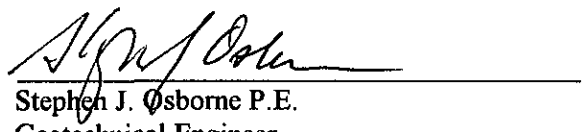
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland International Airport
Oakland, California

12/15/00 # 6409

Prepared for

Port of Oakland
530 Water Street, 2nd Floor
Oakland, California 94607

HLA Project No. 49667.1



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December 15, 2000

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DISTRIBUTION

1.0 INTRODUCTION

This report describes the installation, development and first quarterly round of sampling for four wells located at Taxiway U of the South Airport Self-Fueling Facility at the Oakland International Airport in Oakland, California (Plate 1). This report summarized the results of the activities as described in *Work Plan – Groundwater Monitoring, Oakland International Airport, Oakland, California* dated March 16, 2000. The objectives of the site activities were to evaluate the variations in the groundwater levels and the concentrations of petroleum hydrocarbons beneath the site in the vicinity of the former underground storage tanks (USTs) MF-08, MW-09 and MF-10. These USTs which were removed in April 1999.

Initially, HLA's teaming partner MSE Group, was scheduled to do this work, but due to staff availability, MSE Group requested HLA complete all aspects of the project (telephone conversation between Mr. Carl Hackney of MSE Group and Mr. Stephen Osborne of HLA on April 18, 2000). Prior to any sight activity, MSE Group prepared the Work Plan and the Health and Safety Plan, dated March 2000.

1.1 Background

1.1.1 UST Removal

On April 26, 1999, the Port of Oakland' contractor, Enviroclean, removed three underground storage tanks (USTs), MF-08, MF-09, and MF-10 from an area adjacent to Taxiway U, see Plate 2. MF-08 was a 5,000-gallon gasoline UST and MF-08 and MF—09 were 1,000-gallon diesel tanks. Removal of the three USTs involved two separate excavations, one for the diesel tanks and one for the gasoline tank. Soil and groundwater samples collected from the excavations indicated that there had been a release of petroleum hydrocarbons at both sites. Total petroleum hydrocarbons as diesel (TPH-diesel), total petroleum hydrocarbons as gasoline (TPH-gas), benzene, toluene, ethylbenzene, and total xylenes (BTEX) and methyl tertiary butyl-ether (MTBE) were detected in both soil and groundwater samples collected from the excavations.

Analytical results of soil samples collected from excavation of the two diesel USTs indicated TPH-diesel and TPH-gas concentrations as high as 39,000 and 3,000 milligrams per kilogram (mg/kg) respectively. Benzene constituents were less than 1.5 mg/kg. Grab groundwater samples collected within the excavation detected TPH-diesel and TPH-gas at concentrations of up to 51 and 120 milligrams per liter (mg/l), respectively.

Analytical results of soil samples collected from the excavation of the gasoline UST detected TPH-gas at 4,300 mg/kg, TPH-diesel concentrations at 6,200 mg/kg, benzene at 1.4 mg/kg, toluene at 87 mg/kg, ethylbenezene at 65 mg/kg, xylenes at 540 mg/kg, and MTBE at 5.5 mg/kg. Groundwater samples collected within the excavation detected TPH-gas at 42 mg/l and TPH-diesel concentrations at 1.7 mg/l, respectively. Dissolved BTEX ranged from 0.27 to 8.9 mg/l and MTBE was detected at 15 mg/l.

Groundwater was measured at a depth of 3.5 to 4.0 feet. Both excavations were reportedly backfilled with pea gravel to a depth of 3 feet and capped with aggregate base rock.

1.1.2 August 1999 Site Investigation

On August 31, 1999, HLA performed a subsurface investigation at the site. Eight geoprobe borings were advanced in locations surrounding the former USTs. Soil and groundwater samples were collected from the borings. The boring locations are shown on Plate 2. TPH-diesel was detected in soil at

concentrations of 8.7 micrograms per kilogram (µg/kg) to 680 µg/kg. The highest TPH-gasoline concentration was found in a boring SB-4 (see Plate 2), and the highest TPH-diesel concentration was found at SB-8.

The soil sample with the highest diesel concentration was also analyzed for polynuclear aromatic hydrocarbons (PAHs). Naphthalene was detected at 8,800 µg/kg and benzo(a)pyrene was detected at 620 µg/kg, as well as minimal concentrations of several other PAHs.

TPH-diesel was detected in the groundwater at concentrations ranging from 71 micrograms per liter (µg/L) to 380 µg/L. The highest TPH-diesel concentration was found in SB-4. TPH-gas was detected in the groundwater at concentrations ranging from 33 µg/L to 300 µg/L. MTBE was encountered at concentrations ranging from 3.5 µg/L to 4,500 µg/L. Benzene was detected above the MCL for drinking water at a concentration of 63 µg/L. PAHs were analyzed in the groundwater sample with the highest diesel concentration and no PAHs were detected at or above their reporting limits. The highest concentrations of TPH-gasoline, benzene, and MTBE were found at SB-2.

During the August 31, 1999 investigation, The groundwater samples were subjected to a variety of chemical analyses to evaluate the potential for natural attenuation. HLA also measured certain groundwater parameters in the field to supplement the chemical data. The recorded groundwater temperature and pH measurements were all within ranges acceptable to support the presence of microorganisms. The presence of ferrous iron in the groundwater may be evidence of natural bio-degradation of the petroleum hydrocarbons. The absence of organophosphate in the groundwater may indicate micobial growth because phosphate is utilized by the microbes to break down the petroleum hydrocarbons.

2.0 FIELD ACTIVITIES

The following sections describe the field activities associated with the installation and quarterly sampling of the four groundwater monitoring wells, designated MW-1, MW-2, MW-3 and MW-4, located adjacent to Taxiway U. Section 2.1 describes the well installation on April 27, 2000, Section 2.2 describes the well development on May 18, 2000, Section 2.3 describes the first quarterly groundwater monitoring on May 30, 2000 and Section 2.4 describes the location surveying of the monitoring wells on July 21, 2000.

2.1 Monitoring Well Installation

Prior to initiating field activities, MSE Group marked the well locations and notified Underground Service Alert. Also prior to initiating drilling activities, HLA obtained a drilling permit from Alameda County Department of Public Works. On April 27, 2000 prior to drilling, HLA contracted Cruz Brothers to locate any existing utilities in the vicinity of the work area.

On April 27, 2000, Greg Drilling and Testing, Inc. (Gregg), under the direction of HLA, drilled four boreholes to a total depth of 10 feet and installed four monitoring wells, MW-1, MW-2, MW-3 and MW-4, as shown on Plate 2. Gregg continuously cored the boreholes using an 8-inch outside diameter hollow-stem auger, . The samples were continuously contained in 18-inch intervals by 6-inch stainless steel tubes.

HLA's field engineer directed the work, logged the borings in accordance with ASTM D2487-85 Unified Soil Classification, and screened the samples with a photo-ionization detector (PID). HLA selected and preserved the soil sample from each boring that was most likely to have an impact of petroleum hydrocarbon contamination. The soil samples selected for chemical testing were immediately sealed, labeled, placed in a chilled cooler and delivered under chain-of-custody to Sequoia Analytical, a California state-certified laboratory under direct contract to the Port, for chemical analysis. Soil samples were analyzed for the following constituents:

- TPH-gas in accordance with EPA Test Method 8015 modified
- BTEX and MTBE in accordance with EPA Test Method 8020, MTBE confirmation samples of detections by EPA Test Method 8260.
- TPH-diesel in accordance with EPA Test Method 8015 modified
- Total Lead in accordance with EPA Test Method 6000/7000.

PNA's ?

Gregg installed a monitoring well in each of the four boring at a total depth 10 feet. The wells were constructed of 2-inch diameter schedule 40 polyvinyl chloride (PCV). Under the direction of HLA, Gregg installed the screened interval consisting of 0.02-inch slotted casing between the depths of 3 and 10 feet. 3 feet of flush-threaded, 2-inch diameter PVC solid casing was installed between the ground surface and 3 feet. The top of the well casing was fitted with an expandable locking well plug.

The hollow stem augers were slowly removed from the borehole as the sand pack was added between the depths of 2 and 10 feet. Gregg added a nine inch bentonite seal above the sand pack. Above the bentonite seal, Gregg added a bentonite cement mixture to just below the top of the well casing. Gregg installed 12.5-inch diameter watertight, traffic rated, christy boxes, setting MW-1 flush with the existing grade and MW-2, MW-3, and MW-4 approximately 2-inches above existing grade. The boring logs and well completion logs are found in Appendix A.

Soil and drilling mud generated during the field activities was placed in 55-gallon drums and

located in a nearby area which was designated by the Port, pending disposal by the Port's contractor. HLA sampled the two drums to be analyzed by Sequoia for the same constituents as the soil boring samples.

2.2 Well Development Monitoring

MW-1, MW-2, MW-3 and MW-4 were developed to remove fine particles from the well near the well screen on May 18, 2000. The well development forms can be found in Appendix B.

To develop the monitoring wells, HLA first surged the wells for approximately ten minutes. The surge block was used in order to move the water back and forth across the well screen, which aids in producing a well that will improve hydraulic communication with the surrounding formation. After ten minutes, HLA pumped the wells using a centrifugal pump until the water cleared up, taking field measurements of pH, temperature, conductivity and turbidity.

Purge water generated during the field activities was placed in 55-gallon drums and located in a nearby area which was designated by the Port, pending disposal by the Port's contractor.

2.3 Quarterly Groundwater Monitoring

Following development of the wells, HLA conducted groundwater monitoring for the quarter of April 1 through June 30, 2000. On May 30, HLA measured groundwater elevations and collected groundwater samples for chemical analyses. Prior to purging or sampling the monitoring wells, HLA measured dissolved oxygen (DO) concentrations, reduction oxidation potential (Redox), water levels. HLA monitored the pH, conductivity, and temperature of the groundwater during purging. HLA sampled the monitoring wells after purging at least four well volumes of groundwater and after parameters had stabilized to within 10 percent; the groundwater sampling forms with the field data are included in Appendix C.

HLA collected groundwater samples from the four monitoring wells using pre-cleaned disposable Teflon bailers and then transferred the groundwater into laboratory-provided containers. Sample containers were labeled with the sample number, date and time of collection, and sampler's initials, then placed in an insulated cooler with blue ice. The samples were delivered for chemical testing under chain-of-custody to Sequoia Analytical of Walnut Creek, California. The samples were analyzed for the following analytes:

- TPH- gas in accordance with EPA Test Method 8015 modified
- BTEX and MTBE in accordance with EPA Test Method 8020, MTBE confirmation samples of detections by EPA Test Method 8260.
- TPH-diesel and total petroleum hydrocarbons as motor oil (TPH-mo) in accordance with EPA Test Method 8015 modified
- Total iron and ferrous iron by EPA Test Method 6000/7000
- Nitrate as NO3, Orthophosphate as PO4, and sulfate as SO4 by EPA Test Method 300
- Total Organic Carbon by EPA Test Method 415.1.

HLA contained the purge water in a 55-gallon drum for subsequent disposal by the Port's contractor.

2.4 Monitoring Well Location Surveying

On July 21, 2000 HLA contracted PLS Surveys, Inc. to locate and provide elevations to the nearest 0.01 foot, relative to the Port's datum for the four monitoring wells. The wells were also surveyed in horizontally using NAD '83. The survey data can be found in Appendix D.

3.0 ANALYTICAL RESULTS AND DISCUSSION

The following discusses the results of the well installation and the quarterly groundwater monitoring.

3.1 Well Installation Soil Sample Results

Analytical results for the soil samples taken during the monitoring well installation are summarized in Table 1. These samples were collected in the upper five feet. The results of the TPH analysis are displayed on Plate 3. The laboratory report and chain-of-custody forms are presented in Appendix E. TPH-diesel was detected in the soil at MW-1 at a concentration of 1.2 milligrams per kilogram (mg/kg). Total lead was detected in MW-1 at a concentration of 1.9 mg/kg, in MW-2 at a concentration of 1.0 mg/kg, and in MW-4 at a concentration of 3.2 mg/kg. No other analytes were detected above the reporting limits.

3.2 Quarterly Groundwater Monitoring Results

Groundwater elevations are presented in Table 2 and shown on Plate 4 with an apparent gradient towards the southwest. Table 3 and Plate 5 presents the petroleum hydrocarbon analytical data. Table 4 presents the natural attenuation parameter analytical results. The laboratory report and chain-of-custody forms are presented in Appendix F.

TPH-diesel was reported in all four of the monitoring wells at concentrations ranging from 210 micrograms per liter (µg/L) in MW-4 to 51 µg/L in MW-2. MTBE was detected in MW-3 and MW-4 as concentrations of 7.5 µg/L and 19 µg/L respectively. The MTBE detections were confirmed by EPA 8260 with results of 2.6 µg/L in MW-3 and 17 µg/L in MW-4. No other petroleum hydrocarbons were detected above the reporting limits.

The groundwater samples were subjected to a variety of chemical analyses to evaluate the potential for natural attenuation. HLA also measured certain groundwater parameters in the field to supplement the chemical data. This data is summarized in Table 4.

The presence of ferrous iron and the absence of phosphorous at the site may be indications that natural bio-degradation of the petroleum hydrocarbons are occurring. Ferrous iron is produced when ferric iron is used in the bio-degradation process. Phosphate is utilized by the microbes to break down the petroleum hydrocarbons. The REDOX measurements are also consistent with the above indications of reduction of petroleum hydrocarbons; measurements of less than 300 millivolts can be considered evidence of a reducing environment.

3.3 Soil Investigative Derived Waste

Analytical results for the soil drums containing the soil cuttings from the monitoring well installation are also summarized in Table1. TPH-diesel was detected in the soil at both drums at concentrations of 13 mg/kg and 1.2 mg/kg. Total lead was detected at both drums at concentrations of 3.0 mg/kg and 2.5 mg/kg. No other analytes were detected above the reporting limits.

4.0 REFERENCES

Harding Lawson Associates (HLA), 1999. *Underground Storage Tank Closure Report – Port Tanks MF08, MF-09 and MF-10, South Airport Self-Fueling Facility, Taxiway 4, Oakland, California.* June 29.

HLA, 1999. *Subsurface Investigation – Former USTs: MF-08, MF-09, MF-10, South Airport Self-Fueling Facility, Taxiway U, Oakland, California.* October 7.

MSE Group and HLA, 2000. *Work Plan – Groundwater Monitoring, Oakland International Airport, Oakland, California.* March

TABLES

Table 1. Soil Analytical Data
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

Sample Identification			MW-1	MW-2	MW-3	MW-4	Drum 4223	Drum 4230
Depth			4.5	4.0	3.5	3.0		
Sample Date	EPA		4/27/2000	4/27/2000	4/27/2000	4/27/2000	4/27/2000	4/27/2000
Analyte	Method	Units						
TPH gas	8015 M	mg/kg	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
TPH diesel	8015 M	mg/kg	1.2 [1]	ND<1	ND<1	ND<1	13 [1]	1.2 [1]
MTBE	8020	mg/kg	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05	ND<0.05
Benzene	8020	mg/kg	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Toluene	8020	mg/kg	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Ethylbeneze	8020	mg/kg	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Total Xylenes	8020	mg/kg	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005	ND<0.005
Total Lead	6000/7000	mg/kg	1.9	1.0	ND<1	3.2	2.5	3.0

Notes:
1 = Chromatogram Pattern: Unidentified Hydrocarbons > C16
mg/kg = milligrams per kilogram

Table 2. Groundwater Elevations
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

Well ID	Elevation Top of Casing (feet)	Date Of Monitoring	Depth to Water (feet)	Groundwater Elevation (feet)
MW-1	8.28	04/27/00	4.91 [1]	3.37
		05/18/00	4.96 [1]	3.32
		05/30/00	5.11	3.17
MW-2	6.41	04/27/00	4.34 [1]	2.07
		05/18/00	3.21 [1]	3.20
		05/30/00	3.49	2.92
MW-3	5.24	04/24/00	2.38 [1]	2.11
		05/18/00	2.33 [1]	2.16
		05/30/00	2.70	2.54
MW-4	4.49	04/24/00	2.48 [1]	2.01
		05/18/00	2.47 [1]	2.02
		05/30/00	2.93	1.56

Elevation data relative to Port of Oakland datum; well surveys performed on July 21, 2000

[1] Water level taken prior to well development

Table 3. Groundwater Monitoring Well Petroleum Hydrocarbon Analytical Results
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

Well	Date	Analyte / EPA Method / Units	TPH gas 8015 M µg/L	TPH diesel 8015 M µg/L	TPH motor oil 8015 M µg/L	MTBE 8020 µg/L	Confirmation MTBE 8260 µg/L	Benzene 8020 µg/L	Toluene 8020 µg/L	Ethylbeneze 8020 µg/L	Total Xylenes 8020 µg/L
MW-1	5/30/2000		ND<50	60 [2]	ND<250	ND<2.5	ND<2.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
MW-2	5/30/2000		ND<50	51 [2]	ND<250	ND<2.5	ND<2.5	ND<0.5	ND<0.5	ND<0.5	ND<0.5
MW-3	5/30/2000		ND<50	60 [2]	ND<250	7.5	2.6	ND<0.5	ND<0.5	ND<0.5	ND<0.5
MW-4	5/30/2000		ND<50	210 [1]	ND<250	19	17	ND<0.5	ND<0.5	ND<0.5	ND<0.5

µg/L = micrograms per liter
mg/L = milligrams per liter
mV = millivolts

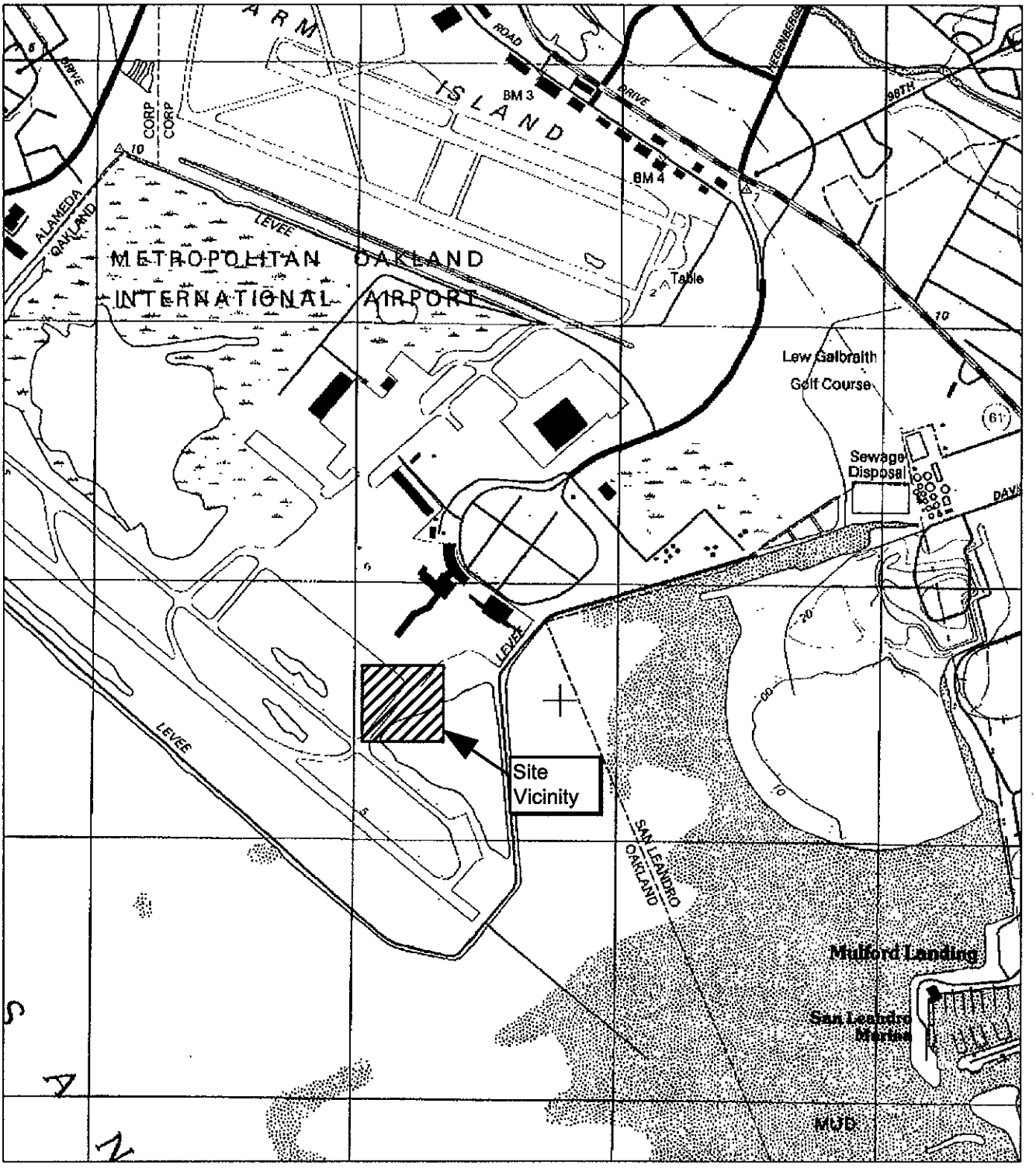
1 Chromatograph Pattern: Unidentified Hydrocarbons >C16
1 Chromagraph Pattern: Diesel C9-C24

Table 4. Groundwater Monitoring Well Natural Attenuation Analytical Results
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

Well	Date	Analyte / EPA Method / Units	Ferrous Iron 6000/7000 mg/L	Iron 6000/7000 mg/L	Nitrate 300 mg/L	Orthophosphate 300 mg/L	Sulfate 300 mg/L	Total Organic Carbon 415.1 mg/L	Dissolved Oxygen Field mg/L	Redox Field mV
MW-1	5/30/2000		1.0	0.75	5.5	ND<0.5	76	47.2	2.8	208
MW-2	5/30/2000		0.1	2.9	1.3	ND<0.5	14	9.39	2.2	228
MW-3	5/30/2000		0.7	3.9	ND<0.1	ND<0.5	51	22.5	1.2	164
MW-4	5/30/2000		0.4	4.6	ND<0.1	0.94	38	21.4	1.0	184

µg/L = micrograms per liter
mg/L = milligrams per liter
mV = millivolts

PLATES



Source: TOPO! © 1997 Wildflower Productions.

0 2,000

Scale in feet

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Site Location Map

Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

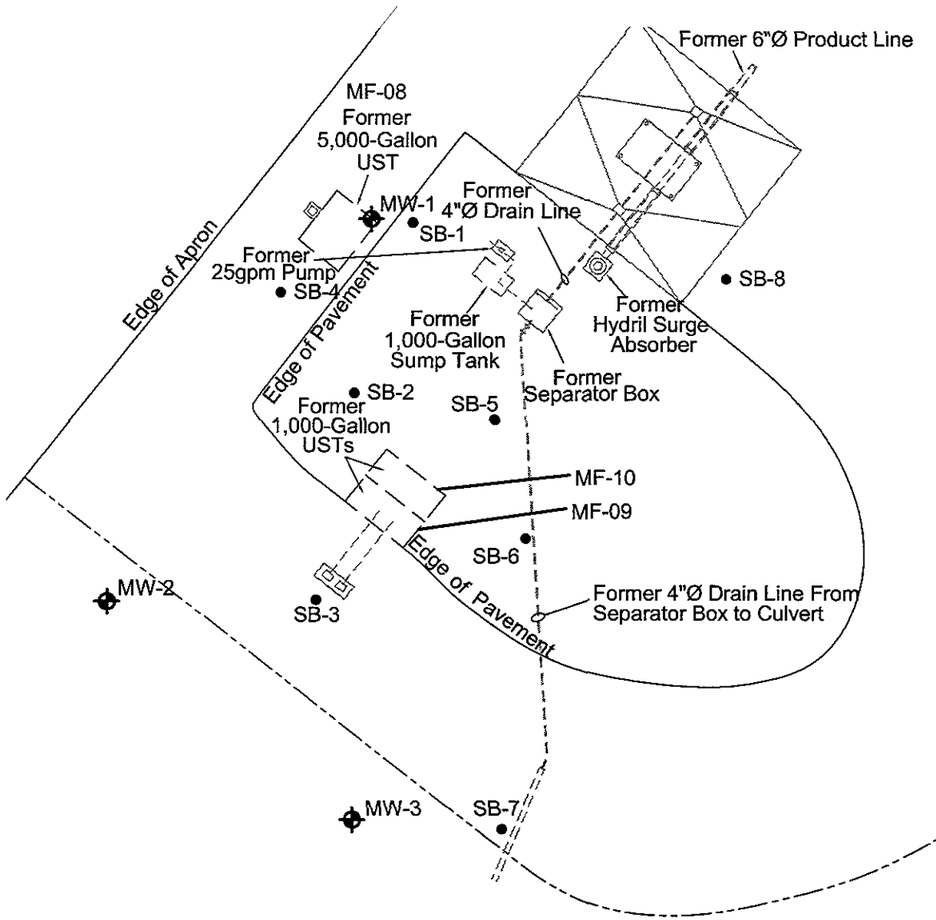
PLATE
1

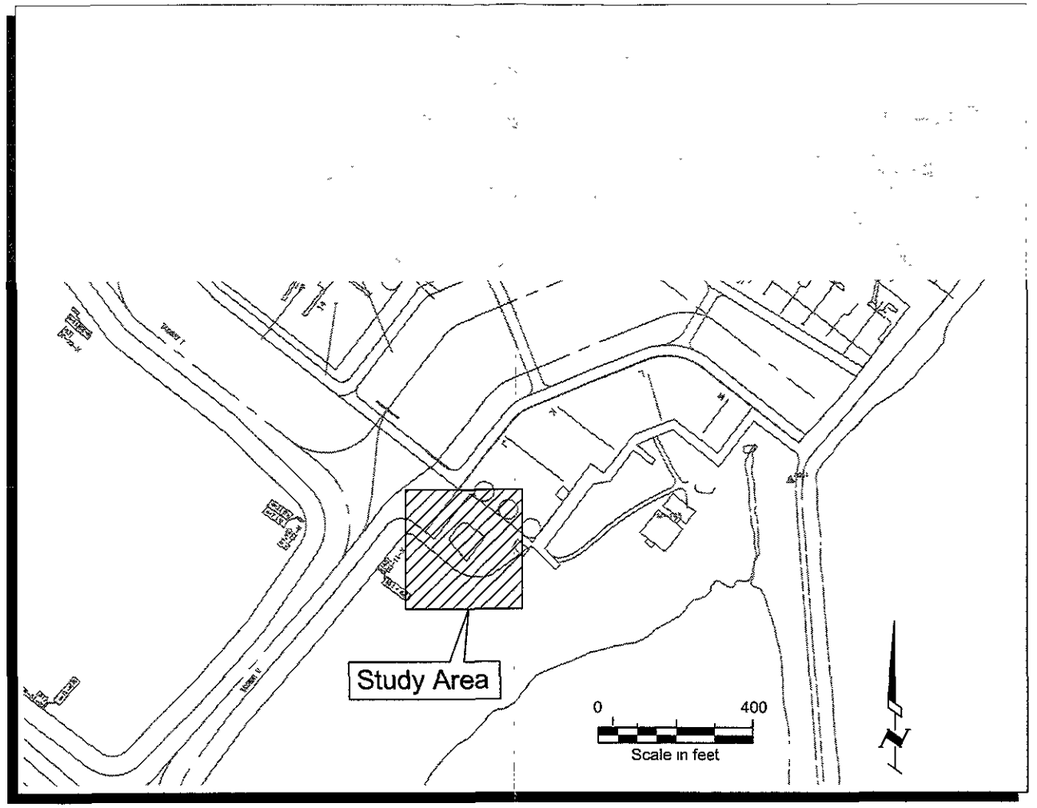
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AJW	49667.1		7/00	---

Legend

MW-1 Monitoring Well

SB-1 Geoprobe Boring





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Site Plan
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

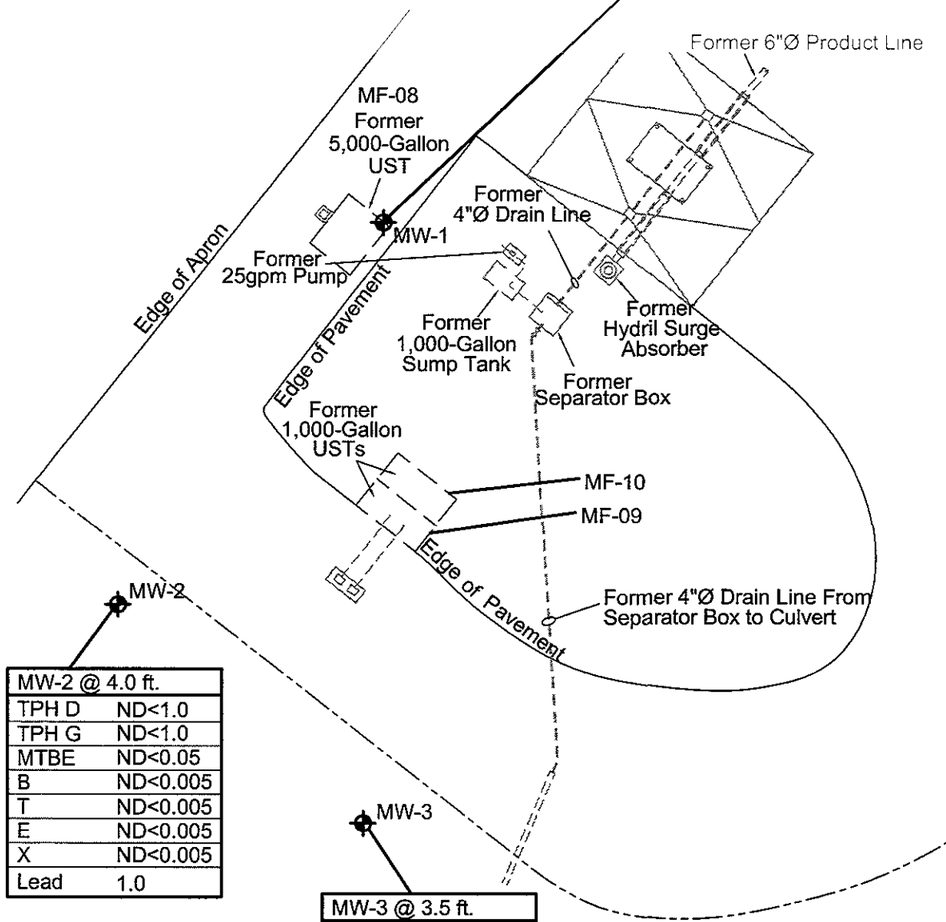
PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	49667.1	JJO	7/00	12/00

Legend

MW-1 Monitoring Well

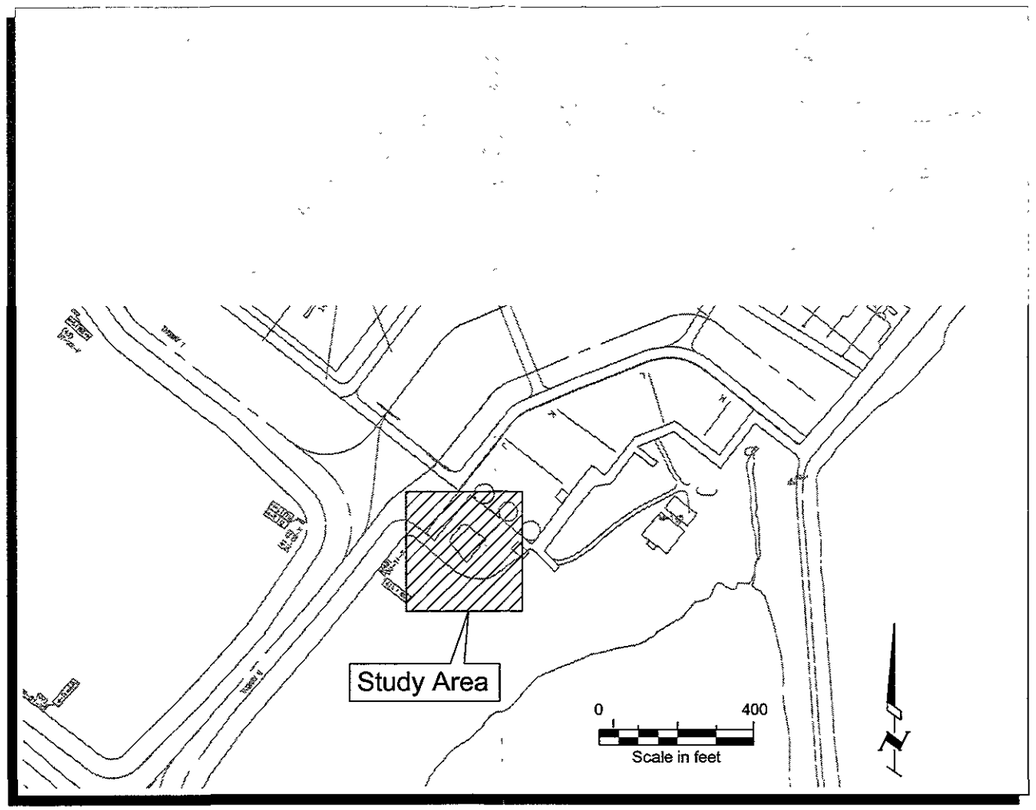
MW-1 @ 4 5 ft	
TPH D	1 2
TPH G	ND<1 0
MTBE	ND<0.05
B	ND<0 005
T	ND<0 005
E	ND<0 005
X	ND<0 005
Lead	1 9



MW-2 @ 4.0 ft.	
TPH D	ND<1.0
TPH G	ND<1.0
MTBE	ND<0.05
B	ND<0.005
T	ND<0.005
E	ND<0.005
X	ND<0.005
Lead	1.0

MW-3 @ 3.5 ft.	
TPH D	ND<1.0
TPH G	ND<1.0
MTBE	ND<0.05
B	ND<0.005
T	ND<0.005
E	ND<0.005
X	ND<0.005
Lead	ND<1.0

MW-4 @ 3.0 ft.	
TPH D	ND<1.0
TPH G	ND<1.0
MTBE	ND<0.05
B	ND<0.005
T	ND<0.005
E	ND<0.005
X	ND<0.005
Lead	3.2



KEY:

TPH D = TPH Diesel
TPH G = TPH Gas
B = Benzene
T = Toluene
E = Ethylbenzene
X = Xylene

All results in mg/kg.

Samples collected 4/27/00.

49667003.DWG 0.0
20001214.1130

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Soil Chemical Results
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

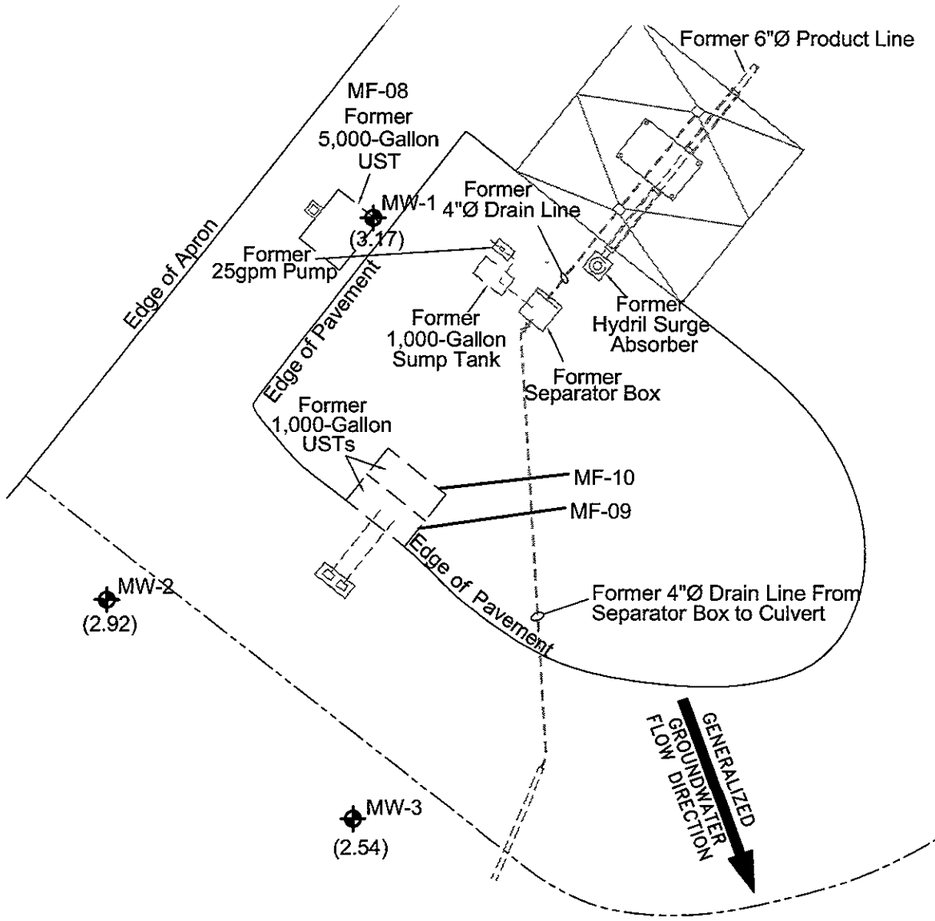
PLATE **3**

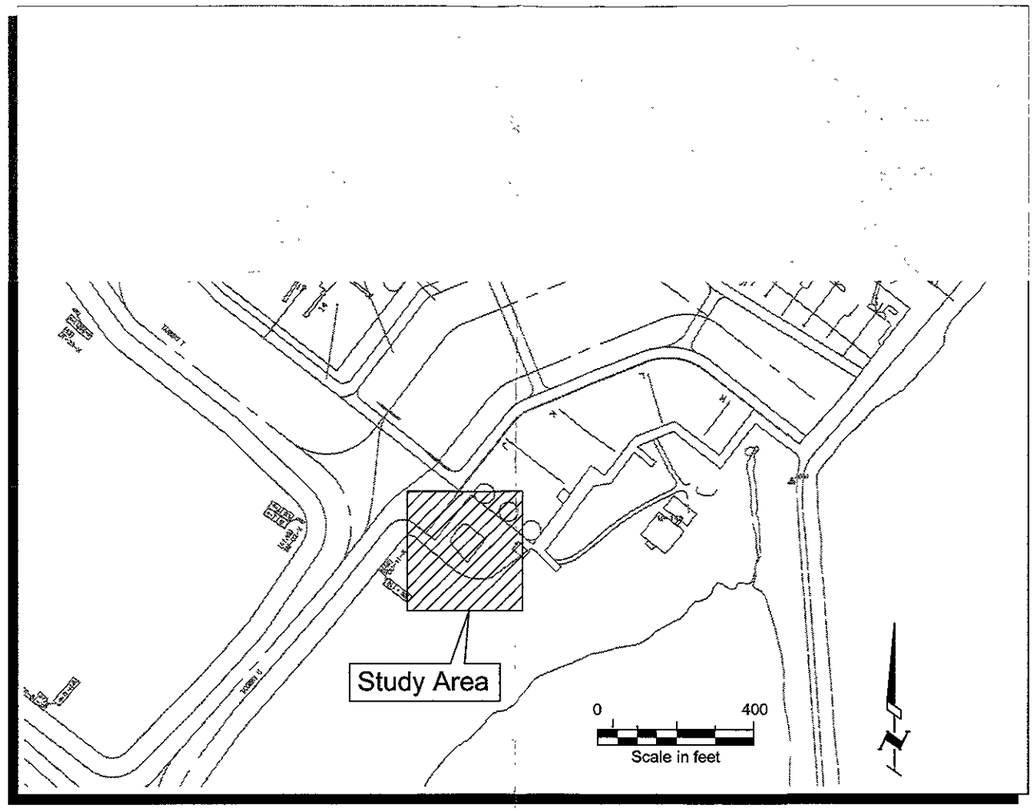
DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	49667.1	1 1 6	7/00	12/00

Legend

MW-1 Groundwater Well

(3.17) Groundwater Elevation (port datum)





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Groundwater Elevations (5/30/00)
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

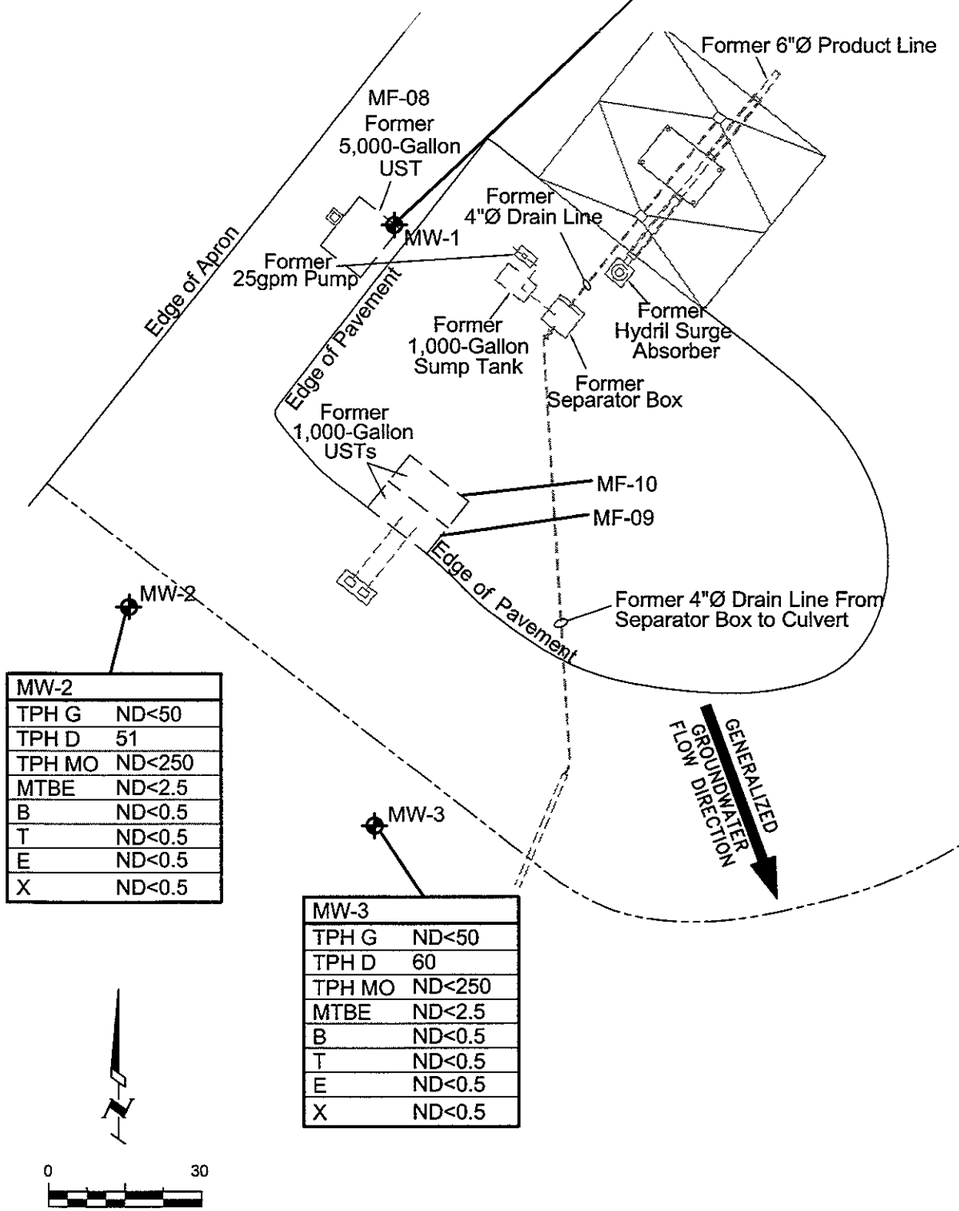
PLATE **4**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	49667.1	TLO	7/00	12/00

Legend

MW-1 Monitoring Well

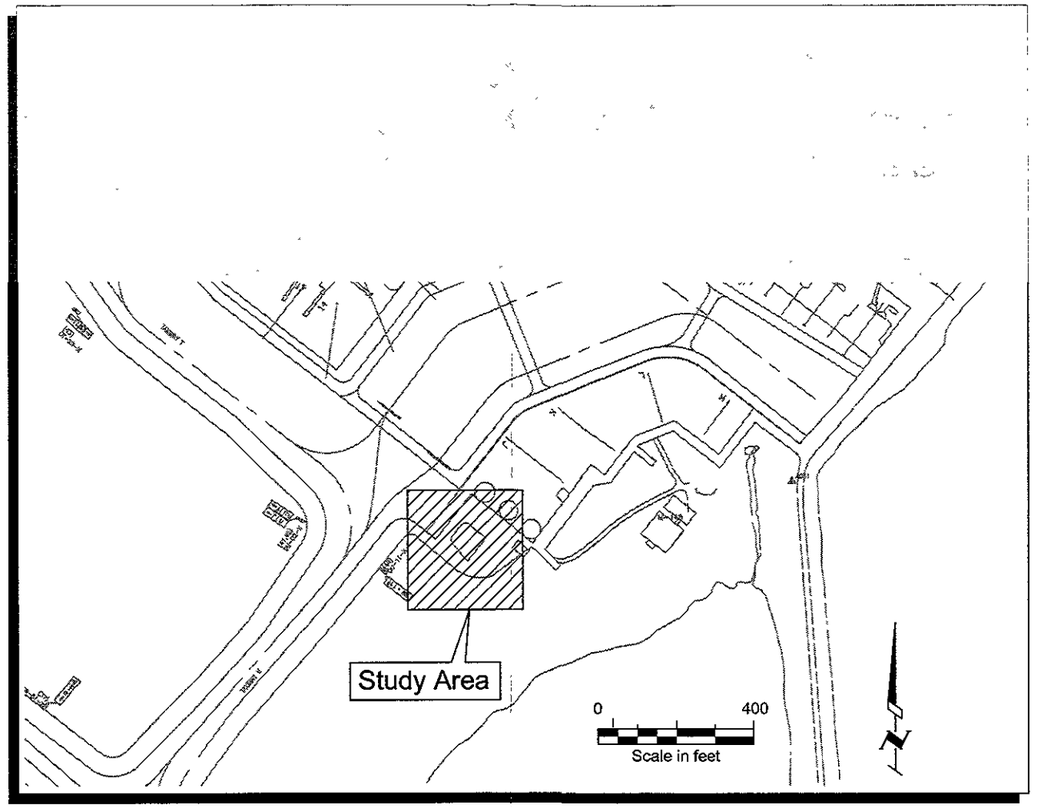
MW-1	
TPH G	ND<50
TPH D	60
TPH MO	ND<250
MTBE	ND<2 5
B	ND<0 5
T	ND<0.5
E	ND<0 5
X	ND<0.5



MW-2	
TPH G	ND<50
TPH D	51
TPH MO	ND<250
MTBE	ND<2.5
B	ND<0.5
T	ND<0.5
E	ND<0.5
X	ND<0.5

MW-3	
TPH G	ND<50
TPH D	60
TPH MO	ND<250
MTBE	ND<2.5
B	ND<0.5
T	ND<0.5
E	ND<0.5
X	ND<0.5

MW-1	
TPH G	ND<50
TPH D	210
TPH MO	ND<250
MTBE	ND<2.5
B	ND<0.5
T	ND<0.5
E	ND<0.5
X	ND<0.5



KEY:

TPH G = TPH Gas
TPH D = TPH Diesel
TPH MO = TPH Motor Oil
B = Benzene
T = Toluene
E = Ethylbenzene
X = Xylene

All results in ug/L.

Samples collected 5/30/00.

49667005.DWG 0.0
20001214,1151

Harding Lawson Associates
Engineering and
Environmental Services

Groundwater Chemical Results
Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

PLATE **5**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	49667.1		7/00	12/00

APPENDIX A
BORING LOGS AND WELL COMPLETION LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM - ASTM D2488-93

MAJOR DIVISIONS			SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS OVER 50% RETAINED ON No.200 SIEVE SIZE	GRAVELS MORE THAN 1/2 OF COARSE FRACTION RETAINED ON No.4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW	Well-graded gravels or gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		GRAVELS WITH OVER 15% FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS MORE THAN 1/2 OF COARSE FRACTION PASSING No.4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW	Well-graded sand or gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		SANDS WITH OVER 15% FINES	SM	Silty sand, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS OVER 50% PASSING No.200 SIEVE SIZE	SILTS & CLAYS LIQUID LIMIT 50% OR LESS		ML	Inorganic silts and sandy or gravelly silts, rock flour
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LIQUID LIMIT GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays and silty clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils

	SPT Sampler
	Modified California Sampler
	Shelby or Osterberg Sampler
	Rock Core or Pitcher Barrel
	Grab or Bulk Sample
	G.W. measured after water level stabilizes
	G.W. measured during or soon after drilling
Perm	Permeability
Consol	Consolidation
LL	Liquid Limit (%)
PI	Plasticity Index (%)
Gs	Specific Gravity
MA	Particle Size Analysis
-200=55%	Percent Passing No. 200 Sieve

Shear Strength (psf) — Confining Pressure

TxUU	3200 (2600) (FM) or (S)	-Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
TxCU	3200 (2600) (P)	-Consolidated Undrained Triaxial Shear (with or without pore pressure measurement.)
TxCD	3200 (2600)	-Consolidated Drained Triaxial Shear
SSCU	3200 (2600) (P)	-Simple Shear Consolidated Undrained (with or without pore pressure measurement.)
SSCD	3200 (2600)	-Simple Shear Consolidated Drained
DSCD	2700 (2000)	-Consolidated Drained Direct Shear
UC	470	-Unconfined Compression
LVS	700	-Laboratory Vane Shear

KEY TO TEST DATA

Source: ASTM D 2488-93, based on Unified Soil Classification system

SOIL_CLASS_GEOTECH_NEW 49667.GPJ GEOTECH.GDT 8/1/00

Harding Lawson Associates
Engineering and Environmental Services

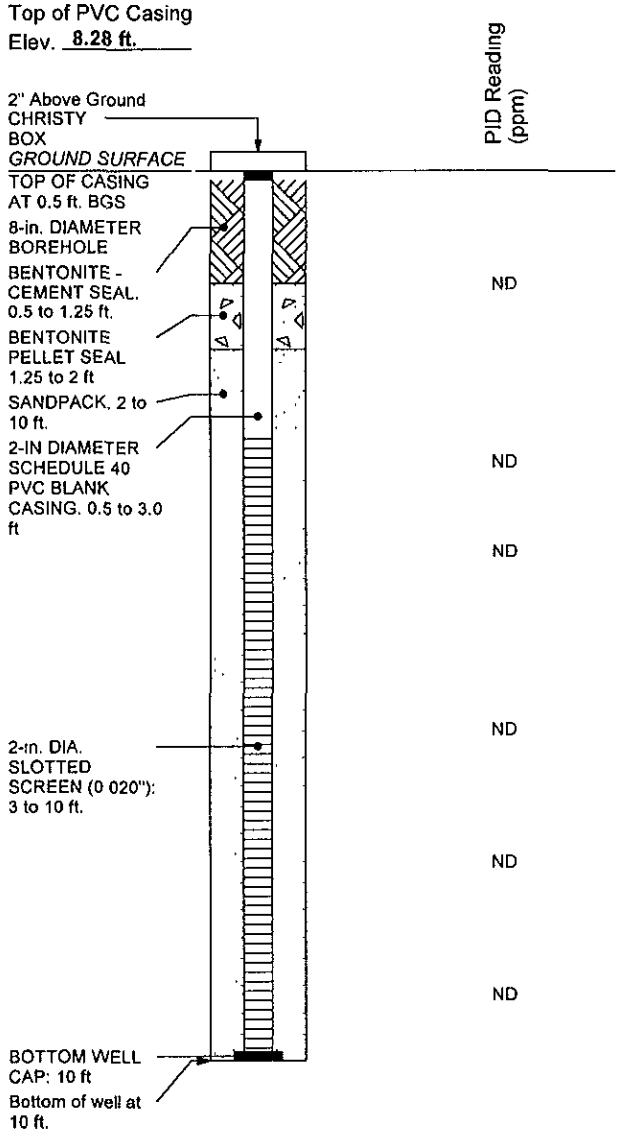
Soil Classification Chart and Key to Test Data
Groundwater Monitoring Well Installation
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

PLATE **A-1**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
AMA	49667 1	110	8/00	

Top of PVC Casing
Elev. 8.28 ft.

Equipment Hollow Stem Auger
Hole Diameter 8 in.
Surface Elevation _____ **Date** 4/27/00
Reference Datum Port of Oakland



PID Reading (ppm)	Depth (ft.)	Sample	
ND	0		LIGHT BROWN SAND (SP) Medium dense, damp
ND			Shell fragments
ND			Wet
	5		
ND			@ 6 ft.: Color change to gray
ND			
ND			
	10		Boring terminated at 10 ft.

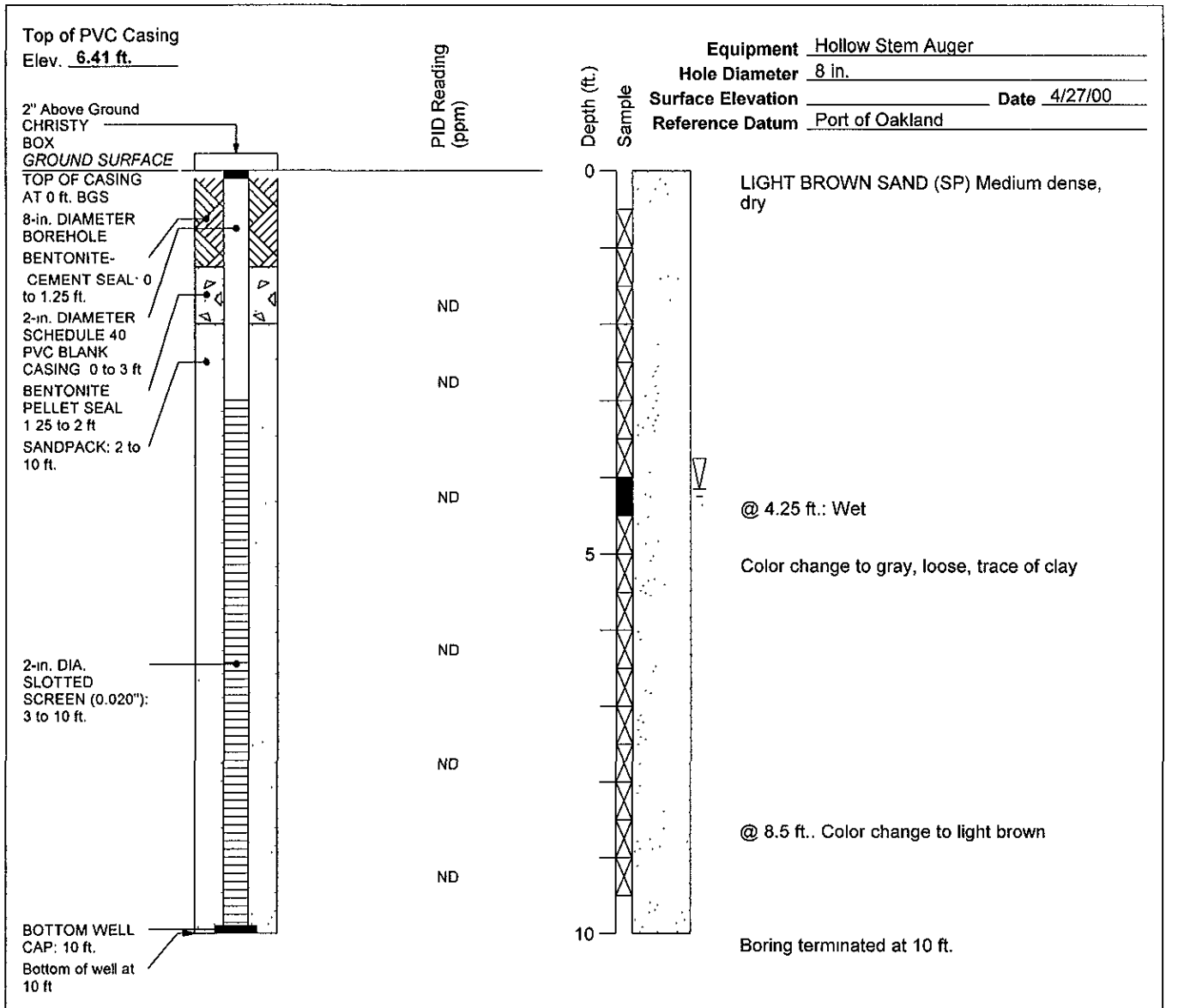
BORING_WELL 49667.GPJ TEMP.GDT 8/1/00

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring MW-1
Groundwater Monitoring Well Installation
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

PLATE
A-2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	49667 1		8/00	



BORING_WELL 49667 GPJ TEMP GDT 8/1/00

Harding Lawson Associates
Engineering and
Environmental Services

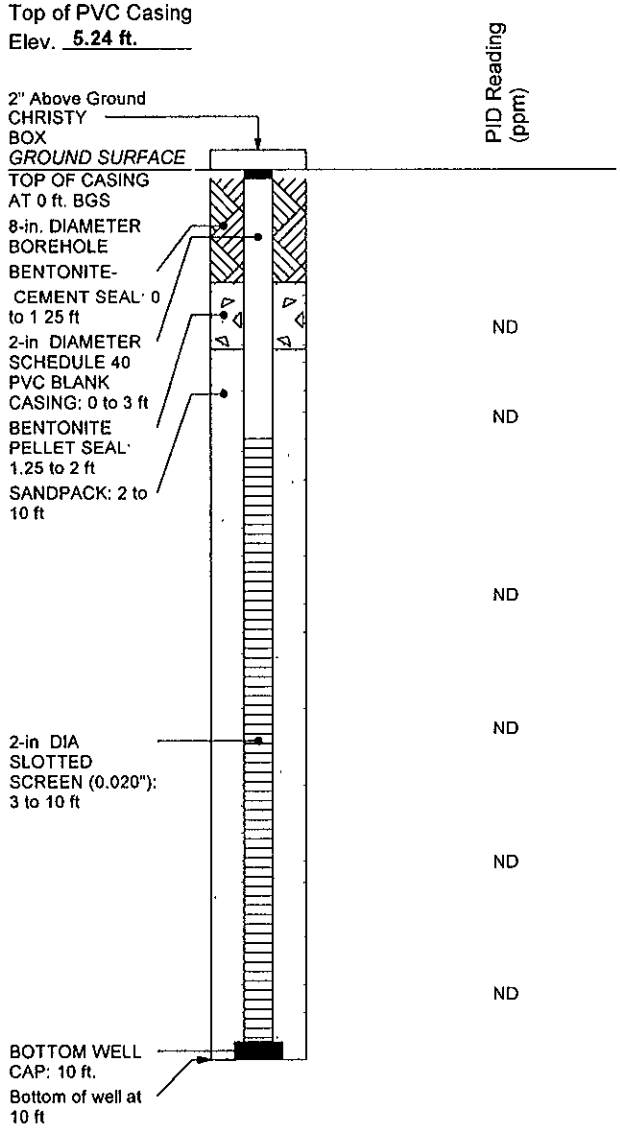
Log of Boring MW-2
Groundwater Monitoring Well Installation
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

PLATE
A-3

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	49667 1		8/00	

Top of PVC Casing
Elev. 5.24 ft.

Equipment Hollow Stem Auger
Hole Diameter 8 in
Surface Elevation _____ **Date** 4/27/00
Reference Datum Port of Oakland



PID Reading (ppm)	Depth (ft.)	Sample	
ND	0		LIGHT BROWN SAND (SP) Medium dense, dry
ND			Change to damp
ND			@ 3.75 ft.: Wet
ND	5		Color change to gray, loose, trace of clay
ND			
ND			
ND	10		Boring terminated at 10 ft.

BORING_WELL 49667.GPJ TEMP GDT 8/1/00

Harding Lawson Associates
Engineering and Environmental Services

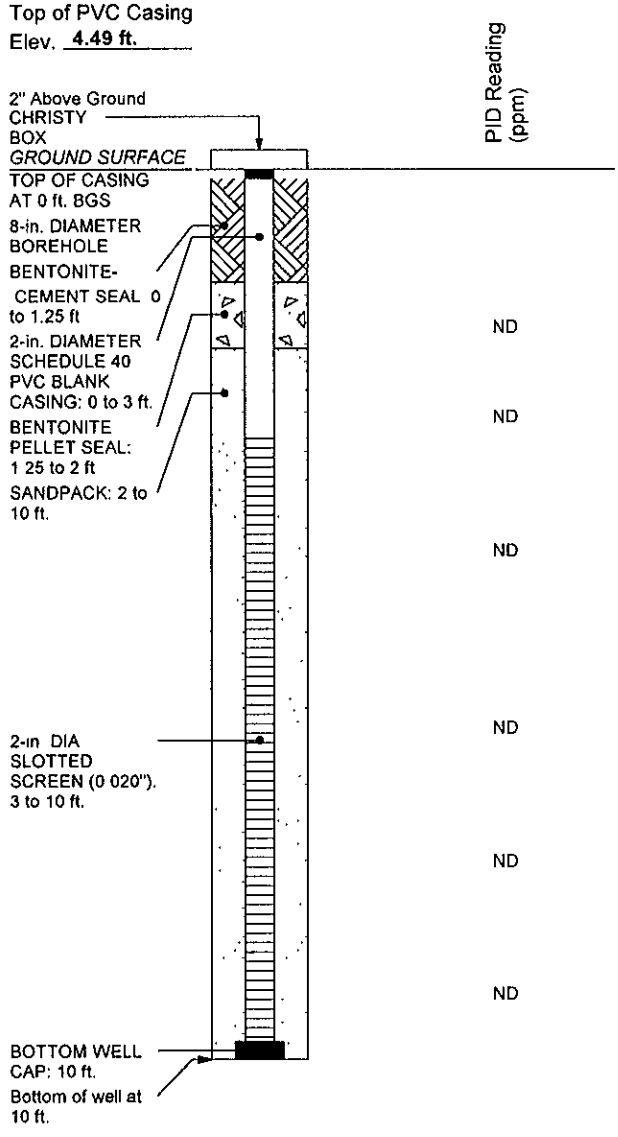
Log of Boring MW-3
Groundwater Monitoring Well Installation
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

PLATE
A-4

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	49667 1		8/00	

Top of PVC Casing
Elev. **4.49 ft.**

Equipment Hollow Stem Auger
Hole Diameter 8 in.
Surface Elevation _____ **Date** 4/27/00
Reference Datum Port of Oakland



PID Reading (ppm)	Depth (ft.)	Sample	
ND	0		LIGHT BROWN SAND (SP) Medium dense, dry
ND			
ND			@ 3.25 ft.: Wet
	5		Color change to gray, loose, trace of clay
ND			
ND			@ 8.5 ft.: Color change to light brown
ND	10		Boring terminated at 10 ft.

BORING_WELL 49667 GPJ TEMP GDT 8/1/00

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring MW-4
Groundwater Monitoring Well Installation
South Airport Self-Fueling Facility, Taxiway U
Oakland, California

PLATE
A-5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
PCB	49667 1		8/00	

APPENDIX B
WELL DEVELOPMENT FORMS

Harding Lawson Associates

Well Development Form

Project: Taxiway U

Personnel: HDL

Development Method: Surge/pump

Well No.: MW-1

Date: 5/18/00

Time	Depth to Water (ft)	Gallons Removed	Turbidity (Ntu)	pH	Temp °F	E.C.	Recovery Rate inches/min	Recovery Rate gpm	Observations
0800	DW 4.96 / TD 8.95	∅							white pipe residue on sand
0818-0821	- Surge								
0822	5.07/9.46	initial	>1000	7.96	68.4	1370			murky brown
0827	5.32/9.92	4	>1000	8.06	66.3	1330			bail
0853	5.75/9.56	14	~~2555~~	8.21	71.1	1690			pump
0901	5.30	16	>1000	7.94	69.3	1330			bail
0907		23	302	8.20	69.5	1600			
0911		26	36.39	8.23	70.3	1650			
0913		~~29~~	17.14	8.25	71.2	1870			
0916		32	12.61	8.25	~~70~~ 70.0	1770			
0918		35	6.34	8.32	70.1	1820			
0919		38	3.96	8.24	~~69~~ 69.6	1810			
0921	6.26	40	4.26	8.27	69.8	1950			

Total Gallons Removed: 40

Harding Lawson Associates

Well Development Form

Project: Tanforan H
Personnel: HDL

Development Method: Surge/bail/pump

Well No. MW-2
Date: 5/18/00

Time	Depth to Water (ft)	Gallons Removed	Turbidity (Ntu)	pH	Temp ~~°C~~ °F	E.C.	Recovery Rate inches/min	Recovery Rate gpm	Observations
0933	DW 3.22 / TD 8.74	Ø							white pipe residue on sounder
0940-0950	- surge well								
0951	3.29/8.91	initial	>1000	9.26	71.0	357			silty brown high silt
0957		3	>1000	9.09	71.9	351			high silt
0959		6	~~>1000~~ 710	9.04	69.5	304			
1002		10	598	8.92	70.6	334			
1005		15	236	9.06	70.9	447			
1007		19	103	9.08	69.6	355			
1009		22	95	9.03	71.0	482			
1011		26	74	9.11	72.7	423			
1014		31	59	9.35	70.7	380			
1016		35	42.32	9.09	71.0	363			
1016		38	36.02	9.07	71.0	378			

Total Gallons Removed

Harding Lawson Associates

Well Development Form

Project: Taxiway U

Personnel: HDL

Development Method: Surge/pump

Well No.: MW-2 cont

Date: 5/18/00

Time	Depth to Water (ft)	Gallons Removed	Turbidity (Ntu)	pH	Temp °C	E.C.	Recovery Rate inches/min	Recovery Rate gpm	Observations
1021		42	31.26	9.02	71.7	551			
1023		47	30.29	8.82	70.8	394			
1026		51	25.43	8.97	69.3	397			
1028		54	23.02	9.13	72.5	363			
1030		59	21.06	9.15	70.5	418			
1032		63	19.59	9.12	69.3	398			
1034	4.92	65					12		
1035	3.94	65							

Total Gallons Removed: 65

Harding Lawson Associates

Well Development Form

Project: Taxiway Z1

Personnel: [illegible]

Development Method surge/pump

Well No. MW/3

Date: 5/18/00

Time	Depth to Water (ft)	Gallons Removed	Turbidity (Ntu)	pH	Temp °C °F	E.C.	Recovery Rate inches/min	Recovery Rate gpm	Observations
1344	DW 3.33 TD 9.16	8							white residue
1348 - 1358 - purge well									
1359	2.61	initial	71000	8.99	72.3	2430			dark silty gray brown
1403		6	71000	8.93	70.6	2290			
1407		9	71000	8.83	71.1	2600			
1410		14	597	8.84	70.1	1850			starts to clear
1412		18	330	8.76	69.9	1790			
1415		22	284	8.68	69.7	1730			
1417		26	181	8.70	70.1	1650			
1419		30	146	8.65	70.3	1640			
1425		34	238	8.62	70.2	1350			
1428		38	295	8.61	68.5	1540			
1431		42	199	8.62	70.2	1470			

Total Gallons Removed

Harding Lawson Associates

Well Development Form

Project: Taxiway A

Personnel: HDL/C

Development Method surge/pump

Well No. MW-3 cont

Date: 5/18/05

Time	Depth to Water (ft)	Gallons Removed	Turbidity (Ntu)	pH	Temp °C °F	E.C.	Recovery Rate inches/min	Recovery Rate gpm	Observations
1433	↓	50	89	8.64	71.3	1370			
1436		54	69	8.60	71.1	1400			
1438		58	29.88	8.63	70.4	1310			
1441		62	20.2/	8.64	70.9	1370			
1444	3.95								
1445	3.13/9.45								

Total Gallons Removed 64

Harding Lawson Associates

Well Development Form

Project: Taxiway U

Personnel: HDL

Development Method: Surge / pump

Well No. MW-4

Date: 5/18/05

Time	Depth to Water (ft)	Gallons Removed	Turbidity (Ntu)	pH	Temp °C	E.C.	Recovery Rate inches/min	Recovery Rate gpm	Observations
1211	DW TD 2.47/9.65	Ø							white pipe residue on grinder
1216-1226 - surge									
1227	2.91/9.61	initial	71006	8.47	69.0	2120			dark gray brown
1236		4	71000	8.57	76.3	2140			
1239		6	71000	8.69	74.3	1560			
1242		9	71008	8.66	78.8	1700			
1246		13	328	8.53	74.5	1090			starts to clear
1257		18	177	8.52	79.0	1890			
1255		21	50	8.51	75.9	1360			
1301		25	38.31	8.59	75.3	1430			
1303		28	23.01	8.58	75.7	1450			
1305		30	37.33	8.61	77.0	1700			
1309		34	29.49	8.33	79.3	2020			

Total Gallons Removed _____

Harding Lawson Associates

Well Development Form

Project: Taxiway L1

Personnel: HDL

Development Method purge/pump

Well No. MW-4-cont

Date: 5/18/00

Time	Depth to Water (ft)	Gallons Removed	Turbidity (Ntu)	pH	Temp °F	E.C.	Recovery Rate inches/min	Recovery Rate gpm	Observations
1313		38	18.39	8.58	76.3	1583			
1316		41	19.81	8.57	76.9	1780			
1320		45	16.96	8.50	79.1	2000			
1322		50	14.95	8.49	75.8	1570			
1323	8.22								
1324	5.84								

Total Gallons Removed 50

APPENDIX C
GROUNDWATER SAMPLING FORMS

Harding Lawson Associates
Engineering and Environmental Services

GROUNDWATER SAMPLING FORM

Well Number: MW- 1

Well Type: [x] Monitor [ ] Extraction [ ] Other ___
[x] PVC [ ] St. Steel [ ] Other ___

Job Name: Port of Oakland - Taxiway U

Job Number: 49667.1

Date: 5/30/00

Recorded By: (Signature)

Sampled By: HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches): 2
Total Depth of Casing (TD in ft BTOC): ~~9.40~~ 10
Water Level Depth (WL in ft BTOC): 5.11
No.of Well Volumes to be purged (# 4

PURGE METHOD

[x] Bailer - Type: teflon
[ ] Submersible - Type:
[ ] Other - Type:

PUMP INTAKE SETTING

[ ] Near Bottom [ ] Near Top
[ ] Other
Depth in feet (BTOC):
Screen Interval in feet (BTOC): from ___ to ___

PURGE VOLUME CALCULATION

(10 - 5.11) X 2 ² X 4 X 0.0408 = 3.19 gals
TD (feet) WL (Feet) D (inches) # V Calculated Purge Volume

Field Parameter Measurement

Minutes	pH	Conductivity (µS)	Temp. [ ]°C [x]°F
Initial	8.10	1090	68.2
1	7.84	1220	71.2
2	7.72	1220	71.4
3	7.73	1220	70.6
4	7.77	1380	70.6
Meter S/N	9510	9510	9510

PURGE TIME

Purge Start: 1121
Purge Stop: 1131
Elapsed: 10

PURGE RATE

GPM: ___
GPM: ___

PURGE VOLUME

Volume: 4 gallons

Observations During Purging (Well Condition, Color, Odor):
clear, no odor

Discharge Water Disposal: [ ] Sanitary Sewer
[ ] Storm Sewer [x] Other onsite drum

WELL SAMPLING

[x] Bailer - Type: disposable

Sample Time: 1145

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
MW- 1	3 VOA	TPH gas by 8015	HCL	Sequoia	
	3 VOA	8020/MTBE/BTEX	HCL	Sequoia	
	2 amber VOA	TOC by 415.1	HCL	Sequoia	
	1 LA	TPH diesel	none	Sequoia	
	1 500mL Poly	Total Iron	HNO3	Sequoia	
	1 500mL Poly	Ferrous Iron, NO3, SO4, PO4	none	Sequoia	24 hour HT on ferrous iron
	1LP	"	none	"	

QUALITY CONTROL SAMPLES

Duplicate Samples	
Original Sample No.	Dupl Sample No.

Blank Samples	
Type	Sample No.

Other Samples	
Type	Sample No.

Harding Lawson Associates
Engineering and Environmental Services

GROUNDWATER SAMPLING FORM

Well Number: MW- 2

Well Type: [x] Monitor [ ] Extraction [ ] Other ___
[x] PVC [ ] St. Steel [ ] Other ___

Job Name: Port of Oakland - Taxiway U

Job Number: 49667.1

Recorded By: Heather Dee (Signature)

Date: 5/30/00

Sampled By: HDL (initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches): 2
Total Depth of Casing (TD in ft BTOC): 15
Water Level Depth (WL in ft BTOC): 3.49
No.of Well Volumes to be purged (# 4

PURGE METHOD

[x] Bailer - Type: teflon
[ ] Submersible - Type:
[ ] Other - Type:

PUMP INTAKE SETTING

[ ] Near Bottom [ ] Near Top
[ ] Other
Depth in feet (BTOC):
Screen Interval in feet (BTOC): from ___ to ___

PURGE VOLUME CALCULATION

(TD 15 - WL 3.49) x D (inches) 2 ² x # V 4 x 0.0408 = Calculated Purge Volume 4.24 gals

PURGE TIME

Purge Start: 1044
Purge Stop: 1052
Elapsed: 8

PURGE RATE

GPM: ___
GPM: ___

PURGE VOLUME

Volume: ___ gallons

Field Parameter Measurement

Minutes	pH	Conductivity (µS)	Temp. [ ] °C [x] °F
Initial	8.68	288	64.9
1.5	8.33	443	67.8
2.5	8.40	275	67.4
3.5	8.29	245	67.5
4.5	8.22	276	66.9
Meter S/N	9510	9510	9510

Observations During Purging (Well Condition, Color, Odor):
initially clear, becomes light brown, no odor

Discharge Water Disposal: [ ] Sanitary Sewer [ ] Storm Sewer [x] Other onsite drum

WELL SAMPLING

[x] Bailer - Type: disposable

Sample Time: 1103

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
MW- 2	3 VOA	TPH gas by 8015	HCL	Sequoia	
	3 VOA	8020/MTBE/BTEX	HCL	Sequoia	
	2 amber VOA	TOC by 415.1	HCL	Sequoia	
	1 LA	TPH diesel	none	Sequoia	
	1 500mL Poly	Total Iron	HNO3	Sequoia	
	1 500mL Poly	Ferrous Iron, NO3, SO4, PO4	none	Sequoia	24 hour HT on ferrous iron
	1 LP	2	none	1	

QUALITY CONTROL SAMPLES

Duplicate Samples	
Original Sample No.	Dupl. Sample No.

Blank Samples	
Type	Sample No.

Other Samples	
Type	Sample No.

Harding Lawson Associates
Engineering and Environmental Services

GROUNDWATER SAMPLING FORM

Well Number: MW-3

Well Type: [x] Monitor [ ] Extraction [ ] Other ___ ; [x] PVC [ ] St. Steel [ ] Other ___

Job Name: Port of Oakland - Taxiway U

Job Number: 49667 1

Date: 5/30/00

Recorded By: Heather D Lee (Signature)

Sampled By: HDL (initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches): 2
Total Depth of Casing (TD in ft BTOC): 9.43
Water Level Depth (WL in ft BTOC): 2.78
No.of Well Volumes to be purged (# 4

PURGE METHOD

[x] Bailer - Type: teflon
[ ] Submersible - Type:
[ ] Other - Type:

PUMP INTAKE SETTING

[ ] Near Bottom [ ] Near Top
[ ] Other
Depth in feet (BTOC):
Screen Interval in feet (BTOC): from ___ to ___

PURGE VOLUME CALCULATION

(9.43 - 2.78) X 2 ² X 4 X 0.0408 = 4.39 gals

TD (feet) WL (Feet) D (inches) #V Calculated Purge Volume

Field Parameter Measurement

Minutes	pH	Conductivity (µS)	Temp. [ ] °C [x] °F
Initial	8.21	1210	68.0
1.5	8.04	1540	68.6
2.5	7.98	2280	67.6
3.5	8.05	1510	67.8
4.5	8.10	1730	68.1
Meter S/N	9510	9510	9510

PURGE TIME

Purge Start: 1013
Purge Stop: 1021
Elapsed: 8

PURGE RATE

GPM:
GPM:

PURGE VOLUME

Volume 4.5 gallons

Observations During Purging (Well Condition, Color, Odor):
initially clear, became light brown, no odor

Discharge Water Disposal: [ ] Sanitary Sewer [ ] Storm Sewer [x] Other onsite drum

WELL SAMPLING

[x] Bailer - Type: disposable

Sample Time: 1031

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
MW-3	3 VOA	TPH gas by 8015	HCL	Sequoia	
	3 VOA	8020/MTBE/BTEX	HCL	Sequoia	
	2 amber VOA	TOC by 415.1	HCL	Sequoia	
	1 LA	TPH diesel	none	Sequoia	
	1 500mL Poly	Total Iron	HNO3	Sequoia	
	1 500mL Poly	Ferrous Iron, NO3, SO4, PO4	none	Sequoia	24 hour HT on ferrous iron

QUALITY CONTROL SAMPLES

Duplicate Samples	
Original Sample No.	Dupl. Sample No.

Blank Samples	
Type	Sample No

Other Samples	
Type	Sample No.

Harding Lawson Associates
Engineering and Environmental Services

GROUNDWATER SAMPLING FORM

Well Number: MW- 4

Well Type: [x] Monitor [ ] Extraction [ ] Other ___ ; [x] PVC [ ] St. Steel [ ] Other ___

Job Name: Port of Oakland - Taxiway U

Job Number: 49667.1

Date: 5/30/00

Recorded By: Heather D Lee (Signature)

Sampled By: HDL (Initials)

WELL PURGING

PURGE VOLUME

Casing Diameter (D in inches): 2
Total Depth of Casing (TD in ft BTOC): 9.75
Water Level Depth (WL in ft BTOC): 2.93
No.of Well Volumes to be purged (# 4

PURGE METHOD

[x] Bailer - Type: teflon
[ ] Submersible - Type:
[ ] Other - Type:

PUMP INTAKE SETTING

[ ] Near Bottom [ ] Near Top
[ ] Other
Depth in feet (BTOC):
Screen Interval in feet (BTOC): from ___ to ___

PURGE VOLUME CALCULATION

(9.75 - 2.93) X 2 ² X 4 X 0.0408 = 4.45 gals

TD (feet) WL (Feet) D (inches) # V Calculated Purge Volume

Field Parameter Measurement

Minutes	pH	Conductivity (µS)	Temp. [ ] °C [x] °F	
Initial	7.61	630	70.4	
1.5	7.63	643	67.5	
3.5	7.73	713	66.0	
5	7.75	749	65.8	
Meter S/N	9510	9510	9510	

PURGE TIME

Purge Start: 0931
Purge Stop: 0940
Elapsed: 9

PURGE RATE

GPM:
GPM:

PURGE VOLUME

Volume: 5 gallons

Observations During Purging (Well Condition, Color, Odor):
initially clear becomes light brown no odor

Discharge Water Disposal: [ ] Sanitary Sewer [ ] Storm Sewer [x] Other onsite drum

WELL SAMPLING

[x] Bailer - Type: disposable

Sample Time: 0950

Sample No.	Volume/Cont.	Analysis Requested	Preservatives	Lab	Comments
MW- 4	3 VOA	TPH gas by 8015	HCL	Sequoia	
	3 VOA	~~8240~~ MTBE/BTEX	HCL	Sequoia	
	2 amber VOA	TOC by 415.1	HCL	Sequoia	
	1 LA	TPH diesel	none	Sequoia	
	1 500mL Poly	Total Iron	HNO3	Sequoia	
	1 500mL Poly	Ferrous Iron, ~~NO3, SO4, PO4~~	none	Sequoia	24 hour HT on ferrous iron
	1 L Poly	" NO3, SO4, PO4	none	"	

QUALITY CONTROL SAMPLES

Duplicate Samples	
Original Sample No.	Dupl. Sample No.

Blank Samples	
Type	Sample No.

Other Samples	
Type	Sample No.

APPENDIX D
MONITORING WELL SURVEY DATA

Project: 00030 Fri Jul 21 12:08:26 2000

Point statistics:

Starting point number: 1

Current point number: 9 ('L' indicates locked point)

Current Coordinate Listing by Selection

Point	Northing	Easting	Elevation	Description
8	2084890.8879	6065651.7055	4.49	MW4
7	2084958.4453	6065503.1385	5.24	MW3
6	2085001.1226	6065455.0511	6.41	MW2
5	2085076.0032	6065507.0442	8.28	MW1

APPENDIX E
SOIL LABORATORY REPORTS AND CHAIN-OF-CUSTODY FORMS

Sequoia
Analytical

404 N. Wiget Lane
Walnut Creek, CA 94598
(925) 988-9600
FAX (925) 988-9673
www.sequoialabs.com

16 May, 2000

Steve Osborne
Harding-Lawson Associates - Oakland
383 Fourth Street
Oakland, CA 94607

RE: Taxiway U
Sequoia Report: W004649

Enclosed are the results of analyses for samples received by the laboratory on 28-Apr-00 13:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dimple Sharma
Project Manager

CA ELAP Certificate #1271

Sequoia Analytical

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-1@4.5'	W004649-01	Soil	27-Apr-00 08:42	28-Apr-00 13:30
MW-2@4.0'	W004649-02	Soil	27-Apr-00 09:43	28-Apr-00 13:30
MW-3@3.5'	W004649-03	Soil	27-Apr-00 10:20	28-Apr-00 13:30
MW-4@3.0'	W004649-04	Soil	27-Apr-00 11:15	28-Apr-00 13:30
Drum 4223	W004649-05	Soil	27-Apr-00 12:00	28-Apr-00 13:30
Drum 4230	W004649-06	Soil	27-Apr-00 12:05	28-Apr-00 13:30

Dimple Sharma, Project Manager

Sequoia Analytical

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1@4.5' (W004649-01) Soil Sampled: 27-Apr-00 08:42 Received: 28-Apr-00 13:30									
Purgeable Hydrocarbons	ND	1.0	mg/kg	20	0E03002	03-May-00	04-May-00	EPA 8015/8020	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	0.050	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*95.7 %*		*40-140*		"	"	"	
MW-2@4.0' (W004649-02) Soil Sampled: 27-Apr-00 09:43 Received: 28-Apr-00 13:30									
Purgeable Hydrocarbons	ND	1.0	mg/kg	20	0E03002	03-May-00	04-May-00	EPA 8015/8020	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	0.050	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*90.7 %*		*40-140*		"	"	"	
MW-3@3.5' (W004649-03) Soil Sampled: 27-Apr-00 10:20 Received: 28-Apr-00 13:30									
Purgeable Hydrocarbons	ND	1.0	mg/kg	20	0E03002	03-May-00	04-May-00	EPA 8015/8020	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	0.050	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*93.0 %*		*40-140*		"	"	"	

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-4@3.0' (W004649-04) Soil Sampled: 27-Apr-00 11:15 Received: 28-Apr-00 13:30									
Purgeable Hydrocarbons	ND	1.0	mg/kg	20	0E03002	03-May-00	04-May-00	EPA 8015/8020	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	0.050	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*86.0 %*		*40-140*	"	"	"	"	
Drum 4223 (W004649-05) Soil Sampled: 27-Apr-00 12:00 Received: 28-Apr-00 13:30									
Purgeable Hydrocarbons	ND	1.0	mg/kg	20	0E03002	03-May-00	04-May-00	EPA 8015/8020	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	0.050	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*88.3 %*		*40-140*	"	"	"	"	
Drum 4230 (W004649-06) Soil Sampled: 27-Apr-00 12:05 Received: 28-Apr-00 13:30									
Purgeable Hydrocarbons	ND	1.0	mg/kg	20	0E03002	03-May-00	04-May-00	EPA 8015/8020	
Benzene	ND	0.0050	"	"	"	"	"	"	
Toluene	ND	0.0050	"	"	"	"	"	"	
Ethylbenzene	ND	0.0050	"	"	"	"	"	"	
Xylenes (total)	ND	0.0050	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	0.050	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*89.7 %*		*40-140*	"	"	"	"	

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

Diesel Hydrocarbons (C9-C24) with Silica Gel Cleanup by DHS LUFT

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1@4.5' (W004649-01) Soil	**Sampled: 27-Apr-00 08:42**		**Received: 28-Apr-00 13:30**						
Diesel Range Hydrocarbons	**1.2**	1.0	mg/kg	1	0E09018	09-May-00	16-May-00	DHS LUFT	D-12
Surrogate: n-Pentacosane		*142 %*	*50-150*		"	"	"	"	
MW-2@4.0' (W004649-02) Soil	**Sampled: 27-Apr-00 09:43**		**Received: 28-Apr-00 13:30**						
Diesel Range Hydrocarbons	ND	1.0	mg/kg	1	0E09018	09-May-00	16-May-00	DHS LUFT	
Surrogate: n-Pentacosane		*105 %*	*50-150*		"	"	"	"	
MW-3@3.5' (W004649-03) Soil	**Sampled: 27-Apr-00 10:20**		**Received: 28-Apr-00 13:30**						
Diesel Range Hydrocarbons	ND	1.0	mg/kg	1	0E09018	09-May-00	16-May-00	DHS LUFT	
Surrogate: n-Pentacosane		*90.1 %*	*50-150*		"	"	"	"	
MW-4@3.0' (W004649-04) Soil	**Sampled: 27-Apr-00 11:15**		**Received: 28-Apr-00 13:30**						
Diesel Range Hydrocarbons	ND	1.0	mg/kg	1	0E09018	09-May-00	16-May-00	DHS LUFT	
Surrogate: n-Pentacosane		*90.1 %*	*50-150*		"	"	"	"	
Drum 4223 (W004649-05) Soil	**Sampled: 27-Apr-00 12:00**		**Received: 28-Apr-00 13:30**						
Diesel Range Hydrocarbons	**13**	1.0	mg/kg	1	0E09018	09-May-00	16-May-00	DHS LUFT	D-12
Surrogate: n-Pentacosane		*244 %*	*50-150*		"	"	"	"	*D-07*
Drum 4230 (W004649-06) Soil	**Sampled: 27-Apr-00 12:05**		**Received: 28-Apr-00 13:30**						
Diesel Range Hydrocarbons	**1.2**	1.0	mg/kg	1	0E09018	09-May-00	16-May-00	DHS LUFT	D-12
Surrogate: n-Pentacosane		*109 %*	*50-150*		"	"	"	"	

Sequoia Analytical

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

Total Metals by EPA 6000/7000 Series Methods

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1@4.5' (W004649-01) Soil	**Sampled: 27-Apr-00 08:42**	**Received: 28-Apr-00 13:30**							
Lead	**1.9**	1.0	mg/kg	1	0E01006	01-May-00	02-May-00	EPA 6010A	
MW-2@4.0' (W004649-02) Soil	**Sampled: 27-Apr-00 09:43**	**Received: 28-Apr-00 13:30**							
Lead	**1.0**	1.0	mg/kg	1	0E01006	01-May-00	02-May-00	EPA 6010A	
MW-3@3.5' (W004649-03) Soil	**Sampled: 27-Apr-00 10:20**	**Received: 28-Apr-00 13:30**							
Lead	ND	1.0	mg/kg	1	0E01006	01-May-00	02-May-00	EPA 6010A	
MW-4@3.0' (W004649-04) Soil	**Sampled: 27-Apr-00 11:15**	**Received: 28-Apr-00 13:30**							
Lead	**3.2**	1.0	mg/kg	1	0E01006	01-May-00	02-May-00	EPA 6010A	
Drum 4223 (W004649-05) Soil	**Sampled: 27-Apr-00 12:00**	**Received: 28-Apr-00 13:30**							
Lead	**2.5**	1.0	mg/kg	1	0E01006	01-May-00	02-May-00	EPA 6010A	
Drum 4230 (W004649-06) Soil	**Sampled: 27-Apr-00 12:05**	**Received: 28-Apr-00 13:30**							
Lead	**3.0**	1.0	mg/kg	1	0E01006	01-May-00	02-May-00	EPA 6010A	

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT - Quality Control

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0E03002 - EPA 5030B [MeOH]										
Blank (0E03002-BLK1)				Prepared & Analyzed: 03-May-00						
Purgeable Hydrocarbons	ND	20	mg/kg							
Benzene	ND	10	"							
Toluene	ND	10	"							
Ethylbenzene	ND	10	"							
Xylenes (total)	ND	10	"							
Methyl tert-butyl ether	ND	1.0	"							
Surrogate: a,a,a-Trifluorotoluene	*0.682*		"	*0.600*		*114*	*70-130*			
LCS (0E03002-BS1)				Prepared & Analyzed: 03-May-00						
Benzene	0.778	0.10	mg/kg	0.800		97.2	70-130			
Toluene	0.802	0.10	"	0.800		100	70-130			
Ethylbenzene	0.834	0.10	"	0.800		104	70-130			
Xylenes (total)	2.46	0.10	"	2.40		102	70-130			
Surrogate: a,a,a-Trifluorotoluene	*0.652*		"	*0.600*		*109*	*70-130*			
Matrix Spike (0E03002-MS1)		**Source: W004628-11**		Prepared & Analyzed: 03-May-00						
Benzene	0.816	0.10	mg/kg	0.800	ND	102	70-130			
Toluene	0.854	0.10	"	0.800	ND	107	70-130			
Ethylbenzene	0.880	0.10	"	0.800	ND	110	70-130			
Xylenes (total)	2.60	0.10	"	2.40	ND	108	70-130			
Surrogate: a,a,a-Trifluorotoluene	*0.578*		"	*0.600*		*96.3*	*70-130*			
Matrix Spike Dup (0E03002-MSD1)		**Source: W004628-11**		Prepared & Analyzed: 03-May-00						
Benzene	0.844	0.10	mg/kg	0.800	ND	105	70-130	3.37	20	
Toluene	0.882	0.10	"	0.800	ND	110	70-130	3.23	20	
Ethylbenzene	0.906	0.10	"	0.800	ND	113	70-130	2.91	20	
Xylenes (total)	2.64	0.10	"	2.40	ND	110	70-130	1.53	20	
Surrogate: a,a,a-Trifluorotoluene	*0.606*		"	*0.600*		*101*	*70-130*			

Sequoia Analytical

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

Diesel Hydrocarbons (C9-C24) with Silica Gel Cleanup by DHS LUFT - Quality Control

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0E09018 - EPA 3550A										
Blank (0E09018-BLK1)				Prepared: 09-May-00 Analyzed: 11-May-00						
Hydraulic Fluid	ND	10	mg/kg							
Motor Oil (C16-C36)	ND	10	"							
Diesel Range Hydrocarbons	ND	1.0	"							
Surrogate: n-Pentacosane	*1.11*		"	*1.11*		*100*	*50-150*			
LCS (0E09018-BS1)				Prepared: 09-May-00 Analyzed: 11-May-00						
Diesel Range Hydrocarbons	10.4	1.0	mg/kg	15.0		69.3	60-140			
Surrogate: n-Pentacosane	*1.12*		"	*1.11*		*101*	*50-150*			
LCS Dup (0E09018-BSD1)				Prepared: 09-May-00 Analyzed: 11-May-00						
Diesel Range Hydrocarbons	10.3	1.0	mg/kg	15.0		68.7	60-140	0.966	40	
Surrogate: n-Pentacosane	*1.10*		"	*1.11*		*99.1*	*50-150*			

Sequoia Analytical

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

Total Metals by EPA 6000/7000 Series Methods - Quality Control

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0E01006 - EPA 3050B										
Blank (0E01006-BLK1)				Prepared: 01-May-00 Analyzed: 02-May-00						
Lead	ND	1.0	mg/kg							
LCS (0E01006-BS1)				Prepared: 01-May-00 Analyzed: 02-May-00						
Lead	50.5	1.0	mg/kg	50.0		101	80-120			
LCS Dup (0E01006-BSD1)				Prepared: 01-May-00 Analyzed: 02-May-00						
Lead	51.5	1.0	mg/kg	50.0		103	80-120	1.96	20	
Matrix Spike (0E01006-MS1)		Source: W005003-01		Prepared: 01-May-00 Analyzed: 02-May-00						
Lead	59.5	1.0	mg/kg	50.0	12	95.0	80-120			
Matrix Spike Dup (0E01006-MSD1)		Source: W005003-01		Prepared: 01-May-00 Analyzed: 02-May-00						
Lead	58.5	1.0	mg/kg	50.0	12	93.0	80-120	1.69	20	

Sequoia Analytical

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Harding-Lawson Associates - Oakland	Project: Taxiway U	
383 Fourth Street	Project Number: # 49667-1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	16-May-00 15:38

Notes and Definitions

D-07	Surrogate out of control limits because of peak coelution with the sample.
D-12	Chromatogram Pattern: Unidentified Hydrocarbons > C16
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Harding Lawson Associates
383 Fourth Street, Third Floor
Oakland, California 94607
(510) 451-1001 - Phone
(510) 451-3165 - Fax

CHAIN OF CUSTODY FORM

Nº 2502

WO04649

Lab: Sequoia Analytical

Samplers: JGM

Job Number: 49667-1

Name/Location: Taxiway U

Project Manager: Steve Osborne

Recorder: James M°Carty (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	# CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	HCL	Ice	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Day	Time	STATION DESCRIPTION/ NOTES
01			X						1	MW-1	@	4.5'	00	04	27	0842	
02			X						1	MW-2	@	4.0'				0943	
03			X						1	MW-3	@	3.5'				1020	
04			X						1	MW-4	@	3.0'				1115	
05			X						1	Drum	4223					1240	
06			X						1	Drum	4230					1205	

ANALYSIS REQUESTED

EPA 8010	EPA 8020	EPA 8260	EPA 8270	METALS	EPA 8015M/TPHG	EPA 8020/BTEX	EPA 8015M/TPHd,o	Total Lead	MTBE by 8260	TPH w/ silica gel cleanup
					X	X		X	X	X
					X	X		X	X	X
					X	X		X	X	X
					X	X		X	X	X
					X	X		X	X	X
					X	X		X	X	X

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE

MISCELLANEOUS

* confirmation by 8260

Std TAT

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) James M°Carty	RECEIVED BY: (Signature) Will H	DATE/TIME 4-28-00 12:00
RELINQUISHED BY: (Signature) Will H 4-28-00 13:30	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature) (illegible)	DATE/TIME 4/28/00 13:30

METHOD OF SHIPMENT

SAMPLE CONDITION WHEN RECEIVED BY THE LABORATORY

[redacted] Copy White [redacted] Project Copy Yellow [redacted] or Office Copy Pink [redacted]

APPENDIX F
GROUNDWATER LABORATORY REPORTS AND CHAIN-OF-CUSTODY FORMS

Sequoia Analytical

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29 June, 2000

Steve Osborne
Harding-Lawson Associates - Oakland
383 Fourth Street
Oakland, CA 94607

RE: Port of Oakland
Sequoia Report: W005748

Enclosed are the results of analyses for samples received by the laboratory on 30-May-00 15:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Dimple Sharma
Project Manager

CA ELAP Certificate #1271

Sequoia Analytical

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Walnut Creek, CA 94598
(925) 988-9600
FAX (925) 988-9673
www.sequoialabs.com

Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-4	W005748-01	Water	30-May-00 00:00	30-May-00 15:30
MW-3	W005748-02	Water	30-May-00 00:00	30-May-00 15:30
MW-2	W005748-03	Water	30-May-00 00:00	30-May-00 15:30
MW-1	W005748-04	Water	30-May-00 00:00	30-May-00 15:30

Sequoia Analytical - Walnut Creek

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Dimple Sharma, Project Manager

Sequoia Analytical

404 N. Wiget Lane
Walnut Creek, CA 94598
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www.sequoialabs.com

Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-4 (W005748-01) Water Sampled: 30-May-00 09:50 Received: 30-May-00 15:30									
Purgeable Hydrocarbons	ND	50	ug/l	1	0F09001	09-Jun-00	09-Jun-00	EPA 8015M/8020	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
Xylenes (total)	ND	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	19	2.5	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*110 %*		*70-130*		"	"	"	
MW-3 (W005748-02) Water Sampled: 30-May-00 10:31 Received: 30-May-00 15:30									
Purgeable Hydrocarbons	ND	50	ug/l	1	0F09001	09-Jun-00	09-Jun-00	EPA 8015M/8020	
Benzene	ND	0 50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
Xylenes (total)	ND	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	7.5	2.5	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*101 %*		*70-130*		"	"	"	
MW-2 (W005748-03) Water Sampled: 30-May-00 11:03 Received: 30-May-00 15:30									
Purgeable Hydrocarbons	ND	50	ug/l	1	0F09001	09-Jun-00	09-Jun-00	EPA 8015M/8020	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
Xylenes (total)	ND	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	2.5	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*97.7 %*		*70-130*		"	"	"	

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Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-1 (W005748-04) Water Sampled: 30-May-00 11:45 Received: 30-May-00 15:30									
Purgeable Hydrocarbons	ND	50	ug/l	1	0F09001	09-Jun-00	09-Jun-00	EPA 8015M/8020	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
Xylenes (total)	ND	0.50	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	2.5	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*101 %*	*70-130*		"	"	"	"	

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Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Diesel Hydrocarbons (C9-C24) with Silica Gel Cleanup by DHS LUFT

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-4 (W005748-01) Water	**Sampled: 30-May-00 09:50**	**Received: 30-May-00 15:30**							
Diesel Range Hydrocarbons	**210**	50	ug/l	1	0F12011	12-Jun-00	13-Jun-00	DHS LUFT	D-13
Motor Oil (C16-C36)	ND	250	"	"	"	"	"	"	
Surrogate: n-Pentacosane		*124 %*	*50-150*		"	"	"	"	
MW-3 (W005748-02) Water	**Sampled: 30-May-00 10:31**	**Received: 30-May-00 15:30**							
Diesel Range Hydrocarbons	**60**	50	ug/l	1	0F12011	12-Jun-00	13-Jun-00	DHS LUFT	D-12
Motor Oil (C16-C36)	ND	250	"	"	"	"	"	"	
Surrogate: n-Pentacosane		*108 %*	*50-150*		"	"	"	"	
MW-2 (W005748-03) Water	**Sampled: 30-May-00 11:03**	**Received: 30-May-00 15:30**							
Diesel Range Hydrocarbons	**51**	50	ug/l	1	0F12011	12-Jun-00	13-Jun-00	DHS LUFT	D-12
Motor Oil (C16-C36)	ND	250	"	"	"	"	"	"	
Surrogate: n-Pentacosane		*102 %*	*50-150*		"	"	"	"	
MW-1 (W005748-04) Water	**Sampled: 30-May-00 11:45**	**Received: 30-May-00 15:30**							
Diesel Range Hydrocarbons	**60**	50	ug/l	1	0F12011	12-Jun-00	13-Jun-00	DHS LUFT	D-12
Motor Oil (C16-C36)	ND	250	"	"	"	"	"	"	
Surrogate: n-Pentacosane		*96.1 %*	*50-150*		"	"	"	"	

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Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

MTBE Confirmation by EPA Method 8260A

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-4 (W005748-01) Water Sampled: 30-May-00 09:50 Received: 30-May-00 15:30									
Methyl tert-butyl ether	17	2.0	ug/l	1	0F09020	13-Jun-00	13-Jun-00	EPA 8260A	
Surrogate: Dibromofluoromethane		*94.0 %*	*50-150*		"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*106 %*	*50-150*		"	"	"	"	
MW-3 (W005748-02) Water Sampled: 30-May-00 10:31 Received: 30-May-00 15:30									
Methyl tert-butyl ether	**2.6**	2.0	ug/l	1	0F09020	13-Jun-00	13-Jun-00	EPA 8260A	
Surrogate: Dibromofluoromethane		*96.0 %*	*50-150*		"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*106 %*	*50-150*		"	"	"	"	

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Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Total Metals by EPA 6000/7000 Series Methods

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-4 (W005748-01) Water	**Sampled: 30-May-00 09:50**	**Received: 30-May-00 15:30**							
Ferrous Iron	**0.40**	0.010	mg/l	1	0F13017	13-Jun-00	16-Jun-00	EPA 6010A	
Iron	**4.6**	0.010	"	"	"	"	"	EPA 200.7	
MW-3 (W005748-02) Water	**Sampled: 30-May-00 10:31**	**Received: 30-May-00 15:30**							
Ferrous Iron	**0.74**	0.010	mg/l	1	0F13017	13-Jun-00	16-Jun-00	EPA 6010A	
Iron	**3.9**	0.010	"	"	"	"	"	EPA 200.7	
MW-2 (W005748-03) Water	**Sampled: 30-May-00 11:03**	**Received: 30-May-00 15:30**							
Ferrous Iron	**0.13**	0.010	mg/l	1	0F13017	13-Jun-00	16-Jun-00	EPA 6010A	
Iron	**2.9**	0.010	"	"	"	"	"	EPA 200.7	
MW-1 (W005748-04) Water	**Sampled: 30-May-00 11:45**	**Received: 30-May-00 15:30**							
Ferrous Iron	**1.0**	0.010	mg/l	1	0F13017	13-Jun-00	16-Jun-00	EPA 6010A	
Iron	**0.75**	0.010	"	"	"	"	"	EPA 200.7	

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Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Anions by EPA Method 300.0

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-4 (W005748-01) Water	**Sampled: 30-May-00 09:50**		**Received: 30-May-00 15:30**						
Nitrate as NO3	ND	0.10	mg/l	1	0F01025	31-May-00	31-May-00	EPA 300.0	
Orthophosphate as PO4	**0.94**	0.50	"	"	"	"	"	"	
Sulfate as SO4	**38**	0.20	"	2	"	"	"	"	
MW-3 (W005748-02) Water	**Sampled: 30-May-00 10:31**		**Received: 30-May-00 15:30**						
Nitrate as NO3	ND	0.10	mg/l	1	0F01025	31-May-00	31-May-00	EPA 300.0	
Orthophosphate as PO4	ND	0.50	"	"	"	"	"	"	
Sulfate as SO4	**51**	1.0	"	10	"	"	"	"	
MW-2 (W005748-03) Water	**Sampled: 30-May-00 11:03**		**Received: 30-May-00 15:30**						
Nitrate as NO3	**1.3**	0.10	mg/l	1	0F01025	31-May-00	31-May-00	EPA 300.0	
Orthophosphate as PO4	ND	0.50	"	"	"	"	"	"	
Sulfate as SO4	**14**	0.10	"	"	"	"	"	"	
MW-1 (W005748-04) Water	**Sampled: 30-May-00 11:45**		**Received: 30-May-00 15:30**						
Nitrate as NO3	**5.5**	0.10	mg/l	1	0F01025	31-May-00	31-May-00	EPA 300 0	
Orthophosphate as PO4	ND	0.50	"	"	"	"	"	"	
Sulfate as SO4	**76**	1.0	"	10	"	"	"	"	

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Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Conventional Chemistry Parameters by APHA/EPA Methods

Sequoia Analytical - Petaluma

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
MW-4 (W005748-01) Water	**Sampled: 30-May-00 00:00**	**Received: 30-May-00 15:30**							
Total Organic Carbon	**21.4**	4.00	mg/l	4	0060459	20-Jun-00	20-Jun-00	EPA 415.1	
MW-3 (W005748-02) Water	**Sampled: 30-May-00 00:00**	**Received: 30-May-00 15:30**							
Total Organic Carbon	**22.5**	4.00	mg/l	4	0060459	20-Jun-00	20-Jun-00	EPA 415.1	
MW-2 (W005748-03) Water	**Sampled: 30-May-00 00:00**	**Received: 30-May-00 15:30**							
Total Organic Carbon	**9.39**	4.00	mg/l	4	0060459	20-Jun-00	20-Jun-00	EPA 415.1	
MW-1 (W005748-04) Water	**Sampled: 30-May-00 00:00**	**Received: 30-May-00 15:30**							
Total Organic Carbon	**47.2**	4.00	mg/l	4	0060459	20-Jun-00	20-Jun-00	EPA 415.1	

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Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Total Purgeable Hydrocarbons (C6-C12), BTEX and MTBE by DHS LUFT - Quality Control

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0F09001 - EPA 5030B [P/T]										
Blank (0F09001-BLK1)				Prepared & Analyzed: 09-Jun-00						
Purgeable Hydrocarbons	ND	50	ug/l							
Benzene	ND	0.50	"							
Toluene	ND	0.50	"							
Ethylbenzene	ND	0.50	"							
Xylenes (total)	ND	0.50	"							
Methyl tert-butyl ether	ND	2.5	"							
Surrogate: a,a,a-Trifluorotoluene	*31.3*		"	*30.0*		*104*	*70-130*			
LCS (0F09001-BS1)				Prepared & Analyzed: 09-Jun-00						
Benzene	17.9	0.50	ug/l	20.0		89.5	70-130			
Toluene	19.6	0.50	"	20.0		98.0	70-130			
Ethylbenzene	22.6	0.50	"	20.0		113	70-130			
Xylenes (total)	64.7	0.50	"	60.0		108	70-130			
Surrogate: a,a,a-Trifluorotoluene	*26.8*		"	*30.0*		*89.3*	*70-130*			
Matrix Spike (0F09001-MS1)	**Source: W005776-02**			Prepared & Analyzed: 09-Jun-00						
Benzene	15.9	0.50	ug/l	20.0	ND	79.5	70-130			
Toluene	17.2	0.50	"	20.0	ND	86.0	70-130			
Ethylbenzene	19.2	0.50	"	20.0	ND	96.0	70-130			
Xylenes (total)	57.4	0.50	"	60.0	ND	95.7	70-130			
Surrogate: a,a,a-Trifluorotoluene	*26.8*		"	*30.0*		*89.3*	*70-130*			
Matrix Spike Dup (0F09001-MSD1)	**Source: W005776-02**			Prepared & Analyzed: 09-Jun-00						
Benzene	17.1	0.50	ug/l	20.0	ND	85.5	70-130	7.27	20	
Toluene	17.7	0.50	"	20.0	ND	88.5	70-130	2.87	20	
Ethylbenzene	19.5	0.50	"	20.0	ND	97.5	70-130	1.55	20	
Xylenes (total)	57.8	0.50	"	60.0	ND	96.3	70-130	0.694	20	
Surrogate: a,a,a-Trifluorotoluene	*25.5*		"	*30.0*		*85.0*	*70-130*			

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383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Diesel Hydrocarbons (C9-C24) with Silica Gel Cleanup by DHS LUFT - Quality Control

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0F12011 - EPA 3510B										
Blank (0F12011-BLK1)				Prepared: 12-Jun-00 Analyzed: 13-Jun-00						
Diesel Range Hydrocarbons	ND	50	ug/l							
Motor Oil (C16-C36)	ND	250	"							
Surrogate: n-Pentacosane	*31.3*		"	*33.3*		*94.0*	*50-150*			
LCS (0F12011-BS1)				Prepared: 12-Jun-00 Analyzed: 16-Jun-00						
Diesel Range Hydrocarbons	274	50	ug/l	500		54.8	35-125			
Surrogate: n-Pentacosane	*39.7*		"	*33.3*		*119*	*50-150*			
LCS Dup (0F12011-BSD1)				Prepared: 12-Jun-00 Analyzed: 14-Jun-00						
Diesel Range Hydrocarbons	331	50	ug/l	500		66.2	35-125	18.8	50	
Surrogate: n-Pentacosane	*45.0*		"	*33.3*		*135*	*50-150*			

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383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

MTBE Confirmation by EPA Method 8260A - Quality Control
Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0F09020 - EPA 5030B [P/T]										
Blank (0F09020-BLK2)				Prepared & Analyzed: 13-Jun-00						
Methyl tert-butyl ether	ND	2.0	ug/l							
Surrogate: Dibromofluoromethane	*49.0*		"	*50.0*		*98.0*	*50-150*			
Surrogate: 1,2-Dichloroethane-d4	*53.0*		"	*50.0*		*106*	*50-150*			
LCS (0F09020-BS2)				Prepared & Analyzed: 13-Jun-00						
Methyl tert-butyl ether	40.0	2.0	ug/l	50.0		80.0	70-130			
Surrogate: Dibromofluoromethane	*48.0*		"	*50.0*		*96 0*	*50-150*			
Surrogate 1,2-Dichloroethane-d4	*52.0*		"	*50.0*		*104*	*50-150*			
Matrix Spike (0F09020-MS1)		**Source: W006098-17**		Prepared & Analyzed: 09-Jun-00						
Methyl tert-butyl ether	52.0	2.0	ug/l	50.0	ND	104	60-150			
Surrogate Dibromofluoromethane	*51.0*		"	*50 0*		*102*	*50-150*			
Surrogate: 1,2-Dichloroethane-d4	*50 0*		"	*50.0*		*100*	*50-150*			
Matrix Spike Dup (0F09020-MSD1)		**Source: W006098-17**		Prepared & Analyzed: 09-Jun-00						
Methyl tert-butyl ether	52.0	2.0	ug/l	50.0	ND	104	60-150	0	25	
Surrogate: Dibromofluoromethane	*52.0*		"	*50 0*		*104*	*50-150*			
Surrogate. 1,2-Dichloroethane-d4	*50.0*		"	*50.0*		*100*	*50-150*			

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383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Total Metals by EPA 6000/7000 Series Methods - Quality Control

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0F13017 - 200.7										
Blank (0F13017-BLK1)				Prepared: 13-Jun-00 Analyzed: 16-Jun-00						
Ferrous Iron	ND	0.010	mg/l							
Iron	ND	0.010	"							
LCS (0F13017-BS1)				Prepared: 13-Jun-00 Analyzed: 16-Jun-00						
Ferrous Iron	1.02	0.010	mg/l	1.00		102	80-120			
Iron	1.02	0.010	"	1.00		102	80-120			
LCS Dup (0F13017-BSD1)				Prepared: 13-Jun-00 Analyzed: 16-Jun-00						
Ferrous Iron	1.03	0.010	mg/l	1.00		103	80-120	0.976	20	
Iron	1.03	0.010	"	1.00		103	80-120	0.976	20	
Matrix Spike (0F13017-MS1)		**Source: W006127-01**		Prepared: 13-Jun-00 Analyzed: 16-Jun-00						
Ferrous Iron	1.30	0.010	mg/l	1.00	0.20	110	80-120			
Iron	1.30	0.010	"	1.00	0.20	110	80-120			
Matrix Spike Dup (0F13017-MSD1)		**Source: W006127-01**		Prepared: 13-Jun-00 Analyzed: 16-Jun-00						
Ferrous Iron	1.30	0.010	mg/l	1.00	0.20	110	80-120	0	20	
Iron	1.30	0.010	"	1.00	0.20	110	80-120	0	20	

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Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Anions by EPA Method 300.0 - Quality Control

Sequoia Analytical - Walnut Creek

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0F01025 - General Preparation										
Blank (0F01025-BLK1)				Prepared & Analyzed: 31-May-00						
Nitrate as NO3	ND	0.10	mg/l							
Orthophosphate as PO4	ND	0.50	"							
Sulfate as SO4	ND	0.10	"							
LCS (0F01025-BS1)				Prepared & Analyzed: 31-May-00						
Nitrate as NO3	9 63	0.10	mg/l	10.0		96.3	80-120			
Orthophosphate as PO4	19.7	0.50	"	20.0		98 5	80-120			
Sulfate as SO4	9.81	0.10	"	10.0		98 1	80-120			
Matrix Spike (0F01025-MS1)	Source: W005733-01			Prepared & Analyzed: 31-May-00						
Nitrate as NO3	18.8	0 40	mg/l	20.0	ND	94.0	75-125			
Orthophosphate as PO4	89.9	2.0	"	40.0	50	99 8	75-125			
Sulfate as SO4	29 4	0.40	"	20.0	10	97.0	75-125			
Matrix Spike Dup (0F01025-MSD1)	Source: W005733-01			Prepared & Analyzed: 31-May-00						
Nitrate as NO3	18.9	0.40	mg/l	20 0	ND	94.5	75-125	0.531	20	
Orthophosphate as PO4	90 3	2.0	"	40.0	50	101	75-125	0.444	20	
Sulfate as SO4	29.4	0.40	"	20.0	10	97.0	75-125	0	20	

Sequoia Analytical

404 N. Wiget Lane
Walnut Creek, CA 94598
(925) 988-9600
FAX (925) 988-9673
www.sequoialabs.com

Harding-Lawson Associates - Oakland	Project: Port of Oakland	
383 Fourth Street	Project Number: 49667.1	**Reported:**
Oakland CA, 94607	Project Manager: Steve Osborne	29-Jun-00 12:02

Conventional Chemistry Parameters by APHA/EPA Methods - Quality Control

Sequoia Analytical - Petaluma

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0060459 - General Preparation										
Blank (0060459-BLK1)				Prepared & Analyzed: 20-Jun-00						
Total Organic Carbon	ND	1.00	mg/l							
LCS (0060459-BS1)				Prepared & Analyzed: 20-Jun-00						
Total Organic Carbon	40.1	2.00	mg/l	40.0		100	80.0-120			
Matrix Spike (0060459-MS1)		**Source: P005790-05**		Prepared & Analyzed: 20-Jun-00						
Total Organic Carbon	41.5	4.00	mg/l	40.0	1.96	98.9	75.0-125			
Matrix Spike Dup (0060459-MSD1)		**Source: P005790-05**		Prepared & Analyzed: 20-Jun-00						
Total Organic Carbon	41.0	4.00	mg/l	40.0	1.96	97.6	75.0-125	1.32	20.0	

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Notes and Definitions

D-12	Chromatogram Pattern: Unidentified Hydrocarbons > C16
D-13	Chromatogram Pattern: Diesel C9-C24
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Harding Lawson Associates
383 Fourth Street, Third Floor
Oakland, California 94607
(510) 451-1001 - Phone
(510) 451-3165 - Fax

CHAIN OF CUSTODY FORM

iN005748 Nº 2541

Lab: Sequoia

Samplers: Heather Lee

Job Number: 496671

Name/Location: Port of Oakland - South Airport self-Fueling Taxiway U

Project Manager: Steve Osborne

Recorder: Heather D Lee (Signature Required)

SOURCE CODE	MATRIX: Water	Sediment	Soil	Oil	# CONTAINERS & PRESERV.: Unpres.	H_2SO_4	HNO_3	HCL	Ice	SAMPLE NUMBER OR LAB NUMBER: Yr	Wk	Seq	DATE: Yr	Mo	Day	Time	STATION DESCRIPTION/ NOTES
K	X				3		1	6	X	M	W-	4	0	0	5	0930	
	X				3		1	6	X	M	W-	3	0	0	5	1031	
	X				3		1	6	X	M	W-	2	0	0	5	1103	
	X				3		1	6	X	M	W-	1	0	0	5	1145	

*Silica gel cleanup
**Confirm by 8260

ANALYSIS REQUESTED	EPA 8010	EPA 8020	EPA 8260	EPA 8270	METALS	EPA 8015M/TPHG	EPA 8020/BTEX	EPA 8015M/TPHd,o *	BTEX + MTBE by 8020	Ferrous Iron (24 hour HOLD)	Total Iron	Nitrate	Sulfate	Orthophosphate	Total Organic Carbon
						X		X	X	X	X	X	X	X	X
						X		X	X	X	X	X	X	X	X
						X		X	X	X	X	X	X	X	X
						X		X	X	X	X	X	X	X	X

** If MTBE is detected

LAB NUMBER: Yr	Wk	Seq	DEPTH IN FEET	COL MTD CD	QA CODE	MISCELLANEOUS
						24 hr TAT

CHAIN OF CUSTODY RECORD

RELINQUISHED BY: (Signature) Heather D Lee	RECEIVED BY: (Signature) Mark Collins	DATE/TIME 5-30 14:55
RELINQUISHED BY: (Signature) Mark Collins 5-30 15:30	RECEIVED BY: (Signature) Amanda Jensen 5/30/00	DATE/TIME 15:30
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
RELINQUISHED BY: (Signature)	RECEIVED BY: (Signature)	DATE/TIME
DISPATCHED BY: (Signature) DATE/TIME	RECEIVED FOR LAB BY: (Signature)	DATE/TIME

METHOD OF SHIPMENT

SAMPLE CONDITION WHEN RECEIVED BY THE LABORATORY

Laboratory Copy (White) Project Office Copy (Yellow) Field or Office Copy

DISTRIBUTION

Groundwater Monitoring Well Installation Report
South Airport Self-Fueling Facility, Taxiway U
Oakland International Airport
Oakland, California

December 15, 2000

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4 Copies

Mr. Dale H. Klettke,
CHMM
Port of Oakland
Environmental Health &
Safety Compliance
530 Water Street, 2nd
Floor
Oakland, California 94607

Quality Control Reviewer

Luis Fraticelli
Associate Geologist

JGM/SJO/dmw 49667/037779R