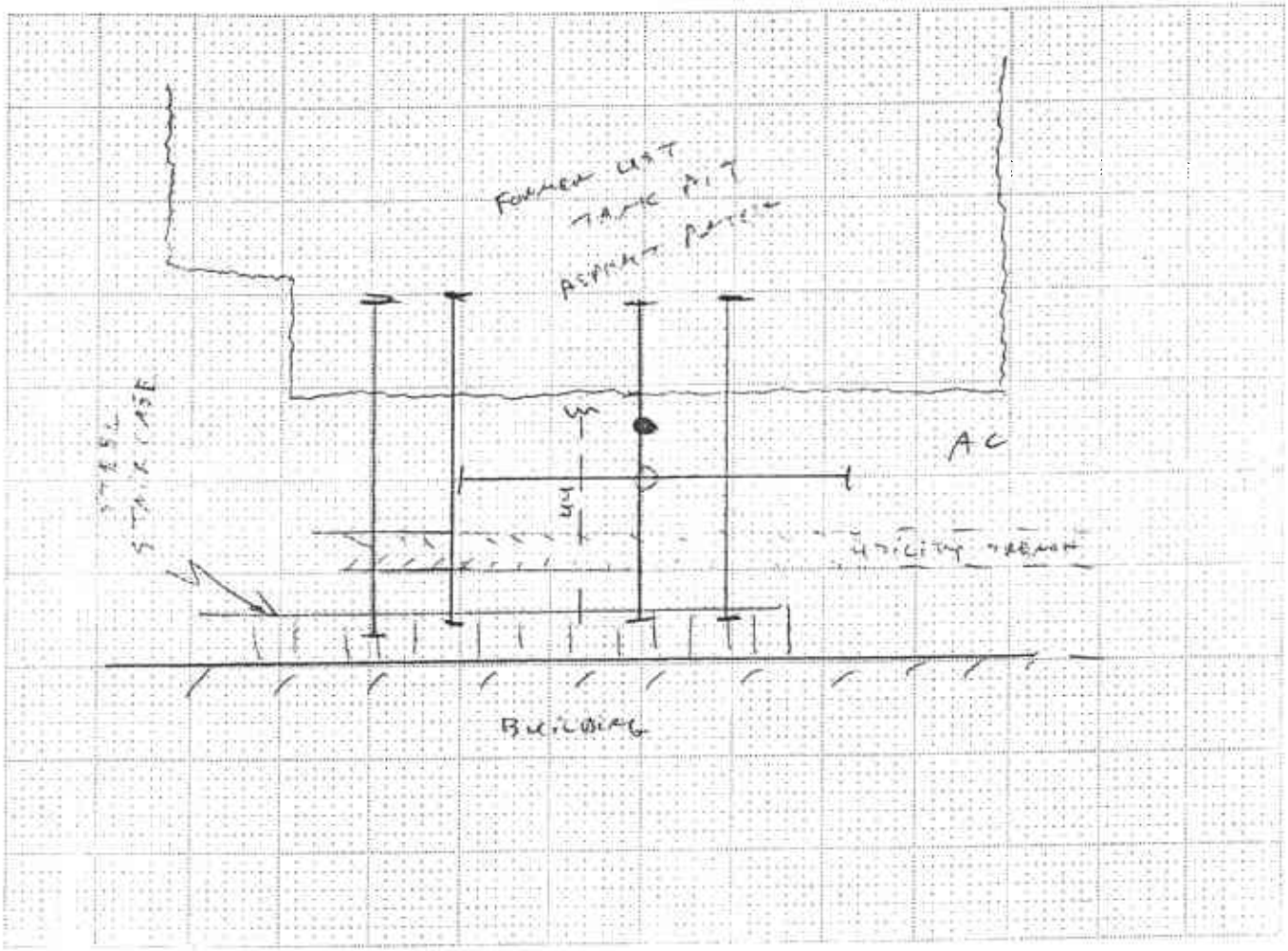
JOB: | DATE: 7/20/99

NORCAL GEOPHYSICAL CONSULTANTS INC.

CLIENT: EASR

LOCATION: UAL - OAKLAND MAINT. FAC.

BORING: MW-2



Scale: 1" = 10'

EXPLANATION

- ○ Original Boring Location
- ● Final Boring Location
- ——— GPR Traverse
- ▭ OR —— Localized GPR Anomaly
- — — — Utility Alignment

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- _ STM (Steam)
- _ SS (Sanitary Sewer)
- _ SD (Storm Drain)
- _ W (Water)
- _ FS (Fire Supression)
- ✓ UU (Undifferentiated Utility)

Surface

- _ RC (Reinforced Concrete)
- ✓ AC (Asphalt)
- _ C (Concrete)
- _ Soil
- _ Gravel
- _ other

NOTES

Equipment:
- _ GPR (Radar)
- ✓ RD 400
- ✓ M Scope
- _ other

Procedure:
- _ EMC (Conduction)
- _ EMI (Induction)
- ✓ Ampteni
- _ GPR

Surface Conditions:
- _ Wet
- ✓ Dry
- _ other

REMARKS

PERSONNEL: DJB

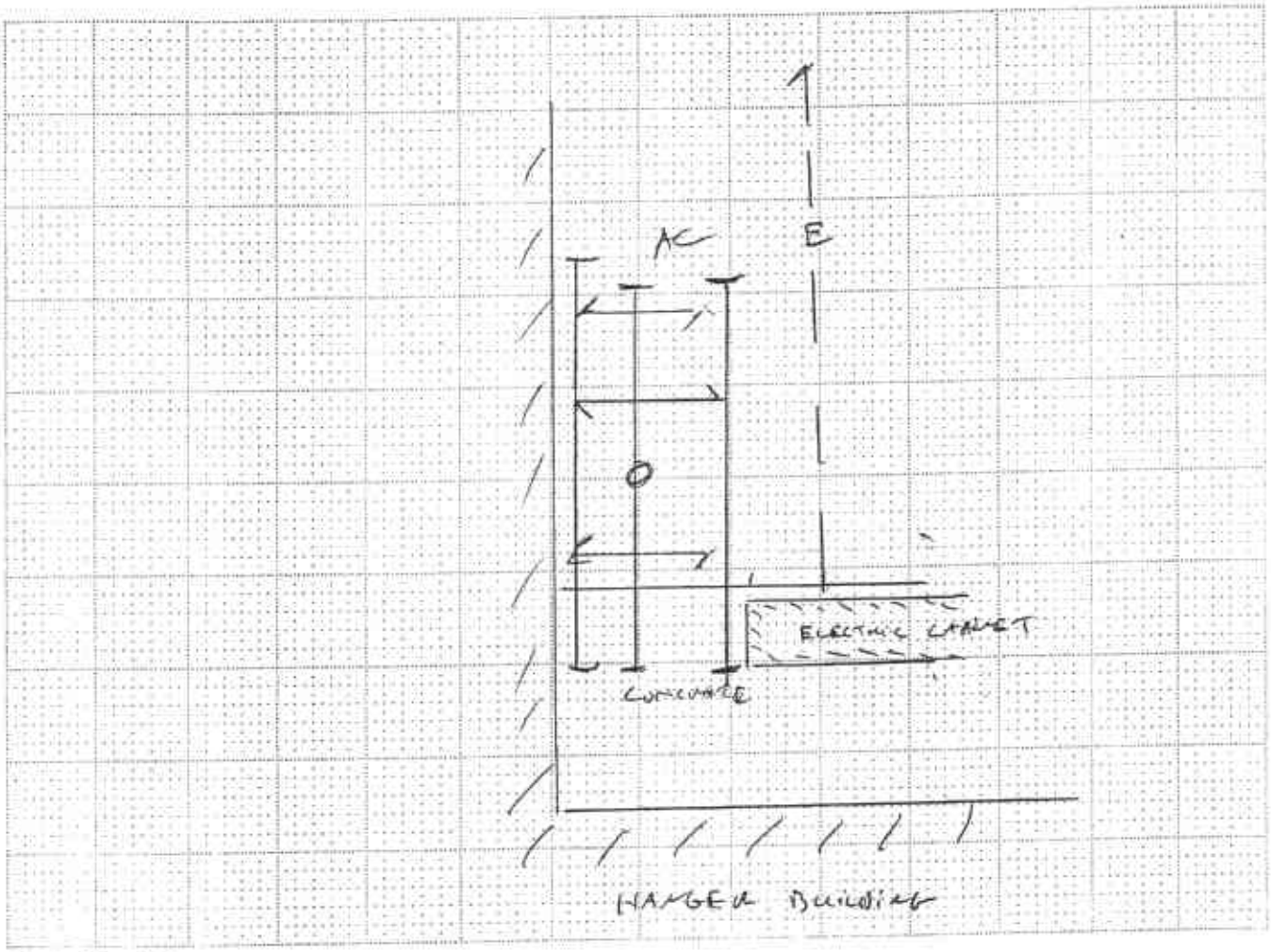
JOB: | DATE: 7/20/99

NORCAL GEOPHYSICAL CONSULTANTS INC.

CLIENT: FNSR

LOCATION: UAL – OAKLAND MAINT. FAC.

BORING: MW-3



Scale: 1" = 10'

EXPLANATION

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- GPR Traverse
- Localized GPR Anomaly
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- _ E (Electric)
- _ NG (Natural Gas)
- _ CA (Compressed Air)
- _ STM (Steam)
- _ SS (Sanitary Sewer)
- _ SD (Storm Drain)
- _ W (Water)
- _ FS (Fire Supression)
- _ UU (Undifferentiated Utility)

Surface

- _ RC (Reinforced Concrete)
- ~~_ AC (Asphalt)~~
- ~~_ C~~ (Concrete)
- _ Soil
- _ Gravel
- _ other

NOTES

Equipment:
- _ ~~GPR~~ (Radar)
- _ RD 400
- _ ~~M~~ Scope
- _ other

Procedure:
- _ EMC (Conduction)
- _ ~~EMI~~ (Induction)
- _ ~~Ambient~~
- _ ~~GPR~~

Surface Conditions:
- _ Wet
- ~~_ Dry~~
- _ other

REMARKS

Recommend Hand-Auger this hole