THE
MARK
GROUP, INC.
ENGINEERS & GEOLOGISTS

HAZMAT
94 AUG 12 AM 9:15

August 10, 1994
92-1175306.15

Ms. Juliet Shin
Hazardous Materials Specialist
Alameda County Health Care Services Agency
80 Swan Way, Room 200
Oakland, California 94621

Subject: QUARTERLY GROUNDWATER MONITORING PROGRAM, APRIL 1994 - South Shore Shopping
2375 Shoreline Drive
Alameda, California

Dear Ms. Shin:

The MARK Group, Inc., (MARK) has prepared this letter on behalf of Harsch, Kamur and Texaco, to provide you with an update on the status of the groundwater monitoring program currently being conducted at the South Shore Shopping Center in Alameda, California.

Firstly, you will find enclosed one copy of the April 1994 Quarterly Groundwater Monitoring Report. This report summarizes the analytical results, notes changes in concentrations from previous sampling events, and discusses program recommendations.

Secondly, because groundwater remediation is anticipated to commence during the 1994 calendar year, we are proposing modifications to the quarterly groundwater monitoring and sampling program. During subsequent sampling events, we recommend that all site wells still be monitored for groundwater elevations and free phase liquid hydrocarbons (FPLH). We recommend quarterly sampling of six wells, four existing perimeter wells (MW-22, MW-16, MW-18 and MW-23) and two new proposed wells. These new wells are proposed along the north-northwest portion of the site. Note that additional wells may be sampled and analyzed during the groundwater remediation program to monitor progress. Please note, the next sampling event will commence immediately following your awaited approval and comments.

Lastly, following discussions with parties from Harsch, Kamur, and Texaco, we feel since there are several new people involved with this project, it would be prudent and beneficial on all parts to meet with you in the next couple of weeks. Shortly following our meeting, we anticipate providing you with a revised schedule for groundwater remediation to demonstrate our commitment to site restoration and regulatory compliance.

If you have any questions, please call the undersigned at (510) 946-1055.

Sincerely,

The MARK Group, Inc.

Alan D. Gibbs, R.G.
Associate

ADG:crh
ACHCSA.LTR

QUARTERLY GROUNDWATER MONITORING PROGRAM
APRIL 1994
SOUTH SHORE SHOPPING CENTER
2375 SHORELINE DRIVE
ALAMEDA, CALIFORNIA

93-1185002.10
August 2, 1994

THE
MARK
GROUP, INC.
ENGINEERS & GEOLOGISTS

HAZMAT
94 AUG 12 AM 9:15

Transmittal

Date
August 4, 1994

Project
93-1185002

To
Alameda County Health Care Services Agency
80 Swan Way, RM 200
Oakland, CA 94621

Attention
Juliet Shin
Hazardous Materials Specialist

We are sending by
☒ Regular Mail
☐ Special Delivery
☐ Air Mail
☐ Express Mail
☐ Carrier
☐

the following
☒ Enclosed
☐ Separately

Quantity	Description
1	REPORT - Quarterly Groundwater Monitoring Program April 1994 South Shore Shopping Center 2375 Shoreline Drive Alameda, California

Comments
Ms. Shin: Please find enclosed the above referenced document. If you should have any questions, please call the undersigned.

Sent by

Alan D. Gibbs, R.G.
Associate

2480 Buskirk Avenue, Suite 120 • Pleasant Hill CA 94523 • (510) 946-1055 • FAX (510) 946-9813

THE
MARK
GROUP, INC.
ENGINEERS & GEOLOGISTS

August 2, 1994
93-1185002.10

Mr. Harold McLoud
Vice President/Finance
Harsch Investment Corp.
1121 S. W. Salmon Street
Portland, Oregon 97208

Subject: REPORT - Quarterly Groundwater Monitoring Program
April 1994
South Shore Shopping Center
2375 Shoreline Drive
Alameda, California

Dear Mr. McLoud:

The MARK Group, Inc. is pleased to submit the enclosed Quarterly Monitoring Program Report for work conducted at the South Shore Shopping Center. This work was conducted pursuant to the requirements of the Alameda County Health Care Services Agency.

We appreciate the opportunity to be of continued service. Should you have any questions or comments regarding this report, please contact Mr. Alan D. Gibbs, R.G. or the undersigned.

Sincerely,

The MARK Group, Inc.

David Rogers

David K. Rogers, ~~P.E.~~, C.E.G.
Principal

DKR:RSS:scd
QTLYJUN.LTR

Enclosure(s)

cc: Mr. Tom Hargett, Texaco
Mr. Murray Stevens, Kamur
Ms. Juliet Shin, ACHCS
Mr. Frank Hamedi, Soil Tech

Hookston Square, Suite 120 • 3480 Buskirk Avenue • Pleasant Hill, CA 94523 • (510) 946-1055 • FAX (510) 946-9813

PROFESSIONAL CERTIFICATION

QUARTERLY GROUNDWATER MONITORING PROGRAM
APRIL 1994
SOUTH SHORE SHOPPING CENTER
2375 SHORELINE DRIVE
ALAMEDA, CALIFORNIA

August 2, 1994

93-1185002.10

This report has been prepared by the staff of The MARK Group, Inc. under the professional supervision of the Principal and senior staff whose seal(s) and signature(s) appear hereon.

The findings, recommendations, specifications or professional opinions are presented, within the limits prescribed by the client, after being prepared in accordance with generally accepted professional engineering and geologic practice. There is no other warranty, either expressed or implied.

REGISTERED GEOLOGIST
DAVID K. ROGERS
No. 967
exp 3/31/95
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

REGISTERED GEOLOGIST
ALAN D. GIBBS
exp 11/30/95
NO. 4827
STATE OF CALIFORNIA

David K Rogers

David K. Rogers, P.E., C.E.G.
Principal

Alan D. Gibbs, R.G.
Associate

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1.0 INTRODUCTION

1.1 Objective

This Quarterly Monitoring Program Report for April 1994 was prepared by The MARK Group, Inc. (MARK) and summarizes the results of the groundwater sampling and analysis conducted at the South Shore Shopping center, Alameda, California (Drawing 1-1). This work is being conducted pursuant to the requirements established by the Alameda County Health Care Services Agency (ACHCSA) and was conducted to (1) satisfy the monitoring requirements of the ACHCSA and (2) to provide a baseline for identifying groundwater impact at the subject site.

1.2 Scope of Work

The scope of work for the Quarterly Monitoring Program consisted of conducting groundwater sampling for April 1994. The work was conducted utilizing sampling methods and procedures specified in the Quality Assurance Project Plan (MARK, 1993) included herein as Appendix A. The scope of work included the following elements:

- Measuring static water levels in 22 monitoring wells and piezometers (refer to Table 3-1). Two additional monitoring wells (MW-4 and MW-13) are damaged and, therefore, were not monitored or sampled;
- Purging and sampling 17 monitoring wells associated with Harsch Investment and Texaco;
- Collecting one duplicate sample from monitoring well MW-14;
- Recording groundwater field parameters (pH, temperature, specific conductance and turbidity) from each of the 17 monitoring wells; and
- Analyzing groundwater samples for the monitoring parameters specified in Section 2; and
- Reporting the results of the groundwater samples collected from the 17 monitoring wells associated with Harsch Investment and Texaco and the results of five monitoring wells associated with Kamur Industries.

2.0 IMPLEMENTATION OF FIELD ACTIVITIES

2.1 Field Activities and Procedures

2.1.1 Observations

Static water levels in 22 wells and piezometers were measured to within 0.01 inch on April 26, 1994, in accordance with the procedures described in the Quality Assurance Project Plan ((QAPP) MARK, 1993). Water level measurement field logs are included as Appendix B. Groundwater elevation contour maps were constructed using linear interpolation between wells from each water-bearing unit monitored. Water-level monitoring results are summarized in Section 3.0.

2.1.2 Groundwater Sampling

For the April 1994 Quarterly Monitoring Program, groundwater was sampled between April 27 and May 3, 1994 from 17 wells which currently make-up the Harsch and Texaco monitoring network. These groundwater samples were collected in accordance with procedures outlined in the water quality monitoring requirements of California Code of Regulations, Title 23, Division 3, Chapter 15. Field forms documenting sampling and purging activities are included in Appendix C. In addition, five monitoring wells identified as MW-10, MW-11, MW-12, MW-24 and MW-25 and associated with Kamur's monitoring networks were sampled by Soil Tech Engineering. The analytical results for these wells have been incorporated into this monitoring report.

Groundwater sampling and water level measurements were conducted by Mr. Thomas C. Jones, Senior Technician under the direct supervision of Mr. Robert S. Spare, Project Environmental Scientist. Mr. Spare has a bachelors degree in Environmental Science and has over seven years experience. Mr. Jones has over three years experience with groundwater sampling techniques. All employees involved in this project have completed 40 hours of health and safety training in accordance with 29CFR 1910.120, and are experienced with generally used sampling protocols.

2.2 Analytical Methods

Groundwater samples collected from the Harsch and Texaco monitoring wells were submitted to Mobile Chem Laboratories, Inc., which is certified by the California Department of Toxic Substances Control (DTSC) to conduct the required analyses. These groundwater samples were analyzed for the following constituents:

- EPA Method 8015/8020, for total petroleum hydrocarbon as gasoline (TPH-g) and benzene, toluene, ethylbenzene, and xylenes (BTEX);
- EPA Method 8015, for total petroleum hydrocarbons as diesel (TPH-d);
- EPA Method 601, for chlorinated hydrocarbons; and
- EPA Method 160.1, for total dissolved solids (TDS).

Five groundwater samples collected from Kamur's monitoring wells were handed over to MARK personnel via chain-of-custody for EPA Method 601 analyses. The remaining analyses for Kamur's wells were conducted by Argon Mobile Labs. All laboratory test reports are presented in Appendix D.

2.3 Quality Assurance/Quality Control

The Quality Assurance and Quality Control (QA/QC) program utilized during this monitoring program reporting period incorporated the following field and laboratory QA/QC methods:

- Chain-of-custody control of samples;
- Field methods:
  - blind duplicate groundwater samples (MW-14B duplicates of MW-14); and
- Laboratory methods:
  - matrix spikes;
  - matrix spike duplicates;
  - method blanks;
  - QC spikes; and
  - QC spike duplicates.

QA/QC laboratory reports are presented in Appendix D.

3.0 RESULTS OF THE SELF-MONITORING PROGRAM

3.1 Groundwater Conditions

There are presently 22 monitoring wells being utilized to evaluate the groundwater flow in the vicinity and beneath the South Shore Shopping Center. Based on the most recent water elevation data collected during April 1994 (see Table 3-1), groundwater is flowing in a north and northwest direction with a gradient averaging 0.0079 feet per foot. Groundwater mounding was observed in the vicinity of monitoring well MW-7B. This may be caused by irrigation or leaking water lines or surface infiltrations. Groundwater elevations and flow are illustrated in Drawing 3-1.

3.2 Monitoring Program

Analytical results for the monitoring network are presented in Tables 3-2 and discussed below. Analytical results from previous sampling rounds are presented in Table 3-3 and can be used for comparison.

- TDS concentrations were notably higher in monitoring wells MW-16 through MW-21 compared to the remaining monitoring network wells. TDS detected in wells MW-16 through MW-21 exceeded the California Secondary Maximum Contaminant Level (SMCL) of 5,000 mg/L. The remaining wells were below the SMCL;
- The concentration of TPH-g ranged from just above the method detection limit of 0.05 mg/L in wells MW-14 and MW-20 to a high of 160 mg/L in well MW-12. Approximately 0.06' of free liquid hydrocarbon (FPLH) was observed in monitoring well MW-12. No drinking water standards have been published for TPH-g. Drawing 3-2 presents isoconcentration contours for TPH-g;
- TPH-d was not detected in any of the Harsch Investment or Texaco monitoring wells. Kamur wells were not analyzed for TPH-d during this sampling event;

- The concentrations of benzene ranged from just above the detection limit of 0.0005 mg/L in monitoring well MW-14 to a high of 3.6 mg/L in monitoring well MW-10. The California Primary Maximum Contaminant Level (PMCL) for benzene is 0.001 mg/L. An isoconcentration plot for benzene is illustrated on Drawing 3-3;

- Concentrations of toluene were notably higher in monitoring wells MW-10, MW-12, and MW-25 (3.2 mg/L, 6.3 mg/L and 1.2 mg/L, respectively) compared to the remaining monitoring network wells. The PMCL for toluene is 1.0 mg/L;

- Concentrations of xylenes and ethylbenzene were also significantly higher in monitoring wells MW-10, MW-12, and MW-25 compared with any other monitoring network well. The PMCL for xylenes and ethylbenzene are 1.75 mg/L and 0.68 mg/L, respectively;

- The concentrations of 1,2-dichloroethane was not detected in any of the Harsch Investment monitoring wells, but exceeded the PMCL in two of Texaco's wells (MW-14 and MW-22) and three of Kamur's wells (MW-10, MW-24, and MW-25). Concentrations ranged from 0.0065 mg/L in well MW-24 to 0.015 mg/L in well MW-22. The PMCL for 1,2-dichloroethane is 0.0005 mg/L. A concentration plot illustrating 1,2-dichloroethane is shown on Drawing 3-4;

- Trans-1,2,-dichloroethene was not detected above the PMCL in any of the monitoring network wells;

- Tetracholoroethene (PCE) was detected in the western portion of the subject site at concentrations just above the detection limit of 0.001 mg/L in monitoring wells MW-5B, MW-18, and MW-19 to an elevated concentration of 0.19 mg/L in monitoring well MW-7B. Two monitoring wells, MW-7B and MW-20 exceeded the PMCL of 0.005 mg/L. An isoconcentration plot illustrating PCE is shown on Drawing 3-5;

- Trichloroethene (TCE) was detected in two of Texaco wells, MW-3 and MW-5B; three of Harsch's wells, MW-7B, MW-8B and MW-20; and one Kamur well, MW-11. Concentrations of TCE ranged from 0.0014 mg/L in monitoring well MW-3 to 0.05 mg/L in monitoring well MW-8B. Four wells, MW-5B, MW-7B, MW-8B and MW-20 all exceeded the PMCL of 0.005 mg/L. An isoconcentration plot for TCE is shown on Drawing 3-6.

- A comparison of petroleum related compounds between this most recent sampling round and February 1993 suggest that the vicinity of monitoring well MW-12 is the primary source area;

- A comparison of chlorinated organic compounds as TCE and PCE are found consistently in monitoring well MW-7B and vicinity with trace concentrations of PCE being reported in monitoring well MW-5B during this sampling round; and

- 1,2-dichloroethane is being found in the northern portions of the site and the southern portion off site of the subject property.

3.3 Quality Assurance/Quality Control

The QA/QC program was designed to:

- Establish the necessary activities to control the quality of sample collection, analysis, and data validations, and

- Guide assessment of the precision, accuracy, and completeness of data.

Sampling methods and protocols have been specified in the QAPP. Sections of the QAPP specify methods and protocols for groundwater sample collection, handling and shipment; water level measurements; purging; and analytical methods.

One duplicate sample was submitted to Mobile Chem Laboratory. Results of analysis of the duplicate sample (MW-14B) are presented in Tables 3-2.

Laboratory in-house QA/QC results indicate that all matrix spikes, matrix spike duplicates, method blanks, QC spike and QC spike duplicate results are within acceptable laboratory limits.

Table 3-1: Groundwater Elevations
South Shore Shopping Center
Texaco, Harsch, and Kamur

Well I.D.	Date Measured	TOSC Elevation (feet)	Measured Depth of Groundwater below TOSC (feet) bgs	Groundwater Elevatons (feet)
Texaco Wells				
MW-2	04/26/94	7.44	5.77	+1.67
MW-3	04/26/94	6.78	5.395	+1.38
MW-5B	04/26/94	5.08	4.00	+1.08
MW-9	04/26/94	NA	5.365	NA
MW-14	04/26/94	5.76	5.065	+0.69
MW-15	04/26/94	4.47	3.46	+1.01
MW-22	04/26/94	7.81	7.57	+0.24
Harsch Wells				
MW-7B	04/26/94	5.52	4.43	-1.09
MW-8B	04/26/94	6.15	6.335	-0.18
MW-16	04/26/94	3.52	2.93	0.59
MW-17	04/26/94	3.32	3.385	-0.06
MW-18	04/26/94	4.72	4.84	-0.12
MW-19	04/26/94	5.28	5.09	0.19
MW-20	04/26/94	6.66	7.11	-0.45
MW-21	04/26/94	6.48	6.6	-0.12
MW-23	04/26/94	7.09	4.45	2.64
Kamur Wells				
MW-10	04/26/94	7.97	6.58	1.39
MW-11	04/26/94	6.96	5.54	1.42
MW-12	04/26/94	8.31	6.41	1.9
MW-24	04/26/94	9.19	8.485	0.71
MW-25	04/26/94	9.41	9.15	0.26

Explanation
bgs = below ground surface
TOSC = top of steel casing
NA = Not Availble

Table 3-2 Groundwater Analytical Results - April 1994
South Shore Shopping Center
Texaco, Harsch, and Kamur

Well No.	Date Sampled	TDS	TPH as Diesel	TPH as Gasoline	Benzene	Toluene	Xylenes	Ethyl-benzene	Chloro-benzene	1,2-Dichloro-ethane	1,1-Dichloro-ethene	trans-1,2-Di-chloroethene	Tetra-chloroethene	Trichloro-ethene
Texaco Wells														
MW [illegible]	04/27/94	650	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.002
MW 3	04/27/94	850	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	0.0082	0.0014
MW 5	04/29/94	2,700	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	0.014	0.0012	0.01
MW [illegible]	04/29/94	920	<0.05	1.9	0.52	0.0028	<0.0005	0.035	<0.001	<0.002	<0.002	<0.001	<0.001	<0.002
MW 14	04/27/94	840	<0.05	0.053	0.00095	<0.0005	0.015	0.0033	<0.001	0.0084	<0.002	<0.001	<0.001	<0.002
MW 14 [illegible]	04/27/94	1,800	<0.05	0.054	0.00096	<0.0005	0.015	0.0034	<0.001	0.0097	<0.002	<0.001	<0.001	<0.002
MW 15	04/27/94	1,500	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.002
MW 22	04/28/94	2,000	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	0.015	<0.002	<0.001	<0.001	<0.002
Harsch Wells														
MW 7B	04/29/94	1,300	<0.05	5.6	0.19	<0.0005	0.027	<0.0005	0.031	<0.002	0.0058	0.013	0.19	0.012
MW 8B	05/02/94	2,900	<0.05	0.14	0.0092	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	0.023	0.07	0.057
MW 16	05/02/94	25,000	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.002
MW 17	04/29/94	18,000	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	0.0024	<0.002
MW 18	04/29/94	19,000	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	0.0014	<0.002
MW 19	04/29/94	20,000	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	0.0011	<0.002
MW 20	04/29/94	13,000	<0.05	0.057	0.021	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	0.058	0.057	0.032
MW-21	04/29/94	20,000	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.002
MW 23	05/02/94	54	<0.05	<0.05	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	<0.001	<0.001	<0.002
Kamur Wells														
MW 10	04/27/94	2,570	NT	90	3.6	3.2	5.3	1.2	<0.001	0.013	<0.002	0.002	0.0039	<0.002
MW 11	04/27/94	1,230	NT	<0.050	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.002	<0.002	0.0015	0.0025	0.0042
MW 12	04/27/94	510	NT	160	1.3	6.3	12	1.4	<0.001	<0.002	<0.002	<0.001	0.0039	<0.002
MW 21	04/27/94	560	NT	<0.050	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	0.0065	<0.002	0.0018	0.0039	<0.002
MW [illegible]	04/27/94	2,5[illegible]	NT	38	3.0	1.2	2.0	0.71	<0.001	0.0093	<0.002	<0.001	0.0039	<0.002
Regulatory Limits														
PMCL		NA	NA	NA	0.001	1.0	1.75	0.68	0.03	0.0005	0.006	0.07	0.005	0.005

[illegible]
All results are in milligrams per liter
NT = Not tested
NA = Not available
TDS = Total Dissolved Solids, Method 160.1
TPH as Gasoline = Total Petroleum Hydrocarbons as Gasoline analyzed using EPA methods 5030 and TPH LUFT
Benzene, Toluene, Xylenes and Ethylbenzene analyzed using method 602
TPH as Diesel = Total Petroleum Hydrocarbons as Diesel analyzed using EPA method 3510 and TPH LUFT
Priority Pollutants analyzed using EPA methods 5030 and 601
PMCL = Primary Maximum Contaminant Level
MW-[illegible] = duplicate sample of MW-14

Table 3-3

Analytical Summary for Groundwater Samples Collected in February 1993
All Concentrations in Micrograms per Liter (µg/l)

Sample I.D.	PCE	TCE	1,2-DCA	1,2-DCE	Benzene	Toluene	Xylenes	Ethylbenzene	Gas	Diesel	Oil & Grease	TDS	DTW	W.E.	C.E.
MW-5B	ND	3.4	0.4	5.0	210	4.2	2.0	1.9	640	2,400	NA	1,400	2.42	+2.66	5.08
MW-7B	5,800	540	ND	150	NA	NA	NA	NA	NA	NA	NA	1,100	3.33	+2.19	5.52
MW-8B	5.0	14	ND	9.0	NA	NA	NA	NA	NA	NA	NA	930	4.92	+1.23	6.15
MW-10	ND	9.5	ND	ND	210	480	1,200	510	66,000	NA	NA	NA	6.04	+2.06	8.10
MW-11	5.8	2.0	ND	ND	NA	NA	NA	NA	NA	NA	NA	630	4.95	+2.26	7.01
MW-12	ND	2.4	ND	ND	620	1,900	6,000	2,200	330,000	NA	3,900	NA	5.92	+2.41	8.33
MW-13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.75	+2.70	7.45
MW-14	ND	ND	3.4	ND	ND	ND	ND	ND	ND	660	NA	2,000	3.42	+2.35	5.77
MW-15	ND	ND	ND	ND	ND	ND	ND	ND	ND	200	NA	880	3.50	+0.96	4.46
MW-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	24,000	0.42	+3.10	3.52
MW-17	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	18,000	2.50	+0.82	3.32
MW-18	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	19,000	4.38	+0.34	4.72
MW-19	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.46	+0.82	5.28
MW-20	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.71	+0.95	6.66
MW-21	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.48
MW-22	ND	ND	22	ND	ND	ND	ND	ND	ND	120	NA	2,100	6.33	NA	NA
MW-23	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	160	3.42	NA	NA
MW-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	NA	NA
MW-25	ND	11	ND	ND	100	230	500	270	33,000	NA	NA	NA	NA	NA	NA
MCL	5	5	0.5	6.0	1.0	NP	1,750	680	NP	NP	NP	---	---	---	---

- ND Not detected at or above analytical detection limits
- NA Not analyzed

- DTW Depth to water
- W.E. Water elevation

4.0 RECOMMENDATION

4.1 Groundwater Impacts

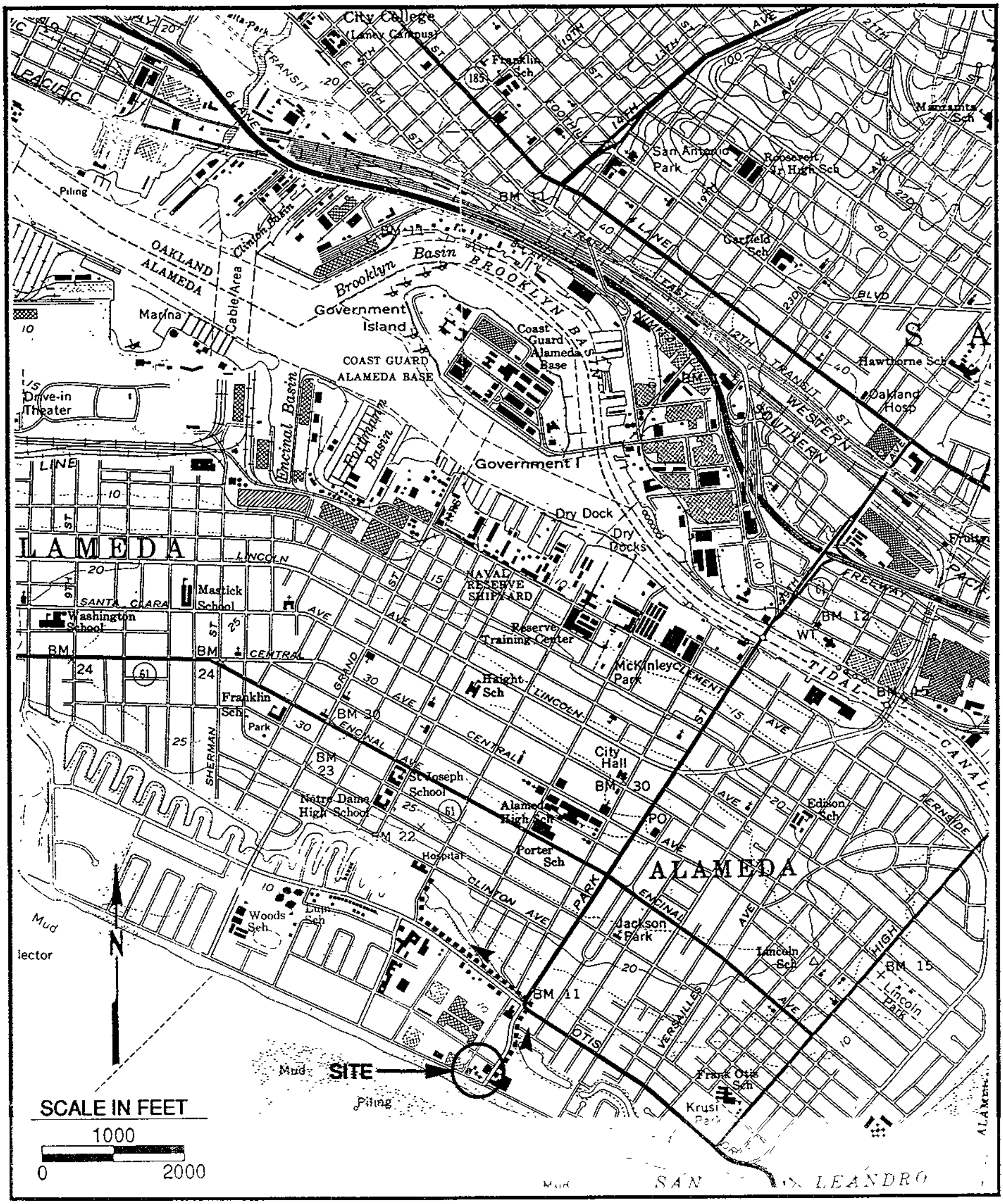
The petroleum hydrocarbon related compounds detected during this baseline groundwater study appear to be more widespread than previous sampling events and now overlap the solvents in the vicinity of the former dry cleaners site.

As illustrated on Drawing 3-2 and 3-3, petroleum hydrocarbons in the groundwater extend towards the north and northwest portions of the site, but has yet to be fully defined. MARK recommends the installation of two to three groundwater monitoring wells in this portion of the site to complete definition of the petroleum hydrocarbon extent.

Upon completion of the installation of these groundwater monitoring wells, they will be incorporated into the current groundwater monitoring program.

In future quarterly monitoring/sampling events, MARK will evaluate the monitoring network to negotiate a reduction in the number of wells to be sampled. MARK recommends continuing monitoring all existing wells, however, for water levels for groundwater elevation contouring.

Drawings



SITE LOCATION MAP

THE MARK GROUP, INC.
ENGINEERS & GEOLOGISTS

Quarterly Groundwater Monitoring Program
Southshore Shopping Center
Corner of Shoreline Drive & Park Avenue
Alameda, California

PROJECT NO
93-1175306

DRAWING NO
1-1

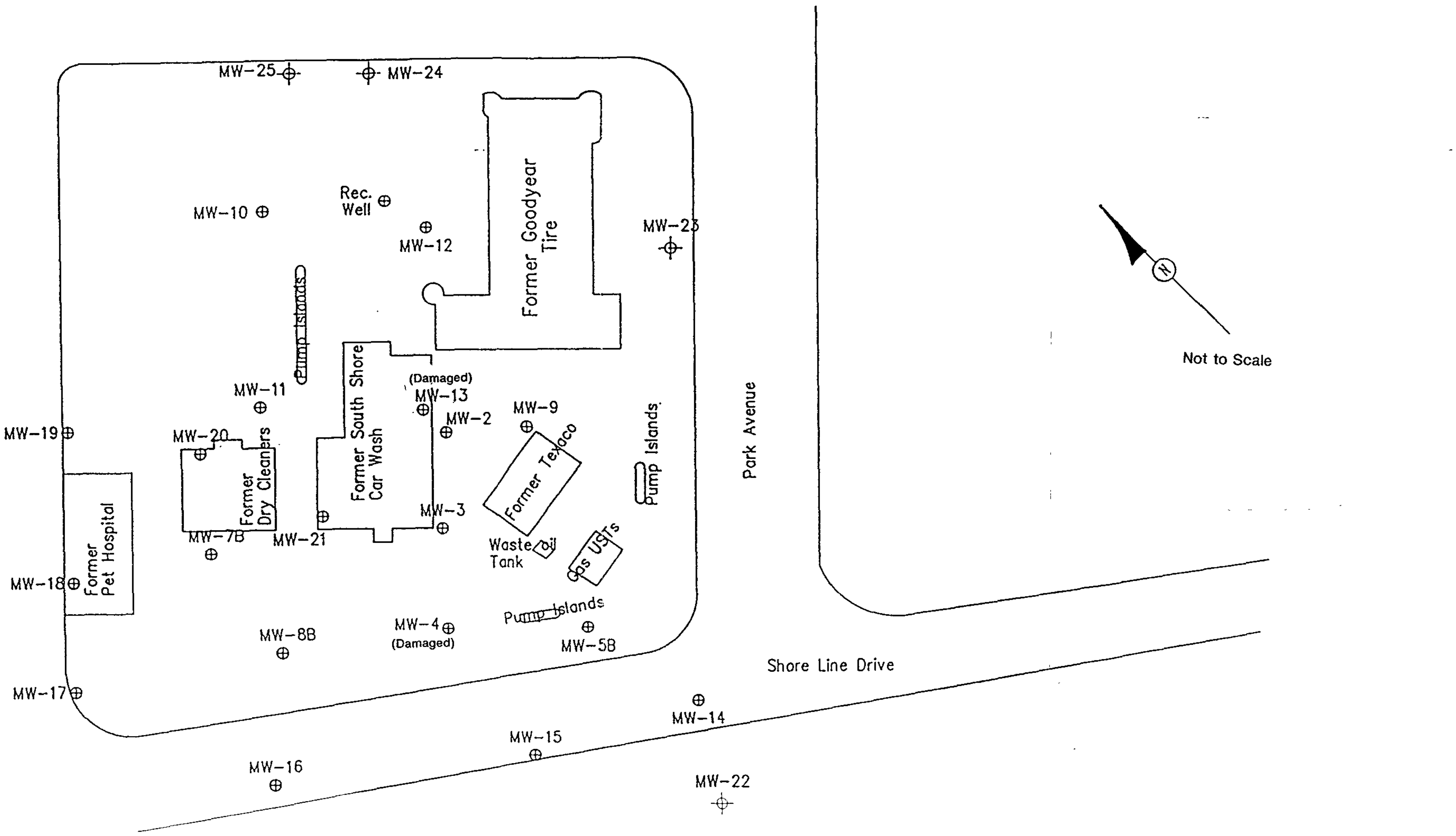
PREPARED BY RSS
REVIEWED BY ADG
DATE 6/22/94

TBLCK (5/28/92)

Date 6/28/94

Approved By ADG

Prepared By RSS



EXPLANATION

⊕ MONITORING WELL

Monitoring Well Location Map

Quarterly Groundwater Monitoring Program
South Shore Shopping Center
Corner of Shoreline Drive & Park Avenue
Alameda, California

PROJECT NO
92-1175306

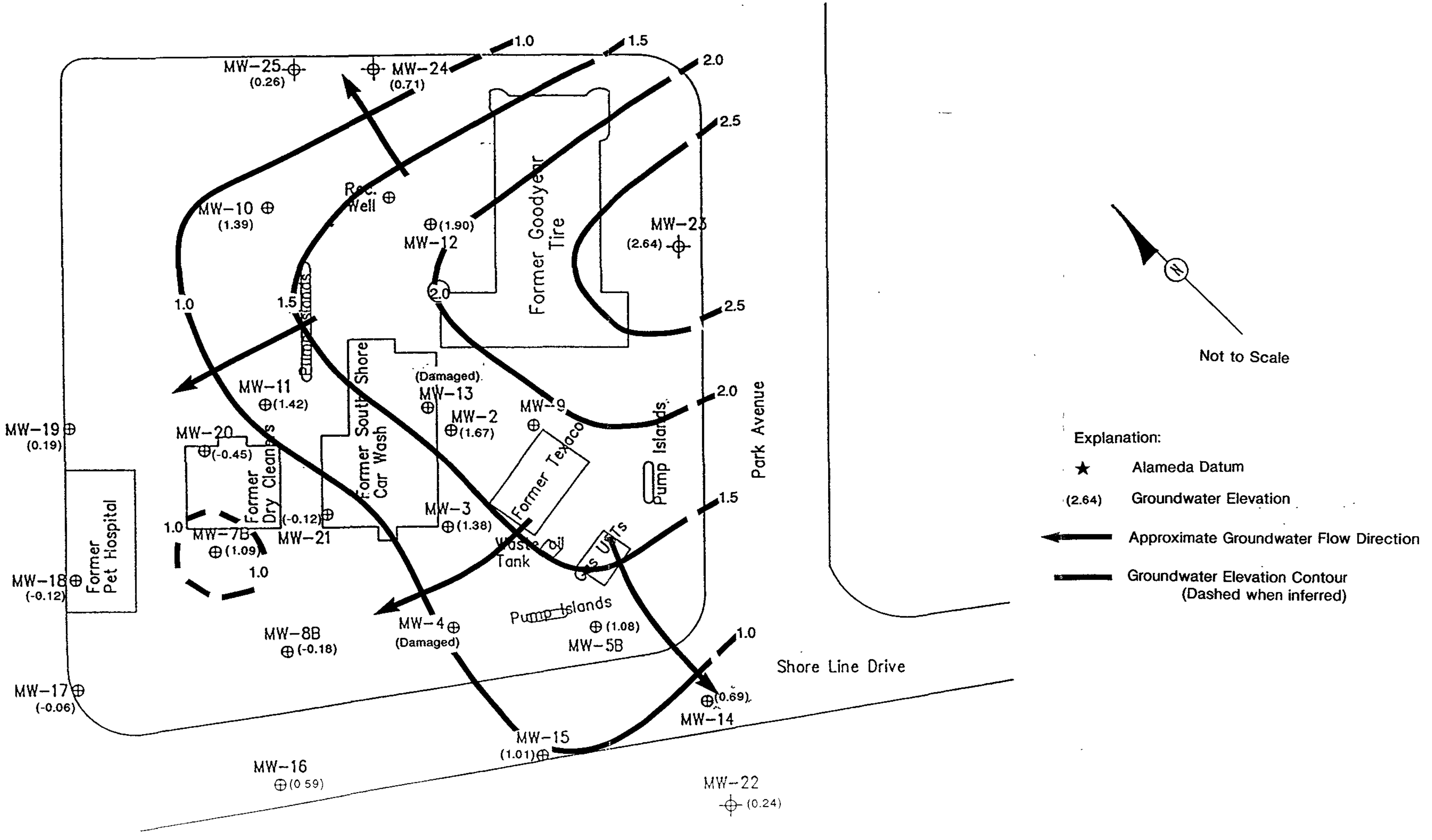
DRAWING NO
1-2

THE MARK GROUP, INC.
ENGINEERS & GEOLOGISTS

Date 6/15/94

Approved By ADG

Prepared By KCS



Groundwater Elevation Contours - 4/26/94

Quarterly Groundwater Monitoring Program
South Shore Shopping Center
Corner of Shoreline Drive & Park Avenue
Alameda, California

THE MARK GROUP, INC.
ENGINEERS & GEOLOGISTS

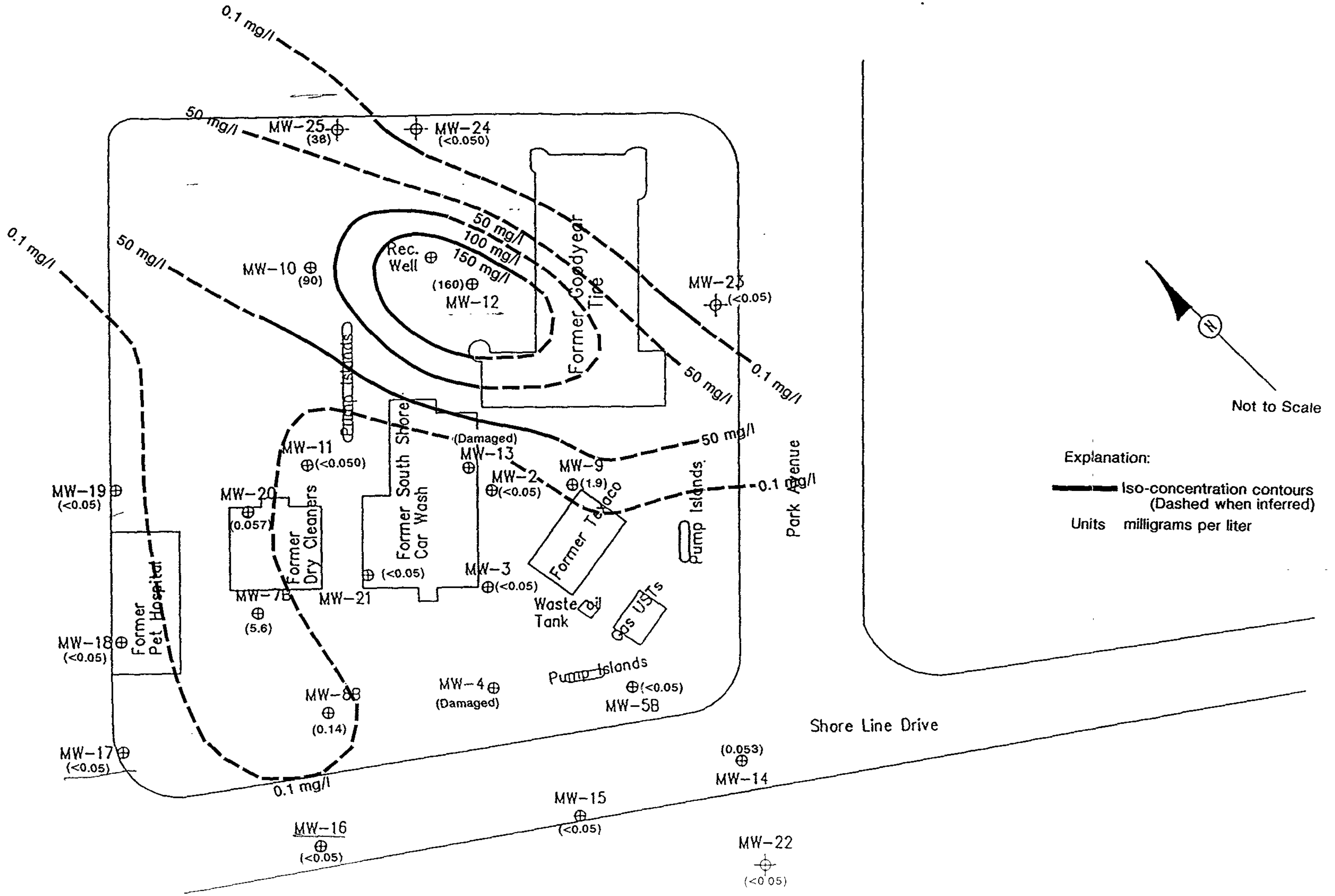
PROJECT NO
92-1175306

DRAWING NO
3-1

Date 06/15/94

Approved By ADG

Prepared By DJL



Iso-concentration Plot - Gasoline

Quarterly Groundwater Monitoring Program
South Shore Shopping Center
Corner of Shoreline Drive & Park Avenue
Alameda, California

PROJECT NO
92-1175306

DRAWING NO
3-2

THE MARK GROUP, INC.
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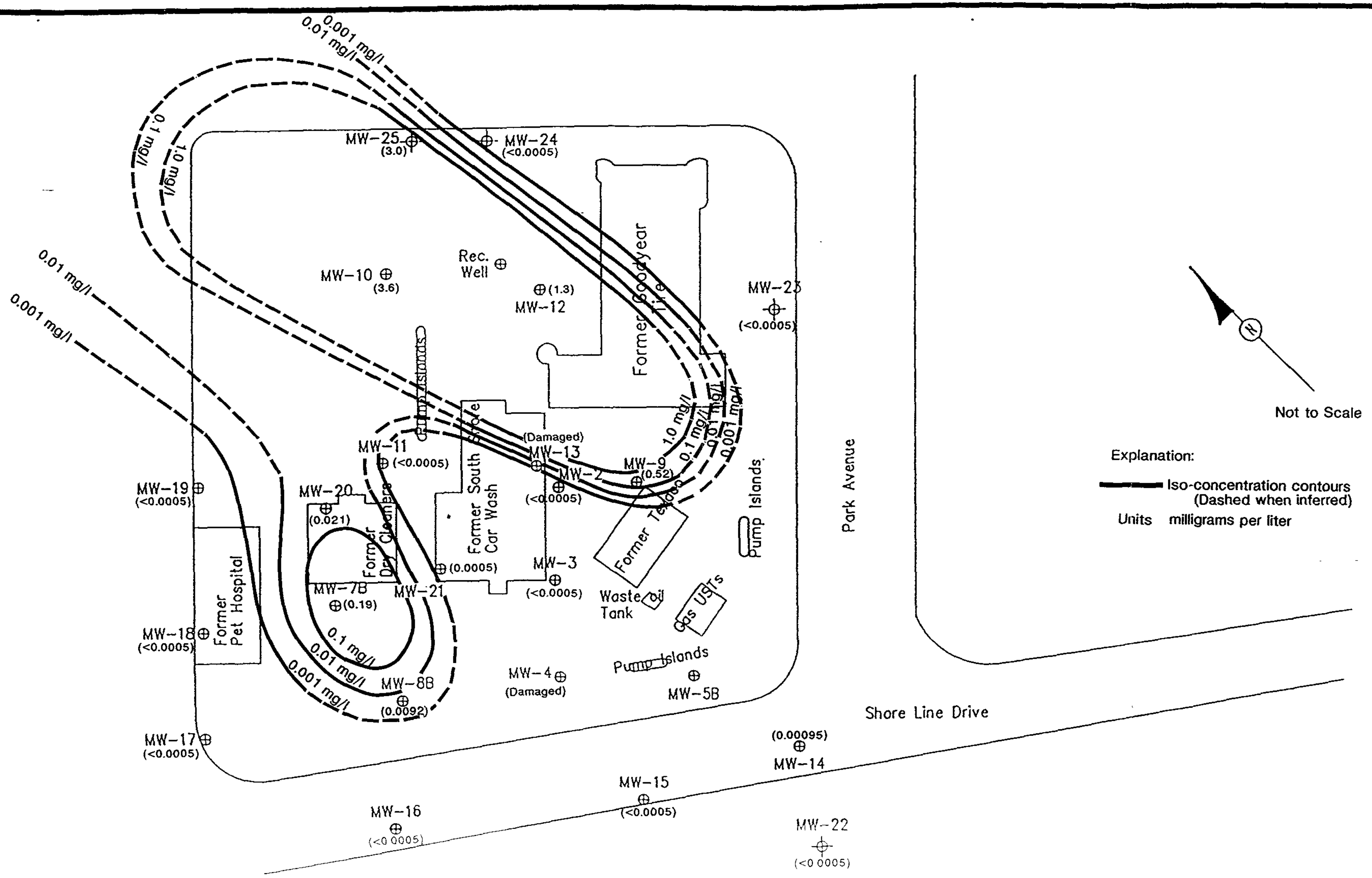

Iso-concentration Plot - Benzene

Quarterly Groundwater Monitoring Program
South Shore Shopping Center
Corner of Shoreline Drive & Park Avenue
Alameda, California

PROJECT NO
92-1175306

DRAWING NO
3-3

THE MARK GROUP, INC.
ENGINEERS & GEOLOGISTS

Date 06/15/94

Approved By ADG

Prepared By DJL

Date 06/15/94

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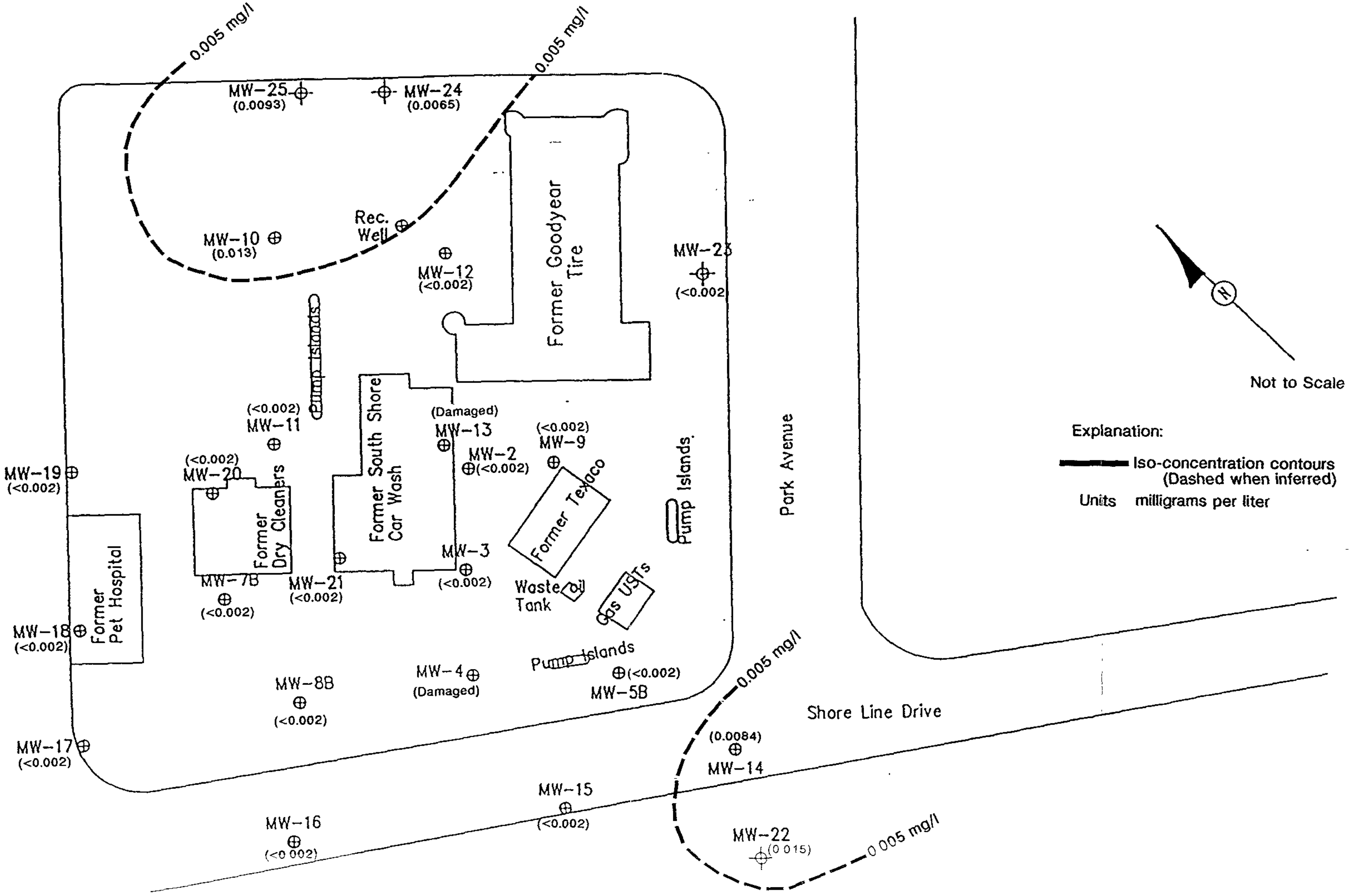
Prepared By DJL



Iso-concentration Plot - 1,2-Dichloroethane

Quarterly Groundwater Monitoring Program
South Shore Shopping Center
Corner of Shoreline Drive & Park Avenue
Alameda, California

THE MARK GROUP, INC.
ENGINEERS & GEOLOGISTS

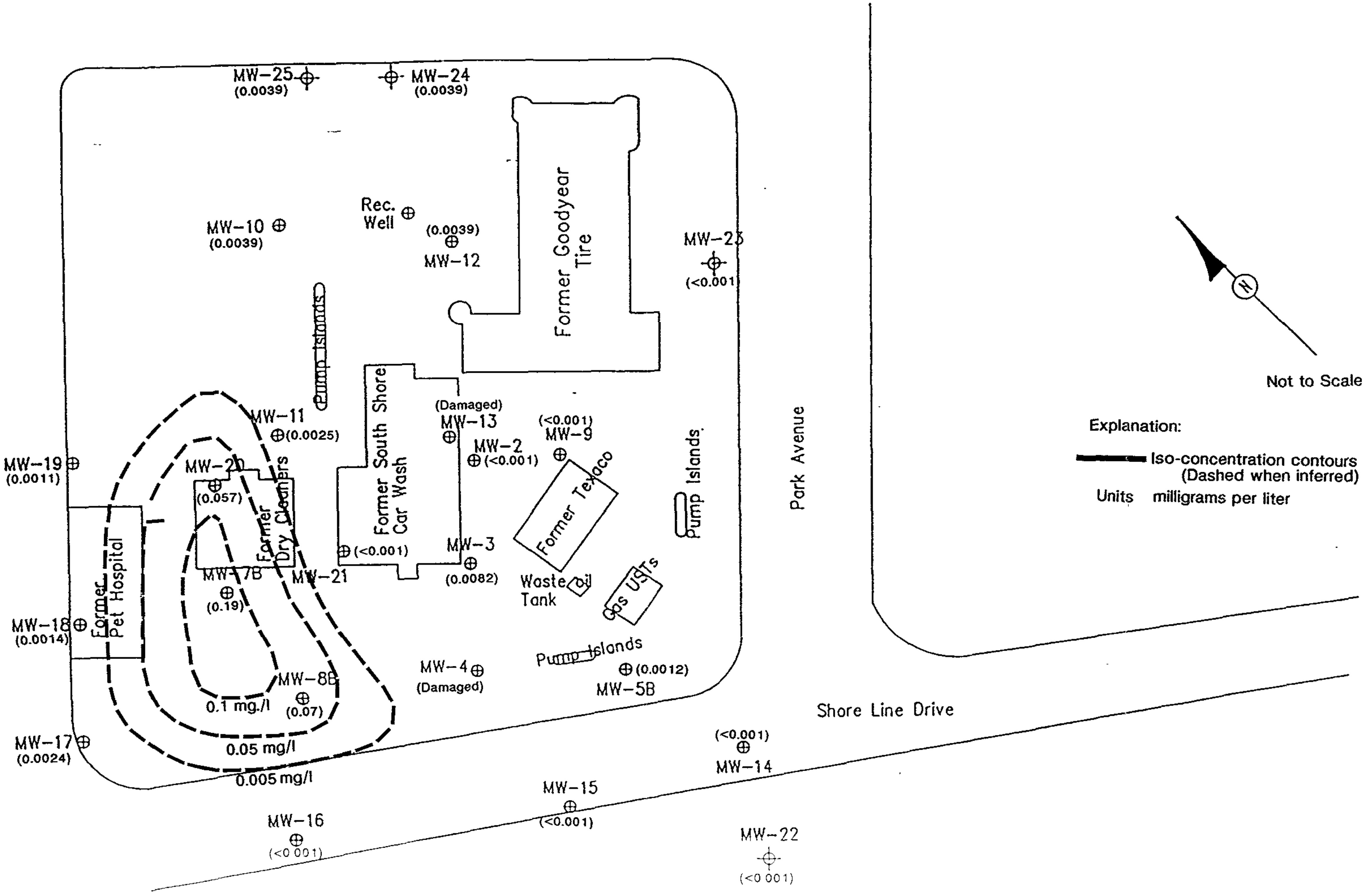
PROJECT NO
92-1175306

DRAWING NO.
3-4

Date 06/15/94

Approved By ADG

Prepared By DJL



Iso-Concentration Plot - Tetrachloroethene (PCE)

Quarterly Groundwater Monitoring Program
South Shore Shopping Center
Corner of Shoreline Drive & Park Avenue
Alameda, California

THE MARK GROUP, INC.
ENGINEERS & GEOLOGISTS

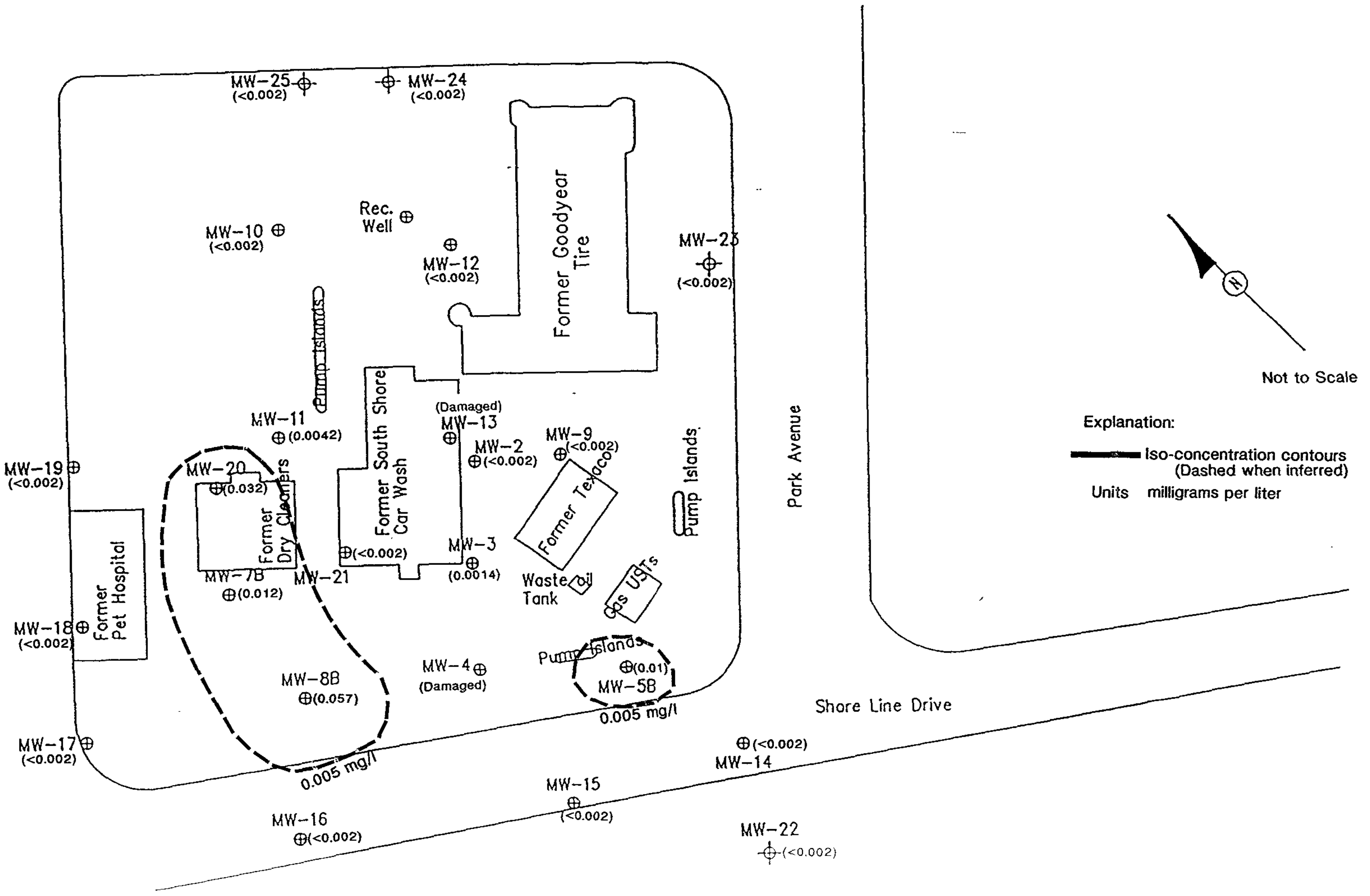
PROJECT NO
92-1175306

DRAWING NO
3-5

Date 06/15/94

Approved By ADG

Prepared By DJL



Iso-concentration Plot - Trichloroethene (TCE)

Quarterly Groundwater Monitoring Program
South Shore Shopping Center
Corner of Shoreline Drive & Park Avenue
Alameda, California

PROJECT NO
92-1175306

DRAWING NO.
3-6

THE MARK GROUP, INC.
ENGINEERS & GEOLOGISTS

Appendix A

APPENDIX A

MARK QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

QUARTERLY GROUNDWATER MONITORING PROGRAM
APRIL 1994

SOUTH SHORE SHOPPING CENTER
2375 SHORELINE DRIVE
ALAMEDA, CALIFORNIA

AUGUST 1994

PREPARED BY

THE MARK GROUP, ENGINEERS & GEOLOGISTS, INC.
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8/3/94
DATE

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THE MARK GROUP, ENGINEERS & GEOLOGISTS, INC.

8/3/94
DATE

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3.2 Site Description

REFER TO SECTION ONE OF TEXT

3.3 Project Purpose

REFER TO SECTION ONE OF TEXT

4.0 PROJECT ORGANIZATION AND MANAGEMENT

4.1 General Information

The purpose of the QAPP is to provide the guidelines and rules to be followed to optimize the accuracy, precision and reliability of the data. The success of the QAPP program depends on the awareness and cooperation of each individual participating in the project.

Representatives of the client and The MARK Group, Engineers & Geologists, Inc. (MARK) share responsibility for implementation of quality assurance/quality control objectives and procedures presented in the Plan.

The primary chemical analytical laboratory for this project will be a State of California-certified laboratory. Any required independent testing for quality assurance/quality control will be performed by a second State of California-certified laboratory. Quality assurance officers for the laboratories will be responsible for verifying that all samples are analyzed in accordance with approved and properly documented procedures.

4.2 MARK Project Management

Project Management with The MARK Group is coordinated among various individuals who are assigned specific project responsibilities commensurate with their experience and education. Key functional positions on the MARK Management Program include the Principal-in-Charge (PIC), Project Manager (PM). Quality Control Officer (QCO), Health and Safety Officer (HSO), and Task Leader (TL). A description of the general responsibilities of each functional position follows.

4.2.1 Principal-in-Charge

On every project, a Principal of the firm is directly involved as the primary executive contact with the client. The PIC is responsible for insuring that contract obligations are met and that necessary resources are available for completion of these obligations. The PIC is ultimately responsible for the health and safety, quality control, and overall performance of the project team. The PIC is an officer of the firm, registered with the appropriate discipline in the state in which the work was performed, and signs all proposals, major correspondence, reports, and contracts relating to the work.

4.2.2 Project Manager

The day-to-day efforts and budget expenditures of the project team are coordinated by the project manager in cooperation with the client's representative. Briefly, the PM has the responsibility to monitor and control the project scope, schedule, and costs and to advise the PIC and client where changes in the scope and (or) budget may occur. The PM prepares progress and status reports as necessary, conducts project progress reviews and assists the client as needed. Requests for additional resources to complete the work are made by the PM to the PIC. The PM is usually the main technical representative of The MARK Group and the client during meetings with regulatory agencies.

4.2.3 Quality Control Officer

During the proposal stage, as the work progresses, and prior to the issuance of reports, the QCO reviews the objectives and respective scope of work for technical merit and completeness. The QCO is a senior officer of the firm who acts as an advisor to the PIC. The responsibilities of the QCO include developing and implementing chain-of-custody, field, and laboratory Quality Assurance/Quality Control (QA/QC) programs. Along with the PIC, the QCO insures that the work is completed in accordance with criteria derived from five sources: The Quality Assurance Project Plan (QAPP), MARK standard procedures, generally accepted engineering and geologic practice, standards of care required in the geographic area, and the limits prescribed by the client and mutually agreed to in writing.

4.2.4 Health and Safety Officer

The responsibility of the HSO is to develop, implement, and enforce the Standard Safety Operating Procedures (SSOP) in compliance with applicable state and federal regulations, our corporate Safety Plan, and the client's safety policies. The HSO conducts safety inspections during field operations and "tailgate" safety meetings. The HSO is an officer of the firm. He works closely with the company's medical group and reports directly to the Corporate Safety Officer (CSO).

4.2.5 Task Leader

A Task Leader is assigned to the project based on his respective expertise in a given discipline or level of experience. These project personnel report directly to the PM and are responsible for supervising subordinate staff and conducting the day-to-day work. These project workers are all professionals with proven leadership abilities and specialized experience to accomplish the assigned tasks. Many are registered professionals within the states where the work is conducted.

4.3 MARK Project Personnel

The MARK personnel assigned to this project and their assignments are listed in the Organization Chart.

4.4 Initiation and Implementation of Project Scope Modifications

At various points in the project, it may become necessary to modify and/or change the project scope, based on unanticipated field conditions, new data, regulatory requirements or other considerations. The sections which follow outline the procedures which will be followed prior to the implementation of any scope changes.

4.4.1 Flow of Information

The Project Manager has primary responsibility for the project scope. As such, all project scope changes must be coordinated with the Project Manager. It is the Project Manager's responsibility to obtain approval of any scope changes from the client, and to coordinate the scope changes with the Principal-in-Charge. With the exception of scope changes requested and made on an "emergency" based on unanticipated field conditions, written confirmation of any scope change should be obtained by project personnel from the Project Manager prior to field implementation of any scope changes. For emergency situations, verbal authorization of the scope changes by the Project Manager is a suitable basis for scope change implementation. In these cases, it is the responsibility of the Project Manager to provide written follow-up authorization of any verbally approved scope changes, both to field personnel, the PIC, and the client.

4.4.2 Review and Approval of Methods

Scope changes may involve an extension of the work elements and procedures previously authorized, the addition of new work elements or procedures, or changes to the procedures originally envisioned to accomplish a particular task. Scope changes involving new procedures and/or protocols not incorporated into the QAPP or Sampling and Analysis Plan (SAAP) must be accompanied by a detailed description of the procedures/protocols to be followed. Prior to implementation, the new procedures/protocols must be approved by the Quality Control Officer, the Principal-in-Charge, the Project Manager and the client. Following required approvals, the new procedures will be incorporated into applicable sections of the QAPP and/or SAAP.

4.4.3 Implementation

Implementation of all project scope changes is the responsibility of the Project Manager. Project scope change implementation includes the following elements:

- Discussion and concurrence of proposed change with Principal-in-Charge, appropriate Task Leader, and client;
- Documentation of client approval of scope change and associated budget via a contract amendment, change order letter, or memo to file;

- As appropriate, preparation of new or modified standard operating procedures, to be incorporated into the QAPP or SAAP following the approval of the QCO, PIC, PM and client; and
- Written communication of the scope change from the PM to the appropriate Task Leader and field personnel, including any changes to the QAPP or SAAP.

5.0 QUALITY ASSURANCE OBJECTIVES

Quality assurance is the total integrated program for assuring the reliability of monitoring and measurement data. Quality Control is defined as the methodology employed to assess the quality assurance program. For air, soil, and groundwater sampling programs, quality assurance means that all samples will be collected, analyzed and reported in accordance with a well-defined set of procedures. In general terms, the quality assurance objectives for this project are that:

- Data should be accurate in terms of their agreement with reference or true values.
- Data should be precise in that there is agreement among individual measurements made under similar conditions.
- Data should be comparable to prior relevant data for evaluation purposes.
- Data should be reproducible under similar conditions.
- Data should be representative of the conditions actually present at the site.
- Data should be sufficient for appropriate evaluation of the remedial alternatives proposed for final remediation at the site.

Quality assurance objectives are often stated in terms of the precision, accuracy, and completeness of the data generated. Precision is the degree of agreement among individual measurements made under prescribed conditions. Comparison of samples run in duplicate provides a good indication of precision. Accuracy is the difference between an average value and true value, when the latter is known or assumed. Accuracy for some methods is determined by instrument specifications. Comparison of known concentrations and reported concentrations provides a good mechanism for evaluating accuracy. Completeness is described as the ratio of acceptable laboratory results to the total number of analyses performed. Methods for determining accuracy, precision, and completeness are described in Section 14.

6.0 SAMPLING PROCEDURES

6.1 General

This section describes the procedures that have and will be used by all personnel to obtain field samples. The procedures presented in this section are designed such that: 1) all samples collected at the sites are consistent with project objectives; 2) samples are identified, preserved, and transported in a manner such that data are representative of the actual site conditions; 3) information is not lost in sample transferral, and 4) data can be used as evidence if litigation occurs. These data will ultimately be used to evaluate the extent and nature of chemical compounds in the wastes, soils and groundwater such that the project objectives may be met.

The field procedures described in the following sections provide either specific protocols for performing the tests outlined in the sampling and analysis plans or minimum general considerations and guidelines to be followed for accomplishing goals or tasks which due to their nature will require highly site specific equipment/procedures.

Sampling and analysis plans are prepared for each phase of work prior to initiation of the work. At a minimum, these plans include the following:

- objectives of the sampling effort;
- sample locations and selection criteria (including permission and permits);
- required field instruments and sampling equipment;
- sample locations and analytical procedures to be used;
- detailed site-specific sampling methodology, if not consistent with QAPP procedures;

- types of field measurements and sample screening procedures;
- well installation and developing methodology, as appropriate;
- decontamination procedures, if not consistent with QAPP procedures;
- disposal of drill cuttings, development and decontamination water;
- time schedule for completion of work.

Sampling activities for this project are varied and correspondingly require a variety of sampling methods. Outlined in this section are procedures to be followed for the collection of soil vapor, air, water, and soil samples in a variety of environmental settings.

As required, additional sections will be added to the QAPP in the future to describe sampling methodologies referenced in future sampling and analysis plans.

6.2 Soil Vapor Sampling

On-site analysis of volatile organic compounds VOCs is increasingly important to environmental assessments. The ability to perform real-time chemical analysis during investigations of potentially contaminated soils allows field decisions to be made regarding the depth and areal extent of the investigation.

The applications of on-site VOC analysis include evaluation of subsurface spills and leaking tanks; evaluation of VOC emissions from landfills, contaminated soils, and industrial facilities; and identification and definition of the vertical and areal extent of groundwater VOC plumes.

Because VOC's are readily transported in soils by diffusive and adjective processes, soil gas surveys have proved to be a powerful technique to determine whether spills have taken place on the site, to locate these spills, and, if subsurface conditions are favorable, to find and delineate groundwater VOC plumes by the presence of VOC's in overlying soils.

The analytical requirements for real-time mobile-laboratory analysis are different than the conventional VOC analyses prescribed by EPA protocols. The laboratory productivity, that is, the number of analyses required per unit time, must be much greater for the mobile facility. Otherwise, the value of using the data to modify the investigation is diminished.

Despite the need for greater productivity, the other analytical requirements for detection limits, variety of analytes, and freedom from laboratory contamination are if anything, more stringent than those of fixed laboratory facilities.

The sampling methods included in the protocol have been designed to allow accurate, contamination-free sampling of soil gas. These methods offer a detection limit of 0.01 μg/l for many compounds. Additional, simultaneous analysis is provided for total petroleum hydrocarbons, methane, and total chlorinated hydrocarbons. The following sections document the materials, apparatus, and procedures used.

6.2.1 Sampling Equipment

6.2.1.1 Sampling Probes and Drive Point Rigs - Sampling probes consist of 5 foot sections of 1 3/8" hardened EW drill rod with Acme threads. The points are machined of high carbon steel and are left behind when the pipe is hydraulically pulled back to expose the formation to pumping. The probes are driven to the sampling depth using a heavy duty hydraulic hammer mounted on 1988, Ford F-450 flat-bed duallys. These rigs are capable of driving sampling pipe to a depth in excess of 50 feet under normal driving conditions. The drive point rigs are also equipped with hydraulic outriggers, pipe racks and steam cleaner. The probes are removed using a hydraulically activated pulling dog. Latex gloves are worn during handling and assembling of the sampling apparatus.

6.2.1.2 Sampling Adaptors - Soil gas samples are collected from the probes via adaptors constructed of stainless steel pipe caps brazed to stainless steel tubing connected to an inline stainless steel bellows valve.

6.2.1.3 Soil Gas Cartridges

Soil gas samples are collected in stainless steel cartridges housing a glass tube (Supelco) filled with a three layer packing of various types of adsorptive hydrophobic carbon. The soil gas is passed through these layers, the first, Carbotrap, absorbing "heavy" volatiles such as dichlorobenzene, the second, Carbopack B, the lighter volatiles such as TCE and DCE, and the third, Carbosieve III, the ultralights such as methylene chloride or vinyl chloride. Because the most mobile constituent, vinyl chloride, has a breakthrough volume of 158 liters, these cartridges are rated to absorb at least 158 liters of soil gas before breakthrough of any of the priority pollutants listed in EPA method 601, 602, or 624. Table 2 shows some breakthrough volumes for the types of carbon sorbents making up the adsorption cartridge. Thus the sampling capacity of this technique far exceeds that of syringe collection. The high capacity is necessary to meet typical client specifications.

TABLE 6-1: Breakthrough Volumes (in Liters) for US EPA TO-1 Hydrocarbons on the Carbosieve™ S-III/Carbopack B/Carbotrap C Thermal Desorption Tube

Hydrocarbon	Carbosieve S-III (125 mg)	Carbopack B (200 mg)	Carbotrap C (300 mg)
Vinyl Chloride	158	1.1	-
Chloroform	-	0.4	-
1,2-Dichloroethane	-	2.7	-
1,1,1-Trichloroethane	-	4.7	-
Carbon tetrachloride	-	6.8	-
1,2-Dichloropropane	-	2.5	-
Trichloroethylene	-	1.7	-
Bromoform	-	2.2	-
841			
Tetrachloroethylene	-	316	-
Chlorobenzene	-	262	-
n-Heptane	-	284	-
Benzene	-	2.3	-
Toluene	-	130	-
Ethylbenzene	-	4060	12.9
p-Xylene	-	-	11.2
m-Xylene	-	-	11.0
o-Xylene	-	-	11.0
Cumene	-	-	27.8

6.2.2 Sample Collection

After purging 3 probe volumes from the sampling train, the bellows valve on the adaptor is shut off and the stainless steel sample cartridge housing is attached in line using Swagelok compression fittings to the adaptor and a programmable mass flow controller equipped with a vacuum regulated oiless diaphragm vacuum pump. The flow controller is typically programmed to pump

200 ml of soil gas at a flow rate between 100 and 200 ml/min. When the total flow volume has been obtained, a solenoid valve is automatically closed and the sample collection is complete. The mass flow meter delivers sample volumes between 20 and 5000 standard ml with less than 2 percent error independent of temperature and vacuum conditions.

6.2.3 Decontamination of Equipment

Prior to each use and reuse, each stainless steel sleeve, sampling probe, point and bailer are steam cleaned and stored in clean storage areas on the drive point rigs. Care is taken with this equipment to eliminate both soil-surface and cross-hole contamination. Vinyl or latex surgical gloves are worn during handling and assembly of the sampling apparatus.

Adaptors and stainless steel bottles are heated to 120 degrees C using a convection oven and held for 1 hour at that temperature. Carbon packed desorption cartridges are purged at 400 degrees C with helium for 8 minutes. Cartridge holders are heated and purged at >200 degrees C for 20 minutes.

Separate storage areas are provided for used and cleaned equipment. No equipment is reused without cleaning.

6.3 Air Sampling

6.3.1 General Considerations

Gas samples may be collected from a variety of environments and sources, each of which require specific sampling techniques:

- Ambient Air Samples may be collected at stations near potential omission sources and located relative to wind direction, land use, and topography as specified in the sampling and analysis plan.

- Confined Space or Personnel Air Samples may be collected for purpose of monitoring specific exposure of personnel. Sampling stations will be located relative to potential emission sources, air flow patterns, and personnel as described in the sampling and analysis plan.
- Subsurface Air Samples may be collected from either temporary or permanent subsurface monitors as specified in the sampling and analysis plan.

Depending on the requirements specified in the sampling and analysis plan, gas samples may be collected by either active or passive means. Collection of air samples by an active means depends on inducing a pressure gradient between the sample source and the sample repository. This pressure gradient will be induced positively by means of a pump or negatively by cryogenic/evacuation techniques. Active air sampling will be performed at a single point in time (grab) by releasing the pressure gradient, or over an extended period of time (i.e., integrated) by maintaining the pressure gradient for the specified period of time (i.e., 24 hours).

Collection of air samples by passive means depends upon ambient pressures, primarily diffusion and dispersion. Passive air sampling methods will be used to monitor personnel exposure by measuring time- averaged concentrations. Gases present in the surrounding environment will be collected by an adsorbent material at rates and quantities dependent upon the process of diffusion.

Both of these methods employ specific sampling equipment requiring specific handling procedures which are described separately in the following sections.

6.3.2 Sample Collection Equipment

The apparatus used variously for passive or active collection of gas samples from subsurface, confined, or ambient environments will be specified in the sampling and analysis plan, based on such factors as the sampling environment, concentration and reactivity of the constituents, and required accuracy, precision and detection limits. Equipment specifications are described below:

- Diaphragm Pump:
    - 12 volt direct current with battery capable of 24-hour continuous pumping;
    - Diaphragm and valves constructed of non-lubricated Viton;
    - Maximum unloaded flow rate of 2 liters per minute;
    - Minimum adjustable flow rate of 1 milliliter per minute;
    - Discharge pressure greater than 15 pounds per square inch gage (psig);
    - Ball check valve constructed of Teflon and responsive to pressure differentials down to a maximum of 1 psig.
- Flow Measurement:
    - Extend bypass variable-area flow meter constructed of borosilicate glass;
    - Scale is in milliliter (ml) of air per minute with major graduations every 5 ml and minor graduations every 1 ml.

- Flow Controller (when using stainless steel canisters):
  - Maximum inlet pressure: 150 psig;
  - Flow range ratio of maximum to minimum is 100 to 1 for any given inlet pressure;
  - Repeatability: Flow is stable within ±2% of the flow value;
  - Body: 316 stainless steel;
  - Diaphragm: Viton;
  - Seals: Viton "A" and Teflon.
- Timer:
  - MOS digital clock which is programmed for the pump duty period with patch cords;
  - Error less than 1%: ±15 minutes per 24-hour period.
- Probe:
  - 316 stainless steel tubing for gas migration;
  - Two 5-foot sections with male-threaded ends and female couplings;
  - All connections are Teflon wrapped;
  - Retractable slotted tip or detachable tip.
- Fittings, Tubing and Connectors:
  - Constructed of stainless steel or Teflon.
- Sample Containers:
  - 2.8 to 6 liter stainless steel SIS (TM) Grab Sampler;
  - 1 to 30 liter Tedlar (TM) polyvinyl fluoride bags with stainless steel fittings;
  - 3M standard model 3500 organic vapor monitors (or equivalent).

6.3.3 Sample Container Preparation

Depending on the requirements specified in the sampling and analysis plan, samples will be collected and transported using three primary containers: stainless steel canisters, polymeric film bags (i.e., Tedlar), and adsorbent cartidges (i.e., activated charcoal). To provide maximum reliability and reproducibility of results, particularly with respect to reactive constituents at trace levels, special precautions are prescribed for the preparation of sample containers. The preparation process involves four steps: (1) leak check; (2) conditioning; (3) quality control analysis; and (4) documentation. Each step is described in the following sections:

6.3.3.1 Leak Check - All containers are leak-tested prior to conditioning. Leak testing of bags is prescribed as follows:

- Fully evacuate the bag. Take care not to crinkle the PVF plastic film (especially next to the valve). Before complete evacuation occurs, reinflate the bag slightly with zero air;
- Test the bag for leakage by fully inflating the bag to drum-tightness with zero air (which normally contains about 0.1 ppm hydrocarbon). Carefully store the bag being cautious about placing undue stress on the Swagelok valve stem. If a mounting rack is unavailable, inflated bags may be placed on a clean level surface in an isolated area. If bag remains drum-tight for 16 hours, it can be used for ambient air sampling applications;
- After 24 hours, bags should be at least 90% full to be acceptable.

Leak testing of stainless steel canisters is prescribed as follows:

- Test as above, except pressurize to maximum design specifications; and then
- Evacuate canister to prescribed subatmospheric (negative) pressure (typically -25 psig);

- Test the canister for maintained evacuation. After 24 hours, canisters with 90% evacuation maintained will be accepted for sampling.

All sample containers used for sample collection and quality assurance testing are conditional prior to use in the field.

6.3.3.2 Conditioning - Bag conditioning is described as follows:

- Bags are temporarily stored (24 to 48 hours) and transported to the field partially filled with gas;
- Quality control analysis determines background concentrations of the analytes of interest;
- The bag is filled with gas once more after conditioning;
- It is stored for 24 hours, then analyzed as a normal sample. Conditioning is accepted if background concentrations do not interfere in attaining required detection limits.

Stainless steel canister conditioning is prescribed as follows:

- Careful selection of custom-made stainless steel hemispheres and use of the highest quality components;
- "SUMMA" passivation of all sample contact surfaces;
- Argon shielded, 100% penetration TIG welding on a custom-built rotary fixture employing latest advances in welding techniques and equipment;
- Helium leak testing of all welds and fittings to 1×10^{-9} Std. cc/sec;
- High temperature ($\leq 400^{\circ}F$) bake-out and pump-down to 1×10^{-5} torr w/ liquid N_2 trapped pumping system with diffusion pump and special ionization/Pirani gauges;
- Continuous Residual Gas Analyzer (RGA) data/sectra throughout final cleaning (bake-out/pump-out) of each Grab Sampler (TM) batch;
- Background (pre-delivery) analysis/blanking of each Grab Sampler (TM) batch (or optionally each Grab Sampler (TM) by ECD/FID Gas Chromatography (GC));

Conditioning is accepted if background concentrations do not interfere with attaining required detection limits.

6.3.3.3 Quality Control Analysis - QA analysis is performed on 10 percent of the conditioned containers or one bag per log, whichever is more. If the QA analysis fails, the entire lot is reconditioned.

6.3.3.4 Documentation - A travel history is kept for each sample container. The dates of leak checks, conditioning, and sampling are documented. QA analyses for conditioning, sample type and sample analyses are also documented. Each container is given an identification number to facilitate travel history documentation. Containers are used for a similar sample matrix throughout their sampling life.

6.3.4 Sample Equipment Decontamination

To minimize the potential of cross-contamination from one sample to the next, the following decontamination procedures will be adhered to:

- Stainless steel sampling probes will be decontaminated by the following procedure:
    - Remove entrained soil materials by brushing and rinsing with water;
    - Wash with Liquinox and water or high-pressure steam;
    - Rinse with water, then dry;
    - Double rinse with deionized water, then dry;
    - Rinse with stream of zero-grade inert gas.
- Pump will be decontaminated by rinsing with a heated stream of zero-grade inert gas;

- Teflon tubing will be replaced.

6.3.5 Sample Collection

6.3.5.1 Integrated Air Sampling System - Integrated air sampling will be utilized to assess impacts on ambient air quality, characterize emissions from a source, or evaluate air quality in confined spaces. For integrated air sampling, the following flow path will be established. A positive pressure gradient between the specified sample source and sample container will be induced by means of a Teflon- or Viton-lined diaphragm pump. Air flow to the pump inlet will be unrestricted in an arc greater than 270 degrees with the predominant wind direction and away from wake-inducing obstructions such as trees, shrubbery and buildings. Air flow from the pump outlet will be discharged exclusively through Viton, Teflon, or stainless steel materials. Air flow will be controlled and measured downstream of the pump using a constant upstream variable flow controller and a bypass variable-area flowmeter, respectively. Subsequent to downstream air flow control, air flow will be discharged to an appropriate sample container specified in the sampling and analysis plan.

Prior to collecting gas samples for laboratory analysis, the sampling apparatus will be purged of stagnant gases according to the following procedures:

- Set up sampling apparatus in accordance with specific testing methodology except without sample container;
- Estimate internal gas volume of sampling apparatus;

- Activate pump, adjusting flow rate to that required by test method using flow control need valve;
- Purge a volume of gas equivalent to three times the estimated internal volume based upon flow rate and duration.

Immediately after the sampling apparatus has been purged of stagnant gases, attach the sample container and commence the sample collection for the prescribed period. Set timer and assure that the sample container is properly labeled. Record data as directed by Gas Purging and Sampling Log.

Before terminating sample collection, monitor the final flow rate and record. Remove the sample container from the sampler using the quick-disconnect fitting.

6.3.5.2 Grab Air Sampling System - Grab air sampling will be utilized to collect subsurface soil-gas samples or characterize source emissions. For grab air sampling, a positive pressure gradient is induced between the specified sample source and sample container by either of two means: pumping or cryogenic/evacuation techniques.

Grab air samples will be collected by a pump with unrestricted air flow to purge the sampling train and then to collect the samples, alternatively following purging by pumping. The sample will be "grabbed" by the pressure differential established by canister evacuation and maintained by condensation using a liquid nitrogen bath. The latter method allows collection of a sample with minimal exposure to sources of potential cross-contamination.

Collection of subsurface soil-gas samples by the grab method will employ special techniques as described below.

Soil-gas samples will be collected from predetermined locations via hollow, stainless steel probes. The procedure is described below:

- Probes will be advanced vertically by hydraulic means to the appropriate sampling depth. Placement of probes by this means in undisturbed soils will provide an air-tight seal. Probes will be designed to allow inlet air to enter only at the required sampling depth and allow passage of the air to the sample container at the surface;
- Soil-gas samples will be extracted from the subsurface by applying sub-atmospheric pressure to the probe. This pressure gradient will be established using a teflon-lined diaphragm pump connected to the sampling probe by flexible tubing;
- The sampling apparatus (probe, tubing, and pump) will be completely purged by evacuating a quantity of gas equivalent to three internal volumes;
- Following complete purging of the sampling apparatus, a soil-gas sample will be discharged from the teflon-lined diaphragm pump to a ten-liter Tedlar bag, or directly sampled via a syringe sampler;
- Soil-gas samples contained in Tedlar bags will be handled, transported and stored in a manner consistent with Section 6.5.

6.3.5.3 Continuous Air Sampling - Continuous air sampling will be utilized to monitor air quality for specific health and safety requirements Continuous monitoring will be performed using portable photo-or flame-ionization detection equipment with internal pumping systems. Sampling and analysis plan will specify purpose and consideration for such monitoring.

6.4 Groundwater Sampling

6.4.1 General Considerations

There are numerous designs of monitoring wells and purging and sampling equipment. Consequently, all the combinations will not be addressed herein. However, general procedures common to all techniques will be presented.

6.4.2 Purging and Sampling Equipment

Purging is typically conducted with a pump capable of pumping several gallons per minute. This may be a centrifugal surface pump, a submersible pump, a surface diaphragm pump, or a submersible gas displacement pump. For low-yielding wells, either a bailer or a bladder pump may be used. Under no circumstances should the water in the well be aerated.

Sampling may be conducted with either a dedicated bladder pump or a bailer. A bailer can be either a decontaminated Teflon bailer or a dedicated single-use disposable bailer.

6.4.3 Sample Container Preparation

Sample container preparation will be in accordance with SW-846 and is the responsibility of the laboratory.

6.4.4 Equipment Decontamination

6.4 4.1 General - All equipment used to measure and sample the groundwater system (e.g., pumps, discharge hose, water level meters) must be cleaned before use in each well to prevent cross-contamination between wells.

A spill containment area will be established at each sampling area. This area will protect the site from possible contamination from accidental groundwater spills, and will also protect sampling equipment from ground contamination.

Well discharge will be pumped directly into a 55-gallon metal DOT-approved drum which will be stored on-site for eventual disposal. Solid waste will also be stored in 55-gallon metal drums. All waste materials generated during purging and sampling procedures will remain the property of the client, who will retain the responsibility for disposal.

6.4.4.2 Decontamination Procedures - All equipment decontamination activities will take place within a designated decontamination area, which will be floored with plastic sheeting in such a way that rinsate may be contained and collected.

All nondisposable sampling equipment will be cleaned using either a steam cleaner or a detergent solution alone.

Decontamination procedures using a steam cleaner are as follows:

1. Lay equipment to be decontaminated on racks in the decontamination area;
2. Inspect equipment for adhering sediments or any other condition which may require scrubbing or other more rigorous cleaning methods;
3. Connect the steam cleaner to the water supply, turn on the water, and turn on the steam cleaner. Turn the cleaner mode switch to the "steam" setting. Allow time for the water to heat.
4. Thoroughly rinse the equipment with the steam cleaner nozzle attachment.
5. Apply a small amount of liquid detergent or detergent solution to the outside of each piece of equipment.

6. Rinse again with the steam cleaner nozzle, scrubbing equipment if necessary. This second rinse should first distribute the detergent solution over the inside and outside surfaces of the equipment. Continued rinsing will remove the detergent.

7. While equipment is still wet, use a Hudson-type sprayer containing organic-free deionized or distilled water to thoroughly rinse the equipment.

8. Remove the equipment to the transport vehicle or to the sampling site. The equipment should be placed on new 6-mil PVC plastic sheeting. It is advisable, whenever practicable, to loosely wrap equipment with plastic sheeting to help prevent contamination during transport. Personnel handling equipment shall do so only when wearing clean latex or plastic gloves.

9. Transfer rinsate to a 55-gallon metal drum for storage.

Decontamination procedures using a detergent solution alone are as follows:

1. Lay equipment to be decontaminated on plastic sheeting in the decontamination area.

2. If visible dirt is observed on the equipment, rinse and scrub with tap water.

3. Wash equipment in an Alconox or Liquinox (detergent) solution and rinse thoroughly with tap water.

4. Twice-rinse equipment with distilled or deionized water, using a Hudson-type sprayer.

5. Remove the equipment to the transport vehicle or to the sampling site,placing on new 6-mil PVC plastic sheeting, and loosely wrapping equipment, where practicable, with plastic sheeting. Equipment will be handled only by personnel wearing clean latex or plastic gloves.

6. Transfer rinsate to a 55-gallon metal drum for storage.

6.4.4.3 Work Area Procedures - A spill containment area will be established at each sampling site. A new, clean length of 6-mil PVC plastic sheeting will be placed on the ground in each area, immediately surrounding the monitoring well. A 15 foot x 15 foot square of plastic will generally be adequate to cover the well area. the sides of the spill control area will be raised, typically by placing 2 x 4 boards under the edges of the plastic sheeting. this will provide containment in the event of accidental leaks, spills, or splashing of groundwater.

Care during purging and sampling operations should minimize the likelihood of spilling or splashing purged fluids. If spills occur on the plastic sheeting, they should be contained on the plastic and wiped with an absorbent material as soon as reasonably possible after spillage. All used absorbent material and used plastic sheeting shall be treated as contaminated waste and disposed as described in the following section.

Disposable latex or plastic gloves will be used by all personnel involved in sampling of groundwater and handling of sampling equipment.

Waste containment bags will be maintained in the sampling area. One bag will contain potentially hazardous materials, i.e., any material that comes into contact with groundwater. A second bag will contain non-hazardous waste materials, i.e., paper towels used for washing hands, scrap paper, etc. This bag will be disposed as regular trash. The bag holding potentially hazardous waste will be disposed as described in the following section.

The guidelines and procedures set forth in the Site Health and Safety Plan shall be followed at all times. Emergency procedures for situations such as personal injury or spillage of contaminated materials are covered in detail in the Health and Safety Plan.

The On-site Health and Safety Coordinator will be primarily responsible for the health and safety aspects of sampling, including monitoring air quality in the sampling area, and establishing and coordinating emergency procedures for situations such as personal injury or spillage of contaminated materials.

Sampling team personnel will have on hand personal protection equipment including respirator, protective clothing, gloves, and eye protection. Eye protection and gloves will be worn by all sampling team personnel during purging and sampling activities. Need for additional protective clothing and/or equipment will be determined by the On-site Health and Safety Coordinator.

6.4.4.4 Waste Management - Water discharged during well purging and sampling will be discharged into a 55-gallon metal DOT-approved drum or other suitable storage container. After completion of purging and sampling, drums will be transported to an on-site holding area and stored for eventual disposal by the Client. Closed containers for liquid waste shall be filled to no greater than 95 percent capacity to allow for temperature-related expansion of liquid materials.

An open 55-gallon metal DOT-approved drum, or other suitable container, will be used during filling of sample containers to contain waste water discharged. Immediately after sampling, this water will be transferred to metal storage drums.

Solid, potentially hazardous waste will be transported to the decontamination/staging area where it sill be stored in sealed, 55-gallon metal DOT-approved drums.

All containers of potentially hazardous materials generated by purging and sampling activities will be labeled according to federal, state and local regulations. These materials shall remain the property of the Client, who will retain responsibility for proper disposal.

6.4.5 Water Level and FPLH Layer Thickness Measurements

Water levels and Floating Petroleum Liquid Hydrocarbon (FPLH) layer thickness measurements are to be recorded in a field notebook or on the appropriate pre-printed MARK field form. Specific procedures follow:

1. Record the pertinent heading information, if necessary.
2. For each well, record the time and ambient weather data.
3. Unlock the well cover and prepare to measure water levels and FPLH layer thickness, where appropriate, with an electronic water level meter (sounder) or with a weighted steel tape.
4. Note the location of the reference notch or marking on the top of the casing, if any.
5. Measure the water level with an electronic water level meter or with a weighted steel tape and water finding paste. Measure the FPLH layer thickness, where appropriate, with a weighted steel tape and water-finding and gas-gauging pastes. Repeat the procedure used to check for error.
6. Record the data on the form.
7. Decontaminate the instrument used by wiping the tape with disposable, ink-free paper towels, and then according to procedures described in Section 6.4.4.2.

6.4.6 Purging

Purging will be conducted immediately before sampling. The volume of well water to be purged from each well or screened well interval sampled will be determined as follows:

- At least three times the volume of water in the well casing will be removed.
- Readings of temperature, pH, and specific conductivity will be taken for at least every casing volume removed. Purging will not be terminated until values for each of these parameters have stabilized to within ten percent.

For purging wells, the following procedures apply:

1. Measure and record water levels before pumping.
2. Measure and record the depth to the bottom of the well.
3. Follow the pump installation and operating procedures.
4. Use the above guidelines to calculate the minimum volume of water to be purged form the well to be sampled.
5. Record the time that purging is started.
6. The pumping discharge rate should be carefully monitored and recorded periodically so that the volume of water purged can be accurately calculated.
7. Measure and record temperature, pH, and specific conductivity parameters at intervals which correspond to no more than one casing volume. Continue to purge until the readings stabilize to ±10 percent and the minimum water volume calculated has been removed. Other observable water parameters should be noted and recorded, such as water color, turbidity, clarity, and odors observed.
8. Measure and record water level in the well periodically during purging. Lower the pumping rate if excessive drawdown of water level is observed.
9. Record the time that purging is stopped.
10. Record water levels after purging.

11. Remove the pump and discharge base from the well.

12. Start the sampling.

6.4.7 Sampling

6.4.7.1 Before-sampling Activities - After purging and before sampling, general "housekeeping" should be conducted. These activities include:

1. Wiping spilled groundwater from all equipment.
2. Changing disposable gloves, clothing or other articles that may contact sample containers.
3. Preparing chain-of-custody records, sample labels, and other paperwork.
4. Organizing sample containers to facilitate accurate, yet efficient, sampling. Place sample containers in ice chest for pre-cooling.
5. Removing the pump and discharge hose from the well.
6. Preparing a thoroughly decontaminated Teflon bailer, with stopcock and new polypropylene line.

Sample labeling, packaging, storage, shipping, as well as preparation of field blanks, duplicate samples, and chain-of-custody procedures are described in Section 7.0.

6.4.7.1 Sampling Procedures - samples will be collected from wells immediately following purging using a Teflon bailer which has been decontaminated according to the procedures described in Section 6.4.4.2 or a dedicated disposable bailer.

The following guidelines apply to sampling from a Teflon bailer:

- Sampling personnel shall wear new plastic or latex gloves when handling the bailer, line, or sample containers.

- The bailer should be lowered into the well, allowed to completely fill with water, be raised from the well and then emptied into the container used to contain waste sampling water. Bailer should be rinsed three times in this manner before collecting the sample.
- When the bailer is drawn from the well for sampling, a steady stream of water, suitable for sampling, is released by pouring from the top.

The containers needed for sampling will be specified by the laboratory. Once opened, a container must be used at once for storage of a particular sample. Unused but opened containers are to be considered contaminated and must be discarded. Because of the potential for introduction of contamination they cannot be reclosed and saved for later use. Likewise, any unused containers which appear contaminated upon receipt, or which are found to have loose caps or missing Teflon liners (if required for that container) should be discarded or returned, unused, to the vendor. The following specific guidelines for filling water sample containers are given. Specific analyses to be performed on samples provided by MARK will be specified by MARK to the chemical laboratory:

- Volatile Organic Constituents (VOCs)
    - Samples for VOCs are collected in 40-ml glass vials equipped with Teflon-backed septum screw caps.
    - When sampling for volatiles, the 40-ml sample vials should have no headspace or bubbles. Aeration or agitation of the sample should be avoided to the greatest possible extent. To avoid aeration, the glass vial should be held at an angle so that the stream of water flows down the side. fill the vial until it overflows to eliminate any air bubbles and replace the Teflon-lined cap.
    - Turn the vial upside down and tap it to check for air bubbles. If any air bubbles are observed, empty and refill the vial and check for air bubbles again. Repeat this procedure until an acceptable sample is obtained.

  - The sample should be labeled, packaged, and placed immediately into iced sample containers.

- Other Constituents

  - Water samples for constituents other than volatile organics will be collected in bottles specified by the laboratory.

  - The sample bottle is filled, capped, labeled, and placed into iced sample transport containers.

6.4.8 Post-sampling Activities

Post-sampling procedures should include completion of all field forms, labels, and chain-of-custody documents. All sampling equipment to be used at other sites should be decontaminated. The sampling site should be cleaned and the wells covered and locked before leaving the vicinity.

6.4.9 Temporary Probes

Temporary probes are utilized for the one-time sampling of groundwater following the advancement of a hollow, small diameter tube or probe into the saturated zone. The probe is equipped with a detachable or retractable tip which when advanced to the desired depth can be "opened" to allow water to enter the probe and sampling chamber. When groundwater is within approximately 22 feet of the surface, a peristaltic suction pump may be used to pump the water to the surface. When groundwater is deeper than 22 feet or when the water level inside the borehole is above the top of the probe, a tube is used to vent the sampling chamber for atmospheric pressure. General procedures and protocols to be followed when using temporary probes to characterize groundwater quality are as follows:

- All sampling equipment which contacts or may contact the sample prior to analysis shall consist of previously unused dedicated equipment or equipment which has been thoroughly decontaminated prior to use;
- Equipment decontamination at a minimum shall consist of a thorough steam cleaning followed by a triple deionized water rinse or a thorough cleaning using a Liquinox soap solution followed by a triple-deionized water rinse;
- Additional equipment decontamination or use of dedicated sampling equipment may be implemented based on the results of quality control checks (in field blanks) as described in Section 11.0;
- Prior to advancement of any subsurface probes, all underground conduits should be located by contacting Underground Service Alert (USA) and the owners of the property under investigation;
- The probe shall be advanced vertically to the desired sampling depth using hydraulic pressure or percussion methods;
- The probe shall be withdrawn slightly to allow groundwater to enter the bottom of the problem (i.e., detachable or retractable probe point);
- A peristaltic pump or venting tube shall be connected to the top of the probe and activated;
- For shallow applications, a water sample shall be collected from the discharge of the pump, appropriately labeled and placed in refrigerated storage;
- For deep applications, a water sample shall be collected by withdrawing the probe to the surface (water is held in sampling chamber by one-way valves) and transferring the water to the appropriate bottles, appropriately labeled and placed in refrigerated storage;
- Following each collection, the probe shall be withdrawn and if deeper samples are required, the borehole shall be advanced to the desired depth and the sampling process re-initiated. If deeper samples are not required, the probe hole shall be filled with a cement or bentonite mixture to grade;

6.5 Soil Sampling

Soil samples are generally collected for chemical analyses, physical testing for geotechnical parameters, and lithologic description. Methods developed to collect representative soil samples, are outlined for the sampling methods listed below:

- Hollow-stem auger drilling;
- Rotary-wash drilling;
- Test pit exploration; and
- Hand sampling methods.

Office preparation and preliminary field reconnaissance are essential prior to executing sampling tasks. Existing reports, well logs, aerial photographs, and other relevant information will be reviewed prior to initiation of the fieldwork. Project background information will be considered in the selection of sampling methods, equipment, subcontractors, and safety protocol.

A preliminary reconnaissance of the site will be performed as an aid in planning the field operations. During the reconnaissance, each sampling location will be checked for accessibility, surficial conditions, and overhead and subsurface obstructions (e.g., powerlines and pipelines). At this time project personnel will locate decontamination areas, water sources, and telephones. All necessary work permits, drilling permits, clearances and fees (if any) will be filed with the appropriate agencies prior to field mobilization.

All sampling personnel will be familiarized with the project safety protocol. Prior to and between sampling all sampling equipment will be thoroughly steam-cleaned followed by a triple distilled water rinse. All decontamination procedures will be documented in the Daily Report Form.

All drilling and sampling tasks will be completed under the supervision of a MARK geologist/hydrogeologist, who in turn is supervised by a Certified Engineering Geologist. Lithologic logs will be prepared and submitted using the Unified Soil Classification System for soils and unconsolidated materials and in accordance with ASTM D 2487-83. The appropriate soil descriptions, stratigraphic changes, geologic notation, sampling intervals, recoveries, blow counts, drilling conditions, groundwater levels and other pertinent data will be recorded on the field logs. All borings not completed as monitoring wells will be backfilled with cement or cement/bentonite mixture to grade, according to county well sealing standards. Drill cuttings and other materials generated during sampling activities will be collected, stored, tested, and disposed of in accordance with applicable state and federal regulations, as described in the sampling and analysis plan.

6.5.1 Hollow-Stem Auger Drilling

Hollow-stem auger drilling methods will be implemented to collect representative undisturbed soil samples from depths less than 70 to 80 feet below land surface. This method is generally preferred since the boreholes are advanced without the addition of drilling fluids and the augers are left in place during sampling which prevents the caving of the borehole and downhole slough from the overlying zones. To obtain samples from depths greater than 70 to 80 feet, rotary-wash drilling methods (described in Section 6.4 2) are usually required

Prior to and between use, all drilling and sampling equipment will be thoroughly steam-cleaned to ensure sample integrity and to prevent cross-contamination between sampling points.

All borehole soil samples for chemical analyses will be collected using a modified Diedrich 3-inch O.D. (2.5 inch I.D.) by 18-inch long split barrel sampler. The sampler will be lined with special 6-inch long aluminum liners which become the sample containers. The aluminum liners will be prepared in advance using the procedures outlined in Section 6.5.

Soil samples will be collected using the following protocols:

- The hollow-stem auger will be advanced to a point immediately above the desired sample interval depth;
- The modified Diedrich sampler, equipped with clean aluminum tubes, will be driven by the 140-pound cat-head hammer or hydraulically advanced into the undisturbed materials;
- The Diedrich sampler will be retrieved from the borehole, disassembled, and the aluminum tube sleeves will be removed from the sampler;
- The sample interval(s) to be retained for chemical analyses will be briefly inspected for lithology and then capped with teflon- lined plastic lids. The lids will then be secured with adhesiveless tape. (NOTE: Shallow tubes will be used for sample submittal only if recovery from the deepest tube is insufficient.);
- Following sample collection, all sample containers will be stored, labeled, and transported to the analytical laboratory in accordance with the procedures in Sections 6.6 and 7.0;
- Organic vapor readings of the headspace above all tubes not packaged for analysis will be measured using a Foxboro OVA, Photovac TIP, or equivalent instrument calibrated per manufacturer's instructions, if specified in the sampling and analysis plan;
- The soil sample will be logged into the field sample control book and pertinent information recorded as described in Section 10.

6.5.2 Rotary-wash Drilling

Rotary-wash drilling methods will be implemented to collect disturbed and undisturbed soil samples when:

- hollow-stem continuous-flight augers cannot be used because of heaving sands and coarse gravels;
- solid-stem continuous-flight augers cannot be used because the boreholes will not stay open below the water table because of heaving sand deposits and coarse gravels which collapse the hole;
- cable tool drilling is excessively slow and casing must be driven as the hole advances thus precluding the use of geophysical logging, a critical tool required for proper placement of well screens to monitor discrete zones;
- air rotary and down-the-hole hammers with casing hammers are not suited for relatively fine-grained deposits below the water table and the casing would preclude the use of geophysical logging;
- reverse circulation rotary requires special sampling devices, causes erosion of the boring walls, and requires large volumes of high velocity circulation water; this method is not well suited for installing relatively small diameter monitoring wells.

When possible, formation water will be used as the drilling fluid. Fully expanded, sodium-free bentonite will be added to the drilling fluid only in amounts to stabilize the borehole. Drilling fluids will be contained in approved holding bins. Specific drilling and sampling details including the borehole diameter, sampling intervals, and other pertinent information will be addressed in the Work Plan for each given task.

Prior to drilling/sampling, the drill rods and bit(s) will be measured and recorded by the project geologist.

Disturbed samples will be collected as the drill rods are advanced by sieving the drilling fluids with a fine mesh screen as the fluids are forced from the borehole. As the sample is collected, the geologist will note the interval at which the drill rods are advanced while the sample is collected, and note this information in the borehole log. The viscosity of the drilling fluid, penetration rates, drilling characteristics, and sample "lag-time" will also be noted in the log. Composite samples representing 5-foot sample intervals will be bagged for future study.

Undisturbed samples may be collected using the Diedrich sampler and related techniques described in Section 6.5.1. The Diedrich sampler is fastened to the lead drill rod, lowered to the bottom of the borehole and hydraulically pushed or hammered into the undisturbed soils in a manner similar to the hollow-stem auger (HSA) method.

Following completion of the borehole, the lithology may be electronically logged using the geophysical methods described in Section 6.10.3.

6.5.3 Test Pit Exploration

For many engineering investigations, backhoe equipment is used for excavation. The locations of test pits are specific to each given task and will be described in the Work Plan for each given task. Trenching locations will be determined on the basis of field reconnaissance completed by field personnel with the approval of the group leader. Trenching locations will be free of any overhead or subsurface obstructions. The process of selecting the trench locations will be documented.

Selection of the excavation equipment to be used and dimensions of the test pit are dependent on the project objectives and will be defined in the Work Plan for each given task. If over 5 feet deep, the test pit will be shored in compliance with the California Division of Industrial Safety Requirements and the U.S. Department of Labor's Construction Safety and Health Regulations. No one will enter deep trenches (greater than 5 feet deep) without the trenches being adequately shored, braced, or sloped.

The test pit log will include the following information:

- trench dimensions, elevations, and locations,
- lithologic description,
- description of stratigraphic, structural, and lithologic variations;
- depths of contacts, marker beds, groundwater, capillary fringe;
- sample locations and elevations;
- other information specific to the given sampling task.

Logging procedures will include making a vertical profile parallel with the trench wall using a natural scale; no vertical exaggeration.

Samples to be collected from the test pit will be obtained using the manual sampling techniques described in Section 6.5.4, or by placing representative samples into a wide-mouth sample container using a clean hand trowel. Specific sampling procedures and safety protocol will be outlined in the Work Plan for each given task.

After the trench is logged and sampling has been completed, the shoring will be removed and the trench may be photographed to provide a complete permanent record of the trench Photographs will show or will be located with reference to bench log stationing and/or baseline elevations. A record of the photographs taken will be logged, which will describe the subject, time, date, depth, and other pertinent information.

6.5.4 Near Surface Soil Samples

Near surface soil samples will be obtained by manually driving an Arts core sampler with a 6-inch long by 2-inch diameter aluminum liner tube. The sampler will be driven into undisturbed materials using a 10-pound slide hammer. Between sampling intervals, the borehole will be advanced using a 3-1/4 diameter hand auger.

Upon removal of the drive sampler from the borehole, the ends of the aluminum tubes will be briefly inspected in the field to identify lithology. Soil descriptions will be prepared and submitted using the Unified Soil Classification (USC) for soils and unconsolidated materials. All sampling will be completed by the project geologist/hydrogeologist. The appropriate soil description, stratigraphic changes, geologic notation, sampling intervals and recoveries, blow counts, and other relevant data will be recorded on the field logs.

Immediately following visual inspection, the ends of the sampling tubes will be covered with Teflon sheeting and plastic caps. The caps will be fastened onto the aluminum tubes using adhesiveless silicon tape to provide an airtight seal. Each sample will be appropriately labeled showing the date, job number, borehole number, sample interval, and analyses to be completed. All samples will be stored and transported in accordance with Section 6.6.

All sampling equipment will be washed with a laboratory trade detergent, and then double rinsed with deionized water prior to and between uses to ensure sample integrity. Sample liners will be prepared implementing the protocols outlined in Section 6.6 prior to arrival at the site.

Upon completion of the hand augering and soil sampling, the shallow boreholes will be sealed with a bentonite grout to ground surface. All auger cuttings and residual sample materials will be shoveled into 55-gallon drums. Final deposition of the cuttings will depend upon the results of chemical analysis performed on the retained samples.

6.6 Sample Storage and Transport

6.6.1 Sample Containers/Preservation and Holding Times

All soil vapor, air, soil, and water samples for this project will be collected, stored, and preserved in accordance with the requirements outlined in SW-846.

Containers used for sample storage will generally be obtained from the laboratory performing the analysis. Air sample containers will be prepared as described in Section 6.3 Water sample containers will be prepared as described in SW-846. Aluminum sleeves for soil sampling using the Diedrich soil sampler will be prepared as follows:

- methanol wash to remove residual machine oil;
- wash in hot soapy water with Liquinox (or equivalent) non- phosphate detergent;
- rinse with tap water;
- air-dry at least one hour:
- double rinse with organic-free distilled water and drain;
- air dry 2 to 4 hours and/or heat to 140 deg.F in oven; cool and

- place in polyethylene plastic bags to minimize atmospheric contamination.

6.6.2 Sample Transportation

DOT (Department of Transportation) regulations will be strictly adhered to when commercial carriers are used to transport samples. All samples will be properly packed and maintained at proper temperatures (e.g., iced cooler) during transport. Sample packaging and shipping requirements are outlined below:

- Add correct preservatives as necessary. Generally, the laboratory will add preservatives when the containers are prepared. Do not rinse out preservatives in the field;
- Print clearly in waterproof ink on the proper sample stickers sample identification data and the preservatives, if any, that have been added to each aliquot;
- Cover the sample labels with one layer of adhesiveless silicon tape if it appears that adhesion to the sample container may be a problem;
- Glass bottles are to be rolled in bubblepack and placed upright in the ice chest. Polyethylene bottles are to be enclosed in protective sealed plastic bags and then placed upright in the ice chest. Pack enough dry ice in the ice chest to last until the laboratory receives it. For overnight delivery, 2-4 lbs. of dry ice per chest should be adequate;
- Shipments containing VOA samples should also be packed with activated charcoal;
- Assign airbills to coolers and compile the Chain-of-Custody Record using the correct airbill numbers. Use one Chain-of-Custody Record per cooler;
- Place samples into coolers according to lab destination. Each loaded cooler must weigh less than 150 lbs.;
- Seal a copy of each Chain-of-Custody Record inside a ziplock bag;

- Seal cooler with strapping tape. Several 12-inch strips are enough to do the job. Place two custody seals on each cooler;
- Coolers must be labeled correctly. "Fragile" and "This-end-up" labels go on all four sides of each cooler. These labels must be completely uncovered and clearly 100% visible;
- Ship samples. Be sure to keep coolers and airbills organized so that shipping destinations are correct;
- Telephone the analytical laboratory immediately or at the beginning of the next working day with the airbill numbers, method of shipment, and the date the samples are shipped.

6.7 Piezometer and Monitoring Well Construction

6.7.1 General Design Considerations

General design considerations including well location, approximate depths, well materials, installation methods, will be specified in the Work Plan for each given task. Several considerations dictate the construction methods and materials used for the construction of monitoring wells and piezometers. These considerations include:

- project objectives;
- depth of installation;
- characteristics of the water-bearing unit;
- the presence of chemicals in the subsurface;
- the secondary use of the monitoring well and piezometer.

6.7.2 Casing Size, Material, and Installation

Specific well construction details including well casing diameters, selected casing materials, installation methods and other pertinent well construction information will be specified in the Work Plan for each given task. Selections of well casing diameters, casing string lengths, casing wall thickness, and selection of casing materials will depend on:

- depth of installation;
- the presence of chemicals in the subsurface;
- the method of installation;
- the primary and secondary use of the well.

Prior to installation, all well casing string and caps will be thoroughly steam-cleaned. The well casing materials will be inspected by the field geologist to ensure that the casing is free of grease, paint, tape, glue, and other foreign materials. All casing strings and caps will be measured prior to installation. Casing string lengths will be recorded in the well construction log. When possible, flush threaded well casing materials will be used to facilitate field assembly. No glues or solvents shall be used to connect the casing strings. Prior to installation, the field geologist will review the available lithologic data and determine the interval within the water-bearing unit to be screened. The total depth of the borehole and water level measurements will be measured and recorded prior to installing the casing. The slot size for the well screen will be selected after the gravel pack is specified from field sieve analyses (described below). The slot size will be small enough to hold out between 80% and 90% of the gravel pack, depending on the uniformity of the gravel pack.

For wells constructed using HSA drilling methods, 2-inch casing will be constructed in HSA of at least 6-inches I.D., and 3- to 4-inch casing will be constructed in an HSA of at least 8-inches I.D. Wells with a diameter greater than 4 inches will be constructed using rotary wash methods. The screen and casing will be suspended from the ground surface such that the screen interval is adjacent to the desired interval to be monitored. The use of centralizers is not required because the HSA will sufficiently center the casing strings in the hole.

For wells constructed using rotary wash methods, the annular space will be no less than 2-inches or the radius of the casing, whichever is greater. The borehole will be lightly reamed to remove "mud cake" on the borehole walls prior to casing installation. The casing string will be suspended from the ground surface. Centralizers will be placed from the bottom of every 20 feet on the well screen greater than 20 feet long. Centralizers will be placed every 40 feet on the blank casing. Casing guides will be kept in a straight line so as not to interfere with the intersection of tremie lines for grouting and placing filter material.

Overlying water-bearing units will be isolated by installing a conductor or surface casing. The conductor casing will be driven into a competent clay layer of thickness no less than 5 feet. Conductor casing shall have a wall thickness of at least 1/4-inch and be made from corrosion-resistant steel. Sections of casing will be joined by welding and will be fitted with welding collars. The casing will be set into a borehole which provides at least four inches of annulus; it must be free in the borehole. Once the casing has been freely set on top of the low permeability stratum it will be seated by pushing it into the stratum 12 to 14 inches. The conductor casing will be pressure grouted using the methods described in Section 6.6.5. The methods and depths of conductor casing installation will be recorded in the well construction log.

6.7.3 Filter Pack Design

A filter pack consisting of clean imported sand or gravel will be installed in the annular space adjacent to the perforated interval in each well. The filter pack design will be completed in accordance with U. S. Bureau of Reclamation Groundwater Manual. Sieve analyses will be performed on representative samples of the water-bearing unit to be monitored. Sieve analyses curves will be plotted for all samples tested. The analyses of the stratum composed of the finest materials will be used as the basis for determining the uniformity coefficient and thus the gravel pack design. The uniformity coefficient, an indicator of the range of particle sizes in the water-bearing material, is calculated by dividing the D40 size (dimension of the mesh opening of the sieve which retains 40 percent of the sample) by the D90 size:

$$\frac{D40}{D90} = \text{uniformity coefficient (UC)}$$

The approximate graduation of the gravel pack will be determined by multiplying the D70 size of the water-bearing material by a factor between 4 and 9, and then constructing a curve through this new point that is essentially parallel to the curve for the aquifer material. The following guidelines will be considered:

- For fine uniform water-bearing zones, UC <2.0, use a multiplier of or near 4 maintaining a UC <2.0 for the gravel pack;
- For coarse non-uniform water-bearing zones, UC ≥ 2.5, use a multiplier of or near six, maintaining a UC of ≤ 2.5 for the gravel pack;

- For coarse non-uniform water-bearing zones, UC ≥5.0, use a multiplier of or near nine, maintaining a UC ≤2.5 for the gravel pack.

The thickness of the gravel pack will be no less than 2-inches and no greater than the radius of the casing.

Prior to installing the filter pack materials, a calculated volume of material needed to fill the annular space to a desired level will be obtained. Dry gravel pack material may be placed by free-fall with the HSA. The HSA will be slowly removed as the gravel pack material fills the annular space. The position of the pack will be periodically verified using a weighted sounding device or staff. If sand bridges occur within the HSA, the bridge will be broken by washing the pack material down the augers using formational or deionized water.

For the deeper wells drilled using rotary-wash methods, the filter pack material is placed at the desired depth by gravity feed through a pipe (tremie method). Prior to installing the filter pack, the drilling fluid will be thinned to facilitate well construction. A tremie pipe with a minimum I.D. of 2 inches will be used for filter pack materials with UC ≤2.5. Larger diameter tremie pipes will be used for coarse-grained filter pack materials or materials that have a UC ≥2.5. Formational or deionized water will be poured along with the gravel to prevent bridging. The distribution of the gravel pack will be checked regularly using a weighted measuring device or the tremie pipe itself. The tremie pipe will be slowly raised as the gravel pack material fills the annulus.

The filter pack material will extend no less than 2 feet above the well screen to allow for compaction of the filter pack over time. Following installation, the top of the filter pack will be carefully measured and recorded. The actual volume of material installed will be checked against the calculated volume to ensure that there are no voids or slough intervals within the filter pack. The final level and volume of filter pack material used will be recorded in the well construction log.

6.7.4 Well Seal Material and Placement

The remaining annular space above the bentonite seal will be backfilled with grout materials in all monitoring wells. The type of grout materials to be used will be specified in the Work Plan for each given task. Prior to grouting, the appropriate regulatory agency will be notified in advance of the work. The depth of the annular space above the bentonite seal will be carefully measured to determine the volume of grout required. Grouting will be completed in one continuous operation in which the annular space is filled. Where pours exceed 100 feet in depth, the collapse strength of the casing will be checked prior to grouting. The annular space will be backfilled from the bottom of the annular space upward using pressure grouting techniques in accordance with <u>State of California Water Well Standards</u>, Bulletin 74-90, January 1990. The grout materials selected will conform to paragraphs D.2 and D.3, Section 9 of the Water Well Standards. The grout seal will extend from the top of the bentonite seal to land surface. Following the grouting operation, the volume of grout used will be checked against the theoretical volume to ensure no gaps or voids within the well seal exist. The volume of grout used will be recorded in the well construction log. No further work will be performed on the well for at least 72 hours after the grout has been poured.

6.7.5 Locking Protective Casing and Aprons

All monitoring wells will be completed above grade with 12-inch diameter locking protective steel casing. The protective casing will extend approximately 3 feet above grade.

Traffic barriers will be installed equidistant around the wells or well clusters and will extend 3 feet above the ground. The surface completion will include a 2-foot square concrete "apron" pad around each monitoring well.

6.7.6 Well Identification Tags

A brass well identification tag will be fastened to each monitoring well following completion. The well identification tag will include the following information:

- The consulting firm which installed the well;
- The consulting firm's telephone number;
- The well owner;
- The well identification number;
- Type of well;
- Depth of well;
- Borehole diameter;
- Casing diameter(s);
- Screen interval(s); and
- Date of completion.

6.7.7 Survey Control

The top of the steel protective casing (TOC) relative to mean sea level will be measured for each well. The TOC elevations and land surface elevations adjacent to each well will be measured from established U.S. Geological Survey benchmarks by a licensed surveyor to within the nearest ±0.01 foot. A mark or notch will be made on the north side of the steel protective casing indicating the survey point location. TOC elevations will be re-surveyed periodically to check for well and/or land subsidence.

6.8 Well Development

All monitoring wells will be developed following construction to remove drilling fluids and/or fine-grained materials in addition to increasing well efficiency. Well development will be completed using surging and/or pumping methods described below. All well development tasks will be overseen by the project geologist. The drilling subcontractor will be a California licensed water-well driller.

Prior to well development, all well development equipment must be thoroughly steam-cleaned. The equipment will be inspected by the project geologist before use. Well construction data will be reviewed to estimate borehole volumes and determine the equipment needed to complete the task. Prior to pumping/surging, the amount of sediment accumulated at the bottom of the casing (if any) and static water levels will be measured and recorded.

All water and sediment removed from the well will be stored on site in a holding tank pending chemical analysis. During well development, samples will be periodically collected and visually inspected for turbidity. Recovery rates will occasionally be monitored to measure increases (or decrease) in well efficiency. Specific conductivity, pH, and temperature will be routinely measured and all well development data will be recorded.

6.8.1 Surge Block Method

The surge block method is generally used to develop wells with smooth interior screens. Two basic varieties of surge blocks may be utilized: the solid surge block and the vented surge block. The solid and vented blocks generally consist of a body block approximately one-inch smaller in diameter than the casing diameter, and are fitted with two to three "leathers" which are roughly the same diameter of the casing. The vented block has four to six ventholes through the body block in addition to a valve which allows water to pass through the block on the downstroke.

The surge block will be attached to the bottom of a drill stem or pipe of sufficient weight to ensure a smooth and brisk downstroke under gravity fall. Development with a surge block will be started at a slow rate and gradually increased as development proceeds. The tool will be moved through a stroke no greater than three feet in length. The well will be periodically bailed to remove sediment buildup. Surging will be conducted until the well discharge is relatively clear and free of sediment.

6.8.2 Pumping Methods

Well development may also be completed by utilizing continuous overpumping and interrupted overpumping methods. When developing using the pumping methods, a stainless steel, water-lubricated, submersible pump will be used. Continuous overpumping involves development by uninterrupted pumping at rates up to 1.5 times the design capacity. Recovery rates will be monitored and turbidity samples collected to measure the progress of development.

Interrupted overpumping must be completed using a pump capable of pumping at rates up to 2 times the design capacity. The pumping will be carried out in 5 steps at pumping rates of 0.25, 0.50, 1, 1.5 and 2 times the well design capacity. Pumping will be conducted in 5-minute cycles until acceptable standards are obtained.

6.9 Hydraulic Evaluation

6.9.1 General Considerations

The collection and analysis of hydraulic data and information is a complex task. A variety of instruments, measurement methods and analytical techniques may be required for any task. It is important that field personnel involved in the data collection understand the basic purpose of the field effort and factors which could influence the results. For hydrogeologic evaluations, field work is performed for the general purpose of understanding groundwater flow and quality. Correspondingly, field personnel must be sensitive to observing and recording information which can be utilized for this purpose.

General considerations for the performance of field work include the following:

- all field equipment should be decontaminated using a detergent solution or steam followed by a triple distilled water rinse prior to each use;
- all field equipment should be calibrated prior to use and a permanent record kept of calibration;
- all water pumped or transferred during field tests should be stored, tested and disposed of in accordance with the procedures in the sampling and analysis plan and applicable state, federal and local regulations;
- factors potentially reflecting the hydraulic parameters being monitored should be observed and recorded; these include:
  - recent rainfall;
  - surface water ponding and drainage;
  - local irrigation practices;
  - known water leaks;
  - vicinity to neighboring streams, ponds, and other surface water bodies;
  - tidal effects.

Prior to the initiation of field work associated with the evaluation of hydraulic properties, field personnel should consult with the Project Manager and become familiar with the purpose of the field effort and relative importance of the factors listed above.

6.9.2 Water Level Measurements

Water level measurements will be made using an electric well sounding device or using the chalked tape method. An electric well sounder for measuring depth to water (DTW) consists of an electrode fastened to the end of two wire cables, and a light, ammeter, or buzzer which indicates a closed circuit when the electrode makes contact with water. The two-wire cables are commonly marked at regular intervals.

The procedure for collecting water level measurement using the electric well probe are as follows:

- lower probe down well casing until water level is reached as indicated by light, buzzer, or meter on the sounding device;
- mark or carefully hold cable at surveyed top of casing (TOC) measuring point or at an elevation equal to this point;
- measure and record depth-to-water level;
- verify by repeating measuring processes and record results. (The results should be within 0.01 feet.)

The chalked tape method involves using a steel or fiberglass tape with a weight attached to the bottom. The lower 2 to 3 feet of the tape is wiped dry and coated with carpenter's chalk. The water level measurement procedure using this method is as follows:

- lower the tape into the well until the chalked section is below the water;
- hold one of the foot marks on the tape exactly at the top of the surveyed TOC measuring point and record measurement;
- remove the tape from the well in a manner such that the chalked section is not dipped further below the water level;
- upon withdrawal, record length of wetted tape section;
- subtract length of wetted section from total length of tape held to calculate measured depth to water, and record results.

Water level measurements will be collected in as short a time as possible in order to approach an instantaneous representative of water level and potentiometric surfaces.

Prior to and between use, the ends of the electric well sounding device and the steel/fiberglass tape will be thoroughly cleaned using a laboratory grade detergent and triple-rinsing in deionized water. The probes will be towel-dried before being lowered into any well.

The electric well sounding device will be calibrated prior to use. Calibration will include:

- measuring distance from electrode to reference markers printed or fastened to the cable by the manufacturer, and recording discrepancies;

- comparing measurements made with the electric sounding device with measurements made using the chalked-type method (when possible) and recording results.

All calibration notes will be recorded. Instruments will be calibrated at least once every four hours.

All water level measurements will also be recorded. Data to be recorded include:

- date and time;
- personnel;
- weather conditions;
- project number;
- measuring method and device;
- calibration data;
- well number;
- top of casing measuring point elevation;
- measured depth to water;
- water level elevation;
- tidal data and references (if applicable);
- other observations.

6.9.3 Slug Tests

The slug test is a means of evaluating the hydraulic conductivity or transmissivity of a given water-bearing unit by the rate of rise or fall of the water level in a well after a known volume or "slug" of water is instantaneously displaced or removed from the well.

Slug tests will be performed by the project geologist who will in turn be supervised by a Certified Engineering Geologist. Prior to field mobilization, all well data and lithologic data will be removed to determine:

- method of test to be used (displacement or withdrawal);
- volumes of water to be injected or withdrawn; and
- method of data collection.

Slug displacement tests will be completed by instantaneously injecting a known volume of water into the well or by dropping a cylinder (slug) into the well to displace a known volume of water. When using the slug injection method, formational water will be added to the well using a PVC funnel with a ball valve. For the slug displacement method, the slug will be constructed of PVC pipe with a diameter at least one inch less than that of the well casing. The cylinder will be partially filled with clean sand, capped, and tested to ensure that no water will enter the slug once submerged. No glues, solvents, or tape will be used in the construction of the slug. Clean cotton rope will be fastened to the slug to lower and raise the slug from the well. The slug will be washed with laboratory grade detergent prior to and between uses.

Prior to performing the test, accurate static water level measurements will be collected from the well using the methods described in Section 6.8.2. Water level measurements collected during the test will be measured automatically using a data logger connected to a downhole pressure compensated transducer; or manually, using an electric well sounding device. The transducer measures the pressure resulting from the water over the sensor. The data logger periodically records the time and pressure values and converts the pressure to height of water above the transducer.

The data logger/transducer will be calibrated according to the manufacturer's specifications. Calibration will be verified by comparing the data logger read-out to manually measured water levels. The instrument will be calibrated for each well tested. Water levels will be allowed to reach static equilibrium following the insertion of the transducer below the water.

Slug withdrawal tests will be completed by either utilizing the dedicated pumps previously installed for groundwater sampling purposes, temporarily installing a pump, or using a bailer to remove a predetermined volume of water. Static water level measurements will be collected prior to the tests. If a pump or bailer is lowered into the well, the water level will be allowed to equilibrate prior to initiating the test. Water level measurements during the test will be measured in the same fashion as previously discussed. All equipment will be thoroughly cleaned with steam or a liquinox soap solution followed by a triple distilled water rinse prior to each use. All decontamination and instrument calibration procedures will be documented using the appropriate field forms.

6.9.4 Pumping Tests

Pumping tests will be performed to determine the hydraulic characteristics of a given water-bearing unit. Special details pertaining to pump tests including test duration, methods, data recording methods, and test objectives will be outlined in the work plan for each given task.

A constant rate pumping test will be used to obtain the specific capacity of a well and the transmissivity and storage values of a given water-bearing unit. This test involves pumping a well at a constant rate and measuring drawdown levels in the well being pumped and nearby observation wells. The well will be pumped for 24 to 72 hours depending on the type of aquifer. Recovery measurements will be collected from the pumping well and observation wells after the pump has been shut off.

Step drawdown tests will be performed on the pumping well prior to performing the constant rate test to determine an appropriate pumping rate at which the constant-rate test should be performed. This test involves increasing the pumping rate at regular intervals and recording the resultant drawdowns. The value of the step drawdown test is that it shows the reduction in specific capacity with increasing yields.

All pumping tests will be performed by the project geologist who will in turn be supervised by a Certified Engineering Geologist. The necessary permits for well discharge (if any) will be obtained prior to performing the test. Methods for disposal of discharge water generated will be investigated and addressed in the work plan for each given task.

Water level measurements will be collected for a minimum of 72 hours prior to the test to ensure static conditions exist. Dynamic water levels will be measured using the data logger/transducer equipment previously described. All equipment will be thoroughly cleaned with steam or a liquinox soap solution followed by a triple distilled water rinse prior to use. Well pumping data including time, date, weather conditions, drawdown, recovery, pump used, discharge volumes and rates, and other relevant data will be recorded.

6.10 In-Situ Subsurface Exploration and Testing

6.10.1 Standard Penetration Tests (SPT)

Standard penetration tests will be utilized for evaluating the strength and/or relative density of soils in-situ. This test will be performed in general conformance with ASTM Standard D 1586-67.

The test will be performed with a 1-3/8-inch I.D., 2-inch O.D. split barrel standard penetration sampler. The sampler is driven into the bottom of the borehole using a 140-pound hammer dropping 30-inches in free fall.

The procedure is generalized as follows:

- clean the boring of all loose material and material disturbed by drilling, before inserting sampler;
- administer a few light taps with the hammer to seat sampler;
- drive the sampler at lest 18 inches, or until normal maximum resistance (refusal) is reached, using the standard hammer and drop (refusal is defined as a penetration of less than 6 inches for 100 hammer blows);
- count and record the blows required to drive each 6 inches of penetration; and
- obtain a consistent 30-inch free-fall drop of the hammer with two wraps of a rope around the cat-head on the drill rig. (Cables attached to the hoisting drum should not be used since it is difficult to obtain a free fall).

Sample intervals and blow counts will be recorded in the borehole log in addition to the USC description of the corresponding lithology.

Correlations between blows per foot penetration (n-value) and the consistency and unconfined compressive strength in clays, and the compactness in sands will be made with caution using the appropriate reference curves. Depth, rod diameter, material penetrated, and proximity to groundwater will also be recorded in the field record and considered in the data analysis.

6.10.2 Cone Penetrometer Testing

Cone penetrometer exploration will be used to characterize the stratigraphy of a site, especially in geologic environments devoid of hard obstacles such as boulders, stone fragments or gravel beds.

Cone penetrometer exploration consists of the advancement of a probe into the ground while measurements of the probe tip resistance and sleeve resistance are recorded. The ratio of the two forces provides valuable insight into the properties of the materials being penetrated.

Cone penetrometer tests will be performed in general conformance with ASTM Standard D 3441-75T. Cone penetrometer tests will be performed in the general vicinity of boreholes which have been carefully logged by a geologist. The interpretation of the CPT data will be calibrated to site specific conditions.

Cone penetrometer tips may be equipped with instrumentation which measures the specific conductance of the water surrounding the tip. When equipped with this instrumentation, cone penetrometers can be used to additionally assess the groundwater quality impact of waste management units which store or handle inorganic liquids of high ionic strength.

Following the completion of cone penetrometer exploration at each borehole, the cone penetrometer will be withdrawn from the ground and the hole will be grouted. Grouting will be accomplished by re-entering the hole with a probe which is advanced to the total depth of the hole and then removed as grout is pumped into the probe hole. Alternatively and preferably, because of recent equipment design changes, grouting will be performed concurrently with cone penetrometer withdrawal.

6.10.3 Geophysical Logging

Deep boreholes drilled using rotary-wash methods will be electrically logged using geophysical methods. The geophysical techniques to be employed are contained within the U.S. Geological Survey National Handbook of Recommended Methods for Water Acquisition (1977). The geophysical techniques to be employed include spontaneous potential and resistivity logging.

Spontaneous potential (SP) is used to evaluate bed thickness, differentiate porous from non-porous materials, and evaluate water quality. The SP log is a graphic plot of the small differences in voltage that develop at contact between borehole fluid, clay deposits, and water in aquifers.

Resistivity logging measures the electrical resistivity of a known or assumed volume of subsurface materials under the direct application of an electrical current. This logging is useful in evaluating formation resistance, formation porosity, and cake resistivity, and water saturation. The methods that will be used are the single point and long (72-inch) normal logs.

All electrical borehole logging will be completed by a registered geophysicist or licensed geophysical technician. The project geologist will oversee the geophysical logging operation.

Logging will be completed prior to casing installation. All geophysical logging tools will be washed using a laboratory grade detergent and rinsed prior to and between uses.

Geophysical logs will be compared to the lithologic log prepared by the geologist during borehole drilling as part of the instrument calibration process. In addition, all instruments will be calibrated implementing the methods described in "Application of Borehole Geophysics to Water Resources Investigations" (USGS, 1976).

7.0 CHAIN OF CUSTODY

7.1 Field Procedures

A critical aspect of sound sampling and analysis protocols is the maintenance of strict chain-of-custody procedures. Field chain-of-custody procedures include inventorying and record keeping during sample collection and shipment through laboratory receipt. The field sampler is personally responsible for the care and custody of the samples collected until they are properly transferred. In general, a sample is under chain-of-custody control if:

- it is in the sampler's actual possession;
- it is in the sampler's view after being in his/her physical possession;
- it is secured by the sampler so no one can tamper with the sample;
- it is secured in an area which is restricted to authorized personnel.

Sample identification documents must be carefully prepared so that identification and chain-of-custody can be maintained, and sample disposition can be controlled. Sample identification documents include:

- Chain-of-Custody records;
- Custody seals; and
- Field notebooks

The sampler must fill out adhesive sample labels and secure them to the sample container. Forms and labels are filled out with waterproof ink. Where necessary, the label is protected from water and solvents with clean label protection tape.

The information on these labels will correspond to the Chain-of-Custody Record which shows the identification of individual samples and the contents of the shipping container. The original record will accompany the shipment, and a copy will be retained by MARK.

When transferring samples, the individual relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer.

Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate Chain-of-Custody Record accompanying each shipment. Shipping containers are padlocked or sealed with custody seals for shipment to the laboratory.

A designated sample custodian accepts custody of the shipped samples and verifies that the information on the Sample Identification number matches that on the Chain-of-Custody Records. Pertinent information as to shipment, pickup, and courier is entered in the "Remarks" section. Once the laboratory custodian receives the samples, laboratory personnel are responsible for the care and custody of the samples.

7.2 Laboratory Procedures

Laboratory chain-of-custody procedures are specific to each commercial laboratory.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

8.1 Field Calibration Procedures

The equipment used in collecting field data includes a variety of instruments. Proper maintenance, calibration, and operation of each instrument is the responsibility of the field staff assigned to the project. All instruments and equipment used are to be maintained, calibrated, and operated according to the manufacturer's guidelines and recommendations.

At a minimum, all instruments should be inspected and calibrated upon receipt. In the event that the instrument is not supplied with manufacturer's recommendations for calibration and calibration frequencies, the following guidelines apply:

- All equipment should be calibrated each day (at a minimum) prior to a field use.
- Instruments for which calibration cannot be easily checked should be either tested against another calibrated instrument of a similar type, or returned to the manufacturer for appropriate calibration. If tested against another instrument capable of making the same measurements, variation between instruments must not exceed 5 percent. If readings vary more than 5 percent, the instrument should be returned to the manufacturer for calibration;
- A permanent record of instrument calibration should be maintained and kept with each instrument.

Instrument specific calibration procedures are outlined in the following sections.

8.1.1 pH Meter

pH meter calibration procedures are in accordance with manufacturer's instructions.

8.1.2 Conductivity Meter

Conductivity meter calibration procedures are in accordance with manufacturer's instructions.

8.1.3 Water Level Recorder

Water level recorder procedures are in accordance with manufacturer's instructions.

8.1.4 Dissolved Oxygen Meter

8.1.4.1 Operation Principles - The calibration procedures presented for the Dissolved Oxygen Meter pertain to the YSI 5700 series dissolved oxygen probes. YSI 5700 Series probes are polarographic sensors. A thin permeable membrane stretched over the sensor isolates the electrodes from the environment, but allows oxygen and certain other gasses to enter. When a polarizing voltage is applied across the sensor, oxygen that has passed through the membrane reacts at the cathode, causing a current to flow.

The membrane passes oxygen at a rate proportional to the difference across it in partial pressure of oxygen. Since oxygen is rapidly consumed at the cathode, it can be assumed that the oxygen pressure under the membrane is zero. Hence the force causing the oxygen to diffuse through the membrane is proportional to the partial pressure of oxygen outside the membrane. As the oxygen partial pressure varies, both the oxygen diffusion through the membrane and the probe current will change proportionally.

8.1.4.2 Calibration - Calibration of the Dissolved Oxygen Meter is performed as described in the instruction manual, a copy of which shall be kept with the instrument at all times. Salient features of the recommended calibration procedure (i.e., air calibration) are listed below. During calibration, it is important that the instrument be placed in the intended operating position. Following preparation of the probe (see Manual), calibration proceeds as follows:

- With switch in the OFF position, adjust the meter pointer to Zero with the screw in the center of the meter panel. Readjustment may be necessary if the instrument position is changed.
- Switch to ZERO and adjust to zero with zero control knob.

- Switch to FULL SCALE and adjust the FULL SCALE knob until the meter needle aligns with the "15" mark on the mg/l scale.
- Attach the prepared probe to the PROBE connector of the instrument and adjust the retaining ring finger tight.
- Before calibrating allow 15 minutes for optimum probe stabilization. Repolarize whenever the instrument has been OFF or the probe has been disconnected.
- Switch to CALIB O_2 position.
- Place the probe in moist air. Probes can be placed in YSI 5075A Calibration Chamber or the small calibration bottle (the one with the hole in the bottom) along with a few drops of water. The probe can also be wrapped loosely in a damp cloth taking care the cloth does not touch the membrane. Wait approximately 10 minutes for temperature stabilization. This may be done simultaneously while the probe is stabilizing.
- With the CALIB Knob set the meter pointer to the mark for the local altitude. Be sure reading is steady. For calibration at altitudes higher than 7000 feet above sea level, see Table II of manual. Recalibration is recommended when altitude is changed. A 1000 ft. altitude change can result in a 3 percent reading error - 0.3 mg/l at 10.0 mg/l.

Calibration should be checked for each series of measurements in the field and adjusted accordingly. During instrument operation, it is important to note that salinity levels affect the measurement of dissolved oxygen. Correspondingly, the salinity of the water being evacuated should be known or estimated, and readings adjusted appropriately as described in the operating manual. In addition, accurate measurements of dissolved oxygen require that the probe or solution being monitored be kept in constant motion.

8.1.5 Gas Chromatograph

8.1.5.1 Operation Principles - The calibration procedures presented for gas chromatography will be used with the Hewlett-Packard (HP) 5890A/19394 gas chromatographic system or the Photovac field gas chromatographic system. The operating principles for both systems are similar. A sample is injected into a packed or capillary column and is carried through the column by an inert gas. The column serves to separate the individual constituents injected into the column. Exiting the column, the separated constituents are detected by a detector, which produces an electrical signal proportional to the quantity of material present. This signal is fed to a strip chart recorder and/or integrator. Integrator or recorder output are then used in conjunction with previously injected standards of known concentrations to identify and quantitate the chemical constituents present.

8.1.5.2 Calibration Procedures - Minimum calibration protocols for the field gas chromatography work include the following:

- Calibration standards are prepared at a minimum of three concentration levels for each parameter of interest;
- Area responses are tabulated against concentration for each compound of interest;
- Response factors for each compound are calculated;
- If the response factor over the working range is consistent (i.e., less than 15 percent of relative standard deviation), the RF can be assumed to be invariant and the average RF used for calculations. Alternately, the results can be used to plot a calibration curve of response ratios against response factors; and
- The working calibration curve or response factor must be verified on each working day by the measurement of one or more calibration standards. If the response for any parameter varies from the predicted response by more than ±15 percent, the test must be repeated using a fresh calibration standard, or alternatively, a new calibration curve must be prepared for that compound.

8.2 Laboratory Calibration Procedures

Laboratory calibration procedures are unique to each individual laboratory.

9.0 ANALYTICAL PROCEDURES

The laboratory that provides analytical services for samples collected for this project adheres to the procedures and protocols of the U.S. Environmental Protection Agency (EPA), and is certified in the State of California.

Laboratories which will provide any required QA/QC control tests are certified in the State of California and will perform all analytic procedures in compliance with the applicable EPA protocols.

10.0 DATA VALIDATION, REPORTING AND DOCUMENT CONTROL PROCEDURES

10.1 Data Validation and Reporting

10.1.1 Literature Reviews

Data validation and reporting procedures for information obtained from the literature will be performed in accordance with the following:

- All literature articles reviewed and potentially used as references for MARK reports shall be summarized on MARK Literature Review Summary Forms;
- At the top of the Summmary Form, the publication shall be identified using the reference style which follows:

  First Author's last name (comma) first two initials (use periods after each) (comma) Second Author's last name (comma first two initials (periods) (comma) and Last Author's last name (comma) initials (periods) (comma) Year (comma). Capitalize only the first letter of the first word in the title of the publication,. as well as in scientific names and proper names (colon). Publishing location (comma) Publisher (comma) volume (small letter "v" period and Arabic numeral) (comma) page numbers (small letter "p" period and Arabic numerals) (period). Other abbreviations should be in small letters and Arabic numerals;
- After review, a copy of the technical article shall be placed in the MARK library;
- All summary forms shall be routed to the project file via the Project Manager and Prinicpal-in-charge;
- The Project Manager or the Principal-in-charge may at their discretion, request that another MARK employee review the same article and verify the information presented on the summary form.

10.1.2 Field Measurements

Data validation and reporting procedures for field data will be performed in accordance with the following protocols:

- The Project Manager shall assign a staff or project level team member the responsibility for validating or reporting the field measurements;
- The assigned individual shall validate all field measurements used or presented in a MARK report by:
  - checking the calibration procedures utilized at the specific site;
  - comparing the data to previous measurements obtained at the specific site;
  - reviewing the daily reports for adherence to established protocols;
  - reviewing the data for reasonableness.
- The assigned individiual will document his review in the project file;
- The assigned individual will report to the Project Manager on any variations or anomolies in field data which cannot be explained by local conditions;
- The Project Manager will review the questioned data and determine how and if the data should be used in MARK reports or engineering evaluations.

10.1.3 Laboratory Data

Laboratory data validation and reporting procedures will be performed in accordance with the following protocols:

- The Project Manager shall assign a staff or project level team member the responsibility for validating and reporting the laboratory data;
- The assigned individual will validate all laboratory data used or presented in MARK reports by:
  - reviewing the quality control data associated with the laboratory data for compliance with established procedures, protocols and quality assurance objectives (i.e. precision, accuracy and completeness);

  - reviewing the results for reasonableness in conjunction with knowledge of past monitoring data and hydrogeologic conditions for evidence of significant deviations from established trends;

  - documenting his review in the project file.

- If data validation procedures suggest a problem exists, the review individual shall:

  - notify the Project Manager of the questionable data;

  - review the field records for evidence that the data anomolies are related to sampling technique/error;

- If a review of the filed sampling procedures does not resolve the question associated with the laboratory data the Project Manager or his appointed designee shall contact the laboratry QA/QC representative and challange the suspect data;

- After careful review, the laboratory QA/QC representative shall either verify, discount or modify the reported data, and issue a revised report as required.

10.1.4 Computer-Processed Data

Data validation and reporting procedures for computer-processed data will be performed in accordance with the following protocols:

- The project manager shall assign a project or senior level team member the responsibility for validating or reporting computer-processed data;

- The assigned individual shall validate all computer-processed data by:

  - reviewing the computer software specifications and validation test results

  - reviewing the computer input data for reasonableness;

  - reviewing the computer output data for reasonableness and consisting with observations made in the field; and

  - performing "spot check" hand calculations and comparing to computer generated results.

- Upon completion of his review the assigned individual shall:
  - initial the computer software as acceptable and approved; and
  - initial the computer-processed data as acceptable and approved; or
  - report back to the Project Manager with specific reasons why the computer-processed data are unacceptable.

10.1.5 Engineering Calculations

Data validation and reporting procedures for engineering calculations will be performed in accordance with the following protocols:

- All engineering calculations will be performed, initialed, and dated on MARK calculation sheets;
- All equations used as a basis for calculations shall be referenced and numbered in MARK reports and calculation sheets;
- The Project Manager will assign a registered engineer in the appropriate field to review the engineering calculations;
- The assigned review engineer will review the calculations and if found to be satisfactory, initial and date the calculation sheets.

10.1.6 Reports and Drawings

All reports and drawings shall be reviewed and approved by the Project Manager and the Principal-in-Charge prior to release. Reports shall be distributed and maintained in accordance with the procedures outlined in Section 10.2

10.2 Document Control

10.2.1 Responsibilities

The Project Manager has responsibility for overall document control program and is responsible for the maintenance of the document control system. Project personnel (i.e. task leaders) are responsible for project documents while working on the site.

10.2.2 Accountable Documents

Almost all project-related materials used or generated are accountable documents. Examples include project notebooks, logbooks, field data forms, field notebooks, Traffic Reports, Chain-of-Custody Records, analytical data, maps and photographic prints. Each completed document is listed in a project inventory and filed in the project file.

10.2.2.1 Field Documents - Serialized (i.e., numbered) field documents which are routinely used include:

- Chain-of-Custody Forms;
- Traffic Reports;
- Special Analytical Services Request Forms; and
- Custody Seals.

These documents are distributed for sampling activities. It is the responsibility of Task Leaders and Project Managers to ensure that these documents are used appropriately, filed correctly, and distributed to the designated organizations.

In addition to these documents, field notebooks, field data forms, calculation briefs, and photographs are subject to inventory and control procedures. Specific protocols to be followed for these documents include the following:

- All entries to the field notebook and field data forms will be made in waterproof ink;
- Each entry will describe the sample location, field measurements taken, station number, and sample identification number;
- All in-situ measurements and field observations shall be recorded with all pertinent information necessary to explain and reconstruct field activities;
- A record of all serialized document numbers will be complete in matrix format either in the notebook or on separate attachments;
- Each page of field notebook or field data form and calculation brief shall be dated and signed by all individuals making entries on that page;
- The Project Manager and the field team on duty are responsible for ensuring that field notebooks and data forms are used during all monitoring activities and are stored safely;
- Any lost, damaged or voided field notebooks or data forms shall be reported to the Project Manager.

10.2.2.2 Office Documents - Office materials include project notebooks and project logbooks, test analyses, calculation briefs, maps, diagrams, etc. Maintaining these and other documents, including reference materials, laboratory reports, and project reports is the responsibility of the Project Manager until the closed project file is assembled. The Project Manager will oversee that documents are labeled, filed, and stored in accordance with their classification.

10.2.3 Document Distribution

The Project Manager will be responsible for coordinating the distribution system of all project documents. This will include documents such as: bid specifications, sampling and technical plans, draft and final reports on field activities and results, and modeling reports. The documents generated by contractors, potential responsible parties and their representatives, and local and state agencies will be sent to the Project Manager after completion of internal QA/QC procedures. The project manager will then distribute these documents as requested by the client.

10.2.4 Filing System

Authorized project files are filed alphabetically by client name. All files will be accounted for by a Confidential Document Inventory and must be signed out and returned daily.

Project files will be arranged from front-to-back as follows:

- Project File, as long as papers are clipped into the file folder it is treated as a "single document";
- Masters (hard copy for reproducing proposals or reports) - diskettes are to be kept in a separate locked file cabinet.;
- Reports (starting with the earliest);
- Reference materials (if an accordian file, the file is considered one document);
- Folded Maps (if in accordian file, the file is considered one document).

Each item listed above for confidential projects will be assigned a "document access" number. "Radiant" red file labels (for confidential documents) are used and a "radiant" red label with document access numbers are affixed to the upper right hand corner of the document. The documents, in turn, are placed in hanging folders with the same access number. Any new documents that cannot be clipped into the project file shall be added to the aforementioned inventory when received and a new access number will be assigned and a hanging folder shall be prepared.

The authorized project files will be ACCO four-part folders (Stock No. 15036) or equivalent. As such, they have clips for six categories of organization which shall contain from left (front) to right (back) the following:

- Correspondence
  - letters, contact records, transmittals, meeting notes, memoranda filed in chronological order;
- Scope and Budget
  - signed Purchase Orders, proposal or contract (copies) with cost estimate sheets and supporting data, work plans or any change orders, correspondence or contact records documenting change orders;
- Field Data (or other category)
  - daily reports, boring logs, water level measurements, aquifer test data, etc.;
- Laboratory Data (or other category)
  - chain-of-custody forms, physical property and strength test data, analytical laboratory data;
- Data Evaluation (or other category)
  - calculation sheets, engineering analysis, cost estimates, data interpretations, well inventories;

- Report/References (or other category)
  - technical reports, contact records with agencies on <u>technical</u> matters, articles, report outline with Principal-in-Charge (PIC) approval.

For those large projects where the data exceeds the capacity of the file clips, or where the Project Manager wants to organize the data according to tasks, separate files may be made for the aforementioned or other categories; however, a project management (task -1) file should keep a cross reference note for referral to the separate files. Additionally, other categories, such as specific project tasks, may be used to suit the needs of the Project Manager if approved by the Principal-in-Charge.

Maintenance of authorized project files is a continuous task and the responsibility of all; however, the Project Manager has the ultimate responsibility. Frequently, the file shall be reviewed to insure the following:

- correspondence is kept in chronological order;
- duplicate material is discarded;
- field forms, daily reports, and other documentation are completed with <u>all</u> of the necessary information;
- incomplete notes, inflammatory comments or other unbusiness-like or unprofessional materials are discarded;
- technical data which is useful on other projects such as regional geologic reports, technical procedures, aerial photographs are to be removed when not needed and placed in the technical references/library; and
- all <u>preliminary</u> draft data, comments, workups, calculations are discarded.

10.2.5 Confidential Document Control

All project documents will be considered as confidential. Specific proceudres which will be followed to maintain confidentiality include the following:

- all documents/files will be secured in locked file cabinets or equally secure areas during other than normal working hours, unless the files are personally attended by a person authorized to have access to such files;
- a continuous and permanent record will be maintained of all persons who access any documents/files, including for each file: the person having access, date and period of access, and location of file;
- employees who are not members of the project team or management are not allowed immediate or direct access to confidential files/documents without approval of the Project Manager or Principal-in-Charge.

10.2.5.1 Confidentiality Agreement - All MARK employees will record and sign a Confidential Disclosure Agreement, acknowledging that they are familiar with and agree to abide by the confidential document control procedures outlined in Section 10.2.5.

10.2.5.2 Security Audits - The Principal-in-Charge will periodically schedule security audits to determine if the confidential document control procedures are being followed. The Principal-in-Charge will implement corrective actions judged as necessary to correct any deficiencies noted during the security audit.

11.0 QUALITY CONTROL CHECKS AND FREQUENCY

11.1 Field Quality Control Checks

Field quality control checks refer to the efforts made to evaluate the accuracy, reproducibility or representatives of the system parameters being measured. Normally related to samples for subsequent chemical analysis, field quality control refers to the preparation and subsequent analysis of travel blanks, field blanks, field duplicates, field splits and blind spikes. When related to physical measurements, field quality control generally refers to duplicate or split measurement of parameters of interest. The magnitude or frequency of various field quality control checks will be specified in the sampling and analysis plan. In the following sections, protocols for the preparation/collection of field quality control samples are provided, as is a recommended frequency for implementation. This frequency is included as a best practices guide to be followed when the sampling and analysis plan is either not specific regarding the scope of the quality control program or when the sampling and analysis plan specifies the frequencies in the QAPP be utilized. It is important that all project team members be knowledgeable regarding the scope of the quality control program. The Project Manager should be consulted when questions regarding the scope of the quality control program arise.

11.1.1 Travel Blanks

Travel blanks are samples which are prepared by the laboratory or field personnel by filling a representative sample container with material which is known to contain non-detectable levels of constituents of interest. These samples are then transported with the filed samples and analyzed for evidence of systematic contamination from the sample container, sample storage and transport, or sample analysis. Because travel blanks are used to detect systematic contamination from sample containers, travel blanks shall be prepared from the same "batch" of sample containers as used for the field samples.

11.1.1.1 Soil Gas Samples - An unused sample cartridge is transported into the field with the sampling equipment. The trip blank cartridge is handled in the same manner as a sample, but a sample is not collected through this cartridge. The trip blank is returned to the lab with the other samples and analyzed. If VOCs are detected, sample handling and transport procedures are subsequently reviewed.

11.1.1.2 Water Samples - Travel blanks for water sampling program generally refer to the preparation of samples using "organic free" water for subsequent analysis for volatile organics. One volatile organic travel blank should be analyzed per day per transport container. Travel blanks are also prepared for subsequent analysis for non-volatile organics and metals, when these parameters are also of potential concern. Travel blanks for these parameters should be analyzed at a frequency of approximately one for every 20 samples collected.

11.1.1.3 Soil Samples - Due to difficulties associated with verification of "blank" soil, travel blank soil samples are not recommended as part of the quality control program.

11.1.1.4 Air Samples - Travel blanks for air sampling program refer to the preparation of samples using an air supply which has been certified by the supplier to contain non-detectable levels of volatile organic constituents, or constituents of interest. One volatile organic travel blank should be analyzed per day of air sampling activities.

11.1.2 Field Blanks

Field blanks are samples which are prepared in the field to evaluate if the methods and procedures used to collect the samples result in contamination of the sample. Field blanks are prepared by sampling methods previously known to contain non-detectable levels of the constituents of interest using, to the extent feasible, the same equipment and procedures as used for the collection of actual field samples. These samples are identified as if field samples and transported with the field samples to the laboratory for analysis.

11.1.2.1 Soil Gas Samples - Prior to each day's soil gas sampling, field blanks of the entire sampling apparatus are taken and analyzed to check background contamination in the sampling system and cartridges. Sampling cartridges are attached to both the inlet and outlet end of a sampling probe. The sample collected in the discharge end cartridge is representative of sampling train contamination only while the intake cartridge provides a measure of the atmospheric concentrations. Additional field blanks are collected prior to any reuse of recleaned sampling equipment.

11.1.2.2 Water Samples - For water sampling programs, one field blank should be prepared and analyzed for every 10 samples collected. Procedures for the preparation of field blanks will vary depending on the equipment and procedures used for water sampling. When sampling wells with dedicated equipment, field blanks shall be collected by simply filling a typical sampling container with "blank" water in the field, in the same manner that field samples are collected. Alternatively, for water samples collected from temporary probes, field blanks shall be collected by placing the probe in a container of "blank" water and pumping water through the probe into the sample container, simulating, to the closest extent possible, the collection of a field water sample using this method.

11.1.2.3 Soil Samples - Due to problems associated with the verification of "blank" soil, no soil field blanks are recommended as part of the quality control program.

11.1.2.4 Air Samples - For air sampling programs, one field blank should be prepared and analyzed for every 10 field samples collected. As with field blanks for water sampling programs, field blanks for air sampling programs will vary depending on the equipment and procedures used for the air sampling. Air certified to contain non-detectable levels of the constituents of interest should be used for the preparation of field blanks. For situations where immediate on-site analysis is being performed, background or ambient air may be utilized if the quality of this air is found to be consistent and thus able to be or accounted for in the field blank evaluation. Field blank sample collection may involve the direct transfer, through the sample pump, of "blank" air to the appropriate sample container. For soil gas probes, field blank preparation will involve the passage of blank or ambient air through a typical probe prior to collection and analysis, with sample collection performed using the same equipment and techniques as used for actual field samples.

11.1.3 Field Duplicates

Field duplicates are collected to evaluate the reproducibility of laboratory data or physical measurements. Field duplicates are prepared by the immediate sequential filling of sample containers at the same sample location, or by the collection and mixing of a sample in one container and subsequent transfer into two other containers. Field duplicates are samples sent to the same laboratory; and which are labeled in such a manner as to suggest they are samples from different locations.

11.1.3.1 Soil Gas Samples - Duplicate soil gas samples are collected from each sampling location. Duplicate analyses are performed on at least 10 percent of the samples collected, or if the initial analysis is outside QA specifications.

11.1.3.2 Water Samples - Field duplicate water samples should be collected for approximately 1 out of every 10 water samples collected. Field duplicates are prepared by the sequential filling of sample containers. If field split samples are also being collected, the frequency of field duplicate samples should be reduced so that either a field duplicate or field split is collected for approximately one out of every 10 water samples collected.

11.1.3.3 Soil Samples - Field duplicate soil samples are not recommended due to difficulties in obtaining true "duplicate" samples in the field.

11.1.3.4 Air Sample - Field duplicate air samples should be collected for approximately 1 out of every 10 air samples collected. Field duplicates are prepared by the sequential filling of sample containers. If field split samples are also being collected, the frequency of field duplicate samples should be reduced so that either a field duplicate or field split is collected for approximately one out of every 10 air samples.

11.1.4 Field Splits

Field splits are collected to evaluate the reproducibility and comparability of laboratory data or physical measurements. Field splits are prepared by the immediate sequential filling of sample containers at the same sample location, or by the collection and mixing of a sample in one container and subsequent transfer into two other containers. Field splits are samples sent to different laboratories; and which are labeled as if they are routine field samples.

11.1.4.1 Soil Gas Samples - Because the primary reason for use of soil vapor surveys is the availability of on-site real-time analytical capability, field splits are not used to check the accuracy of daily analytical data.

11.1.4.2 Water Samples - Field splits water samples should be collected for approximately 1 out of every 10 water samples collected. If field duplicate samples are also being collected, the frequency of field split samples should be reduced so that either a field duplicate or field split is collected for approximately one out of every 10 water samples collected.

11.1.4.3 Soil Samples - Field splits are not recommended due to difficulties in obtaining true "split" samples in field.

11.1.4.4 Air Sample - Field split air samples should be collected for approximately 1 out of every 10 air samples collected. If field duplicate samples are also being collected, the frequency of field split samples should be reduced so that either a field duplicate or field split is collected for approximately one out of every 10 air samples.

11.1.5 Blind Spikes

Blind Spike samples are samples of known concentration which are submitted as if normal field samples to evaluate to accuracy of laboratory results. Spike samples are normally prepared by a certified laboratory at typical concentrations of 10X to 100X the detection level. Laboratories preparing the spike shall submit written documentation to MARK regarding the method of spike preparation and the theoretical constituent concentrations in the spike solutions. The laboratory should also prepare duplicates of the spike solutions and store the duplicates (at 4°C) for a period of not less than 60 days for possible confirmatory analysis at the discretion of the Project Manager.

11.1.5.1 Soil Gas Samples - During each standard calibration procedure for soil gas analysis, the matrix (the activated carbon in the sample collection cartridges only) is directly spiked and thermally desorbed.

11.1.5.2 Water Samples - A blind spike sample should be prepared and submitted for every 20 field sample collected. Final selection of the spike frequency, laboratory to prepare the spike, and constituents and concentrations to be spiked shall be made by the Project Manager or as specified in the sampling and analysis plan.

11.1.5.3 Soil Samples - Due to problems associated with evenly distributing a spike to a soil sample, no blind soil spikes are recommended.

11.1.5.4 Air Samples - A blind spike sample should be prepared and submitted for every 20 samples collected. Final selection of the spike frequency laboratory to prepare the spike, and constituents and concentrations of the spike shall be made by the Project Manager or as specified in the sampling and analysis plan.

12.0 AUDIT PROCEDURES

The Quality Control Officer will monitor and audit the performance of the QA procedures outlined in the QAPP. The Quality Control Officer will conduct field and office audits which will ensure that the information being gathered is reliable and of good quality.

12.1 Field Audits

The Quality Control Officer may schedule audits of field activities at various times to evaluate the execution of sample identification, sample control, chain-of-custody procedures, field documentation, instrument calibration and field measurement and sampling operations. The evaluation is based on the extent to which the applicable Standard Operating Procedures (SOP)s are being followed.

Field documents pertaining to sample identification and control will be examined for completeness and accuracy. Field notebooks and field data forms will be reviewed to see that all entries are dated and signed and that the contents are legible, written in ink, and contain accurate and inclusive documentation of project activities. Because the notebook and field data forms provide the basis for reports written later, they will contain only facts and observations. Language will be objective, factual and free of personal interpretations or other terminology that might prove inappropriate.

The auditor will also check to see that chain-of-custody procedures are being followed and that samples are being kept in custody at all times and are in locked containers or vehicles to prevent tampering.

Sampling operations will be evaluated to determine if they are performed as stated in the project plan or as directed by the project manager. The auditor checks to determine that the appropriate number of samples are being collected, samples are placed in proper containers, and proper preservation, packaging, and shipment protocols are being followed.

Field measurement activities will be evaluated to determine if they are performed according to QAPP guidelines. The auditor will spot check various instruments for proper calibration, the frequency of calibration, and that the techniques utilized with these instruments are providing accurate data.

12.2 Office Audits

The Quality Assurance Office may schedule audits of project files. During the audit, documents will be examined to determine that all necessary items such as signatures, dates, and project codes are included. The auditor will examine any classified documents and determine if they are handled and stored in the proper manner.

In addition to the audits performed by the Quality Assurance Officer, the Project Manager will review product quality and will see that the project is performed in accordance with approved quality assurance procedures. As described in Section 10, prior to the production of the draft document, all work products will undergo review by senior project staff and/or senior staff from the technical disciplines involved in the work. This will include review of calculation briefs, test analyses, field measurements, graphs, tables, computer inputs-outputs, all modeling data and modeling reports and any document which involves generating information from the field data.

12.3 Laboratory Audits

In addition to the internal audits described in the individual laboratory QAPPS, the MARK Project Manager or Quality Assurance Officer may schedule an audit of the laboratory. The auditor will review the laboratory procedures for conformance with the procedures outlined in the laboratory QAPP.

13.0 PREVENTATIVE MAINTENANCE PROCEDURES

13.1 Field

Preventative maintenance for quality assurance includes those tasks that must be carried out to minimize down time of the measurement systems. General procedures for preventative maintenance which apply to measurement systems include the following:

- Instruments for field use will be checked and calibrated prior to use in the field;
- A spare part inventory recommended by the manufacturer or judged as appropriate based on equipment experience shall be maintained;
- When practical backup equipment is available;
- All instruments shall be stored and transported in protective casings;
- Permanent records of the calibration and maintenance of each instrument shall be maintained.

Instrument specific preventative maintenance shall be performed in accordance with the manufacturer's recommendations and/or as described in the following sections.

13.1.1 pH Meter

Preventative maintenance procedures for pH meters are in accordance with manufacturer's instructions.

13.1.2 Conductivity Meter

Preventative maintenance procedures for conductivity meters are in accordance with manufacturer's instructions.

13.1.3 Water Level Indicator

Preventative maintenance procedures for the water level indicators are in accordance with manufacturer's instructions.

13.1.4 Dissolved Oxygen Meter

Specific procedures which should be followed for proper maintenance of the Dissolved Oxygen Meter include the following:

- Replacement of the membrane and KCL solution at 2-4 week intervals or when excessive bubbles form under the membrane, or when erratic measurement/calibration data is observed.
- Storing the membrane in a moist environment when not in use.
- Replacement or reconditioning of the gold cathode should it become tarnished or when it becomes tarnished.
- Replacement of the batteries at six month intervals.

13.1.5 Gas Chromatograph

The heart of preventative maintenance for chromatographic instruments is daily, documented performance checks and calibration. Parameters such as retention times and response factors will be observed and back-checked with prior operational performance. In addition, the following specific procedures will be followed:

- GC detectors will be cleaned every month or when performance, as determined by accuracy and precision determination, begins to degrade.
- Septa will be routinely changed.
- Incoming gas drying cartridges and effluent adsorbent traps will be routinely changed.

- Columns will be routinely checked by performance and operating conditions.
- Compressed gas cylinders shall be checked and replaced when less than 500 psi of pressure is present.
- Temperatures of the injector, detector and column shall be routinely checked.
- The paper supply in the computer printer/integrator shall be routinely checked.

13.2 Laboratory

Laboratory preventative maintenance procedures are described in the respective laboratory QAPPs.

14.0 DATA MANAGEMENT PROCEDURES

As part of the QA Project Plan, routine procedures will be used to assess the precision, accuracy, and completeness of data for every measurement parameter. In addition, an extensive review of field and analytical data will be conducted to ensure that quality control criteria have been met. Data assessment procedures to evaluate accuracy, precision, and completeness of laboratory data are described in the following sections.

14.1 Accuracy

Accuracy is defined as the percent recovery for a spiked sample. A sample spike is prepared by adding a known amount of a pure compound to the environmental sample. The compound added is the same as that being assayed for in the environmental sample. These spikes simulate the background and interferences found in the actual samples; the calculated percent recovery of the spike is taken as a measure of the accuracy of the total analytical method. When there is no change in volume due to the spike, it is calculated as follows:

$$P = \frac{(D-X)\ 100}{(T-X)} = \text{Percent Recovery}$$

where:

X = Measured value of analyte concentration in the sample before the spike was added.

D = Measured value of analyte concentration in the sample after the spike is added.

T = Assumed true value of analyte concentration in the sample after the spike is added.

14.2 Precision

Precision is defined as the relative percent difference of matrix spike recoveries for two matrix spikes of the same sample (replicates) and is evaluated in terms of the relative percent difference. Because of the limited number of replicate samples that can be analyzed in environmental samples using gas chromatograph techniques, precision cannot be evaluated in terms of standard deviations. Consequently, outlier testing is not possible. However, the precision of an analytical method can be evaluated from internal lab and field duplicates by calculating the percent differences between the duplicate sample results:

$$PD = 2\,\frac{(D1-D2)}{(D1+D2)} \times 100$$

where:

PD = Percent Difference

D1 = First Sample Value

D2 = Second Sample Value (duplicated)

14.3 Completeness

Completeness is described as the ratio of acceptable laboratory results to the total number of analyses performed. A completeness value of less than 95% indicates that corrective action is necessary in order to limit the number of defective results.

Criteria for defective results may include exceeded holding times, percent recoveries outside the limits, or unsatisfactory supporting data such as dates, locations, or sample identity numbers. An analysis of sample completeness will be conducted after each sampling round results are returned. Completeness is defined as:

$$C = \left(1 - \frac{\text{number of defective results}}{\text{total number of requested analysis}}\right) 100$$

A C value less than 95% will indicate corrective action in order to avoid repeating similar problems in future sampling rounds.

14.4 Assessment

Field data will be assessed by evaluating adherence to the quality assurance program guidelines. Data collected historically in the study areas will be reviewed and used during the investigation. The kind of data to be used may include water level measurements, chemical data on water and soil, geologic subsurface descriptions, (e.g., drillers' logs) and interpretations of the hydrologic conditions of the study areas.

Each data point used in the investigation will be evaluated against the QAPP standards for a particular type of data collection. For example, a water level measurement collected at a particular well will be assigned a high level of confidence if the data point is accompanied by information on the type of water level measuring device, the measuring point identification, pumping status of the measured well, tidal cycle, construction details of the well, and the general pumping status of adjacent wells; if any of these data should be missing, the recorded, historical water level will be assigned a lower level of confidence, and may be rejected for the analysis of historical conditions.

Historical chemical data on the nature of soil or water conditions in the study areas will be similarly evaluated against the quality control procedures outlined in this document. Unless information is available on the method of sample collection, the analytical methods employed, and the quality assurance/quality control procedures used, the data point will be assigned a low level of confidence.

Information on subsurface conditions is usually obtained from drillers' logs. The quality of these logs varies from well to well and from driller to driller. On the basis of field experience in the study areas and review of existing site-specific literature on subsurface conditions, each well log to be used in interpretative evaluations will be subject to judgment by experienced hydrogeologists.

Data collected during the investigation should be collected according to the procedures outlined in this document. Any apparent data collection errors will be identified by evaluation of adherence to the QAPP procedures and evaluation of the data compared to historical trends. If a data point appears to deviate from an anticipated trend, further investigations into the collection methodology and QA/QC procedures will be initiated to resolve questionable data points; pending the conclusion of these evaluations, the data point may either be accepted with a high or low level of confidence or rejected.

15.0 CORRECTIVE ACTION

15.1 Field Activities

The need for corrective action comes from several sources including: equipment malfunctions; failure of internal QA/QC checks; failure during performance or system activity; and non-compliance with QA requirements. The goal of the corrective action program is to systematically and efficiently identify and correct any deficiencies in the data generation and evaluation process. Towards this end, the procedures described in the following sections shall be adhered to:

15.1.1 Notification and Reporting Procedures - If measurement equipment or analytical methods fail QA/QC checks, the problem will immediately be brought to the attention of the Project Manager, Quality Assurance officer, or the Principal-in-Charge. In addition, the problem should be documented in the daily reports which are completed and submitted to the Project Manager by all field personnel on a daily basis. The daily report should summarize any conversations with the Project Manager, Quality Assurance officer, or Principal-in-Charge and describe the nature of the malfunction or problem identified, any steps or measures taken to remedy the malfunction, and measures taken to document the effectiveness of the remedy.

15.1.2 Review and Approval of Changes - It is the responsibility of the Project Manager, or in his absence, the Quality Control Officer or Principal-in-Charge to assess the cause or causes for non-compliance with

QA/QC objectives and to initiate the necessary changes to assure future compliance. The Project Manager shall consult with the Principal-in-Charge or Quality Control Officer prior to implementation of any significant changes in procedures, and shall document any changes via memos to file, or additions/changes to the sampling and analysis plan or quality assurance project plan. If changes to the SAAP or QAPP are made, the Principal-in-Charge, Quality Assurance Officer, and client must review and sign the new procedures prior to their official implementation. If the changes are of such a magnitude that they constitute a modification to the project scope and budget, the procedures in Section 4.4 shall also be followed.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The final report and progress reports will include a section or statement that discusses and evaluates data quality and validity. At a minimum, the following information will be covered in the progress reports and the final report:

- Assessment of measurement data precision, accuracy, and completeness.
- Documentation of QA/QC practices.
- Performance audit results (if performed).
- System audit results (if performed).
- Significant QA problems and recommended solutions.

Preparation of the quality assurance reports to management is the responsibility of the quality assurance officer. The quality assurance officer may assign portions of the report preparation to other project team members.

Appendix B

APPENDIX B

WATER LEVEL MEASUREMENT FIELD LOGS

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Field Water Level Measurements

DATE: 4-26-94

PERSONNEL: T. Jones

WEATHER: Sunny, p-cloudy

PROJECT No.: Texaco 92117530609

HOW MEASURED/DEVICE: Electronic Sounder

LAST CALIBRATION DATE: factory

COMMENTS:

Time	Well No.	Predicted or Measured Tide Level*	Top of Casing Elevation (Measuring Point)	Depth Below Top of Casing (MP)	Water Level Elevation
~~[illegible]~~	~~MW 1~~		~~4"~~	~~5.365~~	~~4.15'~~
11:15	MW 2 ✓		7.44 4"	5.770'	+1.67
11:17	MW 3 ✓		6.78 4"	5.395'	+1.38
11:20	MW 4 ✓		4"	Dry	—
11:31	MW 5		5.08 4"	4.060'	+1.08
11:12 ~~14:23~~ 11:12	MW 9B		5.365 ~~4"~~ 4"	~~5.365'~~	~~[illegible]~~ N/A
14:06	MW14 ✓		5.76	5.065'	+0.69
14:02	MW15 ✓		4.47	3.460'	+1.01
14:08	MW22		7.81	7.565'	+0.24

* TIDE TABLE REFERENCE:

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Field Water Level Measurements

DATE: 4-26-94

PERSONNEL: T. Jones

WEATHER: Sunny, p-cloudy

PROJECT No.: Harsch 931185003.10

HOW MEASURED/DEVICE: Electronic Sounder

LAST CALIBRATION DATE: factory

COMMENTS:

Time	Well No.	Predicted or Measured Tide Level*	Top of Casing Elevation (Measuring Point)	Depth Below Top of Casing (MP)	Water Level Elevation
11:24	MW7B		5.52 4"	4.430'	-1.09
11:27	MW8B		6.15 4"	6.335'	-0.18
13:58	MW16		3.52	2.930'	+0.59
13:51	MW17		3.32	3.385'	-0.06
13:48	MW18		4.72	4.840'	-0.12
13:45	MW19		5.28	5.090'	+0.19
10:34	MW20		6.66	7.110'	-0.45
13:40	MW21		6.48	6.600'	-0.12
10:59	MW23		7.09	4.450	+2.64

* TIDE TABLE REFERENCE:

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Field Water Level Measurements

DATE: 4-26-94
PERSONNEL: T. Jones

WEATHER: Sunny, p-cloudy

PROJECT No.: Kamas .09
HOW MEASURED/DEVICE: Electronic Sounder
LAST CALIBRATION DATE: factory
COMMENTS:

Time	Well No.	Predicted or Measured Tide Level*	Top of Casing Elevation (Measuring Point)	Depth Below Top of Casing (MP)	Water Level Elevation
10:25 ~~10:34~~	MW 10		7.97	6.580' ~~7.110'~~	+1.39
10:29	MW 11		6.96	5.540'	+1.42
13:01 ~~10:25~~	MW 12	Hydrocarbon 4"	8.31	6.410' ~~6.580'~~	+1.90
10:38	MW 13			dry	—
10:00	MW24		9.19	8.485'	+0.91
9:54	MW25		9.41	9.150'	+0.26

* TIDE TABLE REFERENCE:

Appendix C

APPENDIX C

FIELD PURGING AND SAMPLING LOG

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-27-94 Sample Location MW-2

Project Name Alameda SSSC Project No. 921175306.09

Weather Conditions overcast breezy

Observations/Comments Photo #2 of MW2, #3 of MW 11, #4-sampling MW 11 #5-MW12

Samples Collected By T L

QUALITY CONTROL

Purging/Sampling Method foot valve, poly pipe, diaphram pump/Disp Bailer

Method to Measure Water Level E tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash, DI rinse

pH Meter No. HY 9306 Date Calibrated 4-27-94

Sp Conductance Meter No. YSI BU2 Date Calibrated 4-27-94

TD 14.665'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 11:25-5.795' End 12:27-9.710'

4"X.66 = 5.9g/17.6g.

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (μmhos/cm)	Color	Odor	Turbidity
11:36	2.0	2.0	7.26	18.75°	700	blkish	N/D	High
11:37	2.0	4.0	7.20	19°	560	Cloudy	"	med
1141	2.0	6.0	7.23	18.75°	610	"	"	L/M
1142	2.0	8.0	7.21	19°	600	"	"	"
1145	2.0	10.0	7.27	19°	700	clear	"	Low
1146	2.0	12.0	7.25	19°	610	"	"	Low
1148	2.0	14.0	7.32	18.75°	880	"	"	"
1149	2.0	16.0	7.34	18.5°	760	"	"	"
1151	2.0	18.0	7.36	18.5°	850	"	"	"
Sample								
12:05	600ml		7.39	19°	800	Cloudy	"	L/M
12:25	3.0	21.0	7.46	19.25°	1030	Cloudy	"	L/M
12:26	3.0	24.0	7.4		810	"	"	

Total Discharge 24 gal Casing Volumes 4.07

Method of Disposal of Discharge Water on site bakertank

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-27-94
Sample Location MW-3
Project Name Alameda SSCS
Project No. 921175306.09
Weather Conditions overcast, cool, breeze
Observations/Comments Photo #1
Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method foot valve, poly pipe, diaphram pump / Disp Bailer
Method to Measure Water Level E-tape
Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated
Method of Cleaning Bailer/Pump Liquinox wash / D I Rinse
pH Meter No. Hy 9306
Date Calibrated 4-27-94
Sp Conductance Meter No. Ysi BU 2
Date Calibrated 4-27-92

TD 13.200'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 9:57 5.385' End 10:52 9.350'

4"x.66=5.1/15.5g.

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
10:11	2.0	2.0	7.45	17.5°	1180	black	n/o	high
10:12	2.0	4.0	7.23	18°	1070	Cloudy	"	low
1015	2.0	6.0	7.33	18.25°	1970	Clear	"	"
1016	2.0	8.0	7.19	18.25°	1100	"	"	"
1020	2.0	10.0	7.24	18.25°	1300	"	"	"
1021	2.0	12.0	7.24	18.5°	1120	"	"	"
1023	2.0	14.0	7.24	18.5°	1190	"	"	"
1024	2.0	16.0	7.27	18.5°	1100	"	"	"
Sample								
10:40	600ml		7.30	18.5	1090	Clear/Cloudy	n/o	low
10:50	3.0	19.0	7.29	18.5	1200	Cloudy	"	low/med
10:51	3.0	22.0	7.28	18.75	1210	Cloudy	"	"

Total Discharge 22 gal
Casing Volumes 4.31
Method of Disposal of Discharge Water on site baker tank

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-27-94
Sample Location MW-4
Project Name Alameda SSSC
Project No. 9211 75306.09
Weather Conditions
Observations/Comments this well is not as deep as drilled
Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method
Method to Measure Water Level
Pump Lines or Bailer Ropes: new cleaned dedicated
Method of Cleaning Bailer/Pump
pH Meter No. Date Calibrated
Sp Conductance Meter No. Date Calibrated

TD 5.410

PURGING AND SAMPLING DATA

Water Level (below MP) Start Dry End
Measuring Point (MP)

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity

Total Discharge
Casing Volumes
Method of Disposal of Discharge Water
Sheet of

THE
MARK
GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-28-94
Sample Location MW 5
Project Name Alameda SSSC
Project No. 921175306.09
Weather Conditions Sunny
Observations/Comments Photo #6
Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method ft. valve, poly pipe, diaphram pump / Disp Bailer
Method to Measure Water Level E-tape
Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated
Method of Cleaning Bailer/Pump Liquinox wash / DI Rinse
pH Meter No. Hy 9306
Date Calibrated 4-28-94
Sp Conductance Meter No. Ysi Bu2
Date Calibrated 4-28-94

TD - 13.050'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 10:39 - 4.035' End 11-16 10.950'
4" X .66 = 5.9 / 17.89'
Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidify
1050	2.0	2.0	7.23	19.5	3350	yellowish	N/D	med
1051	2.0	4.0	7.22	17°	3100	"	"	"
10:53	2.0	6.0	7.23	19.5°	2820	Clearing		low
10:54	2.0	8.0	7.27	19.5°	3060	clear	"	"
10:56	2.0	10.0	7.29	19.5°	3260	"	"	"
10:57	2.0	12.0	7.32	19.5°	3410	"	"	"
10:59	2.0	14.0	7.36	19.75°	3690	"	"	"
11:02	2.0	16.0	7.34	20°	3690	"	"	"
11:04	2.0	18.0	7.[illegible]	20.25°	3750			
Sample								
11:09	600ml		7.44	20°	3800	"	"	"
11:13	2.0	20.0	7.43	20°	3800	Cloudy	"	"
11:14	2.0	22.0	7.43	20°	3780	"	"	"
11:15	2.0	24.0	7.43	20°	3820	"	"	"

Total Discharge 24 gal
Casing Volumes 4.07
Method of Disposal of Discharge Water on site Baker tank

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-29-94 Sample Location MW7B

Project Name Alameda SSSC Project No. 931185003.10

Weather Conditions overcast cool

Observations/Comments

Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method ft. valve, poly pipe, diaphram pump / Disp Bailer

Method to Measure Water Level E-tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash / D I Rinse

pH Meter No. Hy 93060 Date Calibrated 4-29-94

Sp Conductance Meter No. Ysi Bu2 Date Calibrated 4-29-94

TD-13.400'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 8:36 - 4.485' End 9:09 - 8.045

4"x.66= 5.9/17.79.

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
8:43	3.0	3.0	7.52	18°	1550	Clear	ND	LOW
8:44	3.0	6.0	7.47	18.75°	1560	↓	↓	↓
8:45	3.0	9.0	7.63	18.25°	1720	↓	↓	↓
8:49	3.0	12.0	7.79	"	2010	↓	↓	↓
8:50	3.0	15.0	7.76	19.25	1890	↓	↓	↓
8:51	3.0	18.0	7.92	"	3320	cloudy	N/D	L/M
Sample								
8:55	600ml		7.81	19.10°	1620	Clear	N/D	L
						↓	↓	↓
9:05	3.0	21.0	7.82	18°	1780	↓	↓	↓
9:06	3.0	24.0	7.78	18°	1710	↓	↓	↓

Total Discharge 24 Casing Volumes 4.07

Method of Disposal of Discharge Water Held on site

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 5-2-94 Sample Location MW 8B

Project Name Alameda SSSC Project No. 931185003.10

Weather Conditions Sunny

Observations/Comments

Samples Collected By TJ/SS

QUALITY CONTROL

Purging/Sampling Method ft Valve, polypipe, diaphram pump / Disp Bailer

Method to Measure Water Level E-tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash / D I rinse

pH Meter No. Hy 9306 Date Calibrated 5-2-94

Sp Conductance Meter No. Ysi Bus Date Calibrated 5-2-94

TD 22.28

PURGING AND SAMPLING DATA

Water Level (below MP) Start 11:15 - 6.360 End 11:57 - 20.45

4"x.66-10.5/31.5g

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity	Sali
11:22	5.0	5.0	7.83	19°	1410	light Brn	~~ND~~ org	low	
11:23	5.0	10.0	7.80	19°	1600	Clear	"	"	
11:24	5.0 dry	15.0	7.74	19°	2620	"	"	"	
11:26	5.0 dry	20.0	7.86	19°	6100	"	"	"	6%
11:37	5.0	25.0	7.58	20°	10000	↓	↓	↓	
11:38	5.0	30.0	7.78	19.25°	4290	↓	↓	↓	
11:40	5.0	35.0	7.87	19°	8500	↓	↓	↓	8%
Sample									
11:45		600ml	7.78	20.5°	4200	"	"	"	2.1%
11:52	5.0	40.0	7.69	19.5	5100	Cloudy	"	"	
11:53	5.0 dry	45.0	7.75	19°	4240	"	"	"	
11:56	5.0	50.0	7.83	20°	9400	"	"	"	

Total Discharge 50gal Casing Volumes 4.76

Method of Disposal of Discharge Water on site held

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-28-94
Sample Location MW9
Project Name Alameda SSSC
Project No. 921175306.09
Weather Conditions Sunny
Observations/Comments
Samples Collected By TL

QUALITY CONTROL

Purging/Sampling Method ft. valve, poly pipe, diaphram pump/Drop Bailer
Method to Measure Water Level E-tape
Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated
Method of Cleaning Bailer/Pump liquinox wash/DI Rinse
pH Meter No. Hy 9306
Date Calibrated 4-28-94
Sp Conductance Meter No. Ysi Bu 2
Date Calibrated 4-28-94
TD-15.150

PURGING AND SAMPLING DATA

Water Level (below MP) Start 1300 - 5.355' End 1:34 - 10.955'
4" 9.66-6.4/19.3
Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
1:07	3.0	3.0	7.57	18°	1060	clear	N/O	low
1:08	3.0	6.0	7.45	17°	1000	↓	↓	↓
1:09	3.0	9.0	7.58	17°	1060	↓	↓	↓
1:13	3.0	12.0	7.63	17°	1250	↓	↓	↓
1:14	3.0	15.0	7.71	17°	1280	↓	↓	↓
1:15	3.0	18.0	7.60	17°	3310	greyish	N/O	high
1:17	3.0	21.0	7.85	17°	1300	Cloudy	"	low
Sample								
1:25	600ml		7.82	18°	1150	clearing	"	low
1:31	3.0	24.0	7.81	17.75	1490	Clear	"	low
1:32	3.5	27.5	7.78	17.25	1190	Cloudy	"	low/med

Total Discharge 27.5 gal
Casing Volumes 4.3
Method of Disposal of Discharge Water on site baker tank

Sheet 2 of 2

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-27-94 Sample Location MW-14 (MW14B) -Dup

Project Name Project No. MB-1 15:10

Weather Conditions

Observations/Comments

Samples Collected By

QUALITY CONTROL

Purging/Sampling Method Same

Method to Measure Water Level

Pump Lines or Bailer Ropes: new cleaned dedicated

Method of Cleaning Bailer/Pump

pH Meter No. Hg 930C Date Calibrated 4-27-94

Sp Conductance Meter No. Ysi Bu2 Date Calibrated 4-27-94

TD 14.475

PURGING AND SAMPLING DATA

Water Level (below MP) Start 14:38 5.065' End 15:30 7.510

4"/.66=6.2/18.69.

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
1443	2.0	2.0	7.50	20.75°	2480	cloudy	N/D	med/high
1444	2.0	4.0	7.72	"	1490	↓	↓	↓
1445	2.0	6.0	7.78	21°	1080			
1446	2.0	8.0	7.76	21°	1320			
1448	2.0	10.0	7.58	21.25°	2200	Clear	N/D	LOW
1449	2.0	12.0	7.54	20.75°	2510	↓	↓	↓
1450	2.0	14.0	7.63	20.75°	1920			
1451	2.0	16.0	7.53	20.75°	2720			
1456	1.5	17.5	7.54	"	3490			
1457	1.5	19.0	7.53	"	3110			
Sample 14B								
14 15:15/1520	600ml		7.56	21°	2460	yellowish	N/D	l/m
1536	3.0	22.0	7.50	21°	3180	Clear	"	l
1537	3.0	25.0	7.55	21°	2580			

Total Discharge 25 Casing Volumes 4.03

Method of Disposal of Discharge Water onsite bakertank

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-27-94 Sample Location MW 15

Project Name Alameda SSSC Project No. 921175306.09

Weather Conditions Sunny

Observations/Comments

Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method ft valve, poly pipe, diaphram pump / Disp Bailer

Method to Measure Water Level E-tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash / DI Rinse

pH Meter No. Hy 930C Date Calibrated 4-27-94

Sp Conductance Meter No. Ysi Bu2 Date Calibrated 4-27-94

TD 19.650'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 13:41 - 4.095' End

2"x.166 = 2.6/7.79.

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp. Cond (µmhos/cm)	Color	Odor	Turbidity
1346	1.0	1.0	8.14	20.25°	2100	black	N/O	High
1347	1.0	2.0	8.18	21°	1700	lighter blk	↓	"
1348	1.0	3.0	8.01	20.25°	2510	Cloudy blk		"
1349	1.0	4.0	8.06	20.25°	2600	Cloudy		med/high
1351	1.0	5.0	8.09	20°	2560	"	↓	↓
1352	1.0	6.0	8.05	20°	2600	"		
1353	1.0	7.0	8.03	19.75°	2500	"		
1354	1.0	8.0	8.06	19.75°	2410	"		
Sample								
14:05	600ml		8.22	20.25	2100	light blk	N/O	high
1415	1.5	9.5	8.12	21°	2380	"	"	"
1416	1.5	11.0	8.16	20°	2130	"	"	"

Total Discharge 11 gal Casing Volumes 4.23

Method of Disposal of Discharge Water on site Baker tank

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 5-2-94 Sample Location MW16

Project Name Alameda SSSC Project No. 931185003.10

Weather Conditions Sunny

Observations/Comments Purged dry twice

Samples Collected By TD / SJ

QUALITY CONTROL

Purging/Sampling Method ft. Valve poly pipe, diaphram pump / Disp. Bailers

Method to Measure Water Level E-tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash / DI Rinse

pH Meter No. Hy 9306 Date Calibrated 5-2-94

Sp Conductance Meter No. Ysi Bux Date Calibrated 5-2-94

TD 30.12

PURGING AND SAMPLING DATA

Water Level (below MP) Start 12:05 - 3.500' End purged dry

2" x .166 - 4.4/13.25

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
1217	2.0	2.0	7.69	20.5°	29,200	black	org	high
1218	2.0 dry	4.0	7.64	20.5°	27200	"	"	"
1229	2.0	6.0	7.25	20.75°	32100	grey	"	"
1230	2.0	8.0	7.47	21°	31600	"	"	"
Sample								
12:35	600 ml		7.33	20.5°	32100	↓	↓	↓
12:45	2.0	10.0	7.23	22°	32900			
12:46	3.5	13.5	7.68	21°	32200			

Total Discharge 13.5 g Casing Volumes 3.07

Method of Disposal of Discharge Water held on site

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-29-94 Sample Location MW17

Project Name Alameda SSSC Project No. 9311185003.10

Weather Conditions Overcast Cool

Observations/Comments very mucky bottom

Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method ft. valve, poly pipe diaphram pump / Disp Bailer

Method to Measure Water Level E-tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash / DI Rinse

pH Meter No. Hy 306 Date Calibrated 4-29-94

Sp Conductance Meter No. Ysi Bus Date Calibrated 4-29-94

PURGING AND SAMPLING DATA

TD-24.8 @

Water Level (below MP) Start 10:46 3.510 End 11:17 = 21.401↑

2"x1.66 - 3.53/10.6g.

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
10:51	2.0	2.0	7.94	18°	13000	black	org	high
10:53	2.0	4.0	8.64	18°	6900	"	"	"
10:55	2.0 dry	6.0	7.86	18.5°	24800	"	"	"
10:57	2.0	8.0	7.83	18.25°	24800	yellow grey	"	med/high
10:59	2.0	11.0	7.83	18°	24700	clearer	"	low
sample								
11:10	600ml		7.63	18°	23900	clear yellow	"	low
11:14	2.0	130	7.58	18°	24200	blk grey	"	high
11:16	2.0	150	7.61	18°	24200	"	"	"

Total Discharge 15g Casing Volumes 4.25

Method of Disposal of Discharge Water held on site

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-29-94
Sample Location MW18
Project Name Alameda SSSC
Project No. 9311850003.10
Weather Conditions Overcast
Observations/Comments
Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method ft valve, poly pipe, diaphram pump / Disp Bailer
Method to Measure Water Level E-tape
Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated
Method of Cleaning Bailer/Pump Liquinox wash / DI Rinse
pH Meter No. Hy 9306 Date Calibrated 4-29-94
Sp Conductance Meter No. ysi Bu 2 Date Calibrated 4-29.94

TD - 24.965'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 11:32 - 5.185' End 12:20 - 22.255'
2"x.166 = 3.3/9.9g.
Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
* Wellwizard pulled small amount continuously								
11:40	2.0	2.0	7.49	18.25°	24500	blk	org	High
11:41	2.0 dry	4.0	7.58	18.50°	24900	"	"	"
11:43	2.0 dry)	6.0	7.90	19°	25000	"	"	"
11:46	2.0 "	} * 8.0	7.94	18.75°	25300	grey blk	"	med, high
11:50	2.0 "	10.0	7.99	19°	25000	"	"	"
Sample								
12:15	600 ml		7.75	18.75°	25500	yellowish	"	low
12:18	2.0	12.0	7.69	19°	25700	black	"	high
12:19	2.0	14.0	7.76	19	25900	grey	-	"

Total Discharge 14g
Casing Volumes 4.24
Method of Disposal of Discharge Water held on site

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-29-94
Sample Location MW19
Project Name Alameda SSSC
Project No. 931185003.10
Weather Conditions overcast cool
Observations/Comments
Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method ft valve, poly pipe, diaphram pump / Disp Bailer
Method to Measure Water Level E-tape
Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated
Method of Cleaning Bailer/Pump Liquinox wash / D.I Rinse
pH Meter No. Hy 9306
Date Calibrated 4-29-94
Sp Conductance Meter No. YuBu 2
Date Calibrated 4-29-94

TD - 24.925'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 12:50 - 5.315' End 13:16 17.800'
2" x .166 - 3.26 / 9.789
Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
1257	2.0	2.0	7.79	18°	16100	blk	org	high
12:58	2.0	4.0	7.65	19°	20500	"	"	"
12:59	2.0	6.0	7.57	19°	25500	"	"	"
1300	2.0	8.0	7.65	19°	26000	"	"	"
	2.0	10.0						
Sample ~~600ml~~								
13:10	600ml		7.54	19°	25300	yellow clear	org	low
13:13	2.0	12.0	7.52	19°	26000	↓	↓	↓ ↓
13:14	2.0	14.0	7.56	19°	26000			

Total Discharge 14 g
Casing Volumes 4.29
Method of Disposal of Discharge Water held onsite

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-29-94 Sample Location MW20

Project Name Alameda SSSC Project No. 931185003.10

Weather Conditions overcast

Observations/Comments Very foul smell coming out of this well

Samples Collected By TJ

QUALITY CONTROL

Purging/Sampling Method ft. valve, poly pipe, diaphram pump/Disp. Bailer

Method to Measure Water Level E-tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash/DI Rinse

pH Meter No. Hy 9306 Date Calibrated 4-29-94

Sp Conductance Meter No. Ysi Bu r Date Calibrated 4-29-94

TD - 25.255'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 9:41 - 6.500' End 10:16 - 21.600↑

2"x.166-3.1/9.39

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
9:44	1.0	1.0	7.56	16.5°	19,000	blk	V/H org	high
9:45	1.0	2.0	7.82	17.5°	6,200	grey	"	med
9:46	1.0	3.0	7.82	19°	6,100	goldish	"	Low
9:47	1.0	4.0	7.56	17°	24200	yellow	"	"
9:52	1.0	5.0	7.52	19.25°	25200	"	"	"
9:53	1.0	6.0	7.79	18.5	17000	"	"	"
9:54	1.0	7.0	7.99	19°	11900	"	"	"
9:55	1.0	8.0	7.57	19°	23800	"	"	"
9:58	1.0	9.0	7.63	18.5°	23800	blk gray	"	high
9:59	2.0	10.0	7.79	19°	19100	yellowish	"	med/Low
Sample								
10:10	600ml		7.76	18°	17000	"	"	Low
10:14	20.	13.0	7.69	19°	21200	"	"	"
10:15	2.0	15.0	7.74	19°	20000	"	"	"

Total Discharge 15 ga Casing Volumes 4.84

Method of Disposal of Discharge Water held on site

Sheet 1 of 1

Water Purging & Sampling Log

Date 4-29-94 Sample Location MW21

Project Name Alameda SSSC Project No. 9311 85003.10

Weather Conditions overcast, cool

Observations/Comments

Samples Collected By TD

QUALITY CONTROL

Purging/Sampling Method ft valve, poly pipe diaphram pump / Disp Bailer

Method to Measure Water Level E-tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash / D I Rinse

pH Meter No. Hy 9306 Date Calibrated 4-29-94

Sp Conductance Meter No. Ysi Bu2 Date Calibrated 4-29-94

PURGING AND SAMPLING DATA

TD 25.110

Water Level (below MP) Start 13:51 6.855' End 14:77 21.955'

2"x.166 = 3.0/9g.

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
13:58	2.0	2.0	7.38	18°	27000	black	org	high
1359	2.0	4.0	7.45	19°	28100	↓	↓	↓
1400	2.0 dry	6.0	7.67	19	27900	↓	↓	↓
~~1401~~	~~2.0~~	~~8.0~~						
14:02	3.0	9.0	7.75	19°	28000	greenish	org	med
Sample								
14:10	600ml		7.53	19°	26500	"	"	"
14:14	2.0	11.0	7.44	19°	27000	"	"	high
14:16	2.0	13.0	7.49	19°	27700			

Total Discharge 13.0 Casing Volumes 4.33

Method of Disposal of Discharge Water held on site

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 4-28-94 Sample Location MW-22

Project Name Alameda SSSC Project No. 921175306.09

Weather Conditions Sunny

Observations/Comments vegitation roots on foot valve when removed for sampling

Samples Collected By T.J

QUALITY CONTROL

Purging/Sampling Method ft. valve, poly pipe, diaphram pump / Disp Bailer

Method to Measure Water Level E-tape

Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated

Method of Cleaning Bailer/Pump Liquinox wash / DI rinse

pH Meter No. Hy 9306 Date Calibrated 4-28-94

Sp Conductance Meter No. YSI Bn 2 Date Calibrated 4-28-94

TD - 24.135'

PURGING AND SAMPLING DATA

Water Level (below MP) Start 9:28 - 7.585' End 10:07 - 10.825'

2"x.166=2.7/8.29.

Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
9:39	1.0	1.0	7.76	17.5°	2100	Blackish	N/O	High
9:40	1.0	2.0	7.78	17°	1810	↓	↓	↓
9:41	1.0	3.0	7.79	17°	1710	↓	↓	↓
9:42	1.0	4.0	7.67	17°	3000	↓	↓	↓
9:44	1.0	5.0	7.77	19°	2700	cloudy grey	"	High
9:45	1.0	6.0	7.73	18°	2490	↓	↓	↓
9:46	1.0	7.0	7.73	17.5°	2910	↓	↓	↓
9:47	1.6	8.5	7.70	17.25°	3300	↓	↓	↓
Sample								
10:00	600ml		7.81	22°	3150			
10:03	2.0	10.5	7.70	18°	3210			
10:04	1.0	11.5	7.70	18°	3280			

Total Discharge 11.5g Casing Volumes 4.26

Method of Disposal of Discharge Water onsite Baker tank

Sheet 1 of 1

MG THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Water Purging & Sampling Log

Date 5-2-94 Sample Location MW 23
Project Name Alameda SSSC Project No. 93118503.10
Weather Conditions Sunny
Observations/Comments E-tape would not sound on this well
Samples Collected By TJ/SJ

QUALITY CONTROL

Purging/Sampling Method ft valve, poly pipe, diaphram pump / Disp Bailer
Method to Measure Water Level E-tape
Pump Lines or Bailer Ropes: [✓ new] cleaned dedicated
Method of Cleaning Bailer/Pump Liquinox wash / D.I. Rinse
pH Meter No. ~~B~~ Hy 9306 Date Calibrated 5-2-94
Sp Conductance Meter No. Ysi Buz Date Calibrated 5-2-94

PURGING AND SAMPLING DATA

TD 18.550'
Water Level (below MP) Start 10:35 - 3.90' End 11:04 ?
2" x .166 · 2.4 / 7.3
Measuring Point (MP) TOC

Time	Pump Rate (gpm)	Discharge (gallons)	pH	Temp (°C)	Sp Cond (µmhos/cm)	Color	Odor	Turbidity
10:42	1.0	1.0	8.22	18°	131	brn	N/O	high
10 43	1.0	2.0	8.27	18°	125	↓	↓	↓
1044	1.0	3.0	8.27	18°	121			
10 45	1.0	4.0	8.31	18°	121			
10 46	1.0	5.0	8.28	18°	123			
10 47	1.0	6.0	8.27	18°	130			
10 48	1.0	7.0	8.25	18°	130			
10 49	1.0	8.0	8.25	18°	130			
Sample								
10:52	600ml		8.51	18°	112	light brn	N/O	med/high
11:01	1.0	9.0	8.33	19°	121			
11:02	1.0	10.0	8.31	18.5°	121			
11.03	1.0	11.0	8.32	18°	120			

Total Discharge 11.0g Casing Volumes 4.58
Method of Disposal of Discharge Water held on site

Sheet 1 of 1

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Conductivity Meter Calibration Log

Ysi 842 **Meter No.**

Date	Temp (°C)	Standard/Actual	Standard/Actual	Standard/Actual	Project No.	Operator	Comments
4-27-94	14.5°	1000/~~1000~~ 900	10K/~~10K~~ 8400		921175306.09	TJ	
4-28-94	16.25°	1000/895	10K/7200		"	"	
4-29-94	15°	1000/890	10K/7200		"	"	
5-2-94	17°	1000/900	10K/7900		"	"	

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

pH Meter Calibration Log

Meter No. Hy-9306

Date	Temp (°C)	Standard/Actual	Standard/Actual	Standard/Actual	Project No.	Operator	Comments
4-27-94	63°F	—/—	7.00/7.01	10.00/10.01	921175306.09	TS	Rental Hydac
4-28-94	63.5°F	—/—	7.00/7.00	10.00/10.00	"	"	"
4-29 94	59.9°F	—/—	7.00/700	10.00/10.00	"	"	"
5-2-94	65.3°F	—/—	7.00/7.00	10.00/10.00	"	"	"

Appendix D

APPENDIX D

LABORATORY ANALYTICAL REPORTS

MOBILE CHEM LABS INC.

5011 Blum Road, Suite 1 • Martinez, CA 94553
Phone (510) 372-3700 • Fax (510) 372-6955

8-90-418-SI-09\1223\013481

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 05-04-94

Sample Number
044254

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
MW10 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	13
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	2.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	3.9
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred [illegible]
for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.
5011 Blum Road, Suite 1 • Martinez, CA 94553
Phone (510) 372-3700 • Fax (510) 372-6955

8-90-418-51.09\1223\013480

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 05-03-94

Sample Number
044193

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
MW11 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	1.5
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	2.5
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	4.2
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred Choske
for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.
5011 Blum Road, Suite 1 • Martinez, CA 94553
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8-90-418-SI-09\1223\013481

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044253	Proj # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW12 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	3.9
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.
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8-90-418-SI-09\1223\013481

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 05-04-94

Sample Number
044255

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
MW24 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS

results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	6.5
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	1.8
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	3.9
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred [illegible]
for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.

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8-90-418-SI-09\1223\013481

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044256	Proj # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW25 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	9.3
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	3.9
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred Closke
for

Ronald G. Evans
Lab Director

THE
MARK
GROUP
ENGINEERS & GEOLOGISTS, INC.

044253

Chain of Custody Recor

Project No. 8-90-418-SI -09		Sample Point:	Alameda SSSC
Date	4-27-94		

	TIME	SAMPLE NUMBER	CONTAINER SIZE	ANALYZE FOR	PRESERVATIVE	HOLDING TIME	REMARKS
[illegible]	12:50	MW12	2x40ml	601	HCL ICE		
254	2:00 P	MW10	2x40ml	601	HCL		
[illegible]	2:20 P	MW24	2x40ml	601	HCL		
[illegible]	2:50 P	MW25	2x40ml	601	HCL		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Receiver represents:
	4-28-94 16:09	Dave Levity	~~MCL~~ Mobile Chem
Relinquished by: (signature)	Date/Time	Received by: (signature)	Receiver represents:
Relinquished by: (signature)	Date/Time	Received by: (signature)	Receiver represents:

FLD-8 (9/91)

Hookston Square, Suite 120 3480 Buskirk Avenue Pleasant Hill, CA 94523 (510) 946-1055

Shipping copy (White) File Copy (Yellow) Field Copy (Pink)

MOBILE CHEM LABS INC.
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Phone (510) 372-3700 • Fax (510) 372-6955

921175306.09\1428\013480

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044187	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW2 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

QA/QC: Spike Recovery is 87%

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS
Fred Chosh
for
Ronald G. Evans
Lab Director

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921175306.09\1428\013480

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044186	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW3 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS

Fred Choske for

Ronald G. Evans
Lab Director

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921175306.09\1428\013481

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044250	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW5 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

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Attn: Alan Gibbs
Project Manager

Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044251	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW9 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	1,900
Benzene	0.5	520
Toluene	0.5	2.8
Xylenes	0.5	<0.5
Ethylbenzene	0.5	35

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044189	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW14 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	53
Benzene	0.5	0.95
Toluene	0.5	<0.5
Xylenes	0.5	15
Ethylbenzene	0.5	3.3

QA/QC: Duplicate Deviation is 4.5%

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044190	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW14B WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	54
Benzene	0.5	0.96
Toluene	0.5	<0.5
Xylenes	0.5	15
Ethylbenzene	0.5	3.4

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044188	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW15 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (μg/L)

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Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044249	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW22 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (μg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044191	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MB-1 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description
044192	Project # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. TB-1 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 05-03-94

Sample Number	Sample Description
044187	Proj # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW2 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS

results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (μg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 05-03-94

Sample Number	Sample Description
044186	Proj # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW3 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	8.2
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	1.4
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (μg/L)

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Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044250	Proj # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW5 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	14
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	1.2
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	10
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (μg/L)

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Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 05-04-94

Sample Number
044251

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
MW9 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 05-03-94

Sample Number
044189

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
MW14 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS

results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	8.4
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (μg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 05-03-94

Sample Number
044190

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
MW14B WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	9.7
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 05-03-94

Sample Number	Sample Description
044188	Proj # 921175306.09 Texaco - Alameda 2375 Shoreline Dr. MW15 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (μg/L)

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Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 05-04-94

Sample Number
044249

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
MW22 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	15
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (μg/L)

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Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 05-03-94

Sample Number
044191

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
MB-1 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----	trans-1,2-Dichloroethene	<1.0
Bromomethane	<5.0	1,2-Dichloropropane	<1.0
Bromodichloromethane	<1.0	cis-1,3-Dichloropropene	<1.0
Bromoform	<5.0	trans-1,3-Dichloropropene	<2.0
Carbon Tetrachloride	<1.0	Ethylbenzene	----
Chlorobenzene	<1.0	Methylene Chloride	<1.0
Chloroethane	<1.0	1,1,2,2-Tetrachloroethane	<2.0
2-Chloroethylvinyl Ether	<5.0	Tetrachloroethene	<1.0
Chloroform	<1.0	1,1,1-Trichloroethane	<1.0
Chloromethane	<1.0	1,1,2-Trichloroethane	<1.0
Dibromochloromethane	<1.0	Trichloroethene	<2.0
1,1-Dichloroethane	<1.0	Trichlorofluoromethane	<2.0
1,2-Dichloroethane	<2.0	Toluene	----
1,1-Dichloroethene	<2.0	Vinyl Chloride	<5.0
		Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred Choske
for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.
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921175306.09\1223\013481

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 05-04-94

Sample Number
044252

Sample Description
Proj # 921175306.09
Texaco - Alameda
2375 Shoreline Dr.
TB WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred Cheshe
for

Ronald G. Evans
Lab Director

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921175306.09\1428\013480

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Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-27-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description	Detection Limit ppb	WATER Total Petroleum Hydrocarbons as Diesel ppb
	Texaco - Alameda ???? Park St. Project No.: 921175306.09		
044186	MW3	50	<50
044187	MW2	50	<50
044188	MW15	50	<50
044189	MW14	50	<50
044190	MW14B	50	<50
044191	MB-1	50	<50

QA/QC: Spike Recovery on 044186 is 73%
Duplicate Spike Deviation is 3.6%

Note: Analysis was performed using EPA method 3510 modified and TPH LUFT.
(ppb) = (µg/L)

MOBILE CHEM LABS
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Ronald G. Evans
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Attn: Alan Gibbs
Project Manager

Date Sampled: 04-28-94
Date Received: 04-28-94
Date Analyzed: 04-29-94

Sample Number	Sample Description	Detection Limit	WATER Total Petroleum Hydrocarbons as Diesel
		ppb	ppb
	Texaco - Alameda ???? Park St. Project No.: 921175306.09		
044249	MW22	50	<50
044250	MW5	50	<50
044251	MW9	50	<50

Note: Analysis was performed using EPA method 3510 modified and TPH LUFT.
(ppb) = (µg/L)

MOBILE CHEM LABS
Fred Choate
for

Ronald G. Evans
Lab Director

CERCO ANALYTICAL
31909 Hayman Street • Hayward, CA 94544 • (510) 487-9675 • Fax (510) 471-3698

Mobile Chem Labs, Inc.
5021 Blum Road, Ste.3
Martinez, CA 94553

Project I.D.: 921175306.09
Date Sampled: 04/27/94
Date Received: 04/28/94
Matrix: Wastewater

May 5, 1994
Job No. 9404127
Sample No. 001-006
Cust. No.: 10334

Lab No.	Client I.D.	Total Dissolved Solids mg/L
001	044186	850
002	044187	650
003	044188	1500
004	044189	840
005	044190	1800
006	044191	50
Detection Limit:		10
Method No.:		160.1
Date Analyzed:		05/02/94

Paula Spiese

Paula Spiese
Laboratory Director

CA

CERCO ANALYTICAL

31909 Hayman Street • Hayward, CA 94544 • (510) 487-9675 • Fax (510) 471-3698

Mobile Chem Labs, Inc.
5021 Blum Road, Ste.3
Martinez, CA 94553

May 5, 1994
Job No. 9404129
Sample No. 001-003
Cust. No.: 10334

Project I.D.: 921175306.09
Date Sampled: 04/27/94
Date Received: 04/29/94
Matrix: Wastewater

Lab No.	Client I.D.	Total Dissolved Solids mg/L
001	044249	2000
002	044250	2700
003	044251	920

Detection Limit: 10
Method No.: 160.1
Date Analyzed: 05/02/94

Paula Spiese

Paula Spiese
Laboratory Director

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Chain of Custody Record

Project No. 8-90-418-SI -09

Date 4-27-94

Sample Point: Alameda SSSC

TIME	SAMPLE NUMBER	CONTAINER SIZE	ANALYZE FOR	PRESERVATIVE	HOLDING TIME	REMARKS
12:50	MW12	2x40ml	601	NCL ICE		
2:00P	MW10	2x40ml	601	HCL ↓		
2:20P	MW24	2x40ml	601	HCL ↓		
2:50P	MW25	2x40ml	601	HCL ↓		

Relinquished by (signature)	Date/Time 4-28-94 16:09	Received by (signature) Dave Levity	Receiver represents ~~mct~~ Mobile Chem
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents

FLD 8 (9/91)

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Mobile Chem Lab

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Chain of Custody Record

Project No. 9211 75306.09	Sample Point: South Shore Shop Center
Date 4-27-94	

TIME	SAMPLE NUMBER	CONTAINER SIZE	ANALYZE FOR	PRESERVATIVE	HOLDING TIME	REMARKS
10:40	MW3	4x40ml	TPHgas/Btex/601	HCL ICE		
10:40	MW3	1qt	TPH Diesel	↓		
10:40	MW3	1qt	TDS	↓		
12:05	MW2	4x40ml	TPHgas/BTEX/601	HCL ICE		
12:05	MW2	1qt	TPH Diesel	↓		
12:05	MW2	1qt	TDS	↓		
14:05	MW15	4x40ml	TPHgas/Btex/601	HCL ICE		
14:05	MW15	1qt	TPH Diesel	↓		
14:05	MW15	1qt	TDS	↓		
15:15	MW14	4x40ml	TPHgas/BTEX/601	HCL ICE		
15:15	MW14	1qt	TPH Diesel	↓		
15:15	MW14	1qt	TDS	↓		
15:20	MW14B	4x40ml	TPHgas/BTEX/601	HCL ICE		
15:20	MW14B	1qt	TPH Diesel	↓		
15:20	MW14B	1qt	TDS	↓		
15:10	MB-1	4x40ml	TPHgas/BTEX/601	HCL ICE		
15:10	MB-1	1qt	TPH Diesel	↓		
15:10	MB-1	1qt	TDS	↓		
	TB-1	2x40ml	Travel Blank	↓		

Relinquished by (signature)	Date Time	Received by (signature)	Receiver represents
	4-28-94 0734	Carol K Hargutt	MARK
Carol K. Hargutt	4/28/94 8:47	Dave Levine,	mobile chem

110-8 (9/91)

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Mobile Chem Lab.

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Chain of Custody Record

Project No. 8-90-418-51.09
Date 4-27-94
Sample Point: ALAmeda Shop Center

TIME	SAMPLE NUMBER	CONTAINER SIZE	ANALYZE FOR	PRESERVATIVE	HOLDING TIME	REMARKS
11:50	MW11	2x40ml	601, Chlorinated Hydrocarbon	HCL/ICE		

Relinquished by (signature)	Date/Time 4-28-94 07:35	Received by (signature) Carol R Hargath	Receiver represents MARK
Relinquished by (signature) Carol R. Hargath	Date/Time 4/28/94 8:47	Received by (signature) DAve Levity	Receiver represents m Ch Labs
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents

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THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Chain of Custody Record

Project No. 921175306.09	Sample Point: Alameda SSSC
Date 4-28-94	

TIME	SAMPLE NUMBER	CONTAINER SIZE	ANALYZE FOR	PRESERVATIVE	HOLDING TIME	REMARKS
10:00	MW22	4x40ml	TPHgas/BTEX/601	HCL ICE		
10:00	MW22	1qt	TPH Diesel	↓		
10:00	MW22	1qt	TDS			
11:09	MW5	4x40ml	TPHgas/BTEX/601	HCL ICE		
11:09	MW5	1qt	TPH Diesel	↓		
11:09	MW5	1qt	TDS			
1:25p	MW9	4x40ml	TPHgas/BTEX/601	HCL-ICE		
1:25p	MW9	1qt	TPH Diesel	↓		
1:25p	MW9	1qt	TDS			
1:40p	TB	2x40ml	601	HCL ICE		

Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents
	4-28-94 16:09	Dave Levine	mobile chem
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents

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931185003.10\1428\013482

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044263	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW7B WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	5,600
Benzene	0.5	190
Toluene	0.5	<0.5
Xylenes	0.5	27
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS
Fred Choske
for
Ronald G. Evans
Lab Director

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Attn: Alan Gibbs
Project Manager

Date Sampled: 05-02-94
Date Received: 05-02-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
054002	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW8B WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	140
Benzene	0.5	9.2
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS

for

Ronald G. Evans
Lab Director

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Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 05-02-94
Date Received: 05-02-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
054003	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW16 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS
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for
Ronald G. Evans
Lab Director

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Attn: Alan Gibbs
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Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044265	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW17 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS

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Lab Director

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Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044266	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW18 WATER

ANALYSIS

	Detection Limit	Sample Results
	ppb	ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS
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for

Ronald G. Evans
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Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044267	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW19 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS
Fred Cloake
for
Ronald G. Evans
Lab Director

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Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044264	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW20 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	57
Benzene	0.5	21
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

QA/QC: Duplicate Deviation is 4.3%

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS
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for

Ronald G. Evans
Lab Director

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Attn: Alan Gibbs
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Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044268	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW21 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

QA/QC: Spike Recovery is 105%

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS
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for

Ronald G. Evans
Lab Director

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Project Manager

Date Sampled: 05-02-94
Date Received: 05-02-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
054001	Project # 931185003.10 S.Shore Shopping Center Shoreline & Park MW23 WATER

ANALYSIS

	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030 and TPH LUFT with method 602 used for BTX distinction.
(ppb) = (µg/L)

MOBILE CHEM LABS

Fred Clarke for

Ronald G. Evans
Lab Director

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Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044263	Proj # 931185003.10 S.Shore Shopping Center Shoreline & Park MW7B WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----	trans-1,2-Dichloroethene	13
Bromomethane	<5.0	1,2-Dichloropropane	<1.0
Bromodichloromethane	<1.0	cis-1,3-Dichloropropene	<1.0
Bromoform	<5.0	trans-1,3-Dichloropropene	<2.0
Carbon Tetrachloride	<1.0	Ethylbenzene	----
Chlorobenzene	31	Methylene Chloride	<1.0
Chloroethane	<1.0	1,1,2,2-Tetrachloroethane	<2.0
2-Chloroethylvinyl Ether	<5.0	Tetrachloroethene	190
Chloroform	<1.0	1,1,1-Trichloroethane	<1.0
Chloromethane	<1.0	1,1,2-Trichloroethane	<1.0
Dibromochloromethane	<1.0	Trichloroethene	12
1,1-Dichloroethane	<1.0	Trichlorofluoromethane	<2.0
1,2-Dichloroethane	<2.0	Toluene	----
1,1-Dichloroethene	5.8	Vinyl Chloride	<5.0
		Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred Cheek
for

Ronald G. Evans
Lab Director

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The Mark Group
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Attn: Alan Gibbs
Project Manager

Date Sampled: 05-02-94
Date Received: 05-02-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
054002	Proj # 931185003.10 S.Shore Shopping Center Shoreline & Park MW8B WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----	trans-1,2-Dichloroethene	23
Bromomethane	<5.0	1,2-Dichloropropane	<1.0
Bromodichloromethane	<1.0	cis-1,3-Dichloropropene	<1.0
Bromoform	<5.0	trans-1,3-Dichloropropene	<2.0
Carbon Tetrachloride	<1.0	Ethylbenzene	----
Chlorobenzene	<1.0	Methylene Chloride	<1.0
Chloroethane	<1.0	1,1,2,2-Tetrachloroethane	<2.0
2-Chloroethylvinyl Ether	<5.0	Tetrachloroethene	70
Chloroform	<1.0	1,1,1-Trichloroethane	<1.0
Chloromethane	<1.0	1,1,2-Trichloroethane	<1.0
Dibromochloromethane	<1.0	Trichloroethene	57
1,1-Dichloroethane	<1.0	Trichlorofluoromethane	<2.0
1,2-Dichloroethane	<2.0	Toluene	----
1,1-Dichloroethene	<2.0	Vinyl Chloride	<5.0
		Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred [illegible]
for

Ronald G. Evans
Lab Director

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931185003.10\1223\013483

The Mark Group
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Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 05-02-94
Date Received: 05-02-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
054003	Proj # 931185003.10 S.Shore Shopping Center Shoreline & Park MW16 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----	trans-1,2-Dichloroethene	<1.0
Bromomethane	<5.0	1,2-Dichloropropane	<1.0
Bromodichloromethane	<1.0	cis-1,3-Dichloropropene	<1.0
Bromoform	<5.0	trans-1,3-Dichloropropene	<2.0
Carbon Tetrachloride	<1.0	Ethylbenzene	----
Chlorobenzene	<1.0	Methylene Chloride	<1.0
Chloroethane	<1.0	1,1,2,2-Tetrachloroethane	<2.0
2-Chloroethylvinyl Ether	<5.0	Tetrachloroethene	<1.0
Chloroform	<1.0	1,1,1-Trichloroethane	<1.0
Chloromethane	<1.0	1,1,2-Trichloroethane	<1.0
Dibromochloromethane	<1.0	Trichloroethene	<2.0
1,1-Dichloroethane	<1.0	Trichlorofluoromethane	<2.0
1,2-Dichloroethane	<2.0	Toluene	----
1,1-Dichloroethene	<2.0	Vinyl Chloride	<5.0
		Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.
5011 Blum Road, Suite 1 • Martinez, CA 94553
Phone (510) 372-3700 • Fax (510) 372-6955

931185003.10\1223\013482

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

<u>Sample Number</u>
044265

<u>Sample Description</u>
Proj # 931185003.10
S.Shore Shopping Center
Shoreline & Park
MW17 WATER

<u>PRIORITY POLLUTANTS</u>
<u>VOLATILE ORGANIC COMPOUNDS</u>
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	2.4
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.

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931185003.10\1223\013482

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044266	Proj # 931185003.10 S.Shore Shopping Center Shoreline & Park MW18 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----	trans-1,2-Dichloroethene	<1.0
Bromomethane	<5.0	1,2-Dichloropropane	<1.0
Bromodichloromethane	<1.0	cis-1,3-Dichloropropene	<1.0
Bromoform	<5.0	trans-1,3-Dichloropropene	<2.0
Carbon Tetrachloride	<1.0	Ethylbenzene	----
Chlorobenzene	<1.0	Methylene Chloride	<1.0
Chloroethane	<1.0	1,1,2,2-Tetrachloroethane	<2.0
2-Chloroethylvinyl Ether	<5.0	Tetrachloroethene	1.4
Chloroform	<1.0	1,1,1-Trichloroethane	<1.0
Chloromethane	<1.0	1,1,2-Trichloroethane	<1.0
Dibromochloromethane	<1.0	Trichloroethene	<2.0
1,1-Dichloroethane	<1.0	Trichlorofluoromethane	<2.0
1,2-Dichloroethane	<2.0	Toluene	----
1,1-Dichloroethene	<2.0	Vinyl Chloride	<5.0
		Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred Choate
for

Ronald G. Evans
Lab Director

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931185003.10\1223\013482

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

<u>Sample Number</u>
044267

<u>Sample Description</u>
Proj # 931185003.10
S.Shore Shopping Center
Shoreline & Park
MW19 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	1.1
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (μg/L)

MOBILE CHEM LABS, INC.

Fred Choske
for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.

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931185003.10\1223\013482

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number
044264

Sample Description
Proj # 931185003.10
S.Shore Shopping Center
Shoreline & Park
MW20 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS

results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	58
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	57
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	32
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

for

Ronald G. Evans
Lab Director

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931185003.10\1223\013482

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number
044268

Sample Description
Proj # 931185003.10
S.Shore Shopping Center
Shoreline & Park
MW21 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.
Fred Choske
for

Ronald G. Evans
Lab Director

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931185003.10\1223\013483

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 05-02-94
Date Received: 05-02-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
054001	Proj # 931185003.10 S.Shore Shopping Center Shoreline & Park MW23 WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----	trans-1,2-Dichloroethene	<1.0
Bromomethane	<5.0	1,2-Dichloropropane	<1.0
Bromodichloromethane	<1.0	cis-1,3-Dichloropropene	<1.0
Bromoform	<5.0	trans-1,3-Dichloropropene	<2.0
Carbon Tetrachloride	<1.0	Ethylbenzene	----
Chlorobenzene	<1.0	Methylene Chloride	<1.0
Chloroethane	<1.0	1,1,2,2-Tetrachloroethane	<2.0
2-Chloroethylvinyl Ether	<5.0	Tetrachloroethene	<1.0
Chloroform	<1.0	1,1,1-Trichloroethane	<1.0
Chloromethane	<1.0	1,1,2-Trichloroethane	<1.0
Dibromochloromethane	<1.0	Trichloroethene	<2.0
1,1-Dichloroethane	<1.0	Trichlorofluoromethane	<2.0
1,2-Dichloroethane	<2.0	Toluene	----
1,1-Dichloroethene	<2.0	Vinyl Chloride	<5.0
		Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.
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931185003.10\1223\013482

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
044269	Proj # 931185003.10 S.Shore Shopping Center Shoreline & Park TB WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----
Bromomethane	<5.0
Bromodichloromethane	<1.0
Bromoform	<5.0
Carbon Tetrachloride	<1.0
Chlorobenzene	<1.0
Chloroethane	<1.0
2-Chloroethylvinyl Ether	<5.0
Chloroform	<1.0
Chloromethane	<1.0
Dibromochloromethane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<2.0
1,1-Dichloroethene	<2.0
trans-1,2-Dichloroethene	<1.0
1,2-Dichloropropane	<1.0
cis-1,3-Dichloropropene	<1.0
trans-1,3-Dichloropropene	<2.0
Ethylbenzene	----
Methylene Chloride	<1.0
1,1,2,2-Tetrachloroethane	<2.0
Tetrachloroethene	<1.0
1,1,1-Trichloroethane	<1.0
1,1,2-Trichloroethane	<1.0
Trichloroethene	<2.0
Trichlorofluoromethane	<2.0
Toluene	----
Vinyl Chloride	<5.0
Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (μg/L)

MOBILE CHEM LABS, INC.

fred Clarke
for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.
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Phone (510) 372-3700 • Fax (510) 372-6955

931185003.10\1223\013483

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 05-02-94
Date Received: 05-02-94
Date Analyzed: 05-04-94

Sample Number	Sample Description
054004	Proj # 931185003.10 S.Shore Shopping Center Shoreline & Park TB WATER

PRIORITY POLLUTANTS
VOLATILE ORGANIC COMPOUNDS
results in ppb

Benzene	----	trans-1,2-Dichloroethene	<1.0
Bromomethane	<5.0	1,2-Dichloropropane	<1.0
Bromodichloromethane	<1.0	cis-1,3-Dichloropropene	<1.0
Bromoform	<5.0	trans-1,3-Dichloropropene	<2.0
Carbon Tetrachloride	<1.0	Ethylbenzene	----
Chlorobenzene	<1.0	Methylene Chloride	<1.0
Chloroethane	<1.0	1,1,2,2-Tetrachloroethane	<2.0
2-Chloroethylvinyl Ether	<5.0	Tetrachloroethene	<1.0
Chloroform	<1.0	1,1,1-Trichloroethane	<1.0
Chloromethane	<1.0	1,1,2-Trichloroethane	<1.0
Dibromochloromethane	<1.0	Trichloroethene	<2.0
1,1-Dichloroethane	<1.0	Trichlorofluoromethane	<2.0
1,2-Dichloroethane	<2.0	Toluene	----
1,1-Dichloroethene	<2.0	Vinyl Chloride	<5.0
		Total Xylenes	----

Note: Analysis was performed using EPA methods 5030 and 601
(ppb) = (µg/L)

MOBILE CHEM LABS, INC.

Fred Cheske
for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.
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931185003.10\1428\013482

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 04-29-94
Date Received: 04-29-94
Date Analyzed: 05-04-94

Sample Number	Sample Description	Detection Limit ppb	WATER Total Petroleum Hydrocarbons as Diesel ppb
	S.Shore Shopping Center Shoreline & Park Project No.: 931185003.10		
044263	MW7B	50	<50
044264	MW20	50	<50
044265	MW17	50	<50
044266	MW18	50	<50
044267	MW19	50	<50
044268	MW21	50	<50

QA/QC: Spike Recovery on 044268 is 101%
Duplicate Spike Deviation is 12.4%

Note: Analysis was performed using EPA method 3510 modified and TPH LUFT.
(ppb) = (μg/L)

MOBILE CHEM LABS
for

Ronald G. Evans
Lab Director

MOBILE CHEM LABS INC.

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Phone (510) 372-3700 • Fax (510) 372-6955

931185003.10\1428\013483

The Mark Group
3480 Buskirk Avenue, Suite #120
Pleasant Hill, CA 94523
Attn: Alan Gibbs
Project Manager

Date Sampled: 05-02-94
Date Received: 05-02-94
Date Analyzed: 05-09-94

S.Shore Shopping Center
Shoreline & Park
Project No.: 931185003.10

Sample Number	Sample Description	Detection Limit ppb	WATER Total Petroleum Hydrocarbons as Diesel ppb
054001	MW23	50	<50
054002	MW8B	50	<50
054003	MW16	50	<50

QA/QC: Spike Recovery on 054003 is 107%
Duplicate Spike Deviation is 8.1%

Note: Analysis was performed using EPA method 3510 modified and TPH LUFT.
(ppb) = (µg/L)

MOBILE CHEM LABS

Ronald G. Evans
Lab Director

CA

CERCO ANALYTICAL

31909 Hayman Street • Hayward, CA 94544 • (510) 487-9675 • Fax (510) 471-3698

Mobile Chem Labs, Inc.
5021 Blum Road, Ste.3
Martinez, CA 94553

Project I.D.: 931185003.10 (001-003)
931185003 (004-009)
Date Sampled: 05/02/94 (001-003)
04/29/94 (004-009)
Date Received: 05/03/94
Matrix: Wastewater

May 6, 1994
Job No. 9405011
Sample No. 001-009
Cust. No.: 10334

Lab No.	Client I.D.	Total Dissolved Solids mg/L
001	054001	54
002	054002	2,900
003	054003	25,000
004	044263	1,300
005	044264	13,000
006	044265	18,000
007	044266	19,000
008	044267	20,000
009	044268	20,000
Detection Limit:		10
Method No.:		160.1
Date Analyzed:		05/05/94

Yvonne Barker for
Paula Spiese
Laboratory Director

THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Chain of Custody Record

Project No. 931/85003.10	Sample Point: Alameda 555 C
Date 4-29-94	

TIME	SAMPLE NUMBER	CONTAINER SIZE	ANALYZE FOR	PRESERVATIVE	HOLDING TIME	REMARKS
8:55	MW7B	4x40ml	TPHgas/BTEX/601	HCL ICE		
8:55	MW7B	1qt	TPH Diesel	↓		
8:55	MW7B	1qt	TDS	↓		
10:10	MW20	4x40ml	TPHgas/BTEX/601	HCL ICE		
10:10	MW20	1qt	TPH Diesel	↓		
10:10	MW20	1qt	TDS	↓		
11:10	MW17	4x40ml	TPH gas/BTEX/601	HCL ICE		
11:10	MW17	1qt	TPH Diesel	↓		
11:10	MW17	1qt	TDS	↓		
12:15	MW18	4x40ml	TPH gas/BTEX/601	HCL ICE		
12:15	MW18	1qt	TPH Diesel	↓		
12:15	MW18	1qt	TDS	↓		
13:10	MW19	4x40ml	TPH gas/BTEX/601	HCL ICE		
13:10	MW19	1qt	TPH Diesel	↓		
13:10	MW19	1qt	TDS	↓		
14:10	MW21	4x40ml	TPHgas/BTEX/601	HCL ICE		
14:10	MW21	1qt	TPH Diesel	↓		
14:10	MW21	1qt	TDS	↓		
	TB	2x40ml	601	HCL ICE		
						ON ICE
						no head space

Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents
	4-29-94 16:13	Dave Levine	
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents

TLD 8 (9/9/91)

Hookston Square, Suite 120 3480 Buskirk Avenue Pleasant Hill, CA 94523 (510) 946-1055

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THE MARK GROUP
ENGINEERS & GEOLOGISTS, INC.

Chain of Custody Record

Project No. 931185003.10	Sample Point: Alameda S.S.S.C
Date 5-2-94	

TIME	SAMPLE NUMBER	CONTAINER SIZE	ANALYZE FOR	PRESERVATIVE	HOLDING TIME	REMARKS
10:52	MW23	4x40ml	TPHgas/BTEX/601	HCL ICE		On ICE
10:52	MW23	1qt	TPH Diesel	↓		
10:52	MW23	1qt	TDS			
11:45	MW8B	4x40ml	TPHgas/BTEX/601	HCL ICE		
11:45	MW8B	1qt	TPH Diesel	↓		
11:45	MW8B	1qt	TDS			
12:35	MW16	4x40ml	TPHgas/BTEX/601	HCL ICE		
12:35	MW16	1qt	TPH Diesel	↓		
12:35	MW16	1qt	TDS			
12:38	TB	2x40ml	601	HCL ICE		

Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents
	5-2-94 15:13	DAVE Levine 5-2-94 15:10	
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents
Relinquished by (signature)	Date/Time	Received by (signature)	Receiver represents

FLD 8 (9/9/91)

Hookston Square, Suite 120 3480 Buskirk Avenue Pleasant Hill, CA 94523 (510) 946-1055

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CH OF TOD ECO

NO. 8-90-418-SI	NAME Kamur Industries 2351 Shoreline Drive, Alameda

SAMPLERS: *(Signature)*

NO.	DATE	TIME	SOIL	WATER	LOCATION	CONTAINER	ANALYSES REQUESTED: TPHg/BTEX (2)	TPHd	TOG	Total Dissolved (2)			REMARKS
	4/27/94	2:50		✓	STMW-1		✓			✓			
	4/27/94	12:50		✓	STMW-3		✓	✓	✓	✓			
	4/27/94	2:20		✓	STMW-5		✓			✓			
	4/27/94	2:00		✓	STMW-6		✓			✓			
	4/27/94			✓	Field Blank		✓						
	4/27/94	2:55		✓	Rinse		✓						
	4/27/94	12:02		✓	STMW-2		✓			✓			

Relinquished by: *(Signature)*	Date / Time 4/28/94 2:25	Received by: *(Signature)* Ivan	Relinquished by: *(Signature)*	Date / Time	Receive by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

SOIL TECH ENGINEERING

Soil, Foundation and Geological Engineers

298 BROKAW ROAD, SANTA CLARA, CA 95050 ■ (408) 866-0919 ■ (415) 791-6406

SOIL TECH ENGINEERING

Soil, Foundation and Geological Engineers

298 BROKAW ROAD, SANTA CLARA, CA 95050 ■ (408) 496-0265 OR (408) 496-0266

DATE: 6/02/94 TIME:

TO: Mark Group

ATTN: Mr. Alan Giles

RE:

FAX: 510-946-9813

10 PAGES
(INCLUDING COVER PAGE)

FROM: Soil Tech Engineering

C/O: Frank Hamedi

OUR FAX: 408-988-3343

NOTE:

PLEASE CALL OUR OFFICE IF YOU DO NOT RECEIVE ALL THE PAGES.

Argon Mobile Labs

3008 McKittrick Ct., Suite N • Ceres, CA 95307 • (209) 537-7836

SOIL TECH ENGINEERING, INC.
298 Brokaw Rd
Santa Clara, CA 95050

Date Sampled: 04/27/94
Date Received: 04/28/94
Date Reported: 05/04/94

Project ID: 8-90-418-SI
Sample ID: STMW-1

Lab Number: T404181
Matrix: Water

TPH-gas/BTXE

ANALYTE	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	90,000
Benzene	0.5	3,600
Toluene	0.5	3,200
Xylenes	0.5	5,300
Ethylbenzene	0.5	1,200

QA/QC: Blank is none detected.
11.1% Duplicate Deviation

Note: Analysis was performed using EPA methods 5030/8015/602
ppb = ug/L

ARGON MOBILE LABS

Hiram Cueto
Lab Director

ARGON MOBILE LABS IS CERTIFIED BY THE STATE OF CALIFORNIA
D.O.H.S. AS A HAZARDOUS WASTE TESTING LABORATORY (CERTIFICATION NO. 1873)

Argon Mobile Labs

3008 McKittrick Ct., Suite N • Ceres, CA 95307 • (209) 537-7836

SOIL TECH ENGINEERING, INC.
298 Brokaw Rd
Santa Clara, CA 95050

Date Sampled: 04/27/94
Date Received: 04/28/94
Date Reported: 05/04/94

Project ID: 8-90-418-SI
Sample ID: STMW-2

Lab Number: T404187
Matrix: Water

TPH-gas/BTXE

ANALYTE	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

QA/QC: 122% Surrogate Spike Recovery
105% Matrix Spike Recovery

Note: Analysis was performed using EPA methods 5030/8015/602
ppb = ug/L

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298 Brokaw Rd
Santa Clara, CA 95050

Date Sampled: 04/27/94
Date Received: 04/28/94
Date Reported: 05/04/94

Project ID: 8-90-418-SI
Sample ID: STMW-3

Lab Number: T404182
Matrix: Water

TPH-gas/BTXE

ANALYTE	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	160,000
Benzene	0.5	1,300
Toluene	0.5	6,300
Xylenes	0.5	12,000
Ethylbenzene	0.5	1,400

Note: Analysis was performed using EPA methods 5030/8015/602
ppb = ug/L

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Lab Director

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SOIL TECH ENGINEERING, INC.
298 Brokaw Rd
Santa Clara, CA 95050

Date Sampled: 04/27/94
Date Received: 04/28/94
Date Reported: 05/04/94

Project ID: 8-90-418-SI
Sample ID: STMW-5

Lab Number: T404183
Matrix: Water

TPH-gas/BTXE

ANALYTE	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

QA/QC: 83% Surrogate Spike Recovery

Note: Analysis was performed using EPA methods 5030/8015/602
ppb = ug/L

ARGON MOBILE LABS

Hiram Cueto
Lab Director

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SOIL TECH ENGINEERING, INC.
298 Brokaw Rd
Santa Clara, CA 95050

Date Sampled: 04/27/94
Date Received: 04/28/94
Date Reported: 05/04/94

Project ID: 8-90-418-SI
Sample ID: STMW-6

Lab Number: T404184
Matrix: Water

TPH-gas/BTXE

ANALYTE	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	38,000
Benzene	0.5	3,000
Toluene	0.5	1,200
Xylenes	0.5	2,000
Ethylbenzene	0.5	710

Note: Analysis was performed using EPA methods 5030/8015/602
ppb = ug/L

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Lab Director

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SOIL TECH ENGINEERING, INC.
298 Brokaw Rd
Santa Clara, CA 95050

Date Sampled: 04/27/94
Date Received: 04/28/94
Date Reported: 05/04/94

Project ID: 8-90-418-SI
Sample ID: Field Blank

Lab Number: T404185
Matrix: Water

TPH-gas/BTXE

ANALYTE	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

QA/QC: 107% Surrogate Spike Recovery

Note: Analysis was performed using EPA methods 5030/8015/602
ppb = ug/L

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Lab Director

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SOIL TECH ENGINEERING, INC.
298 Brokaw Rd
Santa Clara, CA 95050

Date Sampled: 04/27/94
Date Received: 04/28/94
Date Reported: 05/04/94

Project ID: 8-90-418-SI
Sample ID: Rinse

Lab Number: T404186
Matrix: Water

TPH-gas/BTXE

ANALYTE	Detection Limit ppb	Sample Results ppb
Total Petroleum Hydrocarbons as Gasoline	50	<50
Benzene	0.5	<0.5
Toluene	0.5	<0.5
Xylenes	0.5	<0.5
Ethylbenzene	0.5	<0.5

Note: Analysis was performed using EPA methods 5030/8015/602
ppb = ug/L

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SOIL TECH ENGINEERING, INC
298 Brokaw Rd.
Santa Clara CA. 95050

Date Sampled: 04/27/94
Date Received: 04/28/94
Date Reported: 05/04/94

Project ID: 8-90-418-SI

Matrix: Water

TOTAL DISSOLVED SOLIDS ANALYTICAL REPORT

Sample Number	Sample Description	Detection Limit ppm	RESULT ppm
T404181	STMW-1	10	2570
T404182	STMW-3	10	510
T404183	STMW-5	10	560
T404184	STMW-6	10	2550
T404187	STMW-2	10	1230

QA/QC: Blank is none detected.
109% Spike Recovery LCS20
6.5% Duplicate Deviation

Note: Analysis was performed in accordance with method 160.1
ppm = mg/L

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Hiram Cueto
Lab Director