POOR LEGIBILITY

ONE OR MORE PAGES IN THIS DOCUMENT ARE DIFFICULT TO READ
DUE TO THE QUALITY OF THE ORIGINAL

SFUND RECORDS CTR
88151542

SFUND RECORDS CTR
2201-00040

AR0073

00040

Remedial Investigation Report

Sola Optical USA, Inc.
Petaluma, California

December 3, 1990
1954.04

Prepared for:

Sola Optical USA
1500 Cader Lane
Petaluma, California

LEVINE·FRICKE

SOLA
OPTICAL USA, INC.
1500 Cader Lane • P.O. Box 6002, Petaluma, CA 94953-6002 • (707) 763-9911 • FAX (707) 765-1378 • TLX 170714

December 3, 1990

VIA FEDERAL EXPRESS

Michael M. Montgomery
Mail Code H-7-1
U.S. EPA Region IX
Hazardous Waste Management Division
Superfund Branch/Enforcement Response Section
75 Hawthorne Street
San Francisco, CA 94105

Sola Optical U.S.A., Inc
EPA Consent Order No. 89-22

Dear Mr. Montgomery:

Enclosed is the Remedial Investigation Report for the Sola Optical U.S.A., Inc. Site ("Sola") dated December 3,1990. This document was prepared for Sola by Levine-Fricke Inc. for submission to the U.S. Environmental Protection Agency ("EPA") in accordance with EPA Consent Order No. 89-22.

Sincerely,

Mark A. Adams, R.G.
Manager, Environmental Affairs

Enclosure

cc: See Attached Distribution List

Mark A. Adams
Sola Optical U.S.A., Inc.

Patricia Shanks
McCutchen, Doyle, Brown and Enersen

Thomas M. Johnson
Levine-Fricke

Steven R. Ritchie
Lester Feldman
Regional Water Quality Control Board

Fritz Carlson
CH2M Hill

David Clark
State Department of Health Services

Gil Torres
Bill Levine
State Water Resources Control Board

Mark Sullivan
County of Sonoma

Thomas S. Hargis
City of Petaluma

LEVINE·FRICKE

CERTIFICATION

All hydrogeologic and geologic information, conclusions, and recommendations in this report have been prepared and reviewed by a Levine•Fricke California Registered Geologist.

Gregson W. Taylor, R.G.
Senior Hydrogeologist
California Registered Geologist (4758)

REGISTERED GEOLOGIST
GREGSON W. TAYLOR
No. 4758
STATE OF CALIFORNIA

J. Scott Seyfried
Project Hydrogeologist

CONTENTS

PAGE

LIST OF TABLES iii

LIST OF FIGURES iv

1.0 INTRODUCTION 1
1.1 Report Organization 2
1.2 Site Description and History 3
1.3 Previous Investigations 3
1.3.1 Ground-Water Quality 4
1.3.2 Installation and Abandonment of Wells and Drilling of Exploratory Soil Borings 5
1.3.3 Hydraulic Testing of Sediments 8
1.3.4 Soil Quality Investigations 10

2.0 RECENT RI ACTIVITIES 13
2.1 Soil-Quality Investigation 13
2.1.1 Soil-Gas Investigation 14
2.1.2 Soil Sampling 19
2.2 Ground-Water Quality Investigation 25
2.2.1 Ground-Water Investigation Objectives and Approach 25
2.2.2 Field Methodology 27
2.2.3 Results of the Ground-Water Investigation . 27
2.2.4 Quality Assurance/Quality Control (QA/QC) Sample Results 34
2.2.5 Discussion of Ground-Water Investigation Results 35
2.2.6 Conclusions of the Ground-Water Investigation 37

3.0 PHYSICAL CHARACTERISTICS OF THE SITE 39
3.1 Topography 39
3.2 Hydrogeologic Setting 39
3.2.1 Geologic Setting 39
3.2.2 Ground-Water Elevation and Flow Direction . . 42

4.0 NATURE AND EXTENT OF VOCs AT THE SITE 43

4.1 Chemical Source Area 43
4.2 Extent and Distribution of VOCs detected in Soil 43
4.2.1 Aliphatic VOCs 43
4.2.2 Aromatic VOCs 44
4.3 Extent and Distribution of VOCs Detected in Ground Water 44

5.0 FATE AND TRANSPORT OF VOCs AT THE SITE 46
5.1 Transport Mechanisms 46

5.1.1 Volatilization from Soil 47
5.1.2 Migration of Chemicals from the Vadose Zone Into Ground Water 48
5.1.3 Migration of Chemicals in Ground Water . . . 49
5.1.4 Chemical Transformation Processes 51

6.0 CONCLUSIONS AND RECOMMENDATIONS 55
6.1 Conclusions 55
6.2 Recommendations 56

7.0 REFERENCES 57

TABLES

FIGURES

APPENDIX A: Laboratory Data Sheets

APPENDIX B: Selected Figures from the Levine•Fricke Report Entitled: "Results of Hydraulic Testing of Sediments in the Vicinity of the Sola Optical USA, Inc. Facility, Petaluma, California," January, 1988

LIST OF TABLES

Table 1: Historical Ground-Water Quality Data (ppm)

Table 2: Well Construction Details

Table 3: Summary of Calculated Hydraulic Parameters

Table 4: Summary of Chemical Analysis of Soil and Water Samples Collected from the Tank Excavation Pit on July 13 and 29, 1985

Table 5: Chemical Partitioning Calculations

Table 6: Summary of Soil Chemical Analyses Data (ppm)

Table 7: Ground-Water Elevation Data (feet MSL)

Table 8: Calculated Vertical Hydraulic Gradients

Table 9: Ground-Water Chemistry: Major Anions and Cations

Table 10: Summary of Chemical Analysis of Water Samples Collected from Newly-Installed Wells

Table 11: Quality Control Data for Chemical Analyses: Data Precision as Relative Percent Difference (RPD) of Duplicate and Split Sample Analyses and VOCs Detected in Field Blank and Trip Blank Samples (ppm)

Table 12: State and Federal Water-Quality Criteria for the Primary VOCs Detected in Ground Water, Sola Optical USA Inc. Site (ppm)

Table 13: Chemicals Detected in Soil and Ground Water at the Site

Table 14: Chemical Properties of Selected Compounds Detected at the Site

Table 15: Projected RI/FS Deliverables and Schedule

LIST OF FIGURES

Figure 1: Site and Vicinity Plan

Figure 2: Site Plan

Figure 3: Site Plan Showing Location of Van Houten Soil Borings

Figure 4: Layout of Former Underground Storage Tanks

Figure 5: Results of Levine•Fricke Soil-Gas Investigation, Conducted September 1986

Figure 6: Locations of Shallow Soil Borings B-1 Through B-4, March 1988

Figure 7: Soil-Gas Sampling Locations, April 1988

Figure 8: Chemical Concentrations Detected in Soil-Gas Samples, April 1990

Figure 9: Soil Sampling Locations, April 1990

Figure 10: Summary of VOC Concentrations Detected in Soil Samples, April 1990

Figure 11: Geologic Cross Section Locations

Figure 12: Geologic Cross Section A-A′

Figure 13: Geologic Cross Section B-B′

Figure 14: Geologic Cross Section C-C′

Figure 15: Geologic Cross Section D-D′

Figure 16: Shallow Ground-Water Elevations on July 31, 1990

Figure 17: Estimated Area of Capture of Shallow Ground Water Based on July 31, 1990 Ground-Water Elevations

Figure 18: Intermediate-Depth Ground-Water Elevations on July 31, 1990

LIST OF FIGURES
(continued)

Figure 19: Estimated Area of Capture of Intermediate-Depth Ground Water Based on July 31, 1990 Ground-Water Elevations

Figure 20: Hydrographs for Shallow Well W-28 and Intermediate Well LF-4

Figure 21: Hydrographs for Shallow Well W-14 and Intermediate Well W-13

Figure 22: Hydrographs for Shallow Well W-25 and Intermediate Well LF-3

Figure 23: Hydrographs for Shallow Well LF-25 and Intermediate Well LF-26

Figure 24: Concentrations of Volatile Organic Compounds Detected in Newly Installed Monitoring Wells (ppm)

Figure 25: Concentrations of Volatile Organic Compounds Detected in Ground Water, April and August 1990 (ppm)

Figure 26: Estimated Extent of Concentrations of Volatile Organic Compounds Greater than MCLs in Shallow Ground Water, April and August, 1990

Figure 27: Estimated Extent of Concentrations of Volatile Organic Compounds Greater than MCLs in Intermediate-Depth Ground Water, April and August, 1990

Figure 28: Estimated Extent of Concentrations of Volatile Organic Compounds Greater than MCLs in Deep and Deeper Ground Water, April and August, 1990

LIST OF FIGURES IN APPENDIX B

Figure B-1: Ground-Water Elevations in Shallow Sediment Interval Prior to Start-Up of Station 5 Well on 29 October 1987

Figure B-2: Shallow Ground-Water Elevation Measured 50 Days After Start-Up of the Station 5 Well on 18 December 1987

Figure B-3: Ground-Water Elevations in Intermediate Sediment Interval Prior to Start-Up of Station 5 Well on 29 October 1987

Figure B-4: Ground-Water Elevation in Intermediate Sediment Interval on 18 December 1987

Figure B-5: Ground-Water Elevations in Deepest Sediment Interval Prior to Start-Up of Station 5 Well on 29 October 1987

Figure B-6: Ground-Water Elevation in Deepest Sediment Interval on 18 December 1987

December 3, 1990 LF 1954.04

REMEDIAL INVESTIGATION REPORT
SOLA OPTICAL USA, INC.
PETALUMA, CALIFORNIA

1.0 INTRODUCTION

This Remedial Investigation (RI) Report has been prepared on behalf of Sola Optical USA, Inc., a division of Pilkington Visioncare, Inc. (together referred to as "Sola") for submittal to the U.S. Environmental Protection Agency (EPA) in accordance with the Administrative Consent Order for Remedial Investigation/Feasibility Study (RI/FS), EPA Docket Number 89-22, issued by the EPA on October 2, 1989 ("the Consent Order"), and the Remedial Investigation/Feasibility Study Work Plan ("the RI/FS Work Plan") attached as Exhibit A to the Consent Order. This RI Report was prepared pursuant to Task 4 (Remedial Reports), part 4.4.3 (Remedial Investigation Report). This RI Report presents the results of implementing the soil and ground-water investigation portions of the Field Sampling Plan (FSP) dated February 26, 1990 (Levine•Fricke, 1990a) and approved by the EPA on March 1, 1990. This RI report also summarizes the results of remedial investigations completed at the Site prior to the FSP.

The Sola facility is located in Petaluma, California. That portion of the Sola manufacturing plant where hazardous substances were deposited or have come to be located and any other adjacent parcels of land to which ground water containing these hazardous substances has migrated are referred to herein as "the Site" (see Figure 1).

Remedial investigations at the Site began in 1982 when the presence of certain volatile organic compounds (VOCs) was detected in ground water in the vicinity of six 1,000-gallon capacity underground storage tanks used by Sola to store organic solvents (Figure 2). The remedial investigations were conducted with oversight by the Regional Water Quality Control Board - San Francisco Bay Region (RWQCB). In 1987, the RWQCB approved installation of a ground-water extraction and treatment system which has been in operation at the Site since August 1988.

In May 1987, the RWQCB referred the Site to the EPA for inclusion on the National Priorities List. The EPA, in its Special Notice Letter dated May 27, 1989, proposed additional

remedial investigation (RI) activities and preparation of a feasibility study (FS) for the Site. Sola is performing and financing the RI/FS work requested by the EPA. The RI/FS to be performed by Sola is described in the EPA-approved RI/FS Work Plan prepared by Levine•Fricke on behalf of Sola, dated August 30, 1989 ("RI/FS Work Plan"; Levine•Fricke, 1989).

RI activities described in the RI/FS Work Plan included preparation of an FSP, a Health and Safety Plan (HSP), and a Quality Assurance Project Plan (QAPP), submitted to the EPA on February 26, 1990 (Levine•Fricke, 1990a, b, and c).

The FSP included the objectives, rationale, and approach for additional investigations of soil and ground-water quality at the Site. The objectives of these additional investigations are also stated in Section 2.0 (Recent RI Activities) of this RI report.

1.1 Report Organization

This RI report is organized in the following sections:

- **Section 1.0 Introduction** provides a description and brief history of the Site, and a description of remedial investigations conducted at the Site prior to the preparation of the RI/FS Work Plan.

- **Section 2.0 Recent RI Activities** presents the results of soil and ground-water quality investigations conducted at the Site as part of implementation of the RI/FS Work Plan.

- **Section 3.0 Physical Characteristics of the Site** presents a description of the geology, hydrogeology, topography, and demography of the Site.

- **Section 4.0 Nature and Extent of VOCs at the Site** summarizes the results of soil and water-quality investigations conducted at the Site to date with a description of the distribution of VOCs in soil and ground water at the Site.

- **Section 5.0 Fate and Transport of VOCs at the Site** provides a qualitative discussion of factors affecting the environmental fate of VOCs detected in soil and ground water at the Site.

- **Section 6.0 Conclusions and Recommendations** includes a summary of the RI, and provides recommendations for future work at the Site.

1.2 Site Description and History

The Sola facility is located at 1500 Cader Lane (formerly 3600 Lakeville Highway) in southeastern Petaluma, California (Figure 1). The Sola property is bounded by Lakeville Highway to the north, Cader Lane to the west and open fields to the south and east. A large one-story building that houses office, manufacturing, and warehouse facilities and an adjacent asphalt-covered parking lot surrounding the building occupy a portion of the 35-acre Sola property. Figure 2 shows the layout of the Sola property.

The relatively flat surface of the Site slopes gently from the Sola building southwestward at a rate of about 50 feet per mile toward the Petaluma River, located approximately one mile southwest of the Sola building. Surface elevations range from about 30 feet above Mean Sea Level (MSL) in the northeastern part of the Site to about 18 feet above MSL in the southwestern portion of the Site.

Sola initiated production at its ophthalmic manufacturing facility in 1978. Sola used six 1,000-gallon underground tanks, located near the southwestern corner of the manufacturing building, were used at the Site to store 1,1,1-trichloroethane, acetone, and methanol from 1978 to 1985. In 1982 VOCs were detected in ground water beneath the Site in the vicinity of these former underground tanks. Sola removed the six underground storage tanks in July 1985.

1.3 Previous Investigations

Previous hydrogeologic investigations at the Site conducted by other consultants included installation of 33 monitoring wells and drilling of nine test borings. These earlier investigations provided initial data regarding the hydrogeology and extent of VOCs in ground water and soil at the Site. Additional data, however, were needed to define the extent of chemical migration at the Site. To meet these data needs and to implement remedial measures for the Site, Levine•Fricke has installed 28 ground-water monitoring wells, 7 extraction wells, and 12 piezometers at the Site. Levine•Fricke has also conducted hydraulic testing and ground-water sampling and chemical analyses of these wells and collected soil samples for chemical analyses from soil borings drilled at the Site.

The following sections provide a brief summary of the activities conducted by Levine•Fricke prior to the completion of the RI/FS Work Plan. Information presented in these

sections was taken from Levine•Fricke 1986a and 1986b; 1987a, 1987b, 1987c, 1987d, 1987e; and 1988a, 1988b, 1988c, 1988d, 1988e, 1988f, and 1988g. The data collected and conclusions provided in these reports and in the following sections have not been confirmed or approved by the EPA. By setting them forth here, EPA does not adopt or confirm these reports or the data and conclusions in them.

1.3.1 GROUND-WATER QUALITY

Levine•Fricke has been conducting ground-water monitoring at the Site since September 1986 through the completion of quarterly and tri-annual ground-water sampling events. Analytical data from these sampling events are summarized in Table 1.

The primary VOCs detected in ground-water samples from monitoring wells at the Site have included 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE) and 1,1,1-trichloroethane (1,1,1-TCA). The highest concentrations of the principal VOCs have been detected in ground-water samples collected from shallow well W14, located immediately downgradient of the vicinity of the former storage tanks (Figure 2). Trichloroethene (TCE) and other VOCs have also been detected at low concentrations (less than 0.007 ppm) in shallow monitoring well W14.

Analytical results of samples collected from the City of Petaluma Station 5 well (currently not operating), located approximately 300 feet north of the Site, have been inconsistent. Sampling of the Station 5 well by MultiTech Laboratories (MultiTech) for the City of Petaluma in November and December 1986 reportedly revealed the presence of trace concentrations (0.0005 ppm to 0.0037 ppm) of 1,1,1-TCA, 1,1-DCE, and 1,1-DCA. However, subsequent re-sampling of the Station 5 well by Levine•Fricke on December 12, 1986 (analyses by Cal Analytical Laboratories [CAL]) revealed nondetectable concentrations of VOCs in one of two duplicate samples; the other duplicate sample reportedly contained 0.0005 ppm of 1,1,1-TCA and 1,1-DCE (equal to the detection limit). Levine•Fricke again collected duplicate samples from the Station 5 on February 5, 1987 and submitted these samples to two independent State-certified laboratories (CAL and Brown and Caldwell Laboratories) for analysis. Both laboratories reported nondetectable concentrations of VOCs in these samples. Nondetectable concentrations of VOCs were also

reported in samples subsequently collected on March 27 and May 22, 1987 by MultiTech. Samples collected by Levine•Fricke and analyzed by Med Tox Laboratory in May of 1988 revealed the presence of 1,1-DCE at 0.002 ppm and 1,1,1-TCA at 0.0009 ppm.

Based on the May, 1988 results, the City of Petaluma ceased operation of the Station 5 well in June 1988 and demanded compensation from Sola. Sola and the City of Petaluma subsequently entered into a written agreement on October 16, 1989. This agreement ensures that the Station 5 well will not be operated until such time as pumping from that well will no longer potentially adversely affect remedial measures at the Site.

A more detailed discussion of ground-water quality at the Site is presented in Section 2.1 (Ground-Water Quality Investigation) and Section 4.0 (Nature and Extent of VOCs at the Site) of this report.

1.3.2 INSTALLATION AND ABANDONMENT OF WELLS AND DRILLING OF EXPLORATORY SOIL BORINGS

Levine•Fricke installed 20 ground-water monitoring wells (one converted to a ground-water extraction well), 7 extraction wells, and 12 piezometers at the Site under RWQCB oversight. Well construction details for these wells and for recently-installed wells at the Site are provided in Table 2. The drilling and installation of these wells and piezometers provided extensive lithologic, water-quality, and hydraulic data. A summary of these activities is provided below. Additionally, Levine•Fricke has drilled five exploratory soil borings to assist in selecting locations for near-source extraction wells, and also has completed three shallow, hand-augured soil borings to assess soil quality.

1.3.2.1 Monitoring Well Installation

Eight shallow monitoring wells and three intermediate-depth monitoring wells (wells LF-1 through LF-11, Table 2) were drilled and installed between September 1986 and April 1987, using the hollow-stem auger method. The wells were completed to depths ranging from 8 feet to 50 feet with screened intervals ranging from 3 to 10 feet in length. A description of the methods used in the drilling and installation of monitoring wells LF-1 through LF-11 and a discussion of the geology encountered during drilling of these soil borings is provided in our February 1 and May 10, 1987 reports (Levine•Fricke, 1987a and 1987b, respectively).

Monitoring wells LF-12 thorough LF-20 were drilled and installed during June and July 1987 (see Table 2). Two deep well clusters consisting of three wells each, LF-12, LF-13, and LF-14 and LF-15, LF-16, and LF-17, and one additional deep monitoring well (LF-18) were drilled and geophysically logged, providing geologic data for the deeper sediments beneath the Site. Mud-rotary drilling was used to complete wells LF-12 through LF-18. Hollow-stem auger drilling was used to install shallower monitoring wells LF-19 and LF-20.

1.3.2.2 Extraction Well Installation and Development

Drilling of four exploratory borings (SB-1 through SB-4) and drilling and installation of seven extraction wells (E-1, E-2, E-3, E-4, E-5, E-8, and E-9) was conducted between November 1987 and February 1988 (Figure 2). The extraction wells were installed to depths ranging from 29 to 49 feet below the ground surface (Table 2).

Lithologic data from soil borings SB-1 through SB-4, located in the vicinity of the location of the former underground tanks, were used to help select the location and the construction design of extraction wells E-1 and E-2. Because of the low permeability of the sediments encountered in exploratory borings SB-1 through SB-4, large (36-inch diameter) boreholes were drilled for extraction wells E-1 and E-2 using the bucket-auger drilling method. Extraction wells E-1 and E-2 were installed using 8-inch diameter well casing during February 1989. The hollow-stem auger method was used to complete extraction wells E-3, E-4, E-5, E-8, and E-9. Extraction wells E-3 and E-4 were installed during November 1987. Extraction wells E-5, E-8, and E-9 were installed during January 1988. Former ground-water monitoring well W29 was converted to extraction well E-6 and well LF-1 was converted to extraction well E-7.

Development of extraction wells E-1 through E-5, E-8, and E-9 was completed between April 26 and 28, 1988. These wells were developed by swabbing and purging them to remove particles near the well screen and improve hydraulic communication with the surrounding sediments. Extraction wells E-6 and E-7 were converted from monitoring wells that previously had been developed by over-pumping at the time of their installation. Development of wells E-1 and E-2 was augmented by over-pumping.

1.3.2.3 Piezometer Installation

Piezometers PZ-1 through PZ-12 were installed during October 1988 to allow measurement of ground-water levels in shallow sediments in the vicinity of extraction wells E-1 through E-9 (Figure 2). The piezometers were installed to depths ranging from 27.5 to 35 feet below grade. Sediments encountered during drilling of piezometers PZ-1 through PZ-12 were typical of sediments previously encountered at the Site, consisting of lower-permeability silts and clays interbedded with laterally discontinuous intervals of sand and gravel.

1.3.2.4 Abandonment of the Stero and Crandell Wells

Stero Well

The Stero well is located approximately 1,000 feet west of the Sola facility, downgradient and lateral to ground water flow. The Stero well has been sampled on a semi-annual basis since April 1987. Low concentrations (less than 0.002 ppm) of VOCs have been detected from samples collected from the Stero well (Table 1). In order to prevent potential adverse affects of pumping from the Stero well on remedial measures at the Site, and at the request of Stero management, Sola and Stero entered into an agreement providing for Stero to use City-supplied water rather than water from the Stero well in the Stero operations. Stero discontinued use of the Stero well in April, 1990. Sola removed the pumping system from the Stero well on May 8, 1990.

Crandell Well

The location of the former Crandell well is approximately 1,500 feet southwest (downgradient) of the Sola facility. The Crandell well has been sampled on a semi-annual basis since February 1987. No EPA Method 601 (or 8010) analytes have been detected in samples collected from the Crandell well, with the exception of a singular detection of PCE at 0.001 ppm in a sample collected in August 1987.

In order to prevent potential adverse affects of pumping from the Crandell well on remedial measures at the Site and at the demand of the Crandell well property owner, Sola entered into

a written agreement with the Crandell well property owner to connect City of Petaluma water service to the Crandell property. Sola arranged for the abandonment of the Crandell well. Weeks Drilling and Pump of Sebastopol, California (a licensed contractor) abandoned the Crandell well under observation of a Levine•Fricke geologist on October 5, 1990. The abandonment was permitted with the County of Sonoma and was performed in accordance with County of Sonoma guidelines.

1.3.3 HYDRAULIC TESTING OF SEDIMENTS

Hydraulic testing of sediments has been conducted in selected areas to evaluate the hydraulic properties of sediments beneath the Site and to estimate expected yields from extraction wells installed at the Site. Hydraulic test investigations were conducted at the Site by Levine•Fricke on three occasions: October 1986; October 1987; and April and May 1988. These investigations are documented in Levine•Fricke 1986a, 1988a, and 1988f.

1.3.3.1 Hydraulic Slug Tests of Wells LF-1, LF-3, and LF-4

Hydraulic tests were conducted during October 1986 to assess hydraulic properties of sediments beneath the Site. Hydraulic testing included conducting slug tests for the three newly installed wells (wells LF-1, LF-3, and LF-4). A summary of slug test results for those tests is provided in Table 3.

1.3.3.2 Hydraulic Testing of Station 5 Well

The October 1987 hydraulic testing program was conducted to assess the possible significant effects, if any, caused by pumping of the City of Petaluma Station 5 municipal well (Station 5 well) on ground-water levels in the vicinity of the Site. Results of this hydraulic testing program are included in the Levine•Fricke report entitled: "Results of Hydraulic Testing of Sediments in the Vicinity of the Sola Optical USA, Inc. Facility, Petaluma, California," dated January, 1988 (LF 1988a). Selected figures from the January 1988 report illustrating ground-water elevations are also included in Appendix B of this report.

The Station 5 well is screened from approximately 180 to 512 feet below the ground surface. This testing provided hydraulic parameter values for different sediment depth intervals at and near the Site. The City of Petaluma Water Department shut down the Station 5 well on May 26, 1987 to remove and replace its water-supply pump. The hydraulic testing program began on October 29, 1987 in conjunction with

the start-up of the Station 5 well. The hydraulic testing program involved measuring changes in water levels in the Station 5 well and in 42 monitoring wells and water-supply wells in the site vicinity following start-up of the Station 5 well for a period of approximately 50 days. Drawdown test data were used to evaluate transmissivity of sediments beneath the Site.

Prior to start-up of the Station 5 well, ground-water flow and the horizontal hydraulic gradient in each of the sediment intervals were generally toward the southwest and west, in the direction of the Petaluma River (see Figures B-1, B-3, and B-5). Vertical hydraulic gradients in the vicinity of well clusters LF-5/LF-15/LF-16/LF-17, and LF-12/LF-13/LF-14 prior to pumping were upward from the deep sediment interval (about 60 to 100 feet below ground surface) to the intermediate and shallow sediment intervals (30 to 60, and less than 25 feet below ground surface, respectively); and downward from the deep to the deepest (below 190 feet below ground surface) sediment interval.

After 50 days of pumping from the Station 5 well, the direction of ground-water flow in the deepest sediment interval (below 190 feet below ground surface) was toward the Station 5 well in response to the significantly greater drawdowns in the vicinity of the pumping well (see Figure B-6). In shallower sediments, however, the locus of drawdown appeared to shift laterally southeastward from the Station 5 well to the vicinity of wells LF-8 and LF-9 (see Figures B-2 and B-4). This shift in the locus of drawdown appears to result from the presence of sediments with relatively greater vertical hydraulic conductivity and/or a thinning in confining layers in the vicinity of wells LF-8 and LF-9. Thinner confining beds may have resulted in the decreased pressure head observed in that portion of the Site.

Water levels in wells perforated in the deepest sediment depth interval (below about 200 feet below ground surface) showed the greatest response to pumping of the Station 5 well. This result was expected since the uppermost portion of the Station 5 well is screened across the deepest sediment interval.

Drawdown data from the October 1987 hydraulic testing program were used to calculate values of transmissivity for the sediments in the site vicinity. Data obtained from the hydraulic testing programs are summarized in Table 3.

1.3.3.3 Hydraulic Testing of Extraction Wells

Field hydraulic conductivity tests were conducted between April 29 and May 3, 1988 to evaluate hydraulic properties of sediments in the vicinity of the site extraction wells (E-1 through E-5, E-8, and E-9) and to estimate expected yields for each well. Hydraulic testing of the extraction wells included a step-drawdown test of well E-8 and recovery tests for wells E-2, E-3, E-4, and E-5. Hydraulic tests were not conducted for wells E-1 and E-9 since sediments encountered in the borings for these wells were similar to those encountered in the wells being tested.

Hydraulic test data were analyzed using analytical and numerical methods appropriate for the test conducted (e.g., recovery test or pumping test). Data obtained from April and May 1988 hydraulic testing programs are summarized in Table 3.

1.3.4 SOIL QUALITY INVESTIGATIONS

1.3.4.1 Van Houten Soil-Quality Investigations

Soil Borings - In 1984, Van Houten Consultants, Inc., of Petaluma, California (Van Houten) collected shallow (9.5 to 16.5 feet deep) soil samples from six soil borings at the Site (Van Houten, 1984). These six soil borings (V2, V3, V4, V5, V8, and V9) were converted into shallow monitoring wells (W23.V2, W22.V3, W19.V4, W18.V5, W17.V8, and W16.V9, respectively; Figure 3). From each boring, soil samples were collected from two depths (approximately 9.5 and 16.5 feet below grade) and submitted for analysis of VOCs using EPA Methods 601 and 602. No EPA Method 601 or 602 analytes were reported above detection limits for the samples analyzed.

Sampling in the Excavation for Removal of the Former Underground Storage Tanks - Sola's six underground storage tanks were removed in July 1985. During the tank removal, Van Houten reportedly observed oxidation of tank filling pipes and staining of gravel around the filling pipes, suggesting that VOCs may have been released from accidental spillages in these areas. According to Van Houten, no evidence of leakage (e.g., holes) was observed on the tanks upon their removal (Van Houten, 1985b). The removal of the tanks reportedly included the excavation of the gravel backfill and an additional 3 feet of native soil from the sides and bottom of the tank excavation. A total of 22 soil samples were collected from the excavation pit after the backfill and soil had been removed. Three soil samples were collected from beneath each tank, and one sample was collected from each sidewall of the

excavation (a total of four excavation sidewall samples). Samples beneath the excavated tanks were collected from a depth of approximately 7.5 feet below the ground surface. The tank excavation and soil sampling was completed under the observation of Van Houten. Soil samples were collected and analyzed for VOCs using EPA Methods 8010 and 8020 by Multi-Tech Laboratories of Santa Rosa, California (Multi-Tech).

Figure 4 shows the layout of the former tanks; Table 4 summarizes analytical results of soil and water samples collected during excavation activities. Analytical results for the samples collected from the excavation revealed the presence of acetone in 10 of the 22 samples at concentrations ranging from 1.1 to 54 ppm. Concentrations of 1,1-DCE (0.010 ppm) and trans-1,2-dichloroethene (trans-1,2-DCE) (0.005 ppm) were detected in the sample collected from the north sidewall adjacent to Tank 1. No other EPA Method 8010 or 8020 analytes were detected above the reported detection limit of 0.001 ppm in the excavation samples collected.

A water sample collected from a tank backfill water-level observation pipe in the northern end of the former tank excavation (Figure 4) in July 1985 reportedly contained concentrations of 1,1-DCE (0.580 ppm), 1,1,1-TCA (0.420 ppm), and 1,1-DCA (3.25 ppm) (Van Houten, 1985b). A water sample collected from the tank backfill water-level observation pipe in the southern end of the former tank excavation (Figure 4) at the same time reportedly contained 0.0015 ppm of 1,1,1-TCA and 0.0055 ppm of 1,1-DCA (Van Houten, 1985a).

In August 1985, an additional two feet of soil were excavated from the eastern wall of the excavation pit, where acetone was detected at the highest concentrations. Three soil samples were collected along the eastern side of the additional excavation and analyzed by Multi-Tech, using EPA Method 602. Acetone was detected in all three samples at concentrations of 70, 74, and 200 ppm, respectively. Benzene, toluene, xylenes, ethylbenzene, chlorobenzene, and dichlorobenzene were also detected in the three samples at concentrations ranging from 0.002 ppm (chlorobenzene) to 0.230 ppm (xylenes).

One soil sample was also collected from each of the two piles of soil generated during the tank excavation and analyzed using EPA Method 602. Acetone was detected in both samples at 780 ppm and 180 ppm, respectively. Benzene, toluene, xylenes, ethylbenzene, 1,2- and 1,4-dichlorobenzene, and chlorobenzene were also detected in the waste pile samples at concentrations ranging from 0.002 ppm (chlorobenzene) to 0.240 ppm (xylenes) (see Table 4).

1.3.4.2 Levine•Fricke Soil-Quality Investigations

Soil-Gas Investigation - A soil-gas investigation was conducted at the Site between July 31 and August 2, 1986 by Tracer Research Corporation (TRC) of Tucson, Arizona, under the supervision of Levine•Fricke personnel. Results of the soil-gas investigation are illustrated on Figure 5 and are summarized below.

Soil-gas samples were collected from 48 locations throughout the unpaved field southwest of the Sola facility (see Figure 5). Soil-gas samples were analyzed for 1,1-DCE, 1,1-DCA, 1,1,1-TCA, TCE, tetrachloroethylene (PCE), chloroform, and carbon tetrachloride. The investigation was conducted to obtain preliminary information on the extent of VOC migration in shallow ground water at the Site and to aid in the selection of locations for ground-water monitoring and extraction wells. The highest VOC concentrations (250 μg/l of 1,1,1-TCA) were detected in the soil-gas sample collected from sampling point SG-5, near well W14, approximately 70 feet downgradient of the former underground storage tank locations. Chemical concentrations reported in the soil-gas samples decreased rapidly with distance in all directions from sample point SG-5.

Soil Sampling - Four shallow (less than 3 feet deep) soil borings (B-1 through B-4; Figure 6) were completed by Levine•Fricke in the vicinity of monitoring well W-14 on March 23, 1988 to characterize shallow soil quality in that portion of the Site. One soil sample was collected from each soil boring between the depths of 2 and 3 feet. The locations of the soil borings and the concentrations of VOCs detected are shown on Figure 6. Analytical results for soil samples collected from the borings revealed low concentrations (less than 0.018 ppm) to nondetectable concentrations of VOCs.

2.0 RECENT RI ACTIVITIES

This section describes recent soil and ground-water investigations that were proposed in the FSP. Results of these investigations were previously reported in the "Soil Investigation Report" (Levine•Fricke 1990d) and the "Ground-Water Investigation Report" (Levine•Fricke 1990e), dated and submitted to EPA on July 2, 1990. EPA reviewed these two reports and presented its comments to Sola in a letter to Mr. Mark Adams of Sola dated July 18, 1990. Levine•Fricke, on behalf of Sola, submitted a response to those comments in a letter to EPA dated August 15, 1990.

The following sections reflect changes made to the July 2, 1990 soil and ground-water investigation reports in response to EPA comments and in accordance with Levine•Fricke's response to those comments. Water-elevation data collected from the July quarterly water-level measurements and results of Sola's semi-annual sampling event (conducted in August and September 1990) have also been included with the results of the ground-water investigation.

2.1 Soil-Quality Investigation

The objectives of the soil investigation and the approach used to meet each objective were as follows:

Objective One: To assess the distribution of VOCs remaining in soils in the vicinity of the former underground storage tanks, located near the southwestern corner of the facility, using soil-gas investigations and soil sampling and analysis.

Approach for Objective One: A soil investigation was completed in two phases. The first phase consisted of a shallow soil-gas investigation in the vicinity of the location of the former tanks and immediately surrounding areas. The second phase consisted of collecting soil samples at selected locations based on past chemical handling activities at the Site and the results of the soil-gas investigation in order to confirm the soil-gas results.

Objective 2: To assess selected properties of the soils in the vicinity of the former tank locations regarding their potential to transmit, modify, and/or retain VOCs which may be present.

Approach for Objective 2: Physical properties of the sediments encountered during the soil investigation (i.e. porosity, grain size, moisture content) qualitatively evaluated. These observations were combined with data for the chemicals detected in sediments at the Site. These physical and chemical data will be used as input into a mathematical model to evaluate potential migration of chemicals detected in soil at the Site.

Objective 3: To assess the need for, and evaluate the feasibility of, further soil remediation at the Site.

Approach for Objective 3: Soil-gas and soil analytical data obtained during the soil investigation were semi-quantitatively evaluated to assess the potential for soils at the Site to significantly impact ground water. Modeling will be conducted to further assess the potential impact of soils at the Site to the underlying shallow ground water.

2.1.1 SOIL-GAS INVESTIGATION

2.1.1.1 Methodology

The soil-gas investigation was conducted on April 2 through April 5, 1990 by Tracer Research Corporation (TRC) of Tucson, Arizona, under the supervision of Levine•Fricke personnel. Soil-gas samples were collected from sampling locations by driving a 1-1/4-inch diameter metal probe to depths of 2 to 9 feet below the ground surface and placing a vacuum on the end of the probe to evacuate soil gas from the pore space of the surrounding sediments. After purging the air within the probe, a sample of the soil gas was collected from the evacuation line, using a syringe, and immediately analyzed in the field van using a gas chromatograph. The gas chromatograph was equipped with an electron capture detector (ECD) to detect chlorinated VOCs and a flame ionization detector (FID) to detect volatile aromatic hydrocarbons. The procedures used in sample collection and analysis are described in TRC's report included in Appendix A of the Soil Investigation Report (Levine•Fricke, 1990d).

Soil-gas samples were collected from 40 locations at the Site (Figure 7). These sampling locations included 10 sampling locations (SG-31 through SG-40) not proposed in the FSP. These locations were added to further characterize soil gas in areas where VOCs were detected during the April 1990 investigation. Soil-gas samples were collected in the following four areas: the former tank backfill (SG-2, SG-7,

and SG-31); the native soil immediately adjacent to the tank backfill near the former tank fill pipes (SG-3, SG-5, SG-8, and SG-10); the asphalt area immediately downgradient of the former tanks location; and the field area downgradient of the former tanks location.

Soil-gas samples were collected at depths ranging from 2 to 9 feet. Samples were collected from depths as shallow as 2 to 3 feet at those locations where the soils did not yield sufficient soil gas at greater depths for a representative sample. Soil-gas samples were collected at two depths at each of the five sampling locations (SG-32 through SG-36) to assess possible vertical gradients of VOCs in soil gas at the Site. These vertical concentration profile data can be used to evaluate possible source areas for VOCs detected in soil gas. For example, a soil-gas concentration profile in which VOC concentrations increase with depth would indicate that the source of VOCs in soil gas at that sampling location may be the underlying shallow ground water. Conversely, a concentration profile in which VOC concentrations decrease with depth would indicate a possible surface source of VOCs in soils at that sampling location.

Soil-gas samples were analyzed for 1,1-DCE, 1,1-DCA, 1,1,1-TCA, TCE, PCE, Freon 113, and acetone. These compounds were selected for analysis because they had previously been detected in soil samples collected in the vicinity of the location of the former tanks, and/or they had reportedly been stored in the former tanks.

The detection limits for the compounds analyzed varied during the soil-gas survey due to the range of organic compound concentrations in the soil-gas samples. Detection limits are a function of the detector sensitivity for individual compounds and the volume of sample injected into the gas chromatograph (which in turn is dependent on the sample concentrations). In general, detection limits increase (i.e. become less sensitive) as sample concentrations increase.

TRC's quality assurance/quality control (QA/QC) procedures include the analysis of system blanks which consist of ambient air samples collected aboveground. Results of the analyses of these system blanks should be considered when analyzing soil-gas sample results. The ranges of detection limits reported for each targeted compound during the soil-gas survey and the concentrations of compounds detected in system blanks collected during the soil-gas survey are provided below.

Detected Compound	Range of Detection Limits (micrograms/liter of air)	Maximum Concentration in System Blank (micrograms/liter of air)
1,1-DCE	0.003 - 0.008	not detected
Freon 113	0.0003 - 0.001	not detected
1,1-DCA	0.01 - 0.03	not detected
1,1,1-TCA	0.00005	0.004
TCE	0.0002 - 0.0004	not detected
PCE	0.00004 - 0.00008	0.0004
Acetone	0.002 - 0.1	0.2

2.1.1.2 Results of Soil-Gas Sampling

Analysis results (expressed as µg/L of soil gas) for the target compounds are provided in TRC's report included as Appendix A of the Soil Investigation Report (Levine•Fricke 1990d). These data are illustrated on Figure 8 and are discussed below.

Distribution of VOCs in Soil Gas - The targeted compounds were detected at relatively low concentrations (less than about 0.5 µg/l) in shallow (less than 5 feet in depth) soils throughout the sampled area. No areas of significantly higher concentration were identified during the soil-gas investigation, including the investigation of those soils in the immediate vicinity of the location of the location of the former tanks. These data indicate that a source area of VOCs in shallow soils does not exist in the vicinity of the location of the former tanks.

Vertical Profiles of VOCs in Soil Gas - VOCs were detected at relatively higher concentrations in samples collected below a depth of 6 feet when compared with shallower samples. At the five locations where vertical profile data were collected (SG-32 through SG-36), VOC concentrations either increased significantly (SG-35 and SG-32) or did not change significantly with depth. These data suggest that VOCs detected in soil gas in the sampled area originated from the underlying shallow ground water, where VOCs previously have been detected.

Calculation of Equilibrium Soil-Gas Concentrations - Soil-gas data are primarily used as a qualitative tool to assess the possible presence and distribution of VOCs in soil and/or ground water. However, soil-gas data can also be semi-

quantitatively analyzed using certain equations and assumptions. In this case, a semi-quantitative analysis was performed to assess the possibility that the VOCs detected at the Site originated from the underlying shallow ground water.

This analysis is based on the following assumptions:

1. There is equilibrium between vapor phase and liquid phase VOCs. This assumption is appropriate because of the relatively long amount of time that VOCs have been present in shallow ground water at the Site relative to the rates of volatilization of the VOCs.

2. There is a pathway for VOCs from ground water to the soil-gas sampling point. This assumption is appropriate because shallow sediments in the vicinity of the tanks are relatively homogeneous and no significant potential physical barriers to vapor-phase VOC migration were observed during the soil investigation.

3. There is no significant difference between the concentration of VOCs in ground water and the concentration of VOCs in the soil moisture of the overlying vadose zone. This assumption is appropriate because sediments in the vicinity of the location of the former tanks are relatively fine-grained and homogeneous (i.e., clays), resulting in a thick (up to several feet) capillary fringe of near-saturated sediments above the water table.

At equilibrium, the ratio of the concentration of VOCs in vapor and liquid phase is expressed by the Henry's Law Constant:

$$H = \frac{C_{gas}}{C_{liquid}}$$

where:

H = the Henry's Law Constant (dimensionless)
C_{gas} = the concentration of VOCs in gas phase (ppm)
C_{liquid} = the concentration of VOCs in liquid phase (ppm)

Using this formula, the concentrations of VOCs expected in soil gas due to volatilization from the underlying groundwater were calculated (see Table 5).

Comparison of these calculated values with the concentrations detected during the soil-gas investigation indicates that the concentrations of VOCs detected in soil gas at the Site is likely attributed to volatilization from the underlying VOC-affected shallow ground water. With the exception of one detection of TCE (0.1 μg/l at SG-40), VOC concentrations detected in soil gas were either below or within an order-of-magnitude of the calculated values for those compounds.

Based on soil conditions at the Site, the fact that VOCs were detected at relatively higher concentrations in soil samples collected below a depth of 6 feet when compared with shallower samples is also indicative of a shallow ground water source for VOCs detected in soil gas. In generally, there are other mechanisms which could result in the increase of soil-gas concentration with depth. These mechanisms include: 1) volatilization of VOCs from shallow, near-surface sediments resulting in lower VOC concentrations at depth); 2) the downward migration (leaching) of chemicals from shallow into deeper sediments; and 3) the effect of soil heterogeneities (especially grain size and moisture content) on soil-gas concentrations.

However, these mechanisms which could affect VOC migration are not likely significant at the Sola Site for the following reasons:

- Soil-gas concentrations increased with depth both at locations where the soil was capped with asphalt and at locations in the field area. These data indicate that volatilization of VOCs from near-surface shallow soils is not a significant process at the Site. If this process had contributed to the observed increase in soil-gas concentrations with depth in the field area, a different pattern of concentration with depth at the sampling location covered with an asphalt cap would be expected.

- The similarity of soil-gas VOC concentrations with depth at capped and uncapped sampling locations indicates that percolation of recharge water through soils at the Site has not caused significant leaching of VOCs from shallow soils in the vicinity of the former tanks location.

- On-site soils in the vicinity of the former tanks location are relatively homogeneous, consisting primarily of clays to silty clays. Given this relative homogeneity, the influence of heterogeneities in soil type on mobility and concentration of chemicals in soil is not likely significant.

In summary, the lateral and vertical distribution of VOCs and the magnitude of VOC concentrations detected in soil gas do not indicate the presence of a source area for VOCs in vadose-zone soil. Rather, the relatively uniform distribution of VOCs in low concentrations appears to result from volatilization from the underlying shallow ground water.

2.1.2 SOIL SAMPLING

2.1.2.1 Methodology

On April 12 and 18, 1990, soil sampling was conducted at the Site to confirm the results of the soil-gas investigation in accordance with the FSP and the QAPP. No areas of significantly higher VOC concentration were identified during the soil-gas investigation. The only soil-gas samples which contained relatively elevated levels of chemicals, other than those in the general area of the soil sampling locations proposed in the FSP, were SG-40 (68 µg/l 1,1-DCE at a depth of 7 feet), SB-35 (28 µg/l at a depth of 9 feet), SG-33 (14 µg/l at a depth of 8 feet) and SG-30 (16 µg/l at a depth of 8 feet). In each instance, these relatively elevated concentrations of chemicals were detected at depths of 7 feet or more, indicated that the chemicals resulted from volatilization from shallow ground water, rather than from a discrete source in the soil. Accordingly, no soil borings were required in these areas.

Because no areas of significantly higher VOC concentrations were identified during the soil-gas investigation, soil samples were collected from soil borings at six sampling locations (SB-1 through SB-6) identified in the FSP (Figure 9). These locations were selected based on past chemical handling activities at the Site as a means of confirming the soil-gas investigation.

Two samples were collected from each boring: one shallow sample (3.5 to 4.5 feet below ground surface) and one deeper sample (7.5 to 9.5 feet below ground surface). Soil sampling locations were selected in the vicinity of the location of the former tank fill pipes (SB-1 and SB-2), downgradient of the location of the former tanks (SB-3 and SB-4), and in the field

area immediately adjacent to the asphalt area (SB-5 and SB-6; see Figure 9). These locations were selected to obtain soil-quality data from each of the areas addressed in the soil-gas investigation.

Soil borings SB-3, SB-4, SB-5, and SB-6 were drilled using the hollow-stem auger drilling method. Soil samples were collected inside three 6-inch long brass liners contained in a Modified California Sampler (MCS). Samples were collected using the MCS by drilling to the desired depth and lowering the sampling device into the borehole. The sampler was then advanced approximately 18 inches into the underlying undisturbed sediments using a 140-pound hammer. Once the sample was obtained, the middle or lower sample was preserved for chemical analysis by sealing (with Teflon tape), capping, labeling, and storing the sample in a chilled cooler.

Soil borings SB-1 and SB-2 were completed using a hand-auger. Samples were collected from these borings by hand-auguring to the desired depth, lowering a sampler lined with one 6-inch long brass tube liner, and advancing the sampler approximately 6 inches using a hammer. Once the sample was obtained, the brass tube was collected from the sampler and preserved for chemical analysis using the method described above.

Soil samples from the soil borings were screened in the field for VOCs using an organic vapor analyzer (OVA) by extruding a soil sample from the middle or lower brass liner (or cuttings from the boring for SB-1 and SB-2) into a plastic bag and disaggregating the sample. The sample was allowed to equilibrate within the head space of the plastic bag for approximately five minutes. A sampling probe from the OVA was then inserted into the bag to measure the possible presence of VOC compounds in the soil sample. All borings were backfilled from the bottom of the borehole to the ground surface with a 5 percent cement/bentonite grout mixture.

2.1.2.2 Results of Soil Sampling

Analytical results for soil samples collected during the investigation are summarized in Table 6 and illustrated on Figure 10. Laboratory data sheets, including laboratory QA/QC documentation, for the collected soil samples are provided in Appendix B of the Soil Investigation Report (Levine•Fricke 1990d). Lithologic logs of soil borings SB-1 though SB-6 are provided in Appendix C of the Soil Investigation Report (Levine•Fricke 1990d).

Soils encountered during drilling of the borings consisted predominantly of black (organic rich), damp silty clays to clayey silts. Gravelly sandy silt was encountered at a depth of 2 feet at SB-1; this sediment likely represents backfill of the former tank excavation.

Chlorinated VOCs

No chlorinated VOCs were detected in samples collected adjacent to the location of the former underground tanks (SB-1 through SB-3). 1,1-DCA was the only chlorinated VOC detected in the asphalt area downgradient from location of the former tanks; 1,1-DCA was detected in SB-4 at low concentrations of 0.016 ppm (depth of 6.5 feet below ground surface) and 0.051 ppm (depth of 9.5 feet below ground surface). VOCs were detected at low concentrations in soil borings SB-5 and SB-6, at a maximum concentration of 0.16 ppm (1,1-DCA at a depth of 9.5 feet in SB-5); these data were similar to results from samples collected in the field area in March 1988. Concentrations of these VOCs did not increase or decrease significantly with depth.

Toluene, Acetone, 2-Butanone, and 4-Methyl-2-Pentanone

Toluene was detected in each of the collected soil samples at concentrations ranging from 0.007 to 0.24 ppm. Toluene was the only EPA 8240 analyzed reported above detection limits in samples collected from SB-1 and SB-3.

The concentrations of toluene detected in soil samples collected at the Site are within the range of toluene concentrations reported as naturally-occurring in soil (i.e. up to 5 ppm, Dragun, 1990). Thus, the low levels of toluene detected during the soil investigation (maximum of 0.240 ppm) indicate that the presence of this compound in these soils may be from a natural origin.

Acetone was detected at SB-2 (4.6 ppm, 7.5-foot depth) at a concentration one order-of-magnitude higher than the other compounds. This relatively elevated concentration of acetone likely represents residual acetone from past chemical handling at that location. Similarly, the singular detections of 2-butanone and 4-methyl-2-pentanone at that same sampling location and similar depth (SB-2 at 6 feet) may represent residual chemicals that may have been handled in that vicinity.

2.1.2.3 Discussion of Analytical Results

With the exception of acetone (4.6 ppm at a depth of 7.5 feet, SB-2), the low concentrations of VOCs detected in soil samples did not reveal a significant source area of VOCs in the areas sampled. The low concentrations of VOCs detected in soil samples may have resulted from one (or any combination) of the following three mechanisms:

1. VOC-affected shallow ground water may have migrated via capillary action from the water-table depth (approximately 10 feet) to shallower (vadose-zone) soils (approximately 3.5 feet). This mechanism may have been facilitated by seasonal water-table fluctuations.

2. VOCs in shallow ground water may have volatilized into soil gas and adsorbed onto the overlying vadose-zone soils.

3. VOCs previously may have been present at higher concentrations in shallow soils and may have migrated through the vadose zone into the underlying shallow ground water.

The following discussion evaluates these possible mechanisms.

The first mechanism (migration of VOCs via capillary pressure) can be semi-quantitatively evaluated using a partitioning calculation similar to that performed in the previous evaluation of soil-gas results. Under equilibrium conditions, the ratio of the concentrations of VOCs in ground water to that adsorbed onto soil can be described using the following equation:

$$K_d = \frac{C_s}{C_{sm}}$$

where:

K_d = soil water partition coefficient (dimensionless)
C_s = the concentration of the VOC in soil (ppm)
C_{sm} = the concentration of the VOC in soil moisture (ppm)

Using this formula, and assuming that the concentration of VOCs in ground water is representative of the concentration in the overlying soil moisture (see section 2.1.1.2), the expected concentrations were calculated for VOCs in soil due to partitioning from the known concentrations of VOCs in the underlying ground water (see Table 5).

Comparison of these calculated values with measured concentrations indicates that, with the exception of toluene and acetone, the first mechanism (migration of VOCs from ground water via capillary action) provides a likely explanation for the concentrations of VOCs detected in soil. 1,1-DCE, 1,1-DCA, Freon 113, and 1,1,1-TCA were all detected in soil samples at concentrations which are significantly lower than the calculated concentrations. TCE and PCE were detected at concentrations slightly higher than the calculated values; however, both compounds were detected at concentrations within an order-of-magnitude of the calculated values.

It appears likely that the second mechanism (adsorption of volatilized VOCs from shallow ground water onto vadose-zone soils) may have contributed to the concentrations of VOCs detected in soils during this investigation. Once in the vadose-zone soil gas, VOCs may adsorb onto soil surfaces directly, or dissolve into solution phase into the water held by surface tension on the vadose-zone soils and subsequently adsorb onto the soil particle.

Based on physical and chemical characteristics of the soils in the vicinity of the location of the former tanks, the third mechanism (VOCs present at relatively higher concentrations) does not provide a likely explanation for the soil data obtained during this investigation. Based on results of field hydraulic conductivity tests, (i.e. about 10^{-5}cm/sec measured during field hydraulic conductivity tests of E-2), the soils in the vicinity of the location of the former underground tanks have a relatively low hydraulic conductivity. These soils are also described as being relatively high in organic carbon content (black, organic-rich clays). Finally, the soils in the vicinity of the location of the former underground tanks are capped with either asphalt or concrete, thus precluding percolation of surface water from leaching chemicals from vadose-zone soil.

These soil characteristics impede migration of organic chemicals in soils. Under these conditions, VOCs which may previously have been present at relatively higher concentrations would be expected to remain at those concentrations; these concentrations would be expected to be higher than those detected during this investigation.

2.1.2.4 Conclusions of the Soil Investigation

Identification of possible sources for VOCs was accomplished investigation objectives. No further soil-quality investigations are recommended for the Site.

Analysis of soil-gas and soil-quality data suggests that vadose-zone soils in the vicinity of the location of the former tanks do not constitute a significant source of VOCs to the underlying shallow ground water at the Site. Rather, with the exception of acetone, the concentrations of VOCs detected in soil and soil-gas appear to result from volatilization from the underlying shallow ground water and/or upward migration of VOCs from shallow ground water via capillary pressure. (VOCs in shallow ground water appears to have originated from the vicinity of the location of the former tanks, see Section 4.1 of this report).

The singular detection of acetone in soil at a relatively elevated concentration (4.6 ppm at SB-2), as well as the singular detection of 2-butanone and 4-methyl-2-pentanone at much lower concentrations at SB-2, may be the result of previous handling of these chemicals at that location (SB-2 was located immediately adjacent to the former tank fill pipe area of the former tank excavation). The distribution of these chemicals appears to be very localized in soil. These chemicals have not been detected in ground water at the Site, including samples collected from well W14, which is located in the vicinity of the former tanks location. The limited area in which these chemicals were detected is capped with concrete, precluding the potential for percolation of surface water to leach through the chemical-affected soil. Based on these data, the chemicals detected at SB-2 do not represent a source of chemicals in ground water at the Site.

Because no significant sources of VOCs in soils were identified during the soil investigation, a quantitative assessment of the potential for soils to transmit, modify, or retain VOCs was not deemed appropriate for the soil investigation. Rather, the potential for soils in the vicinity of the location of the former tanks to transmit, modify, or retain VOCs was qualitatively assessed using field

lithologic data and data obtained from hydraulic conductivity tests previously conducted of sediments in the vicinity of the location of the former tanks. These data indicated that soils in the vicinity of the location of the former tanks are characterized by properties (e.g. low conductivity, high percent organic carbon) that impede the migration of VOCs in soil.

Data obtained during this investigation suggest that vadose-zone soils in the vicinity of the former storage tanks at the Site do not represent a source for VOCs in shallow ground water. Based on these results, soil remediation does not appear warranted at this Site.

At the request of the EPA, modeling of potential chemical migration in soil and ground water at the Site in the vicinity of the location of the former tanks will be conducted to quantitatively evaluate if the concentrations of VOCs detected in soil during the soil investigation represent a source of VOCs in shallow ground water at the Site. This quantitative evaluation is proposed to be completed as part of the feasibility study. Results from this evaluation will be used in the initial screening evaluation of remedial options for the Site.

2.2 Ground-Water Quality Investigation

2.2.1 GROUND-WATER INVESTIGATION OBJECTIVES AND APPROACH

The objectives of the Ground-Water Investigation and the approach used to meet each objective were as follows:

Objective 1: To confirm the downgradient lateral extent of VOC-affected ground water in shallow sediments.

Approach for Objective 1: Shallow wells LF-25, LF-28, and DH-2 (Figure 2) were installed to assess the downgradient extent of VOCs in shallow ground water and to assess whether the shallow VOC ground-water plume is captured by the existing ground-water extraction system.

Objective 2: To confirm the vertical extent of VOC-affected ground water in the off-site area southwest of the Site.

Approach for Objective 2: Intermediate-depth (up to 60 feet deep) monitoring well LF-23 and deep (up to 100 feet deep) monitoring well LF-24 were installed to confirm the vertical extent of VOC-affected ground water in the off-site area southwest of the Site (see Figure 2). These wells were installed directly downgradient from existing intermediate-depth well LF-17, where low concentrations (less than about 0.020 ppm) of 1,1-DCE, 1,1-DCA, and 1,1,1-TCA have been detected.

Objective 3: To evaluate the distribution of VOC-affected ground water in the deepest (below 200 feet) sediment interval (i.e., the uppermost sediment interval tapped by the Station 5 well) in the area currently downgradient of the Sola facility and in the area downgradient of the Sola facility during operation of the Station 5 well.

Approach for Objective 3: Water-quality data reported in Levine•Fricke's Ground-Water Investigation Report (Levine•Fricke 1990e) were compared with previous water-quality data collected from deepest well LF-12 to assess the distribution of VOCs downgradient from the Sola facility during pumping of the Station 5 Well.

Existing deepest monitoring well LF-15 was sampled and deepest monitoring well LF-27 was installed and sampled to assess: 1) the possibility that VOCs in shallow sediment intervals have migrated vertically under hydraulic gradients imposed by operation of the Station 5 well; and 2) the distribution of VOCs in the deepest sediment interval under natural gradients (i.e., when the Station 5 well is not operating).

Objective 4: To assess whether VOC-affected ground water associated with the Site may be migrating toward and potentially impacting environmental quality in Adobe Creek and/or the Petaluma River.

Approach for Objective 4: Ground-water samples were collected from existing and newly installed monitoring wells at the Site and analyzed to evaluate the potential migration of VOCs to Adobe Creek and the Petaluma River. In addition, geologic and hydrogeologic data obtained from borings of newly installed wells were integrated into the existing conceptual hydrogeologic model for the Site. This conceptual model was also used to help assess potential migration pathways of VOCs at the Site.

2.2.2 FIELD METHODOLOGY

Deep monitoring well LF-24 and deepest monitoring well LF-27 were drilled using the mud-rotary method and installed on April 2 through 6, 1990. Shallow wells LF-25 and LF-28 and intermediate-depth wells LF-21, LF-22, LF-23, and LF-26 were installed on April 8 through 12, 1990, using the hollow-stem auger drilling method. Representatives of CH_2M Hill, a contractor for the EPA, were present during drilling and installation of shallow wells LF-25 and LF-28, deep well LF-24, and deepest well LF-27.

Sola's annual and semi-annual ground-water sampling events were completed between April 19 and May 4, and August 27 and September 11, 1990, respectively. During the annual sampling event, newly installed wells were developed and two rounds of samples were collected from each newly installed well. CH_2M Hill representatives were present during sampling of wells LF-21, LF-24, LF-27, LF-13 and LF-17 during the annual sampling event, and collected split samples from these wells on May 2 and 3, 1990. CH_2M Hill was also present during sampling of LF-17, LF-25, LF-26, and LF-28 and collected split samples from these wells on August 29, 1990. Quarterly water-level measurements were collected at the Site on July 31, 1990. Results from these water-level measurements are included as part of the Ground-Water Investigation.

The methods and procedures to drill, install, develop, sample, and measure water levels from the ground-water monitoring wells for the Ground-Water Investigation are described in detail in Sections 5.3 through 5.7 of the QAPP for the Site (Levine•Fricke, 1990c) and are summarized in Appendix A of the Ground-Water Investigation Report (Levine•Fricke 1990e).

2.2.3 RESULTS OF THE GROUND-WATER INVESTIGATION

2.2.3.1 Geologic Conditions

Geologic conditions encountered during drilling of newly installed and existing wells at the Site are illustrated in geologic cross sections A-A' through D-D' (Figures 12 through 15), oriented generally along the principal direction of shallow ground-water flow. Locations of geologic cross sections are shown on Figure 11. Lithologic and well construction logs for newly installed wells LF-21 through LF-28 are included in Appendix B of the Ground-Water Investigation Report (Levine•Fricke 1990e).

The types and sequence of sediments encountered during drilling of newly installed wells LF-21 through LF-28 were generally consistent with previous observations at the Site. Shallower sediments (depths less than 30 feet) generally consisted of a complex sequence of interbedded clays, silts, and sands, with lesser amounts of gravel. Relatively thick (about 5 feet) sand and gravel intervals were typically encountered at depths between 30 to 40 feet below ground surface. Below depths of about 100 feet, thicker clay intervals (about 30 to 60 feet thick) were encountered.

Some of the sediment intervals encountered during drilling of the newly installed wells appeared to correlate with previously described sediment intervals at the Site. These correlations are described below:

- The gravelly sand interval encountered at a depth of about 30 feet in boring LF-22 appeared to correlate with similar sediments encountered at the same depth in borings E-7 (30 feet north) and PZ-4 (70 feet northeast; Figure 12). The gravelly sand encountered at a depth of 40 feet in boring LF-22 also appears to correlate with the gravelly sand interval encountered at the same depth in boring LF-21.

- The gravelly sand interval encountered at a depth of 30 feet in boring LF-23 appears to correlate with similar sediments at about the same depth in borings LF-8 and LF-27 (Figure 14). A sequence of a gravelly sand underlain by a clay interval underlain by a sandy gravel interval was encountered between depths of 65 feet and 90 feet at boring LF-24. A similar lithologic sequence was encountered in boring LF-27 at about the same depth.

- A relatively thick interval of sand and gravel was encountered at a depth of about 30 feet in borings LF-25, LF-26, and LF-28. Similar to other intermediate-depth sediments, an interval of gravel was also encountered at a depth of 43 feet in boring LF-26 (Figures 13 and 14).

- Sediments encountered below depths of about 100 feet in boring LF-27 were similar to deeper sediments encountered in borings LF-12 and LF-15. In all three of these borings, clayey sediments were generally encountered below depths of 100 feet. In all three borings, sands and/or gravels were also encountered between depths of about 200 and 220 feet (Figure 14).

2.2.3.2 Ground-Water Elevations and Flow

Ground-water levels were measured in all monitoring wells, extraction wells, and piezometers at the Site on July 31, 1990. Calculated ground-water elevations from these measurements are provided in Table 7 and illustrated on Figures 12 through 15. Ground-water elevation contours for data collected on July 31, 1990 are illustrated on Figure 16 through 19.

Depth to ground water measured in monitoring wells at the Site on July 31, 1990 ranged from approximately 9.1 feet (LF-25) to 15.4 feet (W12) below the ground surface. Ground-water elevations ranged from about 18 feet MSL in the northeastern portion of the Site (well W12) to about 9 feet MSL at the southwestern edge of the Site (well LF-25).

2.2.3.2.1 Shallow Sediment Interval

Shallow ground-water elevation contours for data collected on July 31, 1990 are illustrated on Figure 16. These data indicate that ground-water flow in shallow-depth sediments is generally toward the southwest. Water-level data shown on Figure 16 indicate drawdown of shallow ground-water levels in the vicinity of extraction wells E-6, E-7, E-8, and E-9. This drawdown reflects the influence of Sola's ground-water extraction system, which has been operating at the Site since late August 1988. The effects of pumping from extraction wells E-1 through E-5 are not apparent on Figure 16 due to the relatively low pumping rates (1 gallon per minute [gpm] or less) from these wells. The limited influence of these extraction wells on surrounding ground-water elevations is likely due to the relatively low hydraulic conductivity of sediments in this portion of the Site.

Figure 17 illustrates the estimated area of capture of shallow ground-water for Sola's ground water extraction system based on July 31, 1990 shallow ground-water elevation data.

2.2.3.2.2 Intermediate Sediment Interval

Intermediate-depth ground-water elevation contours for data collected on July 31, 1990 are illustrated on Figure 18. Similar to the shallow sediments at the Site, ground-water flow in intermediate-depth sediments is predominantly toward the southwest.

Water-level data shown on Figure 18 indicated drawdown of intermediate-depth ground water in the vicinity of extraction wells E-7, E-8, and E-9. Figure 19 illustrates an estimated capture zone of intermediate-depth ground water for Sola's ground-water extraction system based on July 31, 1990 intermediate ground-water elevation data.

2.2.3.2.3 Deepest Sediment Interval

Ground-water levels in deepest wells LF-12, LF-15, LF-27, and the Sola City well were collected on April 19, 1990. The ground-water elevation calculated for well LF-27 (minus 8.22 feet MSL) was inconsistent with ground-water elevations for other deep wells at the Site (14.74, 15.05, and 20.69 feet MSL for wells LF-12, LF-15, and Sola City, respectively). Based on these data, a confirmatory round of water levels was collected from these wells and the Sola City well on May 25, 1990 and from deepest well LF-27 on June 15, 1990; the ground-water elevation calculated for well LF-27 on May 25 (minus 14.00 feet MSL) was also inconsistent with other deep wells at the Site (14.08, 13.40, and 19.96 feet MSL for wells LF-12, LF-15, and Sola City, respectively). The ground-water elevation calculated for well LF-27 on June 15, 1990 (minus 10.06) revealed that the water level in LF-27 had risen approximately 4 feet since May 25, 1990.

Based on these water-level data, well LF-27 was further developed on August 6 through 8, 1990 by Weeks Drilling and Pump Co., Inc., under the supervision of a Levine•Fricke Geologist. On August 6, a solution of trisodium phosphate (TSP) and water was injected into well LF-27 with a jetting tool. Little of the solution entered the formation, resulting in a rise in the water level in the well. The well was then pressurized to 55 pounds per square inch (psi), and more TSP solution was injected into the well. A total of approximately 10 gallons of TSP solution was injected into well LF-27.

On August 7, 1990, 30 pounds of granular TSP were poured into the well in 5-pound increments. The well was surged with a surge block for approximately 15 minutes after each incremental addition of 5 pounds of TSP. After the TSP was added, a submersible pump was inserted into the well and the well was pumped dry. On August 8, 1990, the well was pumped dry again and the pump was removed.

Improvements in well yield resulting from these further development activities were generally limited. Well LF-27 produced approximately 0.3 gallon per minute during pumping when the pump intake was near the bottom of the well (about 240 feet).

Rates of water-level recovery in LF-27 are such that water-level data from that well cannot be directly compared with water-level data from other wells screened across deepest-zone sediment intervals at the Site. These data suggest that well LF-27 is screened across a sediment interval that may not be in good hydraulic connection with other deepest-zone sediment intervals located at other portions of the Site. Accordingly, another deepest-zone monitoring well (LF-27A) is proposed for installation in the immediate vicinity of existing well LF-27 to monitor deepest-zone water-levels (and water quality) at that portion of the Site. Pending accessibility to the drilling location, it is anticipated that well LF-27A will be installed during December 1990 or January 1991.

2.2.3.2.4 Vertical Hydraulic Gradients

Vertical hydraulic gradients calculated from ground-water elevation data from new and existing wells confirmed previous results; upward hydraulic gradients were measured between the intermediate and shallow depth intervals while downward hydraulic gradients generally were found in the deeper depth intervals. Figures 20 through 23 provide hydrographs for shallow/intermediate-depth well pairs W28/LF-4, W14/W13, W25/LF-3, LF-25/LF-26, respectively for the period September, 1986 to July, 1990. Table 8 presents calculated vertical hydraulic gradients from water-level data collected from April 1989 through July 1990 at selected well pairs at the Site.

Figures 20 through 23 illustrate that vertical hydraulic gradients between intermediate- and shallow-depth sediments at the Site as shown in these wells have been predominantly upward over the measurement period. (Note: The downward vertical hydraulic gradients measured in well pair W25/LF-3 after July 1988 likely reflects the influence of pumping from extraction well E-6, located within about 20 feet of W25 and LF-3 and screened across both shallow and intermediate-depth sediments).

Calculation of vertical hydraulic gradients from the July 31, 1990 ground-water elevation data revealed upward hydraulic gradients for shallow/intermediate-depth well pairs W14/W13 (0.014 ft/ft), LF-25/LF-26 (0.03 ft/ft), W28/LF-4 (0.06), and W25/LF-3 (0.01); shallow/deep well pair LF-5/LF-17 (0.01

ft/ft); and intermediate-depth/deep well pair LF-23/LF-24 (0.02). Similar to previous results, downward hydraulic gradients were calculated from July 31, 1990 data for deeper/deepest well pair LF-13/LF-12 (0.019 ft/ft) and deep/deeper well pair LF-14/LF-13 (0.063 ft/ft). Downward gradients were also calculated for deeper/deepest well pair LF-16/LF-15 (0.042 ft/ft) and for deep/deeper well pair LF-17/LF-16 (0.001 ft/ft). These results are generally consistent with previous data from those well pairs (see Table 8 and Figures 20 through 23).

2.2.3.3 Ground-Water Quality

2.2.3.3.1 Inorganic Water-Quality Analytical Results

Inorganic water-quality analysis results for ground-water samples collected at the Site during April 1990 are provided in Table 9. As shown on Table 9, the total of positively charged ions (cations) is approximately balanced by the total of negatively charged ions (anions) for each well. These data indicate that the inorganic water-quality analyses conducted on the samples included all of the major ionic species in the samples.

The composition of inorganic parameters in ground-water samples collected from shallow, intermediate-depth, and deep wells, and from deeper well LF-13, was generally similar. Measurements of pH for these wells ranged from 6.0 (LF-19) to 7.3 (LF-13). In all of these wells, calcium was the cation detected in relatively highest concentrations, followed by magnesium and sodium. Thus, the relative percent composition of cationic species for these wells can be characterized (in decreasing milliequivalents per liter [meq/l]) by the following order: calcium > magnesium > sodium.

The composition of inorganic parameters in water samples collected from deeper well LF-16 and deepest wells LF-12 and LF-15 was different from the other ground-water samples with respect to the following parameters: (1) pH was significantly higher (range of 8.3 to 9.3); (2) the relative composition of the major cations was reversed (i.e., sodium > magnesium > calcium); and (3) the percentage of sodium cations relative to other cations was significantly higher (47, 89, and 92 percent sodium for LF-12, LF-16, and LF-15, respectively, as compared with a range of 24 to 27 relative percent sodium for the other wells).

The relatively higher pH and relative percent of sodium content of ground-water samples collected from deeper well LF-16 and deepest wells LF-12 and LF-15 suggest that the sediments at these depths may have been deposited in a more saline (e.g., estuary) environment.

2.2.3.3.2 Volatile Organic Compound Water-Quality Analytical Results

Results of the EPA Method 8240 and EPA Method 8010 analyses for samples collected from newly installed wells LF-21 through LF-28 are summarized in Table 10 and illustrated on Figure 24. Analytical results from Sola's annual sampling event (April 1990) and semi-annual event (August 1990) are summarized in Table 1 and illustrated on Figure 25. Analytical results from the annual and semi-annual sampling events for selected wells are also illustrated on cross sections A-A', B-B', C-C' and D-D' (Figures 12, 13, 14 and 15, respectively). Laboratory data sheets from the August semi-annual event are in Appendix A. Laboratory data sheets for the April annual sampling event are included in Appendix A of the Ground-Water Monitoring Report (Levine•Fricke 1990e).

Similar to previous results, 1,1-DCE, 1,1-DCA, and 1,1,1-TCA were the primary VOCs detected in ground-water samples collected during the April and August 1990 sampling events. With the exception of 1,1-DCA in shallow well W28 (0.170 ppm), the highest concentrations of these VOCs were detected in the sample collected from well W14 (1,1-DCE 1.4 ppm; 1,1,1-TCA 0.200 ppm; and 1,1-DCA 0.110 ppm).

Other VOCs detected at low concentrations (less than 0.009 ppm) included chloroform, 1,2-DCA, PCE, 1,2-trichloroethane (1,2-TCA), TCE, Freon 11, and Freon 113. Most of these VOCs (1,2-TCA, TCE, PCE and chloroform) were detected only in the sample collected from well W14.

Shallow Sediment Interval

Concentrations of the primary VOCs decreased to much lower concentrations (less than 0.030 ppm) within about 250 feet downgradient of or lateral to W14 (Figure 25). VOCs were not present above analytical detection limits in downgradient, off-site shallow wells DH-2 and LF-28. Low concentrations (0.004 ppm 1,1-DCE at LF-25) concentrations of the primary VOCs were detected in shallow ground water about 1,000 feet downgradient from well W14, at the southwestern boundary of the Sola property.

Intermediate-Depth and Deep Sediment Intervals

VOCs were not present above analytical detection limits in samples collected from intermediate-depth wells LF-20, LF-21, LF-4, and W15, located in the vicinity of the location of the former tanks. VOCs were also not detected in samples collected from downgradient intermediate-depth well LF-23.

VOCs were detected in the 0.010 to 0.020 ppm range in intermediate-depth wells LF-22 and LF-17, located in the center of the Site (Figure 25). Low concentrations (less than 0.006 ppm) of VOCs also were detected in downgradient intermediate-depth wells LF-6 and LF-26.

Deeper and Deepest Sediment Intervals

Similar to previous results, VOCs were not present above analytical detection limits in samples collected from deeper well LF-16. Low concentrations of VOCs were detected in deeper well LF-13 (1,1-DCE at 0.007 ppm and 1,1,1-TCA at 0.003 ppm).

VOCs were not present above analytical detection limits in samples collected from deepest well LF-15. 1,1-DCE was detected in deepest well LF-12 at 0.0007 ppm during the April sampling event and was not reported above detection limits during the August sampling event.

2.2.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) SAMPLE RESULTS

Water-quality data from the August semi-annual sampling event were evaluated using the QA/QC validation criteria set forth in the QAPP for the Site (Levine•Fricke, 1990c). Results of this evaluation are presented in Table 11. Based on these criteria, the water-quality data gathered for the Ground-Water Investigation are valid.

Analytical results for each field blank and trip blank were below analytical detection limits. Analytical data precision was also good; all but three of the duplicate samples had relative percent differences (RPDs) of less than 30 percent. The three duplicate pairs whose RPDs exceeded 30 percent (TCE and chloroform at W14 and 1,1,1-TCA at LF-25) were reported at concentrations less than five times the detection limits for those compounds, resulting in a disproportionately high RPD.

2.2.4.1 Analytical Results of Split Samples

CH_2M Hill, subcontractor for the EPA, collected split samples during the soil and ground-water investigations. Split ground-water samples were collected from the following sampling locations: LF-13, LF-17, LF-21, LF-24, and LF-27 (April annual sampling event); LF-17, LF-25, LF-26, and LF-28 (August semi-annual sampling event). "Split" soil samples were collected from soil borings SB-3 (9 to 9.5 feet) and SB-6 (8.5 to 9 feet). A QA/QC evaluation of these split samples is presented on Table 11.

Results of the split-sample analyses for ground-water samples indicated good agreement between results from the EPA contract laboratory and results from Med Tox Laboratory. The only two split sample pairs with relatively high RPDs were reported at low concentrations, resulting in a disproportionately high RPDs. Results of the sample analysis for "split" soil samples were also good. The only significantly high RPD for the soil sample pairs was toluene in SB-3.

2.2.5 DISCUSSION OF GROUND-WATER INVESTIGATION RESULTS

The following section presents a discussion of results with respect to the objectives of the Ground-Water Investigation.

Objective 1: To confirm the downgradient lateral extent of VOC-affected shallow sediments.

Water-quality data from downgradient monitoring wells at the Site indicate the downgradient extent of VOC-affected water to concentrations at or below applicable State and/or federal water-quality standards at the southwestern-most portion of the Sola property. State and federal Maximum Contaminant Levels (MCLs) are water-quality standards that public drinking water suppliers must meet at the point of delivery (i.e. "at the tap"). State and federal MCLs for the primary VOCs detected in ground water at the Site are set forth in Table 12.

Water-quality data from downgradient wells W33 (0.003 ppm 1,1-DCE and 0.0009 ppm 1,1,1-TCA), LF-25 (0.004 ppm 1,1-DCE and 0.002 ppm 1,1,1-TCA), LF-26 (0.001 ppm 1,1,1-TCA and 0.002 ppm 1,1-DCE), LF-28 (below detection limits) and DH-2 (below detection limits) indicate that the concentration of these VOCs are at or well below State and federal water quality standards for these compounds. MCLs for 1,1-DCE and 1,1,1-TCA are 0.007 and 0.200 ppm, respectively. MCLs for 1,1-DCA and

Freon 113 are 0.005 ppm and 1.2 ppm, respectively. In summary, Objective 1 has been met because the downgradient lateral extent of VOC-affected shallow ground water has been defined to concentrations at or below State and/or federal water quality standards.

Objective 2: To confirm the vertical extent of VOC-affected ground water in the off-site area southwest of the Site.

Water-quality data from intermediate-depth wells LF-23 and deep well LF-24 confirmed the extent of VOC-affected water in the southwestern portion of the Site. VOCs were not present above analytical detection limits in two rounds of ground-water samples collected from these wells. Thus, Objective 2 has been met because the vertical extent of VOC-affected ground water in the southwest portion of the Site has been confirmed.

Objective 3: To evaluate the distribution of VOC-affected ground water in the deepest (depths below 200 feet) sediment interval (i.e. the uppermost sediment interval tapped by the Station 5 well) in the area currently downgradient of the Sola facility and in the area downgradient of the Sola facility during operation of the Station 5 well.

VOCs were not present above analytical detection limits in samples collected from deepest wells LF-15. These data indicate the vertical extent of VOC-affected ground water at that location.

Water-quality results from deepest well LF-12 (1,1-DCE at 0.0007 ppm) indicate the approximate vertical extent of VOC-affected ground water in the deepest sediment interval at that location. Historically, the highest concentrations of VOCs detected in well LF-12 was 0.004 ppm (1,1-DCE and 1,1,1-TCA in May 1988). Concentrations of VOCs detected in well LF-12 have decreased since July 1988 to current low to nondetectable levels (0.0005 ppm and 0.0007 ppm for 1,1-DCE and below detection limits for all other VOCs in January 1990 and April 1990, respectively). It appears that this decrease in VOC concentrations at well LF-12 is the result of natural reduction of VOC concentrations after cessation of pumping from the Station 5 well. In summary, Objective 3 has been partially met because water-quality data from deepest wells LF-12 and LF-15 confirm the downgradient vertical extent of VOC-affected water at those portions of the Site.

Another deepest-zone monitoring well (LF-27A) is proposed for installation in the immediate vicinity of well LF-27 to further assess the vertical extent of VOC-affected ground water in that portion of the Site.

Objective 4: To assess whether VOC-affected ground water associated with the Site may be migrating toward and potentially impacting environmental quality in Adobe Creek and/or the Petaluma River.

Adobe Creek

Water-quality data (reported as below detection limits) for samples collected from shallow, intermediate-depth, and deep wells LF-19, LF-20, W30, LF-17, LF-18, LF-9, LF-8, LF-23, and LF-24 indicate that VOCs in shallow ground water at the Site are not migrating toward Adobe Creek.

Petaluma River

The low to nondetectable concentrations of VOCs detected in downgradient wells LF-23, LF-24, DH-2, LF-26, LF-25, and W33 confirmed the approximate extent of VOC-affected ground water in shallow and intermediate-depth intervals beneath the Site.

Concentrations of VOCs in these wells reveal a decrease in concentration of VOCs of approximately three orders-of-magnitude over the 1,000-foot distance between well W14 (1,1-DCE at 1.2 ppm) and LF-25 (1,1-DCE at 0.007 ppm) and DH-2 (below detection limits). Based on these results, it is not likely that significant concentrations of VOCs could migrate as far as the Petaluma River, more than one-half mile from the downgradient boundary of the Site. Therefore, Objective 4 has been met because water-quality data from perimeter and downgradient wells indicate that the water quality of Adobe Creek and the Petaluma River is not likely to be impacted by VOC-affected ground water at the Site.

2.2.6 CONCLUSIONS OF THE GROUND-WATER INVESTIGATION

The Ground-Water Investigation conducted at the Site succeeded in meeting investigation objectives. No further investigation is recommended at this time. Objective 1 has been met because the downgradient lateral extent of VOC-affected shallow ground water has been defined to concentrations at or below state and/or federal water quality standards. Objective 2 has been met because the vertical extent of VOC-affected ground water in the southwest portion of the Site has been confirmed. Objective 3 has been partially met because water-quality data

from deepest wells LF-12 and LF-15 confirm the downgradient vertical extent of VOC-affected water at those portions of the Site. (Note: Another deepest-zone monitoring well (LF-27A) is proposed for installation in the immediate vicinity of well LF-27 to further assess the vertical extent of VOC-affected ground water in that portion of the Site.) Finally, Objective 4 has been met because water-quality data from perimeter and downgradient wells indicate that the water quality of Adobe Creek and the Petaluma River is not likely to be impacted by VOC-affected ground water at the Site.

Rates of water-level recovery in LF-27 are such that water-level data from that well cannot be directly compared with water-level data from other wells screened across deepest-zone sediment intervals at the Site. These data suggest that well LF-27 is screened across a sediment interval that may not be in good hydraulic connection with other deepest-zone sediment intervals located at other portions of the Site. Accordingly, water-quality data collected from LF-27 may not by correlative with water-quality data collected from LF-12, LF-15, and the Station 5 well, which are apparently screened across sediments characterized by higher permeability.

Another deepest-zone monitoring well (LF-27A) is proposed for installation in the immediate vicinity of existing well LF-27 in an attempt to provide water-quality data from relatively higher permeability sediments that may be present in that portion of the Site. Pending accessibility to the drilling location, it is anticipated that well LF-27A will be installed during December 1990 or January 1991.

Water-level elevation data collected during the Ground-Water Investigation confirmed previous results and revealed the effect of drawdown resulting from pumping from extraction wells located downgradient of the Sola facility.

3.0 PHYSICAL CHARACTERISTICS OF THE SITE

3.1 Topography

The relatively flat surface in the Site vicinity slopes gently from the Site southwestward at a rate of about 50 feet per mile toward the Petaluma River, approximately one mile south of the Site. Surface elevations range from about 30 feet above Mean Sea Level (MSL) in the northeastern part of the Site to about 18 feet above MSL toward the southwest.

The closest natural surface water feature is Adobe Creek, a north-south trending intermittent stream, located about 1,500 feet west of the Sola building (Section 1.2). Adobe Creek drains into the Petaluma River, a perennial stream located about one mile southwest of the Sola building (Figure 1).

3.2 Hydrogeologic Setting

The hydrogeologic setting of the Site was characterized based on data from numerous soil borings and monitoring and extraction wells installed at the Site. Four geologic cross sections constructed from geologic logs of selected monitoring and extraction wells and piezometers at the Site are presented in Figures 12 through 15 (see Figure 11 for cross section locations).

3.2.1 GEOLOGIC SETTING

Geologic investigations at the Site by Levine•Fricke and previous consultants have revealed that sediments at depths of less than 80 to 100 feet below the surface at the Site consist of a complex sequence of interbedded clays, silts and sands, with lesser amounts of gravel. These sediments probably represent a complex sequence of alluvial (stream-channel and overbank) deposits. The lithologic sequence encountered in these shallow sediments is quite variable and discontinuous, even over short distances. It is possible, however, that channel deposits of sand and gravel may be present which are sinuous but continuous.

Below depths of approximately 80 to 100 feet, thicker clay intervals were encountered which appeared to be relatively continuous over distances of hundreds of feet. Interbedded within these clay intervals are silt, sand, and gravel intervals of variable thickness. These deeper sediments probably represent complex depositional environments involving both alluvial (sands and gravels) and estuary (clays and silts) deposition. Geochemical data collected during the

ground water investigation supports this interpretation; the pH and ionic composition of ground water sampled from deepest sediments at the Site are indicative of sediments deposited in a saline depositional environment (see Section 2.2.3.3.1).

3.2.1.1 Shallow Sediments (0 - 30 feet)

Near surface sediments throughout the area illustrated in the cross sections consist of dark gray to black, clay to clayey silt from the surface to a depth of approximately 5 feet below the surface. Sediments encountered below this depth generally consisted of sandy or silty clay, with some sand and gravel deposits.

Coarser sand or gravelly sand deposits were commonly encountered in the depth interval 13 to 25 feet below the surface. The thickness of coarser-grained sediments encountered in this interval in the site vicinity varied from 2 feet of sandy gravel in well LF-18 to 9 feet of sandy gravel in well LF-12 (Figure 14). However, the types of sediments encountered within this interval were quite variable, ranging from silty clay to sandy gravel. In some wells (such as LF-4, Figure 12) this shallow depth interval is comprised almost entirely of silty clay and clayey silt; whereas, in other wells (W28 and W30, Figure 12) only a short distance (20 and 200 feet, respectively) from LF-4, the interval reportedly consists of sandy silt to sand with only limited amounts of clayey soil.

3.2.1.2 Intermediate-Depth Sediments (30 - 60 feet)

Below depths of 25 to 35 feet, another coarser-grained interval was commonly encountered. This coarser-grained zone generally consists of gravelly sands interbedded with sandy silt and silty sand. The presence of sand and gravel beds within this deeper interval in several wells (e.g. LF-22, PZ-4, E-7, LF-23, LF-8, LF-27, LF-25, LF-26, and LF-28) indicate that these deposits may exist over distances of one hundred feet or more.

3.2.1.3 Deep Sediments (60 - 100 feet)

Geologic data provided by wells at the Site indicate that the sequence of complex interbedding of clays, silts, sands and gravels extends to depths of about 84 to 102 feet below the surface (Figures 12 through 14). Individual sand and gravel intervals within this interval vary in thickness from 1 foot in well LF-18 (49- to 50-foot depth) to as much as 16 feet in

well LF-27 (64- to 80-foot depth). Interpreted correlations of sand and gravel intervals in wells LF-12, LF-18, and LF-15 indicate that some lateral continuity of these coarser-grained intervals may exist over distances of hundreds of feet.

3.2.1.4 Deeper Sediments (100 - 200)

Below depths of 85 to 107 feet, a light to dark blue-gray silty clay to sandy clayey silt is present in each of the deeper wells. This blue-gray clay interval varies in thickness from about 21 feet at well LF-15 to approximately 56 feet at well LF-12; a slight color change of this clay interval to olive-brown was noted at 98 feet below the surface at well LF-15.

The interval between 106 and 174 feet below the surface encountered in well LF-15 was comprised of interbedded silty clays and clayey sands to sandy gravelly siltstones. Individual intervals of coarser-grained sediment in LF-15 varied in thickness from 1 foot of sand (135- to 136-foot depth) to about 8 feet of sandy gravelly siltstone (166- to 174-foot depth). A 4-foot thick gravelly sand was encountered in well LF-12 from 155 to 159 feet below the surface; this was the only coarser-grained unit encountered in well boring LF-12 between the depths of 89 and 215 feet. The only coarser grained interval encountered between 100 and 200 feet in well LF-27 was a 4-foot thick sandy gravel interval at 100 feet below ground surface.

In the Station 5 well, the interval of sediments between 80 and 180 feet is reportedly comprised of blue and yellow clay. However, this same reported interval (approximately 100 to 180 feet deep) in the Sola City well reportedly consists predominantly of coarser-grained sediments, with minor intervals of clay.

3.2.1.5 Deepest Sediments (greater than 200 feet)

Sediments below a depth of 174 feet in well LF-15 consisted mainly of silty clays, with the exception of a 7-foot thick, lightly cemented sand present from 207 to 214 feet. A similar and possibly correlative coarser-grained interval is present in well LF-12 from 218 to 233 feet, in the Station 5 well from 180 to 210 feet, the Sola City well from 183 to 193 feet, and in well LF-27 between 200 and 240 feet.

3.2.2 GROUND-WATER ELEVATION AND FLOW DIRECTION

Ground water in shallow sediments in the site vicinity is generally encountered at elevations of between 20 to 9 feet MSL. Ground-water elevations measured on July 31, 1990 are shown on cross sections A-A′ through D-D′ (Figures 12 through 15). Ground-water elevations are generally higher in the east-northeast portion of the Site and slope west-southwest at about 0.02 to 0.005 ft/ft. The depth to ground water decreases in the downgradient direction from about 12 to 15 feet in the vicinity of the manufacturing building to about 7 to 9 feet in the southwestern-most portion of the property. Based on monthly water-level measurements collected at the Site since 1986, seasonal fluctuations in the water levels apparently have little effect on the general pattern of ground-water flow.

The potentiometric (piezometric) head elevation (the level to which water will rise in a well) in shallow sediments (depths less than about 70 to 80 feet) at the Site generally increases from the shallow to the intermediate-depth and deep sediments (see Figures 20 through 23). This increase indicates that the vertical component of ground-water flow is upward-directed (upward hydraulic gradient) within the upper approximately 100 feet of sediments. An upward hydraulic gradient reduces the potential for downward migration of chemicals in ground water.

Below depths of about 100 feet, however, the potentiometric head elevation decreases with depth, indicating that the vertical component of ground-water flow is downward-directed below these depths. Comparison of calculated vertical gradients for ground-water elevations measured both while the Station 5 well was pumping and after this well was shut down revealed that the magnitude of downward gradients decreases when the Station 5 well is not pumping, thus decreasing the potential for chemicals in ground water to migrate to greater depths.

4.0 NATURE AND EXTENT OF VOCs AT THE SITE

Table 13 lists the compounds detected in soil and ground water at the Site, and shows the highest measured concentration for each compound. The distribution of these compounds in soil and ground water at the Site is summarized below.

4.1 Chemical Source Area

VOCs detected in ground water beneath the Site appear to have originated from the former tank backfill material, and possibly the immediately adjacent soils, in the vicinity of the six 1,000-gallon underground storage tanks that were located in the southwestern portion of the Sola manufacturing building. Inspection of the tanks upon removal did not indicate that the tanks had leaked. However, observations of the tank fill pipes and the backfill surrounding the tank fill pipes at the time the tanks were removed revealed staining of the fill pipes and the immediately adjacent backfill material.

Based on available information, it appears that VOCs entered into soil and ground water at the Site primarily as a result of accidental spillages near and/or leakage from the tank fill pipes into the tank backfill material. Measurements collected from water-level observation pipes in the tank backfill material revealed that up to a few feet of ground water were intermittently present at the bottom of the former tank sump during operation of the tanks. VOCs released from the tank fill pipes appear to have migrated into the backfill material and entered into water in the bottom of the sump, where they then may have migrated directly into the underlying shallow ground water. The fact that the highest concentrations of VOCs in shallow ground water at the Site have been detected at well W14 (located in the vicinity of the former tanks location) supports this hypothesis.

4.2 Extent and Distribution of VOCs detected in Soil

4.2.1 ALIPHATIC VOCs

Analytical results for soil samples collected (1) downgradient of the former tanks location by Van Houten in 1984, (2) from the former tank sump during excavation and removal of the underground tanks by Van Houten in 1985, (3) downgradient of the former tanks location by Levine•Fricke in 1988, and (4) in the general vicinity of the location of the former tanks in 1990 revealed the presence of some chlorinated VOCs at low concentrations (less than 0.190 ppm) in soils at the Site. These data indicated that the concentrations of chlorinated

VOCs did not increase or decrease significantly with distance from the location of the former tanks. Also, data collected during the recent soil-quality investigation revealed that the concentration of chlorinated VOCs does not increase or decrease significantly with depth.

4.2.2 AROMATIC VOCs

Benzene, xylenes, ethylbenzene, chlorobenzene, and dichlorobenzene were detected at a maximum concentration of 0.230 ppm (xylenes) in samples collected from the east sidewall of the tank excavation. These compounds were not detected in any other soil samples collected at the Site. Similarly, 2-butanone and 4-methyl-2-pentanone were detected in only one soil sample collected in the vicinity of the location of the former tanks at 0.15 ppm and 0.27 ppm, respectively. Based on these data, the distribution of the above compounds appears to be limited to the immediate vicinity of the location of the former tanks.

Toluene was detected in each of three samples collected from the east sidewall of the former tank excavation. Toluene was also detected in each of the soil samples collected during the recent soil investigation at a maximum concentration of 0.240 ppm. The concentrations of toluene detected in soil samples collected at the Site during the soil investigation are within the range of toluene concentrations reported as naturally-occurring in soil (i.e. up to 5 ppm, Dragun, 1990).

Acetone was detected in each of three samples collected from the east sidewall of the former excavation (maximum concentration of 200 ppm) and in two of the twelve samples collected during the recent soil-quality investigation (maximum concentration of 4.6 ppm). These relatively elevated concentrations of acetone likely represent residual acetone from past chemical handling in the vicinity of the location of the former tanks.

4.3 Extent and Distribution of VOCs Detected in Ground Water

Levine•Fricke has conducted ground-water monitoring activities at the Site since September 1986. Ground-water quality results from those investigations are summarized below.

- 1,1,-DCA, 1,1-DCE and 1,1,1-TCA are the primary VOCs detected in ground-water samples collected from monitoring wells at the Site. Concentrations of TCE and other VOCs have also been detected at low concentrations (less than 0.009 ppm) in ground-water samples collected from monitoring wells at the Site.

- Historically, the highest concentrations (up to 3.3 ppm of 1,1-DCE, September 1986) of the primary VOCs have been detected in samples collected from shallow monitoring well W14, immediately downgradient of the location of the former underground storage tanks. VOCs in shallow ground water extend downgradient (west-southwest) from the vicinity of well W14 to the southwestern-most portion of the Site, where they have been found at concentrations ranging from at or below detection limits to at or below state and federal water-quality standards.

  Figure 26 illustrates the estimated extent of concentrations of VOCs greater that State and/or Federal MCLs in shallow ground water. Figure 27 illustrates the estimated extent of concentrations of VOCs greater that State and/or Federal MCLs in intermediate-depth ground water. Figure 28 illustrates the estimated extent of concentrations of VOCs greater that State and/or Federal MCLs in deep and deepest ground water.

- VOCs in ground water are found predominantly within about 30 to 45 feet below the ground surface. The predominance of VOCs in shallow ground water (as opposed to deeper ground water) can be partially attributed to the presence of upward hydraulic gradients between the shallow and intermediate sediment intervals at the Site. These upward hydraulic gradients impede the downward migration of chemicals in ground water. Low concentrations (generally less than 0.020 ppm) of VOCs also have been reported in samples collected from monitoring wells LF-17, LF-13, and LF-12, perforated at depths of 67 to 230 feet. Low concentrations (less than 0.004 ppm) of VOCs also have been detected in samples collected from the Station 5 well.

5.0 FATE AND TRANSPORT OF VOCs AT THE SITE

The fate and transport of chemicals detected in soils and ground water at the Site are governed by properties of the chemicals as well as properties of the material in which the chemicals reside (soil, water, or air). Several interacting chemical and physical processes are active in determining the migration of these chemicals. These processes include advection, dispersion and diffusion in ground water; adsorption onto soil; and volatilization from soil or ground water and subsequent migration through the vadose zone to the surface, where chemicals can be introduced into the ambient air. The solubility, volatility, and soil partition coefficient of the chemicals at the Site determine, in part, their distribution and mobility between and within the soil, ground-water, and ambient-air phases. Chemical transformation of these chemicals into breakdown, or daughter, products is also an important factor in the overall fate and transport of chemicals at the Site. These daughter products have toxicological and mobility characteristics different from their respective parent compounds.

Site-specific factors also influence the fate and transport of chemicals at the Site. The porosity and the organic carbon content of the vadose-zone soils overlying ground water, for example, are important factors in determining the migration of a chemical from soil into ground water.

The following sections discuss chemical and environmental properties relevant to the fate and transport of the VOCs detected at the Site. A discussion of chemical transformation processes is also presented.

Selected chemical properties of the VOCs detected at the Site relevant to fate and transport processes are provided in Table 14. The values included on Table 14 were obtained from the Syracuse Research Corporation's (SRC) CHEMFATE data base (Syracuse, New York 13210-4080), unless otherwise noted on the table.

5.1 Transport Mechanisms

Transport mechanisms of chemicals associated with the Site include volatilization from soil, dissolution and subsequent migration from soil into ground water, and advection and dispersion in ground water. These transport mechanisms are discussed in the following sections.

5.1.1 VOLATILIZATION FROM SOIL

Once in the soil, a chemical may volatilize from the liquid phase into the vapor phase in the soil pores and become adsorbed onto soil particles, or migrate through the soil pores into the atmosphere. The volatility of the chemical, as well as the soil's water content, porosity, and percent organic carbon content, determines the relative importance of these potential pathways.

5.1.1.1 Chemical Properties

The tendency of a chemical to enter into vapor phase is measured by the vapor pressure of the chemical. Chemicals with higher vapor pressures (e.g., 1,1-DCE, 600 millimeters [mm] mercury [Hg]) will tend to enter readily into the vapor phase, while chemicals with lower vapor pressures will tend to either remain as a separate phase or remain in solution. The vapor pressure of a chemical is affected proportionally by temperature. The solubility of a chemical also controls its tendency to volatilize. A chemical with high solubility will tend to remain in solution phase and not enter into vapor phase. The parameter of a chemical that considers both its solubility and its volatility is known as the Henry's Law Constant, which can be thought of as the ratio of the vapor pressure of a chemical to its solubility in water. Thus, a chemical with a relatively high Henry's Law Constant will tend to enter more readily into vapor phase than a chemical with a relatively low Henry's Law Constant.

All of the chemicals detected in soil and ground water at the Site are characterized by relatively high vapor pressures and Henry's Law Constants. Thus, these chemicals wills tend to partition into vapor phase.

5.1.1.2 Soil Characteristics

Environmental factors influencing volatilization from soils at the Site include the soil type, water content, and amount of organic matter. Fine-grained soils (e.g., clay) generally have smaller, less interconnected pores than coarse-grained soils (e.g., sand). In unsaturated soils, the larger pores of coarse-grained soils allow greater migration of chemicals in vapor phase than the smaller pores of fine-grained soils. Generally, most of the smaller pores in fine-grained soils are filled with water, which results in fewer interconnected open pores and a decreased potential for vapor-phase migration through fine-grained soils. Organic carbon content in soil influences adsorption of an organic chemical in vapor phase

onto a soil particle. Generally, a higher percent organic carbon content in soil will result in more adsorption of organic chemicals to that soil.

Based on field lithologic classification and observation of vadose zone soils in the vicinity of the former tanks location, soil at the Site consists predominantly of black, damp to moist clays. These soil types impede the transport of vapor-phase VOCs through the vadose zone and into the atmosphere. Also, a large portion of the soils in the vicinity of the source area at the Site are capped with either concrete or asphalt. This cap will act to impede the migration of vapor phase VOCs through the vadose zone.

5.1.2 MIGRATION OF CHEMICALS FROM THE VADOSE ZONE INTO GROUND WATER

Chemicals in soil may dissolve into soil moisture and percolate through the vadose zone and enter into ground water. Chemical parameters affecting this transport mechanism include solubility and the soil adsorption constant, or the octonal-water partition coefficient. Chemicals may also migrate as free product through the vadose zone; however, it is unlikely that significant quantities of free-phase product were ever released directly onto soils or into ground water at the Site (see Section 4.1). Conditions of the soil overlying the ground water influencing these transport mechanisms include soil thickness, depth to ground water, percent organic matter, and permeability.

5.1.2.1 Chemical Properties

Chemicals with relatively high solubilities (e.g., 1,1-DCA, 5060 mg/l) have a greater tendency to dissolve into soil moisture and migrate into ground water than chemicals with relatively lower solubilities.

The process of sorption of a chemical onto a soil particle impedes the migration of that chemical through soil and into ground water. The soil adsorption constant (K_{oc}; Table 14) is a measure of a chemical's tendency to adsorb onto a soil particle. Those chemicals with relatively high K_{oc} values (e.g., 1,1,1-TCA 179) have a greater tendency to adsorb onto soil particles than those chemicals with relatively low K_{oc} values (e.g., acetone, 18).

5.1.2.2 Soil Characteristics

The permeability of the soil overlying ground water is the primary environmental factor influencing the migration of chemicals in solution phase into ground water. Soil with high permeability is more likely to allow migration of chemicals from the surface into ground water than soil with low permeability. The soil in the vicinity of the former tanks location is characterized by a relatively low hydraulic conductivity (about 10^{-5} cm/sec, measured during hydraulic testing of E-2). Also, soils in the vicinity of the former tanks location are capped with either asphalt or concrete.

This relatively low vertical conductivity together with the capped surface condition is expected to slow the vertical migration of chemicals from the surface to ground water. A reduced rate of migration allows greater contact time for chemicals to react (i.e. adsorb) with the surrounding soil surface.

Generally, the percent of organic carbon content in the soil and bedrock overlying ground water influences the tendency of organic chemicals to migrate into the underlying ground water. Soil with high organic carbon content would impede organic chemicals. Based on field observations of vadose-zone soils in the vicinity of the source area and from representative values in the literature (e.g. 2.65 per cent, Jury 1990), it is expected that the percent of organic carbon content in vadose-zone soil at the Site is relatively high and acts to impede migration of organic chemicals at the Site.

5.1.3 MIGRATION OF CHEMICALS IN GROUND WATER

Chemical migration in ground water is influenced by the physical characteristics of the sediments and properties of the chemicals at the Site. The dominant transport processes active in ground water are advection, dispersion, and retardation. Chemical and physical properties that influence these processes are discussed below.

5.1.3.1 Chemical Properties

The solubility, specific gravity, and adsorption coefficient (K_{oc}) are the most significant chemical properties influencing chemical migration in ground water. Higher solubilities (e.g. acetone which is totally miscible) allow larger quantities of

a chemical to go into solution and travel with ground water via advection. Lower solubilities (e.g. 200 mg/l for PCE) result in significantly lesser quantities of a chemical in solution.

The specific gravity of chemicals affects behavior in the ground-water system when those chemicals are at concentrations at or near their solubility limits. Specific gravity data for the VOCs detected at the Site indicate that if present as nonaqueous phase, some of the VOCs are lighter than water and will tend to float (toluene and acetone), while others are heavier than water and will tend to sink (PCE and TCE). However, the fact that chemicals at the Site were detected at concentrations well below their respective solubility limits indicates that specific gravity does not have a significant influence on chemical migration there.

Chemicals with higher K_{oc} values (e.g., 1,1-DCE, 343) will have a greater tendency to sorb onto soil; therefore, these chemicals will be less mobile than chemicals with relatively low K_{oc} values (e.g. acetone, 18).

5.1.3.2 Environmental Conditions

Environmental conditions that influence the migration of chemicals in ground water include the hydraulic gradient of ground water and the permeability of sediments. The hydraulic gradient (both vertical and horizontal) generally determines the direction of ground-water flow and, therefore, the transport pathway for chemicals migrating in solution in the aquifer. Permeability characteristics determine the rate of transport and the resultant distribution of chemicals in ground water.

Under natural conditions (i.e. without pumping from extraction wells and/or the Station 5 well), the horizontal hydraulic gradient of shallow ground water at the Site is generally towards the south and southwest. Thus, chemical movement via advection in ground water would be expected to be toward wells located to the southwestern portion of the Site. Analytical data illustrated on Figure 25 reveals that, although movement of chemicals lateral to ground-water flow has occurred, the primary direction of VOC migration is toward the southwest.

Vertical hydraulic gradients are generally upward-directed at depths above approximately 100 feet below ground surface (see Section 3.2.2. These upward hydraulic gradients reduce the

potential for downward migration of chemicals in ground water, and likely contribute to the absence of VOCs in intermediate-depth wells located in the vicinity of the source area (e.g., wells LF-20, LF-21, LF-4, and LF-15).

Vertical hydraulic gradients are generally downward below about 100 feet below ground surface indicating that the vertical component of ground-water flow is downward-directed below these depths. Additionally, downward vertical hydraulic gradients induced by pumping from the City of Petaluma Station 5 well likely contributed to the downward migration of 1,1-DCE to deepest well LF-12. Concentrations of 1,1-DCE reported for that well have decreased since pumping from the Station 5 well was discontinued in June 1988.

5.1.4 CHEMICAL TRANSFORMATION PROCESSES

Chemicals may undergo chemical transformation when released into the environment. Organic compounds are subject to biodegradation reactions in the soil and/or ground-water environment. The following paragraphs briefly describe some of the likely chemical transformation reactions of the VOCs detected at the Site.

5.1.4.1 Volatile Organic Compounds

VOCs detected in soil and/or ground water at the Site include PCE, TCE, 1,1-DCE, 1,1,1-TCA, and 1,1-DCA; these compounds are classified at halogenated aliphatic compounds. Two reaction mechanisms that can influence the chemical fate of these compounds are dehydrohalogenation and reduction. These processes are discussed below.

Dehydrohalogenation is a reaction that includes removal of a halogen (e.g., chloride) from one carbon atom along with removal of a hydrogen atom from the adjacent carbon atom. An example of this reaction is the removal of a chloride atom and a hydrogen atom from 1,1,1-TCA to produce the daughter product(s) 1,1-DCE and/or 1,2-DCE. The rate at which this reaction takes place depends in part on the number of halogens of the parent compound. The more halogens present on the parent compound, the more rapid the reaction rate. This reaction can be catalyzed abiotically (in the absence of soil microorganisms) or biotically (mediated by the presence of soil microorganisms) (Vogel 1987). The reaction rate under biologically mediated conditions is greater than under abiotic conditions.

1,1-DCE and 1,2-DCE are known daughter products of 1,1,1-TCA via the dehydrohalogenation reaction (Vogel 1987). The rate at which these reactions take place at the Site depends on conditions in the soil/bedrock ground-water environment, including water content, oxygen availability, oxidation/reduction (redox) potential, and, in the case of microbially mediated dehydrohalogenation, soil microorganism population and nutrient supply.

Oxidation is a process in which a compound loses (donates) an electron; reduction is a process in which a compound gains (accepts) an electron. Organic compounds generally represent reduced forms of carbon. Thus, oxidation of organic compounds is typical. In contrast, halogenated aliphatic compounds (e.g., PCE, TCE, 1,1,1-TCA) are relatively oxidized by the presence of halogens (e.g., chloride) and are generally prone to reduction in soil environments (Vogel 1987). The greater the number of halogens present, the more susceptible the compound is to reduction. Thus, reduction would be expected to be a primary reaction mechanism acting on the PCE, TCE, and 1,1,1-TCA encountered in soils at the Site.

Biologically mediated reduction of PCE, TCE, and 1,1,1-TCA into the breakdown products 1,2-DCE, 1,1-DCE, and vinyl chloride (from PCE and/or TCE) and 1,1-DCA (from reduction of 1,1,1-TCA) have been shown to be potential reaction pathways for these compounds (Canter, et al. 1988; Vogel 1987). Thus, the presence of 1,1-DCA at the Site may represent a breakdown product of 1,1,1-TCA via reduction. Similarly, some of the 1,1-DCE detected at the Site may have been produced via the transformation of parent compounds PCE and/or TCE into breakdown products. TCE is a known breakdown product of PCE. Therefore, detection of TCE in soil may represent breakdown of PCE or a separate TCE source. As discussed above, 1,1-DCE and may also result from dehydrohalogenation of 1,1,1-TCA.

Reduction of PCE to form TCE, and reduction of TCE to form 1,2-DCE, 1,1-DCE, and vinyl chloride have been shown to occur under biologically mediated, anaerobic conditions (Canter, et al. 1988). Environmental conditions required for biologically mediated anaerobic respiration to take place in soil include: a population of metabolizing microorganisms specific to the compound to be metabolized; an appropriate nutrient supply for the metabolizing microorganisms; and an appropriate water content, pH, and redox potential. These properties are expected to vary significantly over small vertical and

horizontal distances in the heterogeneous vadose zone soil medium at the Site. Thus, variation in concentrations of breakdown products detected in soil and/or ground-water samples would be expected.

In summary, it appears that the halogenated aliphatic compounds detected in soil and ground water at the Site (PCE, TCE, 1,1-DCE, 1,1,1-TCA, and 1,1-DCA) may be undergoing decomposition into their respective breakdown products, primarily through dehydrohalogenation and reduction.

The rate at which these reactions take place in the soil environment is difficult to quantify. This is especially true for biologically mediated reactions, where variations in the population of soil microorganisms have a large influence on the rate of biodegradation, and hence, the half-life of the compound. Published values for half-lives of halogenated aliphatic compounds generally represent experimental conditions that differ significantly from the soil/water environment of the vadose zone at the Site. However, consideration of the range of reaction rates for these compounds will help yield a general understanding for the time frame in which these reactions occur.

Published half-lives for the dehydrohalogenation of 1,1,1-TCA to 1,1-DCE in ground water range from 0.8 to 2.8 years (Vogel 1987). Other published biodegradation half-lives include: 34 to 230 days (PCE), 33 to 230 days (TCE), 53 to 147 days (1,2-DCE), 81 to 237 days (1,1-DCE), less than 60 days (vinyl chloride), 16 days to 17 years (1,1,1-TCA), and less than 60 days (1,1-DCA). Thus, the range of rates at which these reactions can occur can explain the presence of parent and daughter products in soil and/or ground water at the Site.

5.1.4.2 Other VOC Compounds

Other compounds detected at the Site include acetone and toluene. Specific breakdown products from the biodegradation of these compounds were not found in the literature survey conducted for this report. However, it is reported that acetone will biodegrade in acclimated sewage inocula within time periods of weeks to days (Howard 1990). There is evidence suggesting that acetone will biodegrade fairly rapidly in soils Howard (1990). Similarly, toluene is reported to be readily biodegradable in a variety of standard biodegradability tests using sewage seed or sludge inocula (Howard 1990). Ninety percent degradation of toluene in subsurface soils in four weeks has also been reported (Howard 1990). Persistence of both acetone and toluene under natural soil and ground-water conditions would be not expected to be much longer (months to years).

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Remedial investigations conducted at the Site have revealed the presence of VOCs in soil and ground water beneath the Site. VOCs appear to have been released from accidental spillages near and/or leakage from the fill pipes of six underground storage tanks operated at the Site between 1978 and 1985. These tanks, and the soil adjacent to them, were removed in August 1985.

Analytical data from soil samples collected in the vicinity of the former tanks location reveal the presence of low concentrations (less than 0.190 ppm) of certain chlorinated VOCs and aromatic compounds and slightly elevated concentrations of acetone (reportedly up to 200 ppm, from a sampled collected from an excavation sidewall in 1985). Data collected during the recent soil investigation suggest that vadose-zone soils beneath the Site do not represent a source for VOCs in shallow ground water at the Site. Modeling of potential migration of chemicals in soil and shallow ground water will be conducted to evaluate this hypothesis.

Results of ground-water quality investigations conducted at the Site since 1986 revealed that 1,1,-DCA, 1,1-DCE and 1,1,1-TCA are the primary VOCs detected in ground-water samples collected from monitoring wells at the Site. Historically, the highest concentrations (up to 3.3 ppm of 1,1-DCE, September 1986) of the primary VOCs were detected in samples collected from shallow monitoring well W14, immediately downgradient of the location of the former storage tanks. VOCs in shallow sediments extend downgradient (west-southwest) from the vicinity of well W14 towards the southwestern-most portion of the Site, where they have been detected at concentrations at or below state and federal water-quality standards.

The vertical extent of VOCs in ground water is predominantly within about 30 to 45 feet below the ground surface. Low concentrations (generally less than 0.020 ppm) of VOCs also have been reported in samples collected from monitoring wells LF-12, LF-13 and LF-17, perforated at depths of 67 to 230 feet. Concentrations of VOCs detected in well LF-12 have decreased since July 1988 to current nondetectable concentrations. This decrease in VOC concentrations at well LF-12 corresponds to the cessation of pumping from the Station 5 well.

Water-level elevation data collected during the ground water investigation confirmed previous results. These data confirmed the effects of drawdown resulting as a result of pumping from extraction wells located downgradient of the Sola facility.

6.2 Recommendations

Remedial investigations conducted at the Site have collected data needed for purposes of the Feasibility Study. Therefore, with the exception of installation and sampling of deepest-zone monitoring well LF-27A, no further soil or ground-water investigations are recommended at this time. Continued ground-water monitoring, in accordance with the FSP, is recommended to assess the effects of the operation of the ground-water extraction and treatment system over time and to monitor the lateral and vertical extent of VOC-affected ground water at the Site.

At the request of the EPA, modeling of potential chemical migration in soil and shallow ground water in the vicinity of the former tanks location will be conducted to evaluate the potential for soils in the vicinity of the former tanks location to impact shallow ground-water quality beneath the Site. This evaluation is proposed to be completed as part of the initial screening of remedial options portion of the Feasibility Study for the Site. For comparative purposes, two analytical vadose-zone transport models will be used to simulate chemical transport in the vadose zone; VLEACH, an in-house model developed by CH_2M Hill, Inc., and SESOIL, developed by the EPA. Calculated leachate concentrations from these two models will be input into EPA's AT-123D ground-water transport model to simulate the potential impacts of calculated leachate concentrations on shallow ground water at the Site.

Water-quality data from the current monitoring well network at the Site have defined the extent of VOC-affected ground water to concentrations at or below State and federal water quality standards at the southwestern-most portion of the Sola facility. Further investigation of the downgradient extent of VOCs in ground water at the Site is not recommended at this time. The need for further investigation of VOC-affected ground water downgradient of the Site will be evaluated after cleanup goals for the Site are established as part of the FS.

The projected schedule for RI/FS activities for the Site is shown on Table 15.

7.0 REFERENCES

Canter, L.W., R.C. Knox, D.M. Fairchild, 1988. Ground Water Quality Protection. Lewis Publishers, Michigan.

Dragun, J., 1988. The Soil Chemistry of Hazardous Materials. Hazardous Materials Control Research Institute, Maryland.

Howard, P.P., 1990. Fate and Exposure Data for Organic Chemicals, Volume Two. Lewis Publishers, Michigan.

Jury, et. al., 1990. "Evaluation of Volatilization by Organic Chemicals Residing Below the Surface," Water Resources Research, Vol. 26, No. 1, pp. 13-20, January.

Levine•Fricke, 1986a. "Preliminary Evaluation of Hydrogeologic Conditions at the Sola Optical Facility, Petaluma, California," April 26.

Levine•Fricke, 1986b. "Results of Soil-Gas Survey, Sola Optical USA Facility, Petaluma, California," September 2.

Levine•Fricke, 1987a. "Results of Hydrogeologic Investigations, Sola Optical USA, Inc., Facility, Petaluma, California," February 1.

Levine•Fricke, 1987b. "Monthly/Quarterly Report, Sola Optical USA, Inc., Petaluma, California," May 10.

Levine•Fricke, 1987c. "Evaluation of Interim Remedial Measures, Sola Optical USA Facility, Petaluma, California," July 15.

Levine•Fricke, 1987d. "Monthly/Quarterly Report, Sola Optical USA, Inc., Petaluma, California," August 10.

Levine•Fricke, 1987e. "Results of On-Site and Off-Site Hydrogeologic Investigations, Sola Optical USA Inc. Facility, Petaluma California," December 1.

Levine•Fricke, 1988a. "Results of Hydraulic Testing of Sediments in the Vicinity of the Sola Optical USA, Inc. Facility, Petaluma, California," January 6.

Levine•Fricke, 1988b. "Monthly/Quarterly Report of Hydrogeologic Investigations During November 1987 Through January 1988 at the Sola Optical USA, Inc. Facility, Petaluma, California," February 10.

Levine•Fricke, 1988c. "Monthly Report of Hydrogeologic Investigations During March 1988 at the Sola Optical USA, Inc. Facility, Petaluma, California," April 10.

Levine•Fricke, 1988d. "Proposed Work Order No. 2, Hydraulic Testing, Development and Sampling of Newly-Installed Extraction Wells at the Sola Optical USA, Inc. Facility, Petaluma, California," April 22.

Levine•Fricke, 1988e. "Monthly/Quarterly Report of Hydrogeologic Investigations During February Through April 1988 at the Sola Optical USA, Inc. Facility, Petaluma, California," May 10.

Levine•Fricke, 1988f. "Monthly Report of Hydrogeologic Investigations, Sola Optical USA Facility, Petaluma, California, May 1988," June 10.

Levine•Fricke, 1988g. "Monthly/Quarterly Report of Hydrogeologic Investigations During August Through October 1988 at the Sola Optical USA, Inc. Facility, Petaluma, California," November 10.

Levine•Fricke, 1989. "Remedial Investigation/Feasibility Study (RI/FS) Work Plan, Sola Optical USA Inc. Site, Petaluma, California," August 30.

Levine•Fricke, 1990a. "Field Sampling Plan, Hydrogeologic Investigations, Sola Optical USA Inc., Petaluma, California," February 26.

Levine•Fricke, 1990b. "Health and Safety Plan, Sola Optical USA Inc., Petaluma, California," February 26.

Levine•Fricke, 1990c. "Quality Assurance Project Plan, Sola Optical USA Inc., Petaluma California," February 26.

Levine•Fricke 1990d. "Soil Investigation Report, Sola Optical USA Inc., Petaluma California," July 2.

Levine•Fricke, 1990e. "Ground-Water Investigation Report, Sola Optical USA Inc., Petaluma California," July 2.

Marshack, Jon B., 1989. "A Compilation of Water Quality Goals," Staff Report of the California Regional Water Quality Control Board, Central California Region, May.

Van Houten Consultants, 1984. "Subsurface Investigation, Phase II, Sola Optical USA, Petaluma California," July 19.

Van Houten Consultants, 1985a. "Progress Report of Hydrogeologic Services, Sola Facility, Petaluma, California," July 15.

Van Houten Consultants, 1985b. "Progress Report for July Hydrogeologic Services, Sola Facility, Petaluma, California," August 5.

Vogel, T.M., C.S. Criddle and P.L. McCarty, 1987. Transformations of Halogenated Aliphatic Compounds. Environmental Science and Technology. 21:8 722-736.

TABLES

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113
W-1	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	0.0006	<0.0001	NR
W-2	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
W-3	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
W-4	M-T	EPA 601	03-25-86		0.013	<0.0001	<0.0001	0.020	<0.0001	NR
W-5	M-T	EPA 601	03-25-86	(20)	0.012	<0.0001	<0.0001	0.025	<0.0001	NR
W-6	M-T	EPA 601	03-25-86		0.002	<0.0001	<0.0001	0.003	<0.0001	NR
W-7	M-T	EPA 601	03-25-86		0.004	<0.0001	<0.0001	0.006	<0.0001	NR
W-8	M-T	EPA 601	03-21-86	(21)	0.012	<0.0001	0.008	0.015	<0.0001	NR
	M-T	EPA 601	03-25-86		0.007	<0.0001	<0.0001	0.006	<0.0001	NR
W-9	M-T	EPA 601	03-21-86		0.012	<0.0001	<0.0001	0.038	<0.0001	NR
W-10	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
W-11	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
W-12	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	CAL	EPA 601	04-16-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001
	MED	EPA 601	08-18-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-17-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	05-04-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W-13	M-T	EPA 601	03-21-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	CAL	EPA 601	12-11-86		0.0038	<0.0005	<0.0005	0.0016	<0.0005	<0.0005
	CAL	EPA 601	04-15-87		<0.0005	0.0008	<0.001	0.0014	<0.0005	<0.001
	MED	EPA 601	08-14-87		0.0008	<0.0005	<0.0005	0.0006	<0.0005	NR
	MED	EPA 601	06-01-88		0.086	0.025	<0.0005	0.014	<0.0005	<0.002
	MED	EPA 601	01-20-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-22-90		0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-26-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-31-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W-14	M-T	EPA 601	03-25-86		1.6	0.460	<0.0005	1.300	0.007	NR
	CAL	EPA 624	09-30-86	(1)	2.9	0.590	<0.025	1.50	<0.025	NR
	CAL	EPA 624	09-30-86	(2)	3.3	0.680	<0.050	1.70	<0.050	NR
	CAL	EPA 601	12-11-86		0.570	0.260	<0.010	0.240	<0.010	<0.010
	CAL	EPA 601	04-15-87		3.3	0.500	<0.100	1.500	<0.050	<0.100
	MED	EPA 601	08-14-87		1.2	0.340	<0.010	0.590	<0.010	NR
	MED	EPA 601	duplicate		1.6	0.400	<0.010	0.620	<0.010	NR
	MED	EPA 601	01-13-88	(18)	0.34	0.069	0.0007	0.100	0.001	NR
	MED	EPA 601	06-02-88		0.540	0.110	<0.005	0.150	<0.005	<0.005
	MED	EPA 601	09-30-88		0.750	0.130	0.001	0.300	0.003	0.006
	MED	EPA 601	01-20-89	(27)	0.220	0.057	<0.0005	0.076	0.001	<0.0005
	MED	EPA 601	05-19-89	(32)	2.000	0.120	0.002	0.270	0.004	0.005
	MED	EPA 8010	09-20-89	(33)	2.400	0.100	0.002	0.250	0.003	0.010
	MED	EPA 8010	09-20-89	(34)	2.2	0.100	0.002	0.220	0.003	0.008
	MED	EPA 8010	01-22-90	(42)	0.5	0.043	<0.0005	0.090	0.001	0.001
	MED	EPA 8010	04-26-90	(45)	1.2	0.084	0.002	0.220	0.003	0.007
	MED	EPA 8010	duplicate	(46)	1.2	0.081	0.002	0.200	0.002	0.006
	MED	EPA 8010	09-10-90	(51)	1.4	0.110	0.002	0.200	0.002	0.005
W-15	M-T	EPA 601	03-27-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	CAL	EPA 601	12-10-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	CAL	EPA 601	04-22-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001
	MED	EPA 601	08-14-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-27-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	05-01-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W-17	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	MED	EPA 601	08-13-87		0.0009	<0.0005	<0.0005	<0.0005	<0.0005	NR
W-18	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	MED	EPA 601	08-14-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113
W-19	M-T	EPA 601	03-25-86		0.009	<0.0001	<0.0001	0.032	<0.0001	NR
	MED	EPA 601	08-13-87		0.007	<0.0005	<0.0005	0.015	<0.0005	NR
W-20	M-T	EPA 601	03-21-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	CAL	EPA 601	12-08-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	CAL	EPA 601	04-16-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001
	MED	EPA 601	08-13-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
W-21	M-T	EPA 601	03-21-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	CAL	EPA 601	12-09-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	CAL	EPA 601	04-16-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001
	MED	EPA 601	08-13-87	(17)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-27-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-17-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-27-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W-22	MED	EPA 601	08-17-87		0.007	0.003	<0.0005	0.021	<0.0005	NR
W-23	MED	EPA 601	08-17-87		0.004	0.001	<0.0005	0.007	<0.0005	NR
W-24	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	CAL	EPA 601	12-08-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	CAL	EPA 601	04-22-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001
	MED	EPA 601	08-13-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-17-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	05-03-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W-25	M-T	EPA 601	03-21-86		0.19	0.007	<0.0001	0.360	<0.0001	NR
	M-T	EPA 601	03-26-86		0.13	0.005	<0.0001	0.330	<0.0001	NR
	CAL	EPA 624	09-30-86	(3)	0.14	0.005	<0.005	0.220	<0.005	NR
	CAL	EPA 601	12-08-86		0.11	0.0037	<0.002	0.140	<0.002	<0.002
	CAL	EPA 601	04-15-87		0.036	0.003	<0.100	0.100	<0.050	<0.100
	MED	EPA 601	08-18-87	(9)	0.095	0.004	0.0006	0.130	<0.0005	NR
	MED	EPA 601	duplicate	(10)	0.091	0.004	0.0006	0.110	<0.0005	NR
W-26	M-T	EPA 601	03-21-86		0.013	0.009	<0.0001	0.018	<0.0001	NR
	CAL	EPA 601	04-16-87	(58)	0.022	0.020	<0.001	0.017	<0.0005	0.001
	MED	EPA 601	08-17-87		0.028	0.026	<0.0005	0.021	<0.0005	NR
	MED	EPA 601	05-17-89		0.004	0.003	<0.0005	0.001	<0.0005	<0.0005
		EPA 8010	04-20-90		0.01	0.009	<0.0005	0.003	<0.0005	<0.0005
W-27	M-T	EPA 601	03-21-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	CAL	EPA 601	04-16-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001
	MED	EPA 601	08-17-87		0.013	0.011	<0.0005	0.011	<0.0005	NR
	MED	EPA 601	05-17-89		0.009	0.006	<0.0005	0.003	<0.0005	<0.0005
	MED	EPA 8010	05-02-90		0.005	0.004	<0.0005	0.001	<0.0005	<0.0005
W-28	M-T	EPA 601	03-21-86		0.062	0.140	0.011	0.090	0.0003	NR
	M-T	EPA 601	03-26-86		0.086	0.130	0.010	0.076	<0.0001	NR
	CAL	EPA 624	09-30-86	(4)	0.093	0.150	<0.005	0.049	<0.005	NR
	CAL	EPA 601	12-09-86		0.12	0.160	<0.002	0.050	<0.002	<0.002
	CAL	EPA 601	04-16-87		0.055	0.063	<0.004	0.011	<0.002	<0.004
	CAL	EPA 601	04-16-87		0.062	0.078	<0.004	0.014	<0.002	<0.004
	MED	EPA 601	08-17-87		0.077	0.130	0.0008	0.041	0.0006	NR
	MED	EPA 601	01-13-88		0.075	0.110	0.0007	0.028	<0.0005	NR
	MED	EPA 601	05-31-88		0.110	0.170	0.0007	0.025	0.0005	<0.004
	MED	EPA 601	09-30-88		0.053	0.120	<0.0005	0.015	<0.0005	<0.001
	MED	EPA 601	01-20-89		0.076	0.140	0.0006	0.036	0.0008	<0.0005
	MED	EPA 601	05-17-89	(31)	0.22	0.160	0.0008	0.048	0.001	0.001
	MED	EPA 8010	09-20-89	(35)	0.18	0.210	0.0008	0.034	<0.0005	<0.0005
	MED	EPA 8010	01-22-90	(40)	0.085	0.140	0.0008	0.021	<0.0005	0.0006
	MED	EPA 8010	duplicate	(41)	0.093	0.160	<0.0005	0.022	<0.0005	0.0005
	MED	EPA 8010	05-02-90	(47)	0.17	0.280	0.001	0.032	<0.0005	0.001
	MED	EPA 8010	09-11-90	(52)	0.074	0.170	<0.0005	0.012	<0.0005	<0.0005
W-29	M-T	EPA 601	03-21-86		0.065	0.004	0.003	0.150	<0.0001	NR
	CAL	EPA 601	12-08-86		0.056	0.0018	<0.0005	0.064	<0.0005	<0.0005
	CAL	EPA 601	12-08-86		0.069	0.0029	<0.0005	0.075	<0.0005	<0.0005
	CAL	EPA 601	04-14-87		0.028	0.0012	<0.002	0.046	<0.001	<0.002
	MED	EPA 601	08-17-87	(12)	0.048	0.003	<0.0005	0.056	<0.0005	NR
	MED	EPA 601	01-13-88		0.049	0.002	<0.0005	0.046	<0.0005	NR
	MED	EPA 601	06-02-88	(23)	0.084	0.004	<0.0005	0.059	0.002	<0.0005
	MED	EPA 601	duplicate	(22)	0.076	0.003	<0.0005	0.049	<0.0005	<0.0005

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113	
W-30	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR	
	CAL	EPA 601	02-26-87		<0.0005	<0.0005	<0.001	0.0005	<0.001	<0.001	
	MED	EPA 601	08-17-87	(11)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR	
	MED	EPA 601	05-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	MED	EPA 8010	05-02-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
W-31	MED	EPA 601	08-17-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR	
W-32	M-T	EPA 601	03-25-86		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR	
	CAL	EPA 601	02-26-87		<0.0005	<0.0005	<0.001	0.0005	<0.001	<0.001	
	CAL	EPA 601	02-26-87		<0.0005	<0.0005	<0.001	0.0005	<0.001	<0.001	
	CAL	EPA 601	04-15-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001	
	MED	EPA 601	08-14-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR	
W-33	M-T	EPA 601	03-25-86		0.001	<0.0001	<0.0001	0.005	<0.0001	NR	
	CAL	EPA 601	12-10-86		<0.0005	<0.0005	<0.0005	0.0011	<0.0005	<0.0005	
	CAL	EPA 601	04-15-87		0.0009	<0.0005	<0.001	0.002	<0.0005	<0.001	
	MED	EPA 601	08-13-87		0.002	<0.0005	<0.0005	0.004	<0.0005	NR	
	MED	EPA 601	01-13-88		0.001	<0.0005	<0.0005	0.003	<0.0005	NR	
	MED	EPA 601	05-27-88		0.001	<0.0005	<0.0005	0.002	<0.0005	<0.0005	
	MED	EPA 601	09-30-88		0.002	<0.0005	<0.0005	0.001	<0.0005	<0.0005	
	MED	EPA 601	01-20-89		0.003	<0.0005	<0.0005	0.001	<0.0005	<0.0005	
	MED	EPA 601	05-17-89		0.0007	<0.0005	<0.0005	0.0008	<0.0005	<0.0005	
	MED	EPA 8010	09-20-89		0.004	<0.0005	<0.0005	0.002	<0.0005	<0.0005	
	MED	EPA 8010	04-20-90		0.003	<0.0005	<0.0005	0.003	<0.0005	<0.0005	
	MED	EPA 8010	09-11-90		0.003	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	
LF-1	CAL	EPA 624	09-18-86	(5)	0.061	0.007	<0.005	0.048	<0.005	NR	
	CAL	EPA 601	09-18-86		0.120	0.008	<0.002	0.074	<0.002	0.0044	
	CAL	EPA 601	12-11-86		0.095	0.0079	<0.002	0.060	<0.002	0.0076	
	CAL	EPA 601	04-14-87		0.043	0.0064	<0.002	0.028	<0.001	<0.002	
	MED	EPA 601	08-11-87		0.025	0.006	<0.0005	0.018	<0.0005	NR	
	MED	EPA 601	01-12-88		0.060	0.010	<0.0005	0.031	<0.0005	NR	
	MED	EPA 601	06-01-88		0.085	0.009	<0.0005	0.032	<0.0005	<0.003	
LF-2	CAL	EPA 624	09-17-86		0.001	<0.005	<0.005	0.002	<0.005	NR	
	CAL	EPA 601	09-18-86		<0.0005	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	
	CAL	EPA 601	12-09-86		0.0007	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	
	CAL	EPA 601	12-09-86		0.0007	<0.0005	<0.0005	0.0008	<0.0005	<0.0005	
	CAL	EPA 601	04-14-87		<0.0005	<0.0005	<0.001	0.0006	<0.0005	<0.001	
	MED	EPA 601	08-12-87		0.006	<0.0005	<0.0005	0.009	<0.0005	NR	
	MED	EPA 601	08-12-87		0.007	<0.0005	<0.0005	0.011	<0.0005	NR	
	MED	EPA 601	06-01-88		0.001	<0.0005	<0.0005	0.0007	<0.0005	<0.0005	
	MED	EPA 601	01-20-89		0.014	<0.0005	<0.0005	0.013	<0.0005	<0.0005	
	MED	EPA 601	05-15-89		0.014	<0.0005	<0.0005	0.006	<0.0005	<0.0005	
	MED	EPA 8010	01-17-90		0.020	0.001	<0.0005	0.014	<0.0005	<0.0005	
	MED	EPA 8010	05-03-90		0.022	<0.0005	<0.0005	0.012	<0.0005	<0.0005	
	MED	EPA 8010	08-31-90		0.021	0.004	<0.0005	0.005	<0.0005	<0.0005	
LF-3	CAL	EPA 624	09-18-86		0.004	<0.005	<0.005	0.011	<0.005	NR	
	CAL	EPA 601	09-18-86		0.0017	<0.0005	<0.0005	0.0058	<0.0005	0.0051	
	CAL	EPA 601	09-18-86		0.0019	<0.0005	<0.0005	0.0051	<0.0005	<0.0005	
	CAL	EPA 601	12-11-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	CAL	EPA 601	04-15-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001	
	CAL	EPA 601	04-15-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001	
	MED	EPA 601	08-11-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR	
	MED	EPA 601	05-27-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	MED	EPA 601	01-20-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	MED	EPA 601	05-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	MED	EPA 8010	01-19-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	MED	EPA 8010	04-26-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	MED	EPA 8010	08-31-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
LF-4	CAL	EPA 624	09-17-86		<0.005	<0.005	<0.005	<0.005	<0.005	NR	
	CAL	EPA 624	09-17-86		<0.005	<0.005	<0.005	<0.005	<0.005	NR	
	CAL	EPA 601	09-18-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	CAL	EPA 8240	09-18-86		<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
	CAL	EPA 601	12-11-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	CAL	EPA 601	12-11-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
	CAL	EPA 601	04-14-87		<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001	
	MED	EPA 601	08-11-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR	
	MED	EPA 601	05-25-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113
	MED	EPA 601	01-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-17-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-22-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-26-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-31-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-5	CAL	EPA 624	12-10-86		0.017	0.001	<0.005	0.020	<0.005	NR
	CAL	EPA 601	12-11-86		0.019	0.009	<0.0005	0.020	<0.0005	0.0012
	CAL	EPA 601	04-14-87		0.007	0.0005	<0.001	0.0038	<0.0005	<0.001
	MED	EPA 601	08-06-87		0.014	0.001	<0.0005	0.016	<0.0005	NR
	MED	EPA 601	01-13-88		0.015	0.001	0.0009	0.013	<0.0005	NR
	MED	EPA 601	06-01-88		0.012	0.0007	<0.0005	0.008	<0.0005	<0.001
	MED	EPA 601	09-29-88		0.018	<0.0005	<0.0005	0.019	<0.0005	<0.0005
	MED	EPA 601	01-20-89		0.023	0.003	<0.0005	0.016	<0.0005	<0.001
	MED	EPA 601	duplicate		0.023	0.003	<0.0005	0.016	<0.0005	<0.001
	MED	EPA 601	05-15-89		0.016	0.002	<0.0005	0.007	<0.0005	<0.0005
	MED	EPA 601	duplicate		0.017	0.002	<0.0005	0.008	<0.0005	<0.0005
	MED	EPA 8010	09-19-89		0.010	0.0006	<0.0005	0.002	<0.0005	<0.0005
	MED	EPA 8010	01-18-90		0.002	0.0006	<0.001	0.0007	<0.001	<0.001
	MED	EPA 8010	05-01-90		0.002	<0.0005	<0.001	0.0007	<0.001	<0.001
	MED	EPA 8010	09-10-90		0.0006	<0.0005	<0.001	<0.0005	<0.001	<0.001
LF-6	CAL	EPA 624	12-10-86		<0.005	<0.005	<0.005	0.001	<0.005	NR
	CAL	EPA 624	12-10-86		<0.005	<0.005	<0.005	0.001	<0.005	NR
	CAL	EPA 601	12-11-86		<0.0005	<0.0005	<0.0005	0.0009	<0.0005	NR
	CAL	EPA 601	04-14-87		<0.0005	<0.0005	<0.001	0.0013	<0.0005	<0.001
	MED	EPA 601	08-11-87		0.004	0.0006	<0.0005	0.008	<0.0005	NR
	MED	EPA 601	01-12-88	(18)	0.002	<0.0005	<0.0005	0.004	<0.0005	NR
	MED	EPA 601	06-01-88		0.005	<0.0005	<0.0005	0.005	<0.0005	<0.001
	MED	EPA 601	09-28-88		0.005	<0.0005	<0.0005	0.005	<0.0005	<0.001
	MED	EPA 601	01-20-89		0.005	<0.0005	<0.0005	0.003	<0.0005	<0.0005
	MED	EPA 601	05-16-89		0.003	<0.0005	<0.0005	0.002	<0.0005	<0.0005
	MED	EPA 8010	09-19-89		0.004	<0.0005	<0.0005	0.001	<0.0005	<0.0005
	MED	EPA 8010	01-22-90		0.002	<0.0005	<0.0005	0.001	<0.0005	<0.0005
	MED	EPA 8010	05-01-90		0.002	<0.0005	<0.0005	0.0007	<0.0005	<0.0005
	MED	EPA 8010	09-10-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-7	CAL	EPA 601	04-13-87		<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001
	CAL	EPA 624	04-21-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	08-07-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-26-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-15-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-04-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	08-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-8	CAL	EPA 601	04-13-87		<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001
	CAL	EPA 624	04-21-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	08-10-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-26-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-15-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-01-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	08-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-9	CAL	EPA 601	04-13-87		<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001
	CAL	EPA 624	04-21-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	08-10-87		0.0007	<0.0005	<0.0005	0.001	<0.0005	NR
	MED	EPA 601	01-13-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-26-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	09-28-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-15-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	09-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-22-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	05-03-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	09-10-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	duplicate		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-10	CAL	EPA 601	04-10-87		<0.0005	<0.0005	<0.001	<0.0005	<0.001	<0.001
	CAL	EPA 601	04-21-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	08-12-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-25-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113
	MED	EPA 601	05-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	04-25-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-11	MED	EPA 601	08-17-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
LF-12	MED	EPA 601	07-01-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.002
	MED	EPA 624	08-10-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	05-25-88		0.004	0.001	<0.0005	0.004	0.001	<0.002
	MED	EPA 601	07-01-88		0.004	<0.0005	<0.0005	0.001	<0.0005	<0.0005
	MED	EPA 601	09-30-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-17-89		0.001	<0.0005	<0.0005	0.0006	<0.0005	<0.0005
	MED	EPA 601	05-10-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	09-18-89		0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	09-18-89		0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-17-90		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-27-90		0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	09-11-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-13	CAL	EPA 601	04-15-87		<0.0005	0.0008	<0.001	0.0014	<0.0005	<0.001
	MED	EPA 601	07-01-87		0.011	0.0007	<0.0005	0.006	<0.0005	<0.0005
	MED	EPA 624	08-07-87		0.009	<0.005	<0.005	0.008	<0.005	NR
	MED	EPA 624	duplicate		0.010	<0.005	<0.005	0.007	<0.005	NR
	MED	EPA 601	01-13-88		0.009	0.0005	0.002	0.007	<0.0005	NR
	MED	EPA 601	05-31-88		0.009	0.0007	<0.0005	0.006	<0.0005	<0.002
	MED	EPA 601	duplicate		<0.0005	0.0008	<0.0005	0.007	<0.0005	<0.003
	MED	EPA 601	09-29-88		0.006	<0.0005	<0.0005	0.004	<0.0005	<0.0005
	FIR	EPA 601	09-29-88		0.0016	<0.0005	<0.0005	0.0025	<0.0005	NR
	NET	EPA 624	09-29-88		<0.0028	<0.0047	<0.0028	<0.0038	<0.0019	NR
	MED	EPA 601	01-18-89		0.004	<0.0005	<0.0005	0.004	<0.0005	<0.0005
	MED	EPA 601	05-10-89	(29)	0.003	<0.0005	<0.0005	0.002	<0.0005	<0.0005
	MED	EPA 8010	09-19-89		0.023	0.0005	<0.0005	0.008	<0.0005	0.002
	MED	EPA 8010	01-18-90		0.004	<0.0005	<0.0005	0.004	<0.0005	<0.0005
	MED	EPA 8010	05-02-90		0.022	<0.0005	<0.0005	0.009	<0.0005	0.002
	EPA	EPA 8240	split		0.015	0.001	<0.001	0.008	<0.001	NA
	MED	EPA 8010	09-11-90		0.007	<0.0005	<0.0005	0.003	<0.0005	<0.0005
LF-14	MED	EPA 601	07-01-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 624	08-10-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	05-24-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-17-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-10-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-18-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-02-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-15	MED	EPA 601	07-08-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 624	08-06-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	05-25-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-18-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-11-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-17-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-24-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-29-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-16	MED	EPA 601	07-08-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 624	08-07-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	05-26-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	10-18-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-18-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-11-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	09-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-19-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-25-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-28-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-17	MED	EPA 601	07-08-87	(7)	0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 624	08-06-87		0.008	<0.005	<0.005	0.007	<0.005	NR
	MED	EPA 601	01-12-88		0.012	0.001	0.0006	0.011	<0.0005	NR
	MED	EPA 601	01-12-88		0.012	0.0007	0.003	0.009	<0.0005	NR
	MED	EPA 601	05-26-88		0.009	0.0005	<0.0005	0.007	<0.0005	<0.001
	MED	EPA 601	09-29-88		0.006	<0.0005	<0.0005	0.007	<0.0005	<0.0005
	MED	EPA 601	01-18-89		0.008	<0.0005	<0.0005	0.007	<0.0005	<0.0005
	MED	EPA 601	05-11-89		0.007	<0.0005	<0.0005	0.005	<0.0005	<0.0005

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113
	MED	EPA 601	duplicate		0.008	<0.0005	<0.0005	0.005	<0.0005	<0.0005
	MED	EPA 8010	09-19-89		0.020	<0.0005	<0.0005	0.008	<0.0005	0.0006
	MED	EPA 8010	duplicate		0.020	<0.0005	<0.0005	0.008	<0.0005	<0.0005
	MED	EPA 8010	01-18-90		0.012	0.0006	<0.0005	0.009	<0.0005	<0.0005
	MED	EPA 8010	05-02-90		0.020	0.0009	<0.0005	0.01	<0.0005	0.0006
	EPA	EPA 8240	split	(55)	0.018	0.002	<0.001	0.009	<0.001	NA
	MED	EPA 8010	08-29-90		0.019	0.001	<0.0005	0.009	<0.0005	<0.0005
LF-18	MED	EPA 601	07-08-87		0.003	<0.0005	<0.0005	0.007	<0.0005	<0.0005
	MED	EPA 624	08-06-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	05-31-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-19-88		0.0007	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-15-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-19-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	duplicate		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-25-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-19	MED	EPA 601	07-23-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 624	08-12-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	05-31-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-24-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-20	MED	EPA 601	07-23-87		<0.0005	0.002	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 624	08-12-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	05-31-88		0.0008	0.004	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	04-24-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-21	MED	EPA 8240	4-24-90		<0.005	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8240	duplicate		<0.005	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8010	05-02-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	duplicate		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	EPA	EPA 8240	split	(56)	<0.001	<0.001	<0.001	<0.001	<0.001	NA
	MED	EPA 8010	08-29-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-22	MED	EPA 601	08-12-87		0.007	<0.0005	<0.0005	0.011	<0.0005	<0.0005
	MED	EPA 8240	04-24-90		0.006	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8010	04-30-90		0.012	<0.0005	<0.0005	0.004	<0.0005	<0.0005
	MED	EPA 8010	08-30-90		0.020	0.0006	<0.0005	0.007	<0.0005	<0.0005
LF-23	MED	EPA 601	08-14-87		1.6	0.400	<0.0005	0.620	<0.0005	<0.0005
	MED	EPA 8240	04-23-90		<0.005	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8010	04-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-24	MED	EPA 8240	04-19-90		<0.005	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8240	duplicate		<0.005	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8010	05-02-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	EPA	EPA 8240	split		<0.001	<0.001	<0.001	<0.001	<0.001	NA
	MED	EPA 8010	08-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-25	MED	EPA 8010	01-12-88		0.012	0.0007	0.003	0.009	<0.0005	0.001
	MED	EPA 8240	04-23-90		0.005	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8010	04-30-90		0.007	<0.0005	<0.0005	0.004	<0.0005	0.001
	MED	EPA 8010	08-29-90		0.004	<0.0005	<0.0005	0.003	<0.0005	<0.0005
	MED	EPA 8010	duplicate		0.004	<0.0005	<0.0005	0.002	<0.0005	<0.0005
LF-26	MED	EPA 8240	04-23-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	MED	EPA 8010	04-30-90		<0.0005	0.005	<0.0005	0.004	<0.0005	0.004
	MED	EPA 8010	08-29-90		0.002	<0.0005	<0.0005	0.0008	<0.0005	<0.0005
	MED	EPA 8010	duplicate		0.002	<0.0005	<0.0005	0.001	<0.0005	<0.0005
LF-27	MED	EPA 8240	04-24-90		<0.005	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8010	05-03-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	duplicate		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	EPA	EPA 8240	split	(57)	<0.001	<0.001	<0.001	<0.001	<0.001	NA
	MED	EPA 8010	08-28-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	duplicate		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113
LF-28	MED	EPA 8240	04-20-90		<0.005	<0.005	<0.005	<0.005	<0.005	NA
	MED	EPA 8010	05-01-90		0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-29-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
DH-2	MED	EPA 8010	06-15-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-31-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Station 5	M-T	EPA 601	11-20-86		<0.0001	<0.0001	<0.0001	0.0009	<0.0001	NR
	CAL	EPA 601	12-10-86		0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005
	CAL	EPA 601	12-10-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	M-T	EPA 601	12-12-86		0.0009	0.0009	<0.0001	0.0032	<0.0001	NR
	M-T	EPA 601	12-30-86		0.0004	<0.0001	<0.0001	0.0007	<0.0001	NR
	CAL	EPA 601	02-05-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	B&C	EPA 601	02-05-87		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	CAL	EPA 601	02-26-87		0.0008	<0.0005	<0.001	<0.0005	<0.001	<0.001
	CAL	EPA 601	02-26-87		<0.0005	<0.0005	<0.001	0.0005	<0.001	<0.001
	M-T	EPA 601	03-27-87	(8)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	NR
	CAL	EPA 601	04-21-87	(6)	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.001
	M-T	EPA 601	05-22-87	(8)	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	NR
	M-T	EPA 601	12-03-87		0.0013	0.0006	<0.0005	0.0012	<0.0005	NR
	M-T	EPA 601	12-21-87		0.0012	0.0007	<0.0005	0.0014	<0.0005	NR
	MED	EPA 601	12-30-87		0.002	<0.0005	<0.0005	0.002	<0.0005	NR
	MED	EPA 601	01-13-88		0.001	<0.0005	<0.0005	0.001	<0.0005	NR
	MED	EPA 601	05-26-88		0.002	<0.0005	<0.0005	0.0009	<0.0005	<0.0005
	MED	EPA 601	duplicate		0.002	<0.0005	<0.0005	0.0009	<0.0005	<0.0005
Sola City Well	CAL	EPA 601	12-10-86		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	08-11-87	(16)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-26-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-16-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	04-26-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Stero	CAL	EPA 601	04-10-87		<0.0005	<0.0005	<0.001	0.0006	<0.001	<0.001
	MED	EPA 601	08-12-87	(13)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-26-88	(19)	0.002	<0.0005	<0.0005	0.001	<0.0005	<0.0005
	MED	EPA 601	01-20-89	(28)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-11-89	(30)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-22-90	(44)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Crandell	CAL	EPA 601	02-05-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	CAL	EPA 601	02-05-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	08-12-87	(14)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	05-26-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	01-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 601	05-11-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
E-1	MED	EPA 601	04-29-88	(25)	0.480	0.120	<0.0005	0.079	0.002	<0.010
	MED	EPA 601	09-28-88	(24)	0.160	0.054	<0.0005	0.023	<0.0005	<0.002
	MED	EPA 601	01-20-89		0.056	0.013	<0.0005	0.007	<0.0005	<0.0005
	MED	EPA 601	05-19-89		0.130	0.047	<0.0005	0.012	<0.0005	<0.0005
	MED	EPA 8010	09-20-89	(36)	0.320	0.120	<0.0005	0.020	<0.0005	<0.0005
	MED	EPA 8010	01-19-90		0.120	0.110	<0.0005	0.018	<0.0005	<0.0005
	MED	EPA 8010	04-30-90	(48)	0.1	0.080	<0.0005	0.012	<0.0005	<0.0005
	MED	EPA 8010	duplicate	(49)	0.091	0.059	<0.0005	0.009	<0.0005	<0.0005
	MED	EPA 8010	08-28-90	(53)	0.110	0.085	<0.0005	0.015	<0.0005	<0.0005
E-2	MED	EPA 601	04-29-88	(26)	0.830	0.031	<0.0005	0.460	0.005	<0.0005
	MED	EPA 601	09-28-88		0.110	0.011	<0.0005	0.043	<0.0005	<0.0005
	MED	EPA 601	01-20-89		0.051	0.005	<0.0005	0.022	<0.0005	<0.0005
	MED	EPA 601	05-19-89		0.068	0.036	<0.0005	0.022	<0.0005	<0.0005
	MED	EPA 8010	09-20-89		0.210	0.110	0.0006	0.031	<0.0005	<0.0005
	MED	EPA 8010	01-22-90		0.041	0.028	<0.0005	0.011	<0.0005	<0.0005
	MED	EPA 8010	04-30-90		0.010	0.002	<0.0005	0.003	<0.0005	<0.0005
	MED	EPA 8010	08-28-90	(54)	0.090	0.063	0.0006	0.020	<0.0005	<0.0005
E-3	MED	EPA 601	04-28-88		0.090	0.008	<0.0005	0.041	0.001	<0.010
	MED	EPA 601	Duplicate		0.096	0.008	<0.0005	0.044	0.0009	<0.010
	MED	EPA 601	09-28-88		0.110	0.013	<0.0005	0.043	<0.0005	<0.0005
	MED	EPA 601	01-20-89		0.081	0.014	<0.0005	0.034	<0.0005	<0.0005
	MED	EPA 601	05-19-89		0.130	0.034	<0.0005	0.035	<0.0005	0.009
	MED	EPA 8010	09-20-89		0.110	0.009	<0.0005	0.016	<0.0005	0.002
	MED	EPA 8010	01-22-90		0.053	0.012	<0.0005	0.011	<0.0005	0.0008

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113
	MED	EPA 8010	05-01-90		0.072	0.021	<0.0005	0.015	<0.0005	0.0007
	MED	EPA 8010	08-28-90		0.038	0.009	<0.0005	0.006	<0.0005	<0.0005
E-4	MED	EPA 601	04-28-88		0.041	0.071	<0.0005	0.015	<0.0005	<0.001
	MED	EPA 601	09-28-88		0.050	0.090	<0.0005	0.014	<0.0005	<0.0005
	MED	EPA 601	01-20-89		0.031	0.061	<0.0005	0.010	<0.0005	<0.0005
	MED	EPA 601	05-17-89		0.039	0.058	<0.0005	0.010	<0.0005	<0.0005
	MED	EPA 8010	09-20-89		0.068	0.079	<0.0005	0.011	<0.0005	<0.0005
	MED	EPA 8010	01-22-90	(43)	0.032	0.063	<0.0005	0.007	<0.0005	<0.0005
	MED	EPA 8010	05-01-90	(50)	0.033	0.066	<0.0005	0.007	<0.0005	<0.0005
	MED	EPA 8010	08-28-90		0.032	0.075	<0.0005	0.006	<0.0005	<0.0005
E-5	MED	EPA 601	04-28-88		0.014	0.002	<0.0005	0.010	0.003	<0.001
	MED	EPA 601	09-28-88		0.024	0.003	<0.0005	0.019	<0.0005	<0.0005
	MED	EPA 601	01-20-89		0.024	0.002	<0.0005	0.018	<0.0005	0.0009
	MED	EPA 601	05-16-89		0.026	0.004	<0.0005	0.012	<0.0005	<0.0005
	MED	EPA 8010	09-20-89		0.055	0.006	<0.0005	0.018	<0.0005	<0.0005
	MED	EPA 8010	01-19-90		0.020	0.005	<0.0005	0.010	<0.0005	<0.0005
	MED	EPA 8010	05-01-90		0.026	0.006	<0.0005	0.010	<0.0005	<0.0005
	MED	EPA 8010	08-27-90		0.023	0.004	<0.0005	0.009	<0.0005	<0.0005
E-6	MED	EPA 601	09-28-88		0.026	0.001	<0.0005	0.020	<0.0005	<0.0005
	MED	EPA 601	01-20-89		0.015	<0.0005	<0.0005	0.013	<0.0005	<0.0005
	MED	EPA 601	05-19-89		0.017	0.0006	<0.0005	0.011	<0.0005	<0.0005
	MED	EPA 8010	09-20-89		0.037	0.001	<0.0005	0.017	<0.0005	<0.0005
	MED	EPA 8010	01-19-90		0.020	0.003	<0.0005	0.015	<0.0005	<0.0005
	MED	EPA 8010	04-26-90		0.023	0.003	<0.0005	0.012	<0.0005	<0.0005
	MED	EPA 8010	08-27-90		0.017	0.002	<0.0005	0.008	<0.0005	<0.0005
E-7	MED	EPA 601	09-29-88		0.023	0.007	<0.0005	0.013	<0.0005	<0.0005
	FIR	EPA 601	09-29-88		0.056	0.0046	<0.0005	0.0072	<0.0005	NR
	NET	EPA 624	09-29-88		<0.0028	<0.0047	<0.0028	<0.0038	<0.0019	NR
	MED	EPA 601	01-20-89		0.005	<0.0005	<0.0005	0.001	<0.0005	<0.0005
	MED	EPA 601	01-20-89		0.004	0.001	<0.0005	0.001	<0.0005	<0.0005
	MED	EPA 601	05-19-89		0.003	0.0006	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	09-20-89		0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	01-19-90		0.0007	0.0006	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	05-01-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	duplicate		<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-27-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
E-8	MED	EPA 601	04-28-88		0.010	0.001	<0.0005	0.009	<0.0005	<0.001
	MED	EPA 601	09-29-88		0.009	<0.0005	<0.0005	0.009	<0.0005	<0.0005
	MED	EPA 601	01-20-89		0.021	<0.0005	<0.0005	0.010	<0.0005	0.002
	MED	EPA 601	05-17-89		0.010	<0.0005	<0.0005	0.004	<0.0005	<0.0005
	MED	EPA 8010	09-19-89		0.012	<0.0005	<0.0005	0.003	<0.0005	<0.0005
	MED	EPA 8010	01-17-90		0.004	<0.0005	<0.0005	0.002	<0.0005	<0.0005
	MED	EPA 8010	05-01-90		0.004	<0.0005	<0.0005	0.001	<0.0005	<0.0005
	MED	EPA 8010	08-27-90		0.003	<0.0005	<0.0005	0.001	<0.0005	<0.0005
E-9	MED	EPA 601	04-27-88		0.090	0.0007	<0.0005	0.009	<0.0005	<0.002
	MED	EPA 601	09-30-88		0.008	<0.0005	<0.0005	0.006	<0.0005	<0.001
	MED	EPA 601	01-20-89		0.013	<0.0005	<0.0005	0.008	<0.0005	0.002
	MED	EPA 601	05-16-89		0.011	<0.0005	<0.0005	0.006	<0.0005	<0.0005
	MED	EPA 8010	09-19-89		0.016	<0.0005	<0.0005	0.006	<0.0005	<0.0005
	MED	EPA 8010	01-17-90		0.007	<0.0005	<0.0005	0.004	<0.0005	<0.0005
	MED	EPA 8010	05-01-90		0.007	<0.0005	<0.0005	0.003	<0.0005	<0.0005
	MED	EPA 8010	08-27-90		0.004	<0.0005	<0.0005	0.002	<0.0005	<0.0005
PZ-1	MED	EPA 601	05-18-89		0.004	0.016	<0.0005	0.0008	<0.0005	<0.0005
PZ-2	MED	EPA 601	05-18-89		0.021	0.007	<0.0005	0.006	<0.0005	<0.0005
PZ-3	MED	EPA 601	05-18-89		0.003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
PZ-5	MED	EPA 601	05-16-89		0.018	0.002	<0.0005	0.0005	<0.0005	<0.0005
PZ-8	MED	EPA 601	05-16-89		0.014	0.0005	<0.0005	0.007	<0.0005	<0.0005
PZ-10	MED	EPA 601	05-16-89		0.007	<0.0005	<0.0005	0.006	<0.0005	<0.0005

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113
FIELD BLANK	MED	EPA 624	08-07-87		<0.005	<0.005	<0.005	<0.005	<0.005	NR
	MED	EPA 601	08-12-87	(15)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	08-14-87		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
	MED	EPA 601	08-18-87		<0.0005	0.0008	<0.0005	<0.0005	<0.0005	NR
W29	MED	EPA 601	01-13-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NR
LF-17	MED	EPA 601	01-12-88		0.0009	<0.0005	<0.0005	<0.0005	<0.0005	NR
W14	MED	EPA 601	01-12-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
E-1	MED	EPA 601	04-29-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-4	MED	EPA 601	05-25-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W-14	MED	EPA 601	06-02-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
E-1	MED	EPA 601	09-28-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-9	MED	EPA 601	09-28-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W28	MED	EPA 601	09-30-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
E-9	MED	EPA 601	09-30-88		0.008	<0.0005	<0.0005	0.006	<0.0005	<0.001
LF-16	MED	EPA 601	10-18-88		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-13	MED	EPA 601	05-10-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W27	MED	EPA 601	05-17-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W15B	MED	EPA 601	05-19-89		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W33	MED	EPA 8010	09-20-89	(37)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-12	MED	EPA 8010	09-18-89	(38)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-16	MED	EPA 8010	09-18-89	(39)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-18	MED	EPA 8010	01-19-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
W14	MED	EPA 8010	01-22-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-24	MED	EPA 8240	04-19-90		<0.005	<0.005	<0.005	<0.005	<0.005	NR
LF-28	MED	EPA 8240	04-20-90		<0.005	<0.005	<0.005	<0.005	<0.005	NR
LF-23	MED	EPA 8240	04-23-90		<0.005	<0.005	<0.005	<0.005	<0.005	NR
LF-25	MED	EPA 8240	04-23-90		<0.005	<0.005	<0.005	<0.005	<0.005	NR
LF-26	MED	EPA 8240	04-23-90		<0.005	<0.005	<0.005	<0.005	<0.005	NR
LF-21	MED	EPA 8240	04-21-90		<0.005	<0.005	<0.005	<0.005	<0.005	NR
LF-12	MED	EPA 8010	04-27-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-23	MED	EPA 8010	04-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-27	MED	EPA 8010	05-03-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-7	MED	EPA 8010	05-04-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-3	MED	EPA 8010	08-31-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-4	MED	EPA 8010	08-30-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-6	MED	EPA 8010	09-10-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
LF-17	MED	EPA 8010	08-29-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
TRIP BLANK	MED	EPA 8010	01-17-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	06-15-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-28-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	08-31-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	MED	EPA 8010	09-10-90		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113

NOTES TO TABLE 1

NR = Not reported
NA = Not Analyzed

Analytical Laboratories:

M-T = Multi-Tech Laboratories, Inc., Santa Rosa, California
CAL = California Analytical Laboratories, Inc., Sacramento, California
B&C = Brown and Caldwell Laboratories, Emeryville, California
MED = Med-Tox Associates, Inc., Pleasant Hill, California.
FIR = Fireman's Fund Environmental Laboratory, Petaluma, California.
NET = National Environmental Testing, Inc., Santa Rosa, California.
EPA = U.S. Environmental Protection Agency. Split sample collected by EPA and analyzed by EPA contract laboratory.

NOTES:

(1) 1,1,2-Trichlorethane and Toluene detected at concentrations below the reporting limits.
(2) Toluene detected at a concentration below the reporting limit.
(3) 1,1,2-Trichloroethane detected at a concentration below the reporting limit.
(4) Chloroethane and Methylene Chloride detected at concentrations below the reporting limits.
(5) Toluene detected at a concentration below the reporting limit.
(6) Chloroform detected at 0.002 ppm, Bromodichloromethane detected at 0.0025 ppm, and Dibromochloromethane detected at 0.0022 ppm.
(7) Chloroform detected at 0.001 ppm and Bromodichloromethane detected at 0.0009 ppm.
(8) Samples were collected by Multi-Tech personnel for the City of Petaluma.
(9) Dibromochloromethane detected at 0.001 ppm.
(10) Dibromochloromethane detected at 0.001 ppm.
(11) Tetrachloroethene detected at 0.001 ppm.
(12) Dibromochloromethane detected at 0.0009 ppm.
(13) Bromodichloromethane detected at 0.002 ppm, Chloroform detected at 0.002 ppm, Bromoform detected at 0.002 ppm, Dibromochloromethane detected at 0.002 ppm, Tetrachloroethene detected at 0.002 ppm, and Trans-1,2-Dichloroethene detected at 0.0007 ppm.
(14) Tetrachloroethene detected at 0.001 ppm.
(15) Tetrachloroethene detected at 0.0007 ppm.
(16) Tetrachloroethene detected at 0.0007 ppm.
(17) Tetrachloroethene detected at 0.0006 ppm.
(18) Tetrachloroethene detected at 0.0005 ppm
(19) Chloroform detected at 0.0005 ppm
(20) Trans-1,2-Dichloroethene detected at 0.002 ppm.
(21) Trans-1,2-Dichloroethene detected at 0.002 ppm.
(22) 1,1,2-Trichloroethane detected at 0.001 ppm.
(23) Chlorobenzene detected at 0.002 ppm and 1,1,2-Trichloroethane detected at 0.0008 ppm.
(24) 1,2-Dichloropropane detected at 0.0006 ppm.
(25) 1,1,2-Trichloroethane detected at 0.001 ppm.
(26) 1,1,2-Trichloroethane detected at 0.002 ppm.
(27) Dibromochloromethane detected at 0.001 ppm and Tetrachloroethene detected at 0.0008 ppm.
(28) Bromodichloromethane detected at 0.005 ppm, Bromoform detected at 0.0005 ppm, Chloroform detected at 0.005 ppm and Dibromochloroethane detected at 0.004 ppm.
(29) Dichlorodifluoromethane detected at 0.0007 ppm.
(30) Bromoform detected at 0.002 ppm.
(31) Trichlorofluromethane detected at 0.005 ppm.
(32) Chloroform detected at 0.001 ppm, Tetrachloroethene detected at 0.002 ppm, 1,1,2-Trichloroethane detected at 0.002 ppm and Trichlorofluormethane detected at 0.003 ppm.
(33) Chloroform detected at 0.001 ppm, Tetrachloroethene detected at 0.002 ppm, 1,1,2-Trichloroethane detected at 0.002 ppm and Trichlorofluormethane detected at 0.003 ppm.
(34) Chloroform detected at 0.001 ppm, Tetrachloroethene detected at 0.002 ppm, 1,1,2-Trichloroethane detected at 0.002 ppm and Trichlorofluormethane detected at 0.003 ppm.
(35) Trichlorofluormethane detected at 0.003 ppm.
(36) Trichlorofluormethane detected at 0.003 ppm.
(37) Chloroform detected at 0.002 ppm.
(38) Chloroform detected at 0.002 ppm.
(39) Chloroform detected at 0.002 ppm.
(40) Trichlorofluoromethane detected at 0.003 ppm.
(41) Trichlorofluoromethane detected at 0.001 ppm.
(42) Chloroform detected at 0.0006 ppm and Mthylene C hloride detected at 0..0008 ppm.
(43) Trichlorofluoromethane detected at 0.001 ppm.
(44) Bromodichloromethane detected at 0.006 ppm, Bromoform detected at 0.002 ppm, Chloroform detected at 0.003 ppm and Dibromochloromethane detected at 0.007 ppm.
(45) chloroform, 1,1,2-TCA, PCE, and Freon 11 detected at 0.007, 0.003, 0.002, and 0.004 ppm, respectively
(46) chloroform, 1,1,2-TCA, PCE, and Freon 11 detected at 0.001, 0.003, 0.002, and 0.003 ppm, respectively

TABLE 1

HISTORICAL GROUND-WATER QUALITY DATA
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA
(concentrations expressed in ppm)

WELL NO.	LAB	ANALYSIS	DATE SAMPLED	NOTES	1,1-DCE	1,1-DCA	1,2-DCA	TCA	TCE	FREON 113

Notes to TABLE 1 (continued)

(47) Freon 11 detected at 0.009 ppm
(48) Freon 11 detected at 0.0009 ppm
(49) Freon 11 detected at 0.001 ppm
(50) Freon 11 detected at 0.0007 ppm
(51) Chloroform detected at 0.0009 ppm, PCE detected at 0.001 ppm, 1,1,2 TCA detected at 0.002 ppm and Freon 11 detected at 0.002 ppm
(52) Freon 11 detected at 0.0007 ppm
(53) Methylene Chloride detected at 0.0006 ppm
(54) Methylene Chloride detected at 0.0006 ppm
(55) Toluene detected at 0.003 ppm.
(56) Toluene detected at 0.003 ppm.
(57) Toluene detected at 0.017 ppm.
(58) Methylene Chloride detected at 0.0051 ppm

TABLE 2

WELL CONSTRUCTION DETAILS
SOLA OPTICAL USA, INC., SITE
PETALUMA, CALIFORNIA

Well No.	Well Elevation (feet-MSL)	Screened Interval (depth in feet below grade)	Sediment Depth Interval	Well Diameter (inches)
W-12	33.87	15 - 20	Shallow	2
W-13	31.99	35 - 42	Intermediate	2
W-14	32.23	15 - 19	Shallow	2
W-15	31.39	40 - 53	Intermediate	2
W-17	30.45	11 - 16	Shallow	2
W-18	29.46	10 - 14	Shallow	2
W-19	27.33	11 - 16	Shallow	2
W-20	25.73	45 - 64	Intermediate	2
W-21	25.85	39 - 59	Intermediate	2
W-22	25.90	12 - 17	Shallow	2
W-23	26.90	12 - 17	Shallow	2
W-24	25.11	9 - 19	Shallow	2
W-25	26.95	11 - 24	Shallow	2
W-26	27.86	9 - 20	Shallow	2
W-27	29.21	9 - 20	Shallow	2
W-28	29.50	9 - 20	Shallow	2
W-30	31.62	8 - 18	Shallow	2
W-32	23.08	11 - 22	Shallow	2
W-33	21.64	8 - 18	Shallow	2
LF-2	24.12	20 - 29	Shallow	4
LF-3	25.77	44 - 50	Intermediate	4
LF-4	27.76	35 - 40	Intermediate	4
LF-5	24.04	24 - 33	Shallow	4
LF-6	20.48	39 - 43	Intermediate	4
LF-7	27.30	25 - 35	Shallow	4
LF-8	24.58	25 - 34	Shallow	4
LF-9	27.33	30 - 38	Intermediate	4
LF-10	29.66	29 - 44	Intermediate	4
LF-11	29.42	4 - 9	Shallow	4
LF-12	32.52	212 - 233	Deepest	4
LF-13	32.51	151 - 161	Deeper	4
LF-14	32.34	79 - 89	Deep	4
LF-15	24.85	205 - 215	Deepest	4
LF-16	24.95	163 - 173	Deeper	4
LF-17	25.05	68 - 78	Deep	4
LF-18	27.13	92 - 102	Deep	4
LF-19	30.51	36 - 47	Intermediate	4
LF-20	30.50	14 - 24	Shallow	4
LF-21	28.94	40 - 50	Intermediate	4
LF-22	25.78	39 - 49	Intermediate	4
LF-23	22.94	45 - 55	Intermediate	4
LF-24	22.69	84 - 94	Deep	4
LF-25	19.16	18 - 28	Shallow	4

TABLE 2

WELL CONSTRUCTION DETAILS
SOLA OPTICAL USA, INC., SITE
PETALUMA, CALIFORNIA

Well No.	Well Elevation (feet-MSL)	Screened Interval (depth in feet below grade)	Sediment Depth Interval	Well Diameter (inches)
LF-26	19.12	38 - 48	Intermediate	4
LF-27	25.45	220 - 240	Deepest	4
LF-28	18.71	14 - 24	Shallow	4
STERO	22.92	?	?	4
SOLA CITY	32.67	60 - 280	Deepest	6
STATION 5	30.17	180 - 512	Deepest	6
PZ-1	28.67	8 - 35	Shallow	2
PZ-2	28.30	8 - 28	Shallow	2
PZ-3	26.77	8 - 30	Shallow	2
PZ-4	27.27	8 - 30	Shallow	2
PZ-5	26.08	8 - 31	Shallow	2
PZ-6	26.55	10 - 31	Shallow	2
PZ-7	25.58	11 - 31	Shallow	2
PZ-8	25.68	7 - 27	Shallow	2
PZ-9	24.37	9 - 29	Shallow	2
PZ-10	23.68	8 - 28	Shallow	2
PZ-11	21.47	8 - 28	Shallow	2
PZ-12	21.17	9 - 29	Shallow	2
E-1	29.69	8 - 28	Shallow	5
E-2	29.55	9 - 29	Shallow	5
E-3	27.34	9 - 29	Shallow	5
E-4	26.76	9 - 29	Shallow	5
E-5	24.45	9 - 29	Shallow	5
E-6	24.81	23 - 38	Shallow	5
E-7	24.51	23 - 30	Shallow	4
E-8	23.06	14 - 49	Intermediate	5
E-9	20.72	14 - 49	Intermediate	5

TABLE 3

SUMMARY OF CALCULATED HYDRAULIC PARAMETERS
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA

Well	Hydraulic Conductivity (cm/sec)	Hydraulic Conductivity (gpd/ft2)	Transmissivity (gpd/ft)	Storativity	Approximate Unit Thickness (feet)	Expected Yield (gpm)	LF Report
Intermediate							
LF-1	NA	NA	NA	NA	NA	NA	2/87
LF-3	1.6E-05	0.4	1.0	NA	3	NA	2/87
LF-4	1.0E-02	224.3	897.1	NA	5	NA	2/87
E2	7.1E-05	0.4	1.4	NA	4	1.0	5/88
E3	1.5E-05	0.3	1.2	NA	4	0.1	5/88
E4	3.7E-05	0.8	4.0	NA	5	0.3	5/88
E5	1.6E+00	4.0	15.9	NA	4	0.4	5/88
E6	3E-03	58	864	NA	15	>5	5/88
E8	2E-02	87	869	NA	8	>5	5/88
Deeper							
LF-13	4E-03	90	2,700 (1)	1.5E-04	30	NA	1/88
LF-14	3E-02	733	22,000 (1,3)	2.4E-02	30	NA	1/88
LF-16	4E-03	77	2,300 (1)	5.0E-04	30	NA	1/88
LF-17	8E-03	170	5,100 (1,3)	4.0E-04	30	NA	1/88
LF-18	9E-03	193	5,800 (1,3)	2.0E-04	30	NA	1/88
Stero	7E-03	140	4,200 (1,2,3)	1.0E-03	30	NA	1/88
Deepest							
LF-12	4E-03	80	2,400 (1,3)	1.0E-04	30	NA	1/88
LF-15	2E-03	33	1,000 (1,3)	1.0E-03	30	NA	1/88
Sola City	1E-02	237	7,100 (1,3)	3.4E-02	30	NA	1/88
Station 5	(2E-03 - 4E-03)	(35 - 89)	(2,300 - 5,800)(1,3,4)	NA	65	250	1/88

Notes: (1) Observation well screened across different depth interval than (Station 5) pumping well.
(2) unknown perforated depth interval of observation well.
(3) values approximate due to semi-confined conditions.
(4) High and low values given represent analysis of early time and late time pumping data, respectively.
(NA) Not Analyzed

TABLE 4

SUMMARY OF CHEMICAL ANALYSIS OF SOIL AND WATER SAMPLES
COLLECTED FROM THE TANK EXCAVATION PIT
ON JULY 13 AND 29, 1985
SOLA OPTICAL USA, INC., SITE
PETALUMA, CALIFORNIA
(Concentrations detected in parts per million [ppm])

Sample Name	EPA Method	Acetone	Trans-1,2-DCE	1,1,1-TCA	DCA	Benzene	Toluene	Ethyl-benzene	Xylenes	1,4 and 1,2 Dichloro-benzene	1,3-Dichloro-benzene	Chloro-benzene
SOIL SAMPLES COLLECTED FROM INITIAL EXCAVATION (CONDUCTED JULY 13, 1985):												
East Tank 1	601/602	37	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
West Tank 1	601/602	17	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Side Tank 1 *	601/602	54	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Center Tank 1	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
East Tank 2	601/602	1.2	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
West Tank 2	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Center Tank 2	601/602	5.6	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
East Tank 3	601/602	1.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
West Tank 3	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Center Tank 3	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
East Tank 4	601/602	9.0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
West Tank 4	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Side Tank 4	601/602	7.5	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Center Tank 4	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
East Tank 5	601/602	48	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
West Tank 5	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Side Tank 5	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Side Tank 5	601/602	3.8	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001

TABLE 4

SUMMARY OF CHEMICAL ANALYSIS OF SOIL AND WATER SAMPLES
COLLECTED FROM THE TANK EXCAVATION PIT
ON JULY 13 AND 29, 1985
SOLA OPTICAL USA, INC., SITE
PETALUMA, CALIFORNIA
(Concentrations detected in parts per million [ppm])

Sample Name	EPA Method	Acetone	Trans-1,2-DCE	1,1,1-TCA	DCA	Benzene	Toluene	Ethyl-benzene	Xylenes	1,4 and 1,2 Dichloro-benzene	1,3-Dichloro-benzene	Chloro-benzene
East Tank 6	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
West Tank 6	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Side Tank 6	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
Center Tank 6	601/602	<0.100	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001
SOIL SAMPLES COLLECTED AFTER ADDITIONAL EXCAVATION (CONDUCTED JULY 29, 1985):												
# 1	602	70	NA	NA	NA	0.004	0.016	0.006	0.120	0.002	<0.001	<0.001
# 2	602	74	NA	NA	NA	0.004	0.006	0.002	0.034	0.002	0.002	<0.001
# 3	602	200	NA	NA	NA	0.036	0.025	0.030	0.230	0.004	0.003	0.002
# 4	602	780	NA	NA	NA	0.004	0.019	0.012	0.240	0.013	<0.001	0.002
# 5	602	180	NA	NA	NA	0.003	0.017	0.008	0.160	0.006	<0.001	<0.001
WATER SAMPLES COLLECTED FROM TANK BACKFILL WATER-LEVEL OBSERVATION PIPES ** (COLLECTION DATE UNKNOWN):												
North Observation Pipe	601	NA	*** 0.580	0.42	3.250	NA	NA	NA	NA	NA	NA	NA
South Observation Pipe	601	NA	ND	0.002	0.006	NA	NA	NA	NA	NA	NA	NA

TABLE 5
CHEMICAL PARTITIONING CALCULATIONS

Chemical	Historically Highest Concentration Detected in Well W14 (ppm)	Molecular Weight (Grams/Mole)	Henry's Law Constant (1) (Dimensionless)	Calculated (2) Soil-Gas Concentration from Volitalization (ppm)	Calculated (3) Soil-Gas Concentration from Volitalization (ug/l)	Highest Concentration Detected in Soil-Gas (ug/l)	Koc (1) (Dimension-less)	Kd (4) (Dimension-less)	Calculated (5) Concentration in Soil (ppm)
1,1-DCE	3.3	97	1.02E+00	3.37	13.08	68	343	6.86	22.638
1,1-DCA	0.68	99	2.19E-01	0.15	0.59	12	40	0.80	0.544
TCE	0.001	131	4.01E-01	0.0004	0.002	0.1	104	2.08	0.00208
PCE	0.002	166	7.16E-01	0.001	0.007	0.02	238	4.76	0.00952
Freon 113	0.01	187	2.05E+01	0.21	1.57	0.6	191	3.82	0.0382
TCA	1.7	133	6.89E-01	1.17	6.22	4	179	3.58	6.086

Notes:

Acetone, 2-butanone and 4-methyl-2-pentanone have not been previously detected at well W14. Toluene was reported in one sample (9/30/86) at an estimated concentration below the detection limit.

(1) Values obtained from the Syracuse Research Corporation CHEMFATE Database, Syracuse, New York 13210-4080.
(2) Calculated using the relationship:

H = Csoil gas/Csoil moisture

where:

H = Henry's Law Constant
Csoil gas = concentration of chemical in soil gas
Csoil moisture = concentration of chemical in soil moisture

(3) Soil-gas calculation performed using the following formula:

ppm = ug/l of air*25/molecular weight

assumes that the molecular volume of soil gase is 25 liters/mole.

(4) Kd values were calculated using the following formula:

Kd = Koc*foc

where:

foc is the fraction of organic carbon (assumed equal to 0.02).

(5) Calculated using the relationship:

C s = C sm * Kd

where:

C s and C sm are equal to the concentration of the chemical in soil and soil moisture, respectively.

TABLE 6

SUMMARY OF SOIL CHEMICAL ANALYSES DATA
SOLA OPTICAL USA, INC. SITE
PETALUMA, CALIFORNIA
(Concentrations expressed in parts per million)

Sample Number	Depth (feet)	1,1-DCA		1,1,1-TCA		1,1,2-TCA		1,1-DCE		PCE		TCE		1,2-DCA		Toluene	Acetone	2-Butanone	4-Methyl-2-Petanone
		8240**	8010***	8240**	8010***	8240**	8010***	8240**	8010***	8240**	8010***	8240**	8010***	8240**	8010***	8240**	8240**	8240**	8240**
SB-1	3 - 3.5	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.031	<0.1	<0.1	<0.05
	7 - 7.5	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.11	<0.1	<0.1	<0.05
SB-2	3 - 3.5	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.061	<0.1	<0.1	<0.05
	7 - 7.5	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.14	4.6	0.15	0.27
SB-3	3 - 3.5	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.07	<0.1	<0.1	<0.05
	8.5 - 9	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.19	<0.1	<0.1	<0.05
EPA Split	9 - 9.5	<0.006	NA	NR	NA	NR	NA	NR	NA	NR	NA	NR	NA	<0.006	NA	0.016	NR	NR	NR
SB-4	3 - 3.5	0.016	0.003	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.24	0.11	<0.1	<0.05
	9 - 9.5	0.051	0.029	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.2	<0.1	<0.1	<0.05
SB-5	3 - 3.5	0.02	0.012	0.008	0.012	0.006	0.005	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.042	<0.1	<0.1	<0.05
	9 - 9.5	0.16	0.19	0.018	0.019	0.012	0.019	0.034	0.013	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	0.038	<0.1	<0.1	<0.05
SB-6	3 - 3.5	0.014	<0.001	0.019	0.026	0.034	0.035	0.005	<0.001	0.011	0.015	0.007	0.009	<0.005	<0.001	0.007	<0.1	<0.1	<0.05
	9 - 9.5	0.016	0.007	<0.005	<0.001	0.006	0.003	<0.005	<0.001	<0.005	<0.001	<0.005	<0.001	<0.005	0.003	0.14	<0.1	<0.1	<0.05
EPA Split	8.5 - 9	0.022	NA	NR	NA	0.007	NA	NR	NA	NR	NA	NR	NA	0.006J	NA	0.12	NR	NR	NR

* Chloroform detected in sample at 0.001 ppm.
** EPA Method 8240
*** EPA Method 8010
NR = Not Reported
NA = Not Analyzed
EPA Split = "Split" sampled collected by the U.S. Environmental Protection Agency and analyzed by a U.S. EPA contract laboratory
J = Results are estimated; data are valid for limited purposes. Results are qualitatively acceptable.

TABLE 7

Ground-Water Elevation Data
(feet MSL)

Well Number	Well Elevation Top of Casing (feet MSL)	31-Jul-90
W-12	33.87	18.44
W-13	31.99	17.02
W-14	32.24	16.75
W-15	31.39	17.39
W-17	30.45	16.49
W-18	29.46	16.27
W-19	27.33	13.80
W-20	25.73	14.19
W-21	25.85	12.88
W-22	25.91	12.44
W-23	26.90	12.58
W-24	25.11	13.32
W-25	26.95	13.28
W-26	27.86	13.45
W-27	29.21	14.02
W-28	29.60	15.70
W-30	31.62	16.68
W-31	26.50	12.97
W-32	23.07	9.20
W-33	21.64	11.10
LF-2	24.12	12.63
LF-3	25.74	13.47
LF-4	27.74	17.14
LF-5	24.04	11.38
LF-6	20.46	10.25
LF-7	27.30	13.87
LF-8	24.38	11.82
LF-9	27.13	13.56
LF-10	29.66	NM
LF-11	29.42	NM
LF-12	32.52	11.96
LF-13	32.51	13.23
LF-14	32.34	17.78
LF-15	24.86	10.30
LF-16	24.95	11.65
LF-17	25.05	11.66
LF-18	27.13	13.21
LF-19	30.51	NM
LF-20	30.50	17.39
LF-21	28.94	16.49
LF-22	25.78	12.53
LF-23	22.94	11.17
LF-24	22.69	11.94
LF-25	19.16	8.94
LF-26	19.12	9.43
LF-27	25.45	-7.46*
LF-28	18.71	9.57
STERO	22.92	12.27
SOLA CITY	32.67	18.33
STATION 5	30.17	NM
PZ-1	28.67	14.36
PZ-2	28.30	14.79
PZ-3	26.77	13.12
PZ-4	27.27	13.09
PZ-5	26.08	13.22
PZ-6	26.55	12.47
PZ-7	25.58	12.06
PZ-8	25.68	12.54
PZ-9	24.37	12.05
PZ-10	23.68	NM
PZ-11	21.47	10.51
PZ-12	21.17	8.73

TABLE 7

Ground-Water Elevation Data
(feet MSL)

Well Number	Well Elevation Top of Casing (feet MSL)	31-Jul-90
E-1	29.69	8.03
E-2	29.55	4.93
E-3	27.34	5.26
E-4	26.76	3.30
E-5	24.45	0.99
E-6	24.81	10.00
E-7	24.51	3.39
E-8	23.06	-2.39
E-9	20.72	-0.55

* - Water level had not recovered from purging

NM- Not measured

Table 8

Calculated Vertical Hydraulic Gradients
Sola Optical USA, Inc., Site
Petaluma, California
(negative value indicates a vertical downward gradient)

Well Cluster	Sediment Interval	Elevation of Midpoint of Screened Interval (feet MSL)	Difference in Screened Interval Mid-point Elevation (feet)	Calculated Vertical Hydraulic Gradient (foot per foot)										
				25-Apr-89	09-May-89	26-Jun-89	26-Jul-89	31-Aug-89	18-Sept-89	16-Nov-89	22-Dec-89	16-Jan-90	19-Apr-90	31-Jul-90
W-14	Shallow	13.43	19.94	0.035	0.032	0.030	0.027	0.017	-0.005	0.017	0.024	0.007	0.121	0.014
W-13	Intermediate	-6.51												
LF-25	Shallow	-9	16	---	---	---	---	---	---	---	---	---	0.03	0.03
LF-26	Intermediate	-25												
LF-5	Shallow	-5	43	-0.001	-0.0002	0.0002	0.003	0.007	0.007	0.005	0.005	0.010	0.010	0.007
LF-17	Deep	-48												
LF-23	Intermediate	-29	38	---	---	---	---	---	---	---	---	---	0.03	0.02
LF-24	Deep	-67												
LF-14	Deep	-51.41	71.83	-0.296	-0.057	-0.061	-0.062	-0.059	-0.063	-0.057	-0.055	-0.060	-0.061	-0.063
LF-13	Deeper	-123.24												
LF-17	Deep	-47.7	95.1	0.003	0.003	0.008	0.008	0.007	0.009	0.005	0.007	0.004	0.007	-0.042
LF-16	Deeper	-142.8												
LF-13	Deeper	-123.24	66.24	0.246	-0.014	-0.014	-0.014	-0.015	-0.014	-0.014	-0.011	-0.015	-0.021	-0.019
LF-12	Deepest	-189.48												
LF-16	Deeper	-142.8	32.09	-0.002	-0.005	0.002	0.002	-0.029	0.001	-0.023	-0.006	-0.037	0.008	-0.042
LF-15	Deepest	-184.89												

--- = Wells were not installed.

Table 9

Ground-Water Chemistry: Major Anions and Cations
Sola Optical USA, Inc., Site
Petaluma, California

Parameter	Shallow Wells				Intermediate Wells				Deep Wells				Deeper Wells				Deepest Wells			
	LF-5		LF-20		LF-6		LF-19		LF-14		LF-17		LF-13		LF-16		LF-12		LF-15	
Major Cations	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l	mg/l	meq/l
Calcium	42	2.10	43	2.15	43	2.15	40	2.00	27	1.35	41	2.05	37	1.85	6.4	0.32	25	1.25	7.5	0.37
Magnesium	21	1.73	22	1.81	21	1.73	21	1.73	14	1.15	20	1.65	16	1.32	5	0.41	19	1.56	7.2	0.59
Sodium	28	1.22	28	1.22	28	1.22	28	1.22	32	1.39	27	1.17	27	1.17	130	5.65	57	2.48	250	10.87
Total Cations		5.04		5.17		5.09		4.94		3.89		4.87		4.34		6.38		5.29		11.84
Major Anions																				
Bicarbonate ($CaCO_3$)	120	1.97	130	2.13	130	2.13	110	1.80	160	2.62	130	2.13	160	2.62	200	3.28	130	2.13	310	5.08
Chloride	75	2.12	82	2.31	62	1.75	76	2.14	30	0.85	70	1.97	45	1.27	53	1.50	53	1.50	150	4.23
Sulfate	20	0.42	12	0.25	28	0.58	13	0.27	7.1	0.15	13	0.27	8.6	0.18	58	1.21	20	0.42	120	2.50
Total Anions		4.50		4.69		4.46		4.22		3.62		4.38		4.07		5.98		4.04		11.81
Other Parameters																				
Total Disolved Solids (mg/l)	350		370		350		370		250		350		300		410		270		690	
Conductivity (umho/cm)	520		540		520		530		400		500		460		680		500		1200	
Hardness ($CaCO_3$)	190		200		200		190		130		180		160		37		140		48	
pH (standard units)	6.8		6.7		6.8		6.0		7.5		6.8		7.3		8.5		9.3		8.6	

Table 10

Summary of Chemical Analysis of Water Samples
from Newly-Installed Monitoring Wells
Sola Optical USA, Inc., Site
Petaluma, California
(concentrations expressed in parts per million)

Well Number	Analysis	Date Sampled	NOTES	1,1-DCE	1,1-DCA	1,1,1-TCA	Freon 113
LF-21	EPA 8010	5/2/90		<0.0005	<0.0005	<0.0005	<0.0005
Duplicate	EPA 8010	5/2/90		<0.0005	<0.0005	<0.0005	<0.0005
EPA Split	EPA 8240	5/2/90	(1)	<0.001	<0.001	<0.001	NA
	EPA 8240	4/24/90		<0.005	<0.005	<0.005	NA
Duplicate	EPA 8240	4/24/90		<0.005	<0.005	<0.005	NA
	EPA 8010	8/29/90		<0.0005	<0.0005	<0.0005	<0.0005
LF-22	EPA 8010	4/30/90		0.012	<0.0005	0.004	<0.0005
	EPA 8240	4/24/90		0.006	<0.005	<0.005	NA
	EPA 8010	8/30/90		0.020	0.0006	0.007	<0.0005
LF-23	EPA 8010	4/30/90		<0.0005	<0.0005	<0.0005	<0.0005
	EPA 8240	4/23/90		<0.005	<0.005	<0.005	NA
	EPA 8010	8/30/90		<0.0005	<0.0005	<0.0005	<0.0005
LF-24	EPA 8010	5/2/90		<0.0005	<0.0005	<0.0005	<0.0005
EPA Split	EPA 8240	5/2/90		<0.001	<0.001	<0.001	NA
	EPA 8240	4/19/90		<0.005	<0.005	<0.005	NA
Duplicate	EPA 8240	4/19/90		<0.005	<0.005	<0.005	NA
	EPA 8010	8/30/90		<0.0005	<0.0005	<0.0005	<0.0005
LF-25	EPA 8010	4/30/90		0.007	<0.0005	0.004	0.001
	EPA 8240	4/23/90		0.005	<0.005	<0.005	NA
	EPA 8010	8/29/90		0.004	<0.0005	0.003	<0.0005
Duplicate	EPA 8010	8/29/90		0.004	<0.0005	0.002	<0.0005
LF-26	EPA 8010	4/30/90		<0.0005	0.005	0.004	0.004
	EPA 8240	4/23/90		<0.005	<0.005	<0.005	NA
	EPA 8010	8/29/90		0.002	<0.0005	0.0008	<0.0005
Duplicate	EPA 8010	8/29/90		0.002	<0.0005	0.001	<0.0005
LF-27	EPA 8010	5/3/90		<0.0005	<0.0005	<0.0005	<0.0005
Duplicate	EPA 8010	5/3/90		<0.0005	<0.0005	<0.0005	<0.0005
EPA Split	EPA 8240	5/3/90	(2)	<0.001	<0.001	<0.001	NA
	EPA 8240	4/24/90		<0.005	<0.005	<0.005	NA
	EPA 8010	8/28/90		0.0006	<0.0005	<0.0005	<0.0005
Duplicate	EPA 8010	8/28/90		<0.0005	<0.0005	<0.0005	<0.0005
LF-28	EPA 8010	5/1/90		0.0006	<0.0005	<0.0005	<0.0005
	EPA 8240	4/20/90		<0.005	<0.005	<0.005	NA
	EPA 8010	8/29/80		<0.0005	<0.0005	<0.0005	<0.0005

Table 10

Summary of Chemical Analysis of Water Samples
from Newly-Installed Monitoring Wells
Sola Optical USA, Inc., Site
Petaluma, California
(concentrations expressed in parts per million)

Well Number	Analysis	Date Sampled	NOTES	1,1-DCE	1,1-DCA	1,1,1-TCA	Freon 113
Field Blanks							
LF-28	EPA 8240	4/20/90		<0.005	<0.005	<0.005	NA
LF-24	EPA 8240	4/19/90		<0.005	<0.005	<0.005	NA
LF-27	EPA 8010	5/3/90		<0.0005	<0.0005	<0.0005	<0.0005
LF-26	EPA 8240	4/23/90		<0.005	<0.005	<0.005	NA
LF-25	EPA 8240	4/23/90		<0.005	<0.005	<0.005	NA
LF-23	EPA 8240	4/23/90		<0.005	<0.005	<0.005	NA
	EPA 8010	4/30/90		<0.0005	<0.0005	<0.0005	<0.0005
LF-21	EPA 8240	4/24/90		<0.005	<0.005	<0.005	NA

NA = Not Analyzed.
EPA Split = Split sampled collected by U.S. Environmental Protection Agency and analyzed by a U.S. EPA contract laboratory
(1) = Toluene detected in sample at 0.003 ppm
(2) = Toluene detected in sample at 0.014 ppm

TABLE 11

Quality Control Data for Chemical Analyses:
Data Precision as Relative Percent Difference (RPD) of Duplicate and Split Sample Analysis
and VOCs Detected in Field Blank and Trip Blank Samples
[All concentrations expressed in parts per million (ppm)]

Sample No.	Date	Type of Analysis	1,1,2-TCA	TCE	Chlorform	PCE	Freon 11	1,1-DCE	1,1-DCA	1,2-DCA	1,1,1-TCA	Freon 113	Toluene
W14	26-Apr-90	8010	0.003	0.003	0.007	0.002	0.004	1.200	0.084	0.002	0.220	0.007	NA
	26-Apr-90	8010	0.003	0.002	0.001	0.002	0.003	1.230	0.081	0.002	0.200	0.006	NA
	RPD (%)		0.0	40.0	150.0 *	0.0	28.6	2.5	3.6	0.0	9.5	15.4	---
LF-21	24-Apr-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.005
	24-Apr-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.005
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
LF-21	02-May-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	02-May-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
LF-24	19-Apr-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.0005
	19-Apr-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.0005
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
LF-27	03-May-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	03-May-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
E-1	30-Apr-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.100	0.080	<0.0005	0.012	<0.0005	NA
	30-Apr-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.091	0.059	<0.0005	0.009	<0.0005	NA
	RPD (%)		---	---	---	---	---	9.4	30.2	---	28.6	---	---
E-7	01-May-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	01-May-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	NA
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
LF-9	09-Sept-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	09-Sept-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---

TABLE 11

Quality Control Data for Chemical Analyses:
Data Precision as Relative Percent Difference (RPD) of Duplicate and Split Sample Analysis
and VOCs Detected in Field Blank and Trip Blank Samples
[All concentrations expressed in parts per million (ppm)]

Sample No.	Date	Type of Analysis	1,1,2-TCA	TCE	Chlorform	PCE	Freon 11	1,1-DCE	1,1-DCA	1,2-DCA	1,1,1-TCA	Freon 113	Toluene
LF-25	29-Aug-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.004	<0.0005	<0.0005	0.003	<0.0005	NA
	29-Aug-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.004	<0.0005	<0.0005	0.002	<0.0005	NA
	RPD (%)		---	---	---	---	---	0.0	---	---	40.0*	---	---
LF-26	29-Aug-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.002	<0.0005	<0.0005	0.0008	<0.0005	NA
	29-Aug-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.002	<0.0005	<0.0005	0.001	<0.0005	NA
	RPD (%)		---	---	---	---	---	0.0*	---	---	22.2*	---	---
LF-27	28-Aug-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	28-Aug-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
SPLIT SAMPLES													
SB-3													
(EPA #)	04-12-90	8240	<0.006	NR	NR	NR	NR	NR	<0.006	<0.006	NR	NR	0.016
(LF &)	04-12-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.190
	RPD (%)		---	---	---	---	---	---	---	---	---	---	168.9
SB-6													
(EPA $)	04-12-90	8240	0.007	NR	NR	NR	NR	NR	0.022	0.006J	NR	NR	0.120
(LF @)	04-12-90	8240	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	0.016	<0.005	<0.005	<0.005	0.140
	RPD (%)		15.4	---	---	---	---	---	31.6	---	---	---	15.4
LF-13													
(EPA)	05-02-90	8240	<0.001	<0.001	<0.001	<0.001	NA	0.015	0.001	<0.001	0.008	NA	<0.001
(LF)	05-02-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.022	<0.0005	<0.0005	0.002	0.002	NA
	RPD (%)		---	---	---	---	---	37.8	---	---	120.0*	---	---
LF-17													
(EPA)	05-02-90	8240	<0.001	<0.001	<0.001	<0.001	NA	0.018	0.002	<0.001	0.009	NA	0.003
(LF)	05-02-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.020	0.0009	<0.0005	0.01	0.0006	NA
	RPD (%)		---	---	---	---	---	10.5	75.9 *	---	10.5	---	---

TABLE 11

Quality Control Data for Chemical Analyses:
Data Precision as Relative Percent Difference (RPD) of Duplicate and Split Sample Analysis
and VOCs Detected in Field Blank and Trip Blank Samples
[All concentrations expressed in parts per million (ppm)]

Sample No.	Date	Type of Analysis	1,1,2-TCA	TCE	Chlorform	PCE	Freon 11	1,1-DCE	1,1-DCA	1,2-DCA	1,1,1-TCA	Freon 113	Toluene
LF-21													
(EPA)	05-02-90	8240	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001	<0.001	NA	0.003
(LF)	05-02-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
LF-24													
(EPA)	05-02-90	8240	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001	<0.001	NA	<0.001
(LF)	05-02-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
LF-27													
(EPA)	05-02-90	8240	<0.001	<0.001	<0.001	<0.001	NA	<0.001	<0.001	<0.001	<0.001	NA	0.017
(LF)	05-02-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	RPD (%)		---	---	---	---	---	---	---	---	---	---	---
FIELD BLANKS													
LF-24	04-19-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NR	<0.005
LF-28	04-20-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NR	<0.005
LF-23	04-23-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NR	<0.005
LF-25	04-23-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NR	<0.005
LF-26	04-23-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NR	<0.005
LF-21	04-21-90	8240	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NR	<0.005
LF-12	04-27-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
LF-23	04-30-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
LF-27	05-03-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
LF-7	05-04-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
LF-17	08-29-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
LF-4	08-30-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
LF-3	08-31-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
LF-6	09-10-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
TRIP BLANKS													
	06-15-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	08-28-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	08-31-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA
	09-10-90	8010	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	NA

TABLE 11

Quality Control Data for Chemical Analyses:
Data Precision as Relative Percent Difference (RPD) of Duplicate and Split Sample Analysis
and VOCs Detected in Field Blank and Trip Blank Samples
[All concentrations expressed in parts per million (ppm)]

Sample No.	Date	Type of Analysis	1,1,2-TCA	TCE	Chlorform	PCE	Freon 11	1,1-DCE	1,1-DCA	1,2-DCA	1,1,1-TCA	Freon 113

NOTES TO TABLE 11

8010 = EPA Method 8010 for chlorinated hydrocarbons
8240 = EPA Method 8240 for volatile organics

NA = Not Analyzed
NR = Not Reported
RPD = Relative Percent Difference, defined as the difference between two values divided by their arithmetic mean
J = Results are estimated; data are valid for limited purposes. The results are qualitatively acceptable.
# = Sample collected from 9- to 9.5-foot depth
& = Sample collected from 8.5- to 9-foot depth
$ = Sample collected from 8.5- to 9-foot depth
--- = RPD Calculation not applicable for concentrations below the detection limit of the compound

@ = Sample collected from 9- to 9.5-foot depth

All Levine*Fricke analyses conducted by Med-Tox Associates of Pleasant Hill, California.

Split Samples were collected by EPA and analyzed by EPA contract laboratory

* = UWL & UCL criteria do not apply due to constituent concentrations near the detection limit.

Table 12:

State and Federal Water Quality Criteria for the Primary
for the Primary VOCs Detected in Ground Water
Sola Optical USA Inc., Site
(parts per million)

Chemical	MCL* State	MCL* EPA	MCLG** (EPA)
1,1-DCE	0.006	0.007	0.007
1,1,1-TCA	0.2	0.2	0.2
1,1-DCA	0.005	---	---
Freon 113	1.2	---	---
1,2-DCA	0.0005	0.005	0
TCE	0.005	0.005	0

Notes:

* Maximum Contaminant Level
** Maximum Contaminant Level Goal

References:

California Department of Health Services,
Office of Drinking Water Standards
California Drinking Water Standards", October 24, 1990

U.S. EPA, Office of Drinking Water Standards
Drinking Water Regulations and Health Advisories", April, 199

TABLE 13

CHEMICALS DETECTED IN SOIL
AND GROUND WATER AT THE SITE
SOLA OPTICAL USA, INC., PETALUMA, CALIFORNIA

Chemical Compounds	Maximum Concentration Detected (ppm)
SOIL	
Trichloroethene	0.009
Tetrachloroethene	0.015
1,1,1-Trichloroethane	0.026
1,1-Dichloroethene	0.034
1,1-Dichloroethane	0.19
Acetone	200
1,1,2-Trichloroethane	0.034
1,2-DCA	0.003
trans-1,2-DCE	0.005
chloroform	0.001
benzene	0.036
toluene	0.24
2-butanone	0.15
4-methyl-2-pentanone	0.27
ethylbenzene	0.03
xylenes	0.24
1,2 and 1,4-dichlorobenzene	0.013
1,3-dichlorobenzene	0.003
chlorobenzene	0.002
GROUND WATER	
Trichloroethene	0.007
Tetrachloroethene	0.002
1,1,1-Trichloroethane	1.7
1,1-Dichloroethene	3.3
Trans/Cis-1,2-Dichloroethene	0.002
1,1-Dichloroethane	0.68
Freon 11	0.005
Freon 113	0.009
1,1,2-Trichloroethane	0.002
Bromodichloromethane	0.005
Dibromochloromethane	0.004
Chloroform	0.005
Bromoform	0.002
Chlorobenzene	0.002
1,2-Dichloropropane	0.006

TABLE 14

Chemical Properties of Selected Compounds
Detected at the Sola Optical USA Inc, Site
Petaluma, California

Compound	Molecular Weight	Specific Gravity	Solubility (ppm) (25 deg C)	Vapor Pressure (mm Hg) (20 Deg C)	Henrys Constant (atm cu. m/mol) (25 deg C)	Boiling Point (deg C)	Koc (1)
chloroform	119	1.49 a	7950	197	3.67E-03	61.2	45
1,1-dichloroethane	99	1.17 a	5060	227	5.62E-03	57.3	40
1,1-dichloroethene	97	1.22 a	2250	600	2.61E-02	31.6	343
tetrachlorethene	166	1.62 a	200	14	1.84E-02	121.1	238
1,1,1-trichloroethane	133	1.35 a	1495	124	1.77E-02	74.1	179
trichloroethene	131	1.46 a	1100	69	1.03E-02	86.7	104
toluene	92	0.87 b	538	28	5.94E-03	110.6	95
acetone	58	0.8 b	miscible	232	3.88E-05	56.1	18
Freon 11	137	1.48 b	1100	803	9.70E-02	23.6	93
1,2-dichloroethane	99	1.25 b	8524	79	9.79E-04	83.5	32

Notes:

Values obtained from the Syracuse Research Corporation CHEMFATE Database, Syracuse, New York, 13210-4080, unless otherwise noted

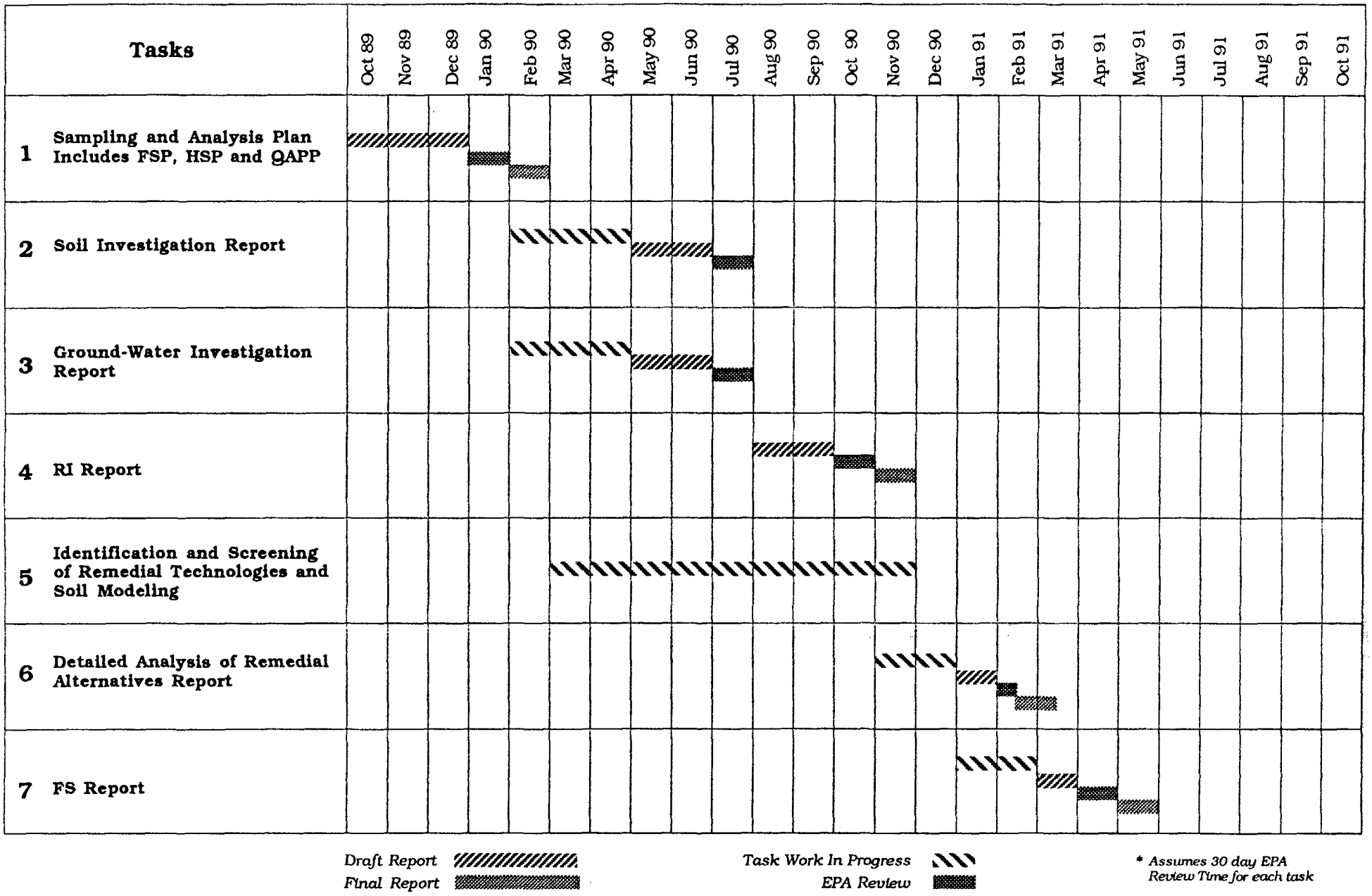
a - Verschueren, Karel "Handbook of Environmental Data
New York: Von Nostrand Reinhold, 1983

b - Montgomery, John H and L. M. Welkom "Ground Water Chemicals Desk Reference"
Michigan: Lewis Publishers, Inc., 1990

(1) Koc - Soil Adsorption Constant
deg C - Degrees Celsius

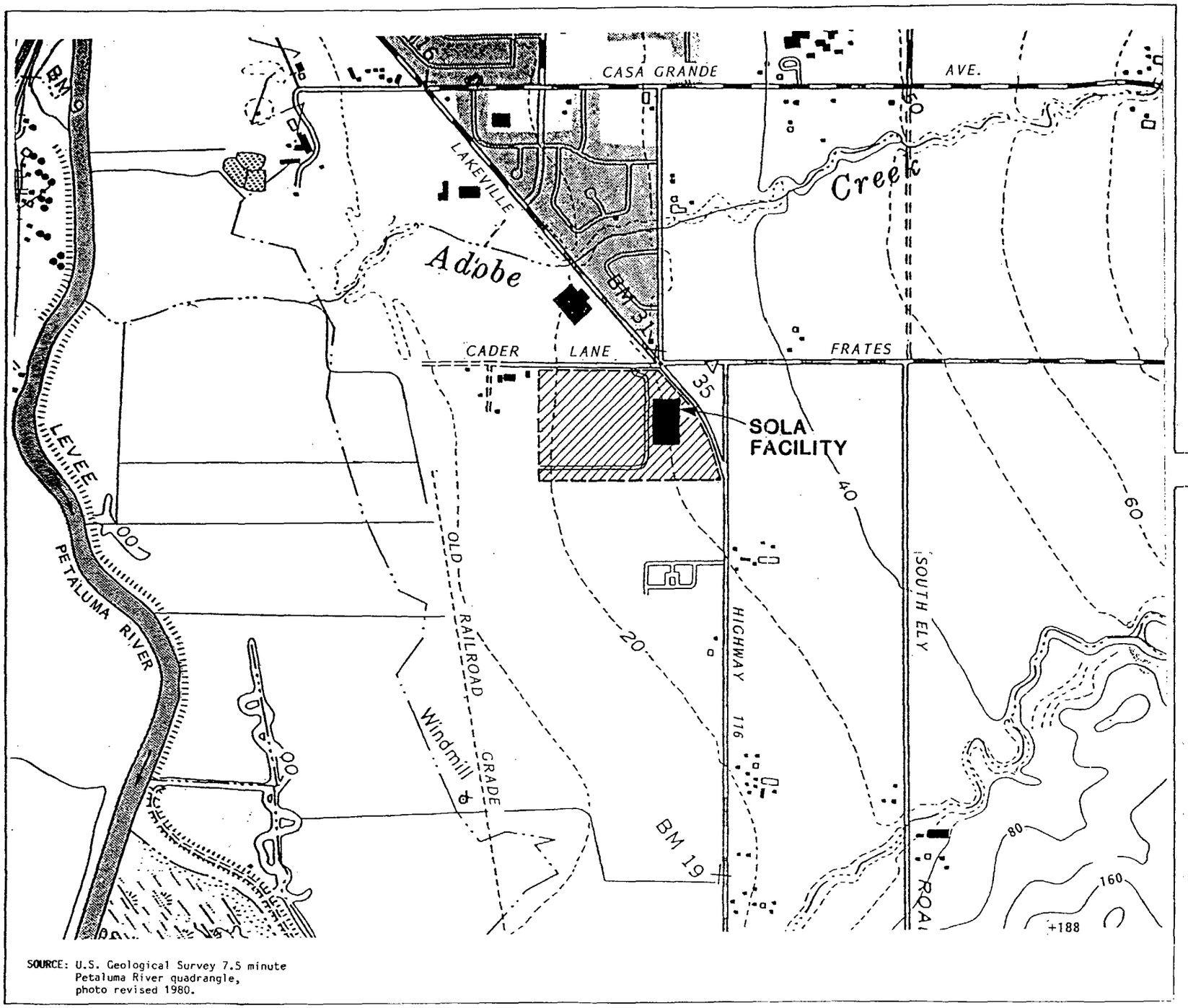
Table 15 :

Projected RI/FS Deliverables and Schedule *

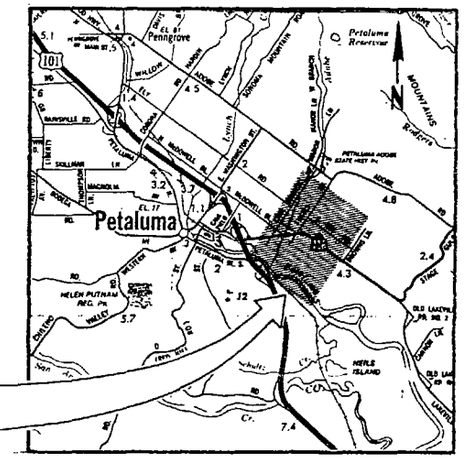


* *Assumes 30 day EPA Review Time for each task*

FIGURES



SOURCE: U.S. Geological Survey 7.5 minute
Petaluma River quadrangle,
photo revised 1980.



LOCATION MAP

0 1000 2000 feet

Figure 1 :

SITE AND VICINITY PLAN

Project No 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

GL25OC189emjs

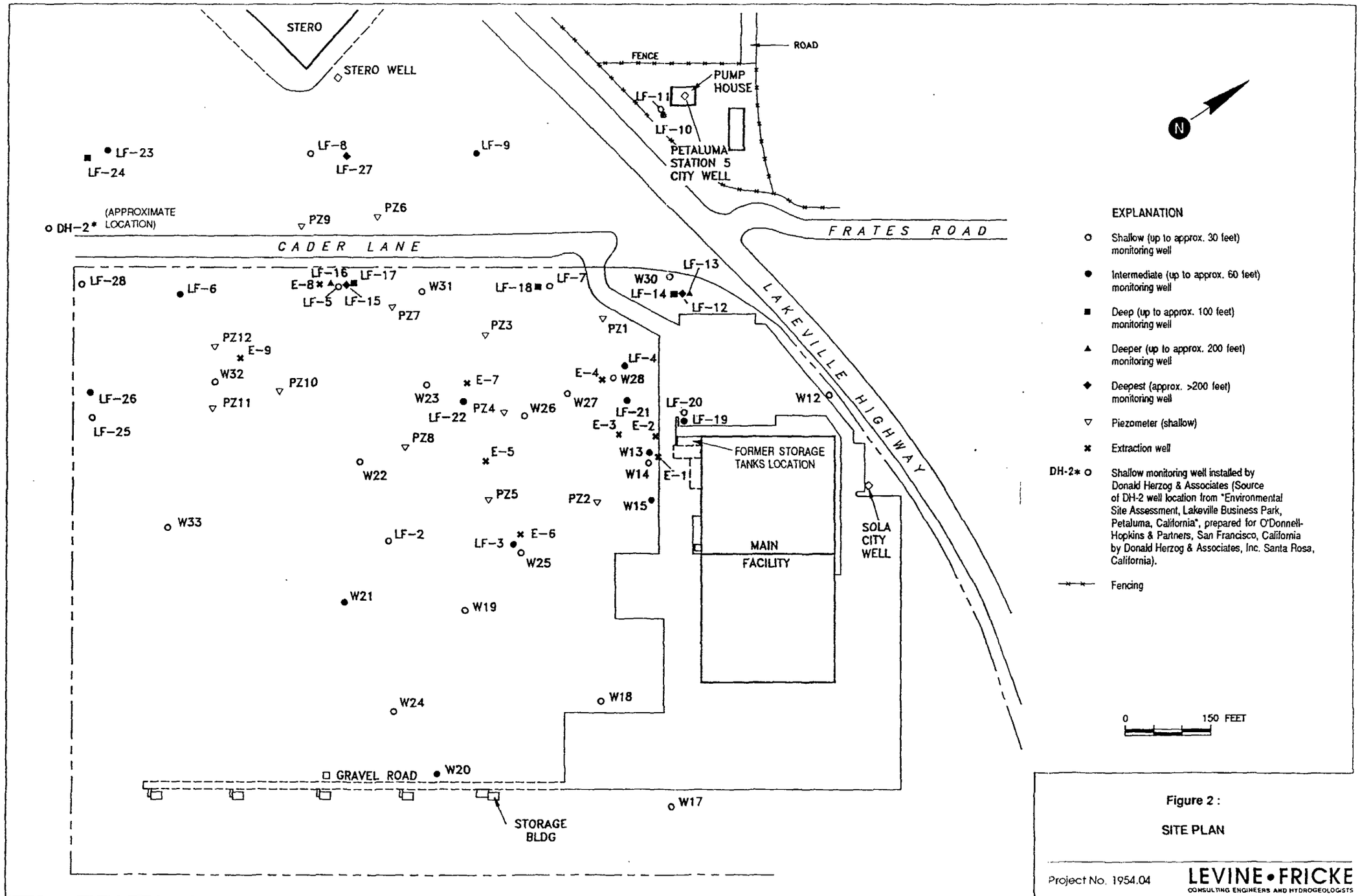


Figure 2 :

SITE PLAN

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GWT89JMS

JS523MAY90mpa

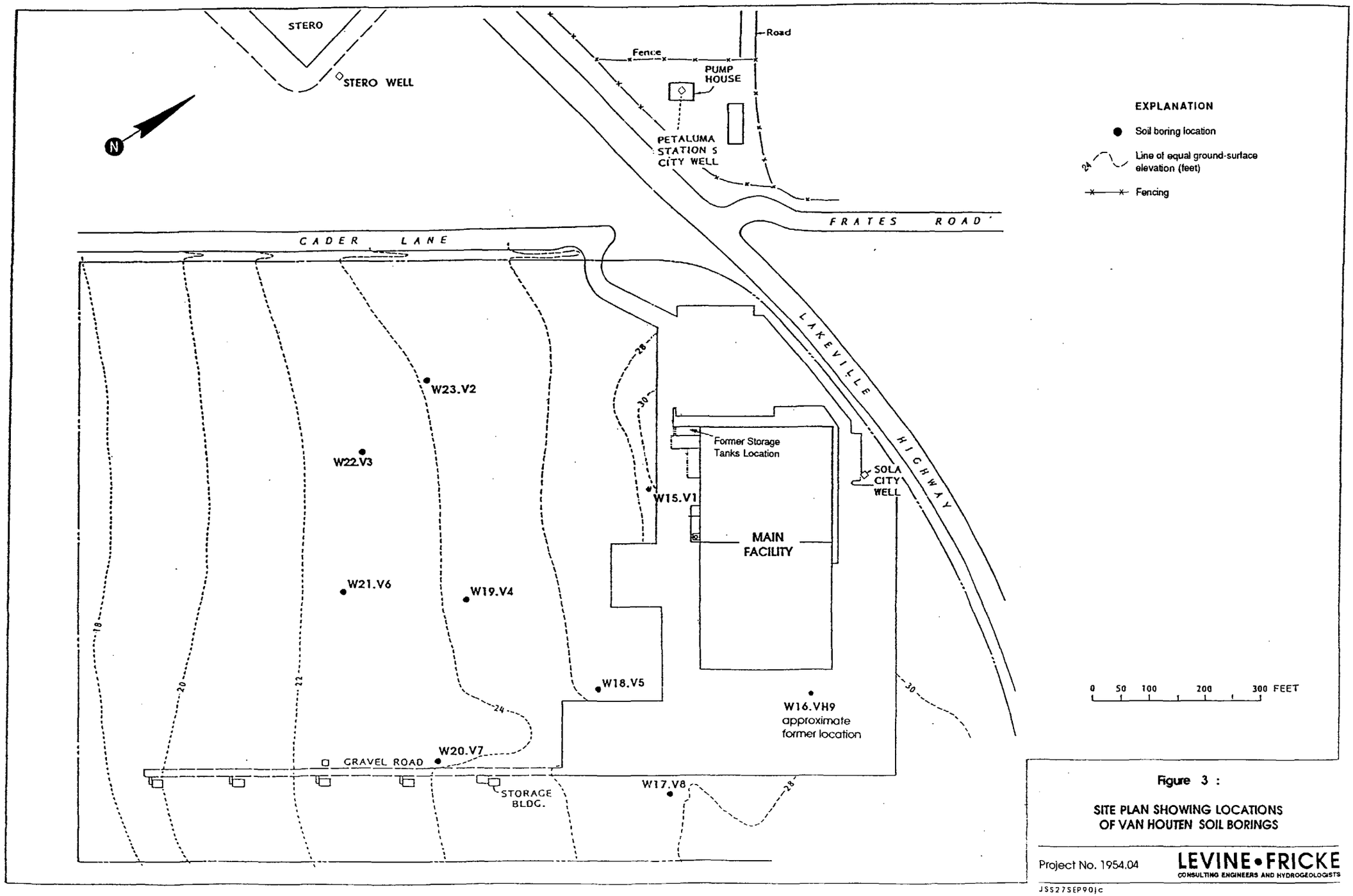


Figure 3 :

SITE PLAN SHOWING LOCATIONS OF VAN HOUTEN SOIL BORINGS

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

JSS27SEP90jc

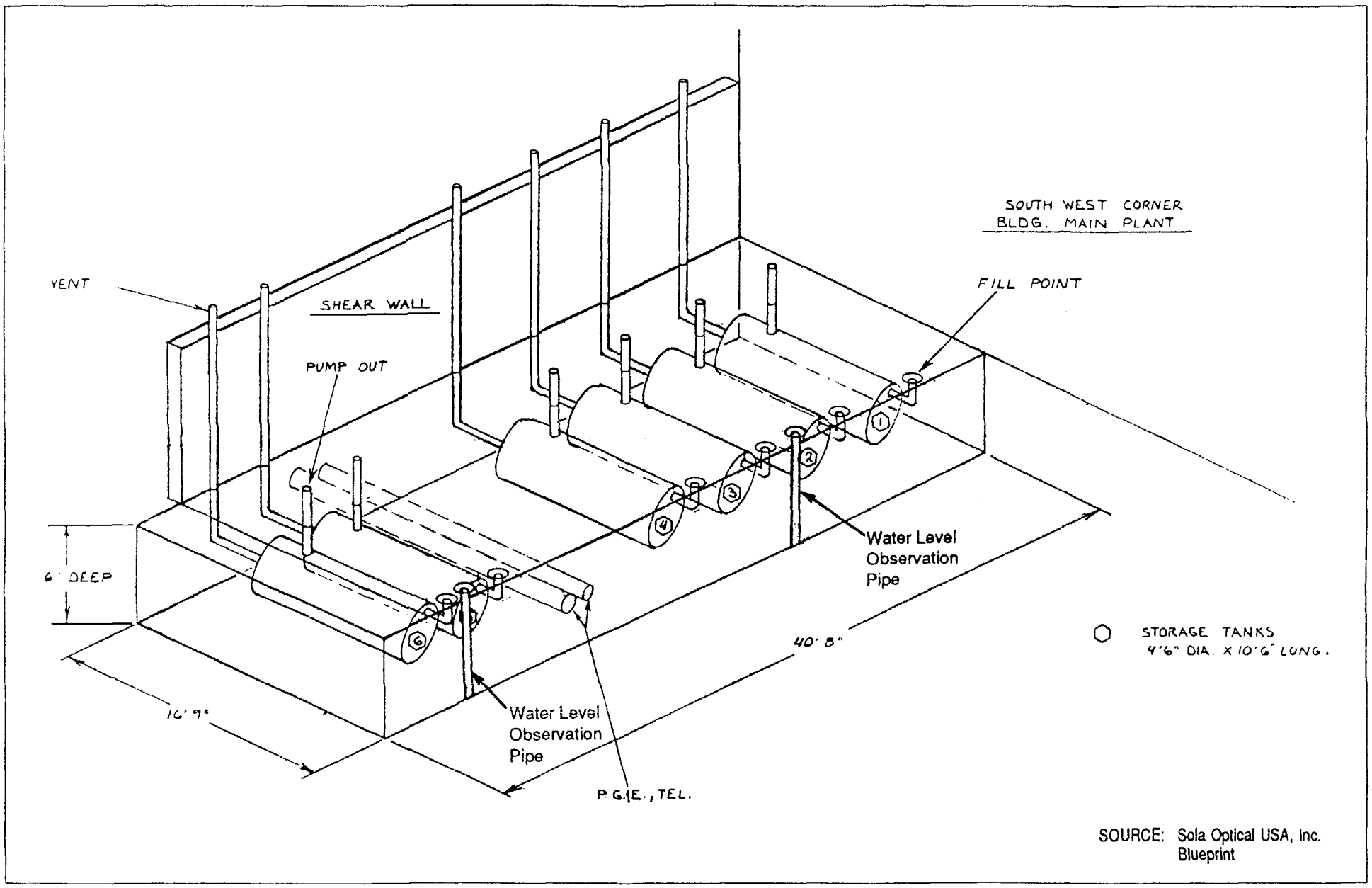


Figure 4 : LAYOUT OF FORMER UNDERGROUND STORAGE TANKS

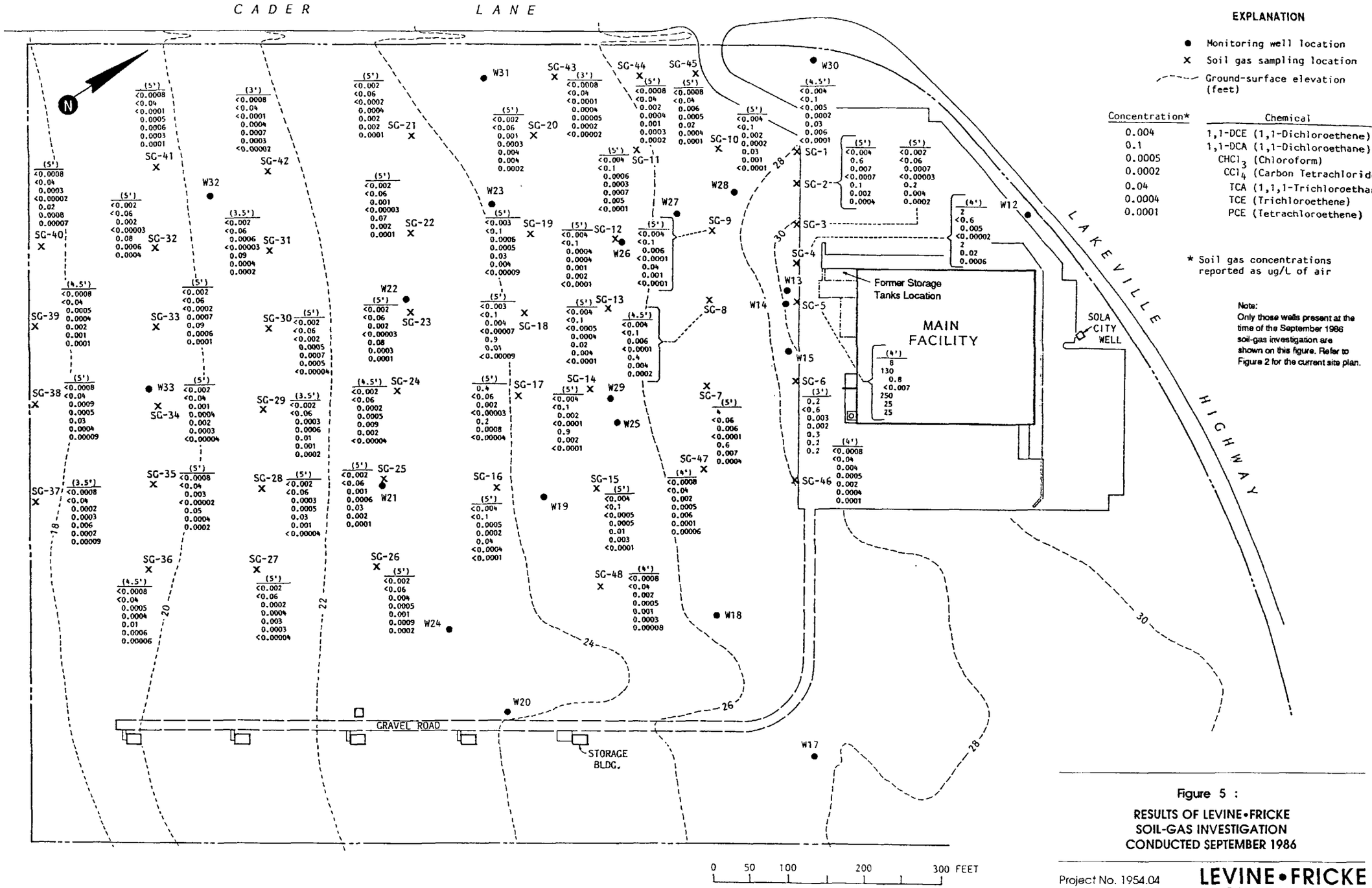


Figure 5 :

RESULTS OF LEVINE•FRICKE SOIL-GAS INVESTIGATION CONDUCTED SEPTEMBER 1986

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

JS527SEP90jc

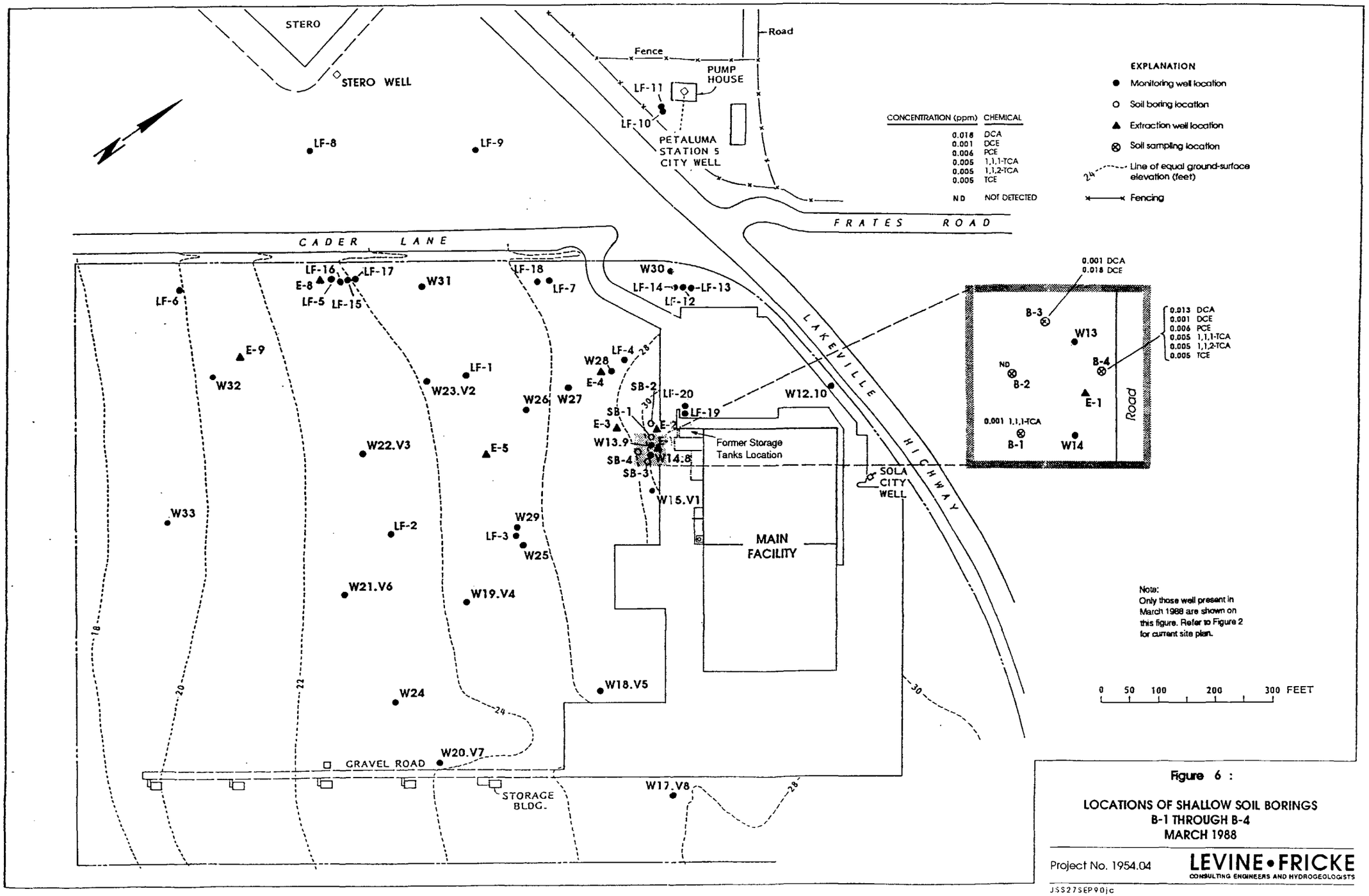


Figure 6 :

LOCATIONS OF SHALLOW SOIL BORINGS B-1 THROUGH B-4 MARCH 1988

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

JSS27SEP90jc

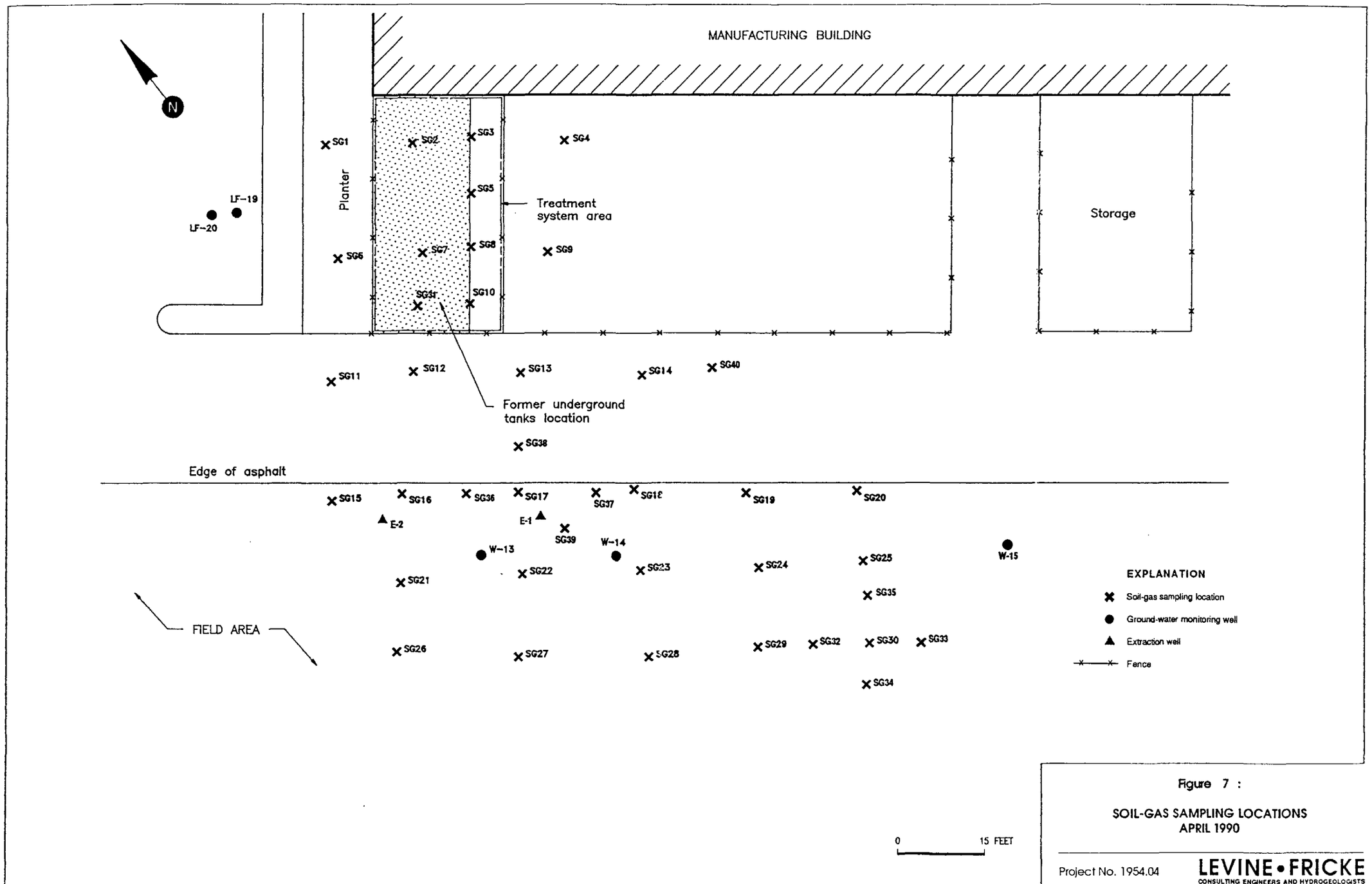


Figure 7 :

SOIL-GAS SAMPLING LOCATIONS
APRIL 1990

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.01\FXMY15JSS90em

JSS27SEP90jc

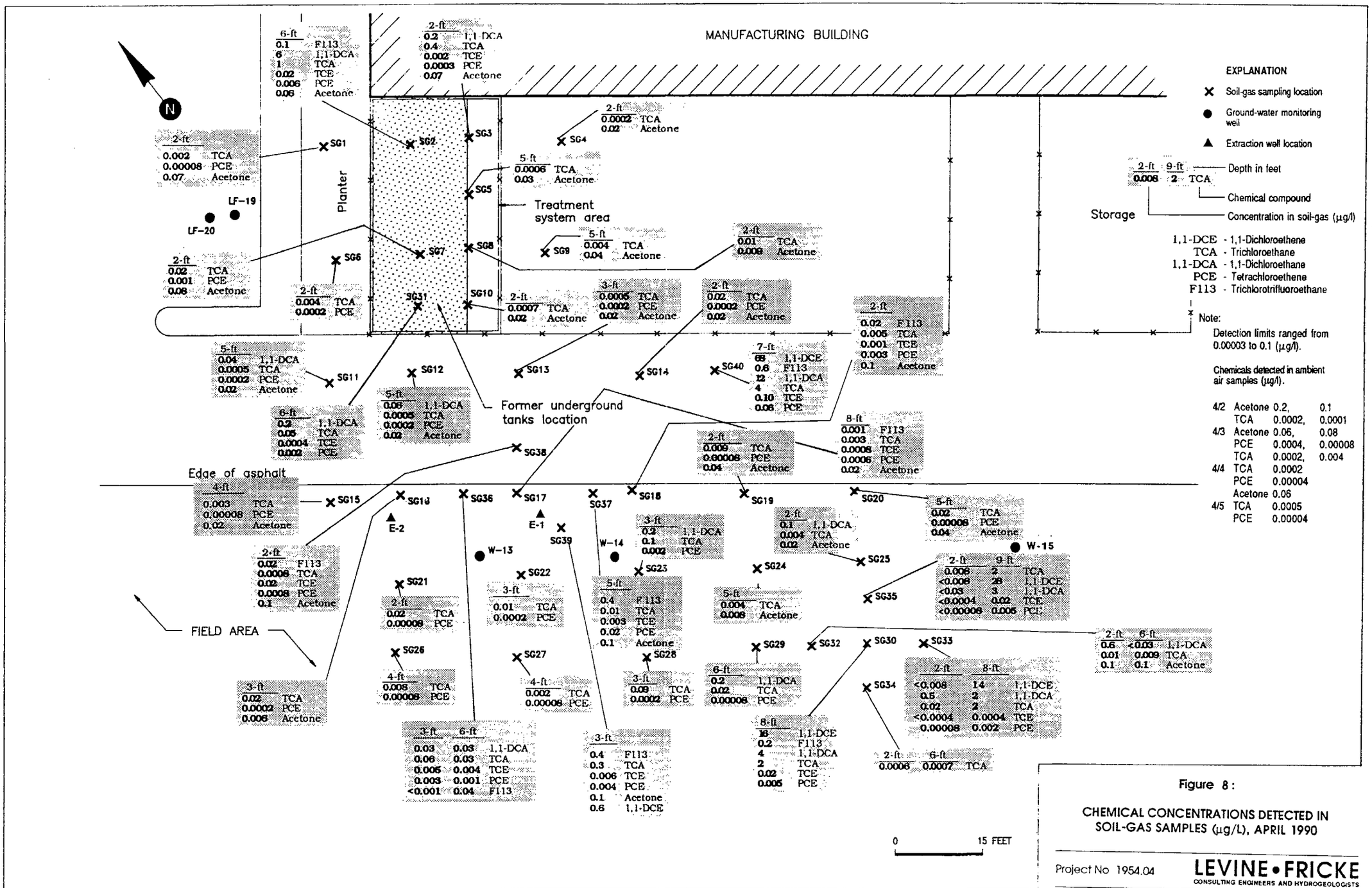


Figure 8:

CHEMICAL CONCENTRATIONS DETECTED IN SOIL-GAS SAMPLES (µg/L), APRIL 1990

Project No 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954 02JSS06JUN90A

1954.02\FXMY15.JSS90em

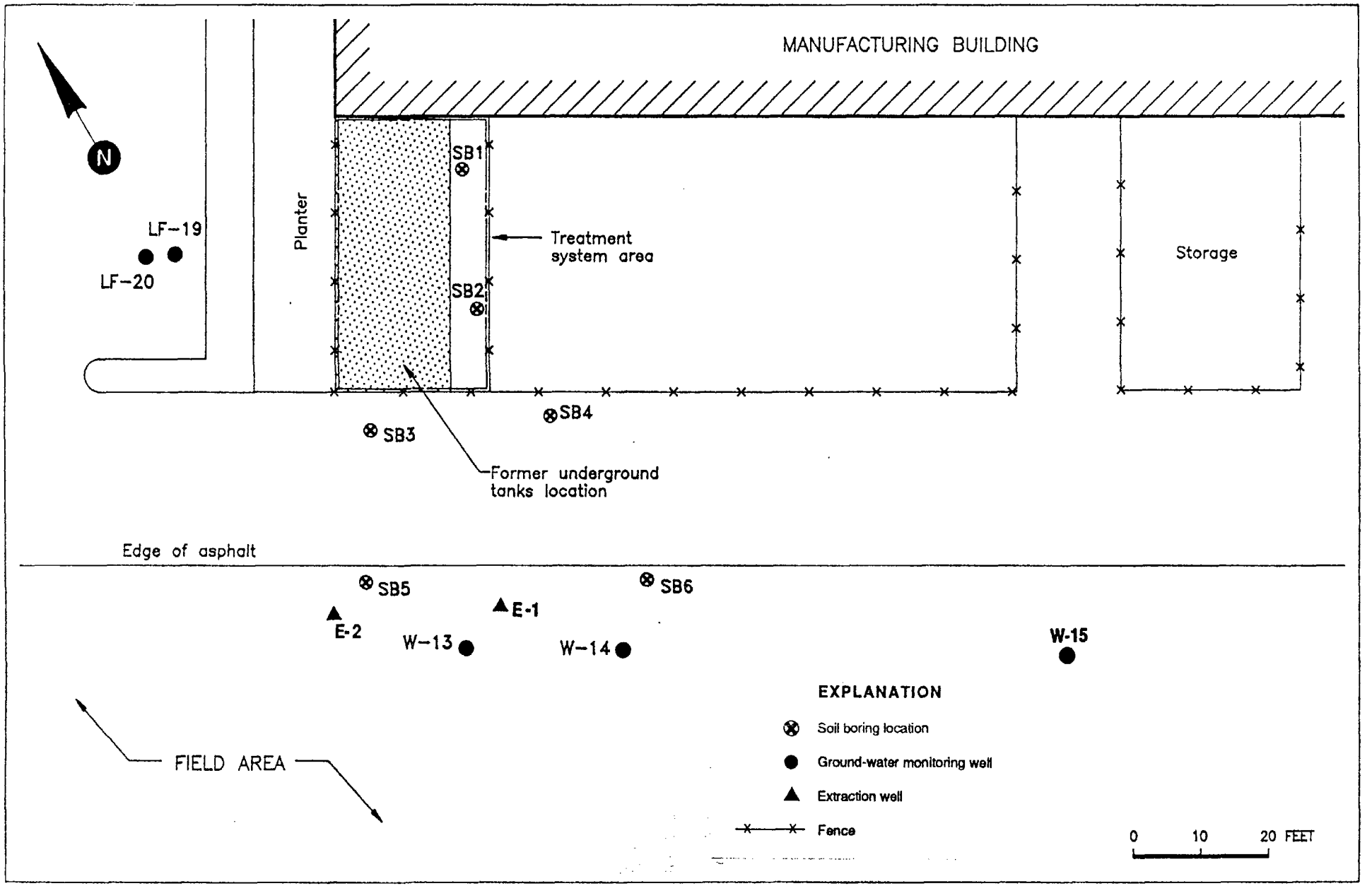


Figure 9 : SOIL SAMPLING LOCATIONS, APRIL 1990

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.01\F6DE07.JSS89AMBA06JUN90mp

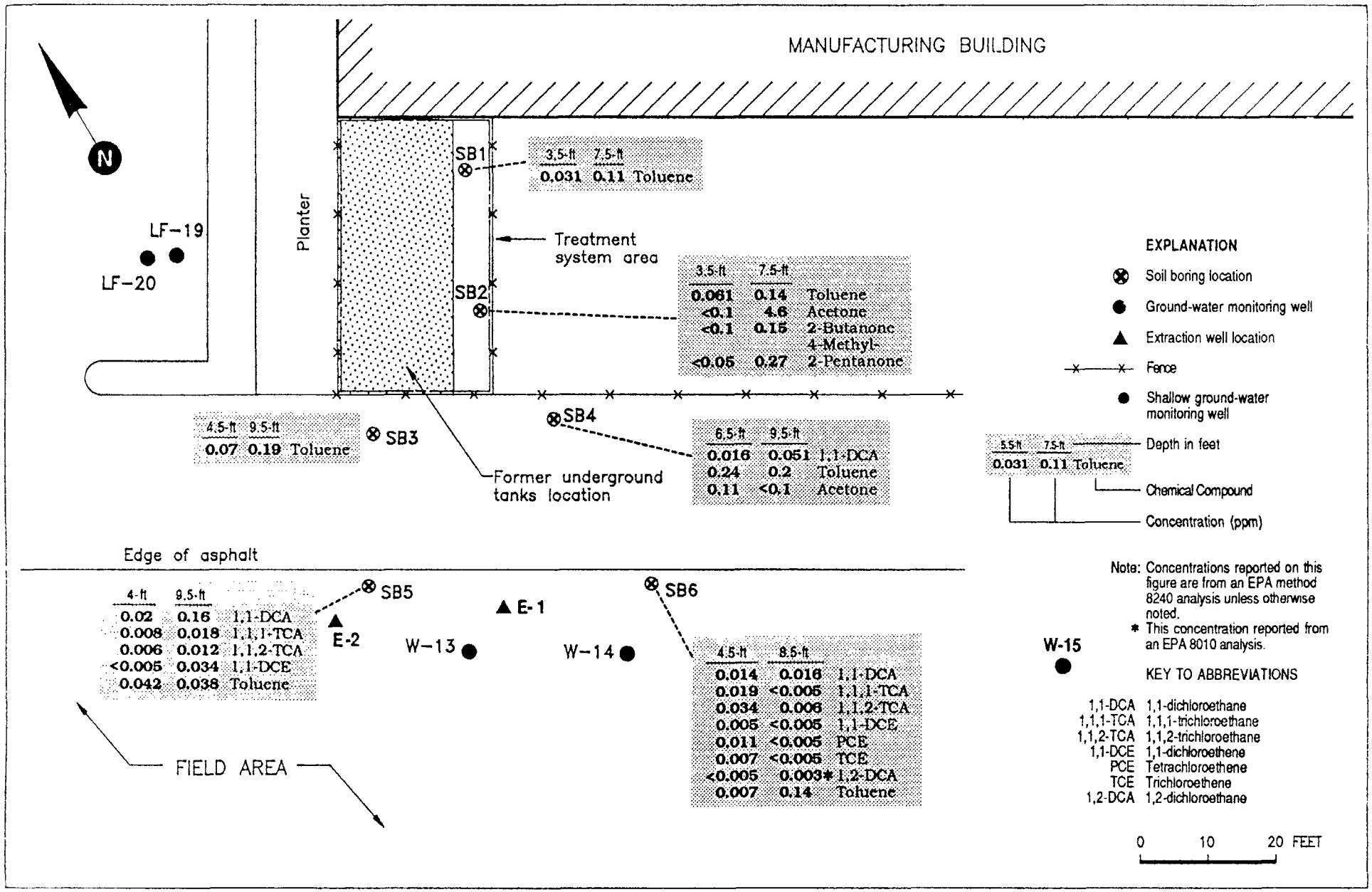


Figure 10 : SUMMMARY OF VOC CONCENTRATIONS DETECTED IN SOIL SAMPLES (ppm), APRIL 1990

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.01\F6DE07.JSS89AMBA05JUN90mp

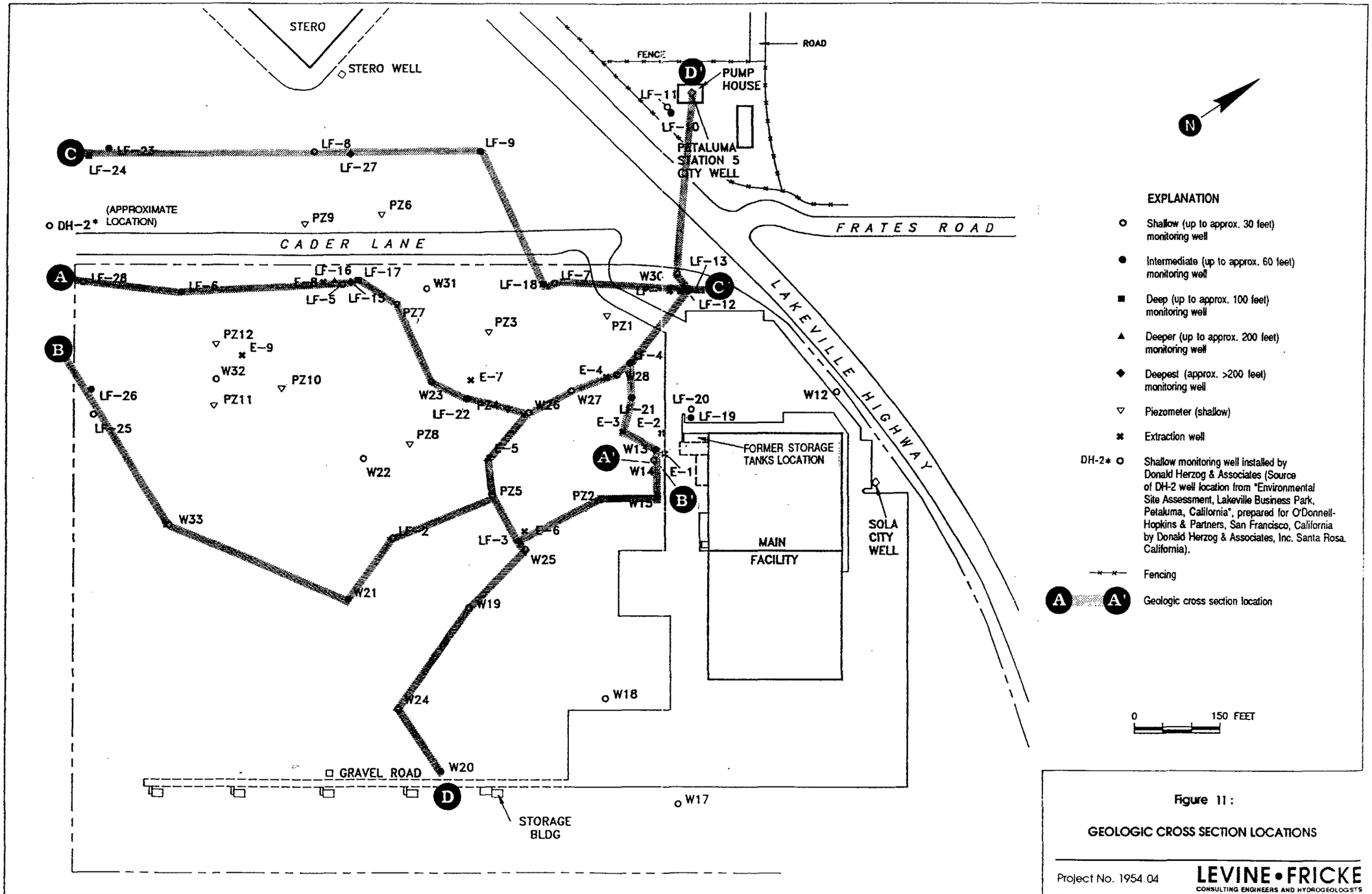


Figure 11:

GEOLOGIC CROSS SECTION LOCATIONS

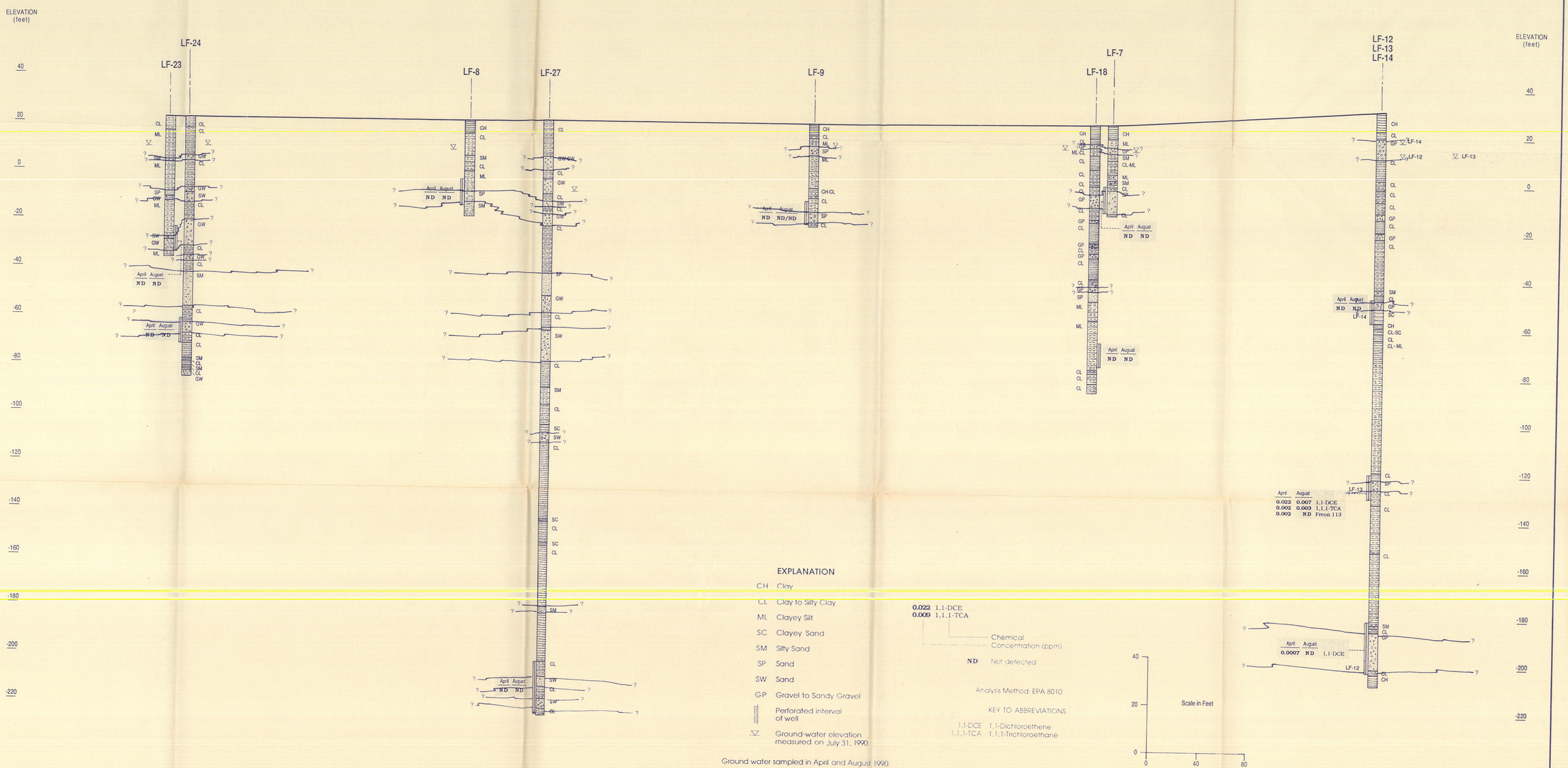
Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

JSS11JUN90jc

1107\81FE14.GWT89JMS

115668



Ground water sampled in April and August 1990.

LEVINE·FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS
Emeryville, California

Figure 14

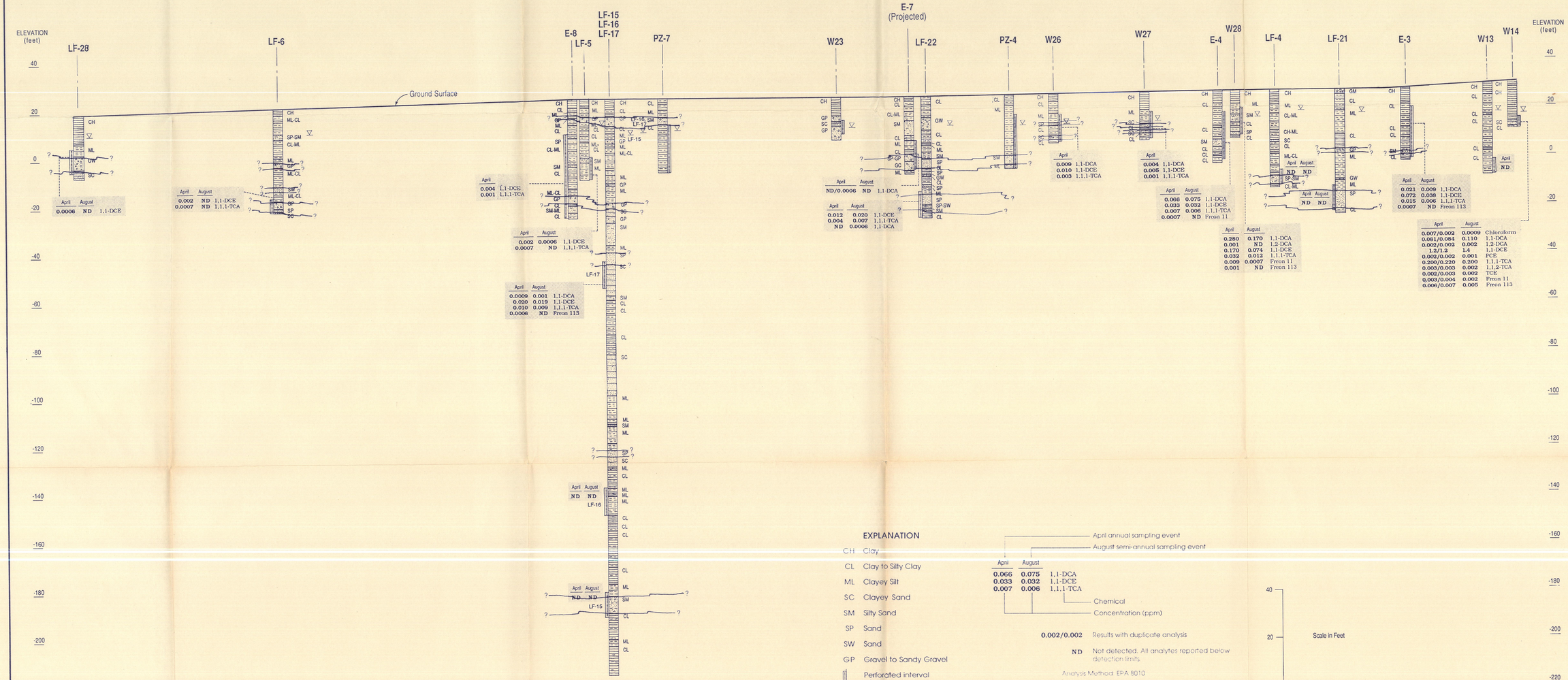
GEOLOGIC CROSS SECTION C-C'

Project No. 1954.04

Date MAY 1990

Sheet of

115668



EXPLANATION

CH	Clay
CL	Clay to Silty Clay
ML	Clayey Silt
SC	Clayey Sand
SM	Silty Sand
SP	Sand
SW	Sand
GP	Gravel to Sandy Gravel

Perforated interval of well

Ground-water elevation measured on July 31, 1990

Ground water sampled in April and August 1990.

April annual sampling event

August semi-annual sampling event

April	August	
0.066	0.075	1,1-DCA
0.033	0.032	1,1-DCE
0.007	0.006	1,1,1-TCA

Chemical

Concentration (ppm)

0.002/0.002 Results with duplicate analysis

ND Not detected. All analytes reported below detection limits

Analysis Method EPA 8010

KEY TO ABBREVIATIONS

PCE	Tetrachloroethene
TCE	Trichloroethene
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,1,1-TCA	1,1,1-trichloroethane
1,1,2-TCA	1,1,2-trichloroethane

Scale in Feet: 0, 20, 40; 0, 40, 80

LEVINE·FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS
Emeryville, California

Figure 12

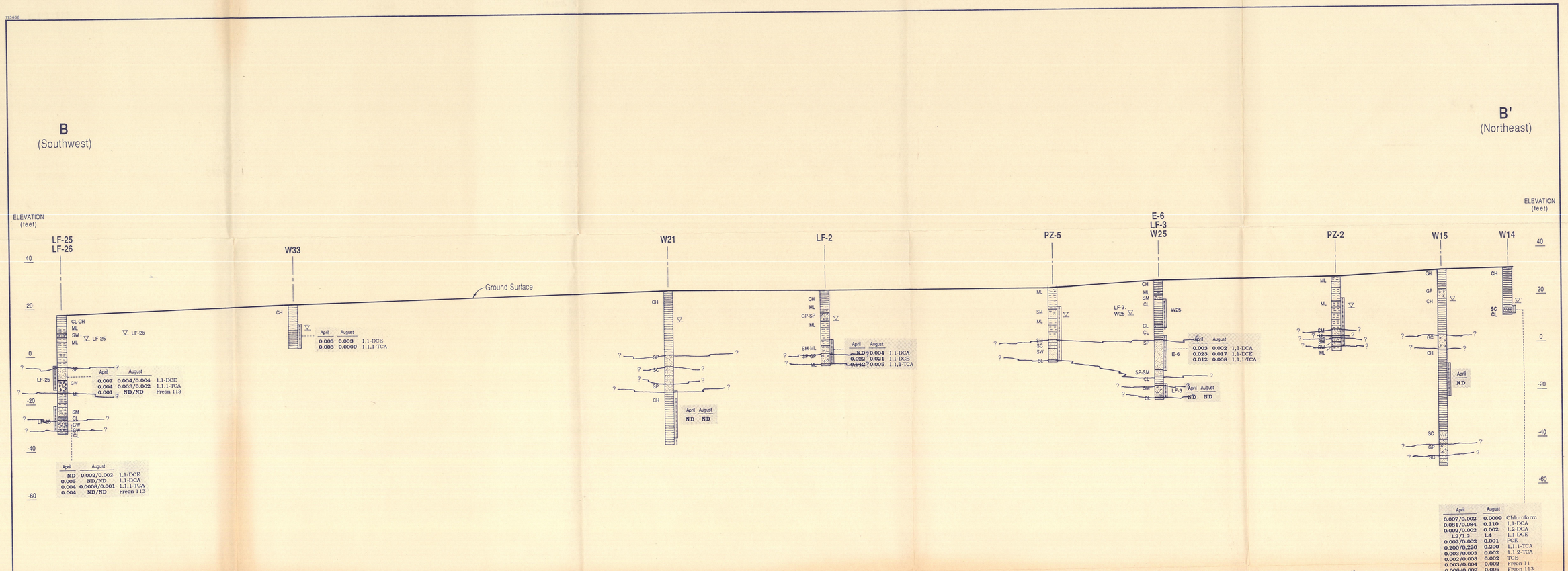
GEOLOGIC CROSS SECTION A-A'

Project No. 1954.04

Date MAY 1990

Sheet of

115668



EXPLANATION

CH	Clay
CL	Clay to Silty Clay
ML	Clayey Silt
SC	Clayey Sand
SM	Silty Sand
SP	Sand
SW	Sand
GP	Gravel to Sandy Gravel
‖	Perforated interval of well
▽	Ground-water elevation measured on July 31, 1990

Ground water sampled in April and August 1990.

April	August	
0.066	0.075	1,1-DCA
0.033	0.032	1,1-DCE
0.007	0.006	1,1,1-TCA

April annual sampling event

August semi-annual sampling event

Chemical

Concentration (ppm)

0.002/0.002 Results with duplicate analysis

ND Not detected. All analytes reported below detection limits.

Analysis Method: EPA 8010

KEY TO ABBREVIATIONS

PCE	Tetrachloroethene
TCE	Trichloroethene
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,1,1-TCA	1,1,1-trichloroethane
1,1,2-TCA	1,1,2-trichloroethane

LEVINE·FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS
Emeryville, California

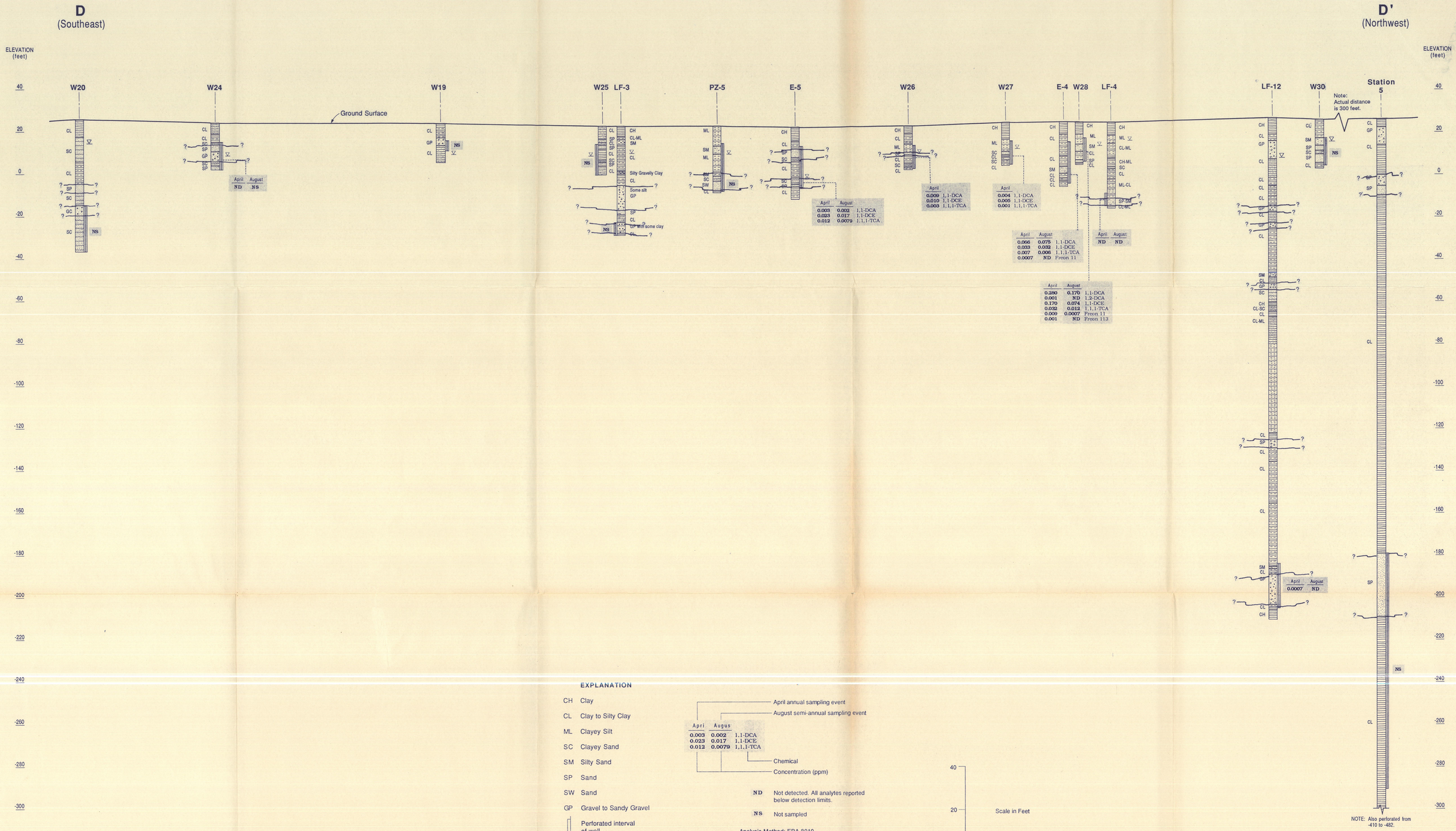
Figure 13

GEOLOGIC CROSS SECTION B-B'

Project No. 1954.04

Date MAY 1990

Sheet of



EXPLANATION

CH	Clay
CL	Clay to Silty Clay
ML	Clayey Silt
SC	Clayey Sand
SM	Silty Sand
SP	Sand
SW	Sand
GP	Gravel to Sandy Gravel

Perforated interval of well

Ground-water elevation measured on July 31, 1990

Ground-water sampled on April and August 1990.

Apri	Augus	
0.003	0.002	1,1-DCA
0.023	0.017	1,1-DCE
0.012	0.0079	1,1,1-TCA

April annual sampling event

August semi-annual sampling event

Chemical

Concentration (ppm)

ND Not detected. All analytes reported below detection limits.

NS Not sampled

Analysis Method: EPA 8010

KEY TO ABBREVIATIONS

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethane
1,1,1-TCA	1,1,1-trichloroethane

40 20 0 — Scale in Feet — 0 40 80

Figure 15 :

GEOLOGIC CROSS SECTION D-D'

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

NRN16NOV90jc

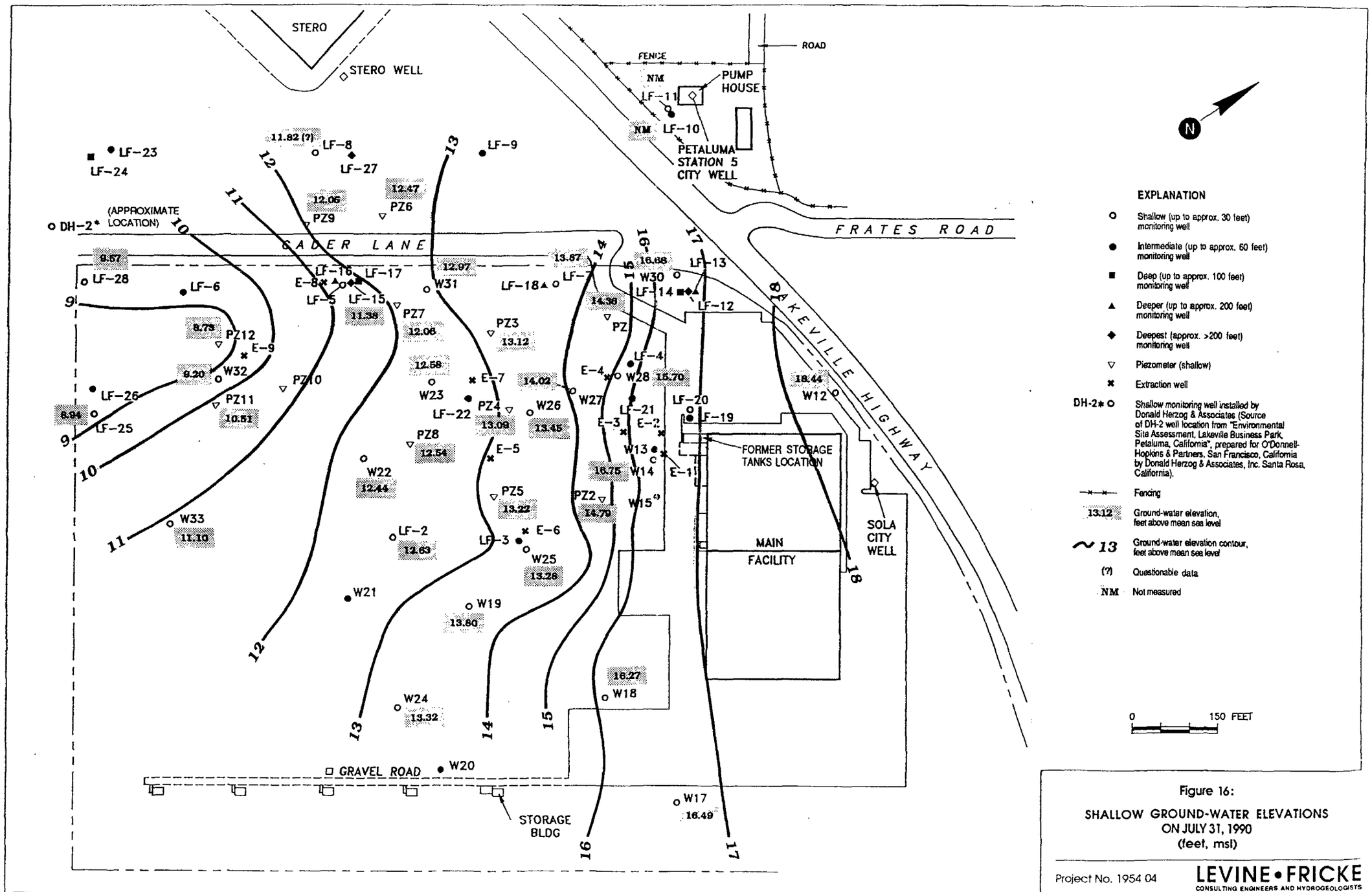


Figure 16:

SHALLOW GROUND-WATER ELEVATIONS ON JULY 31, 1990 (feet, msl)

Project No. 1954 04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GWT89JMS

JSS13AUG90mpa

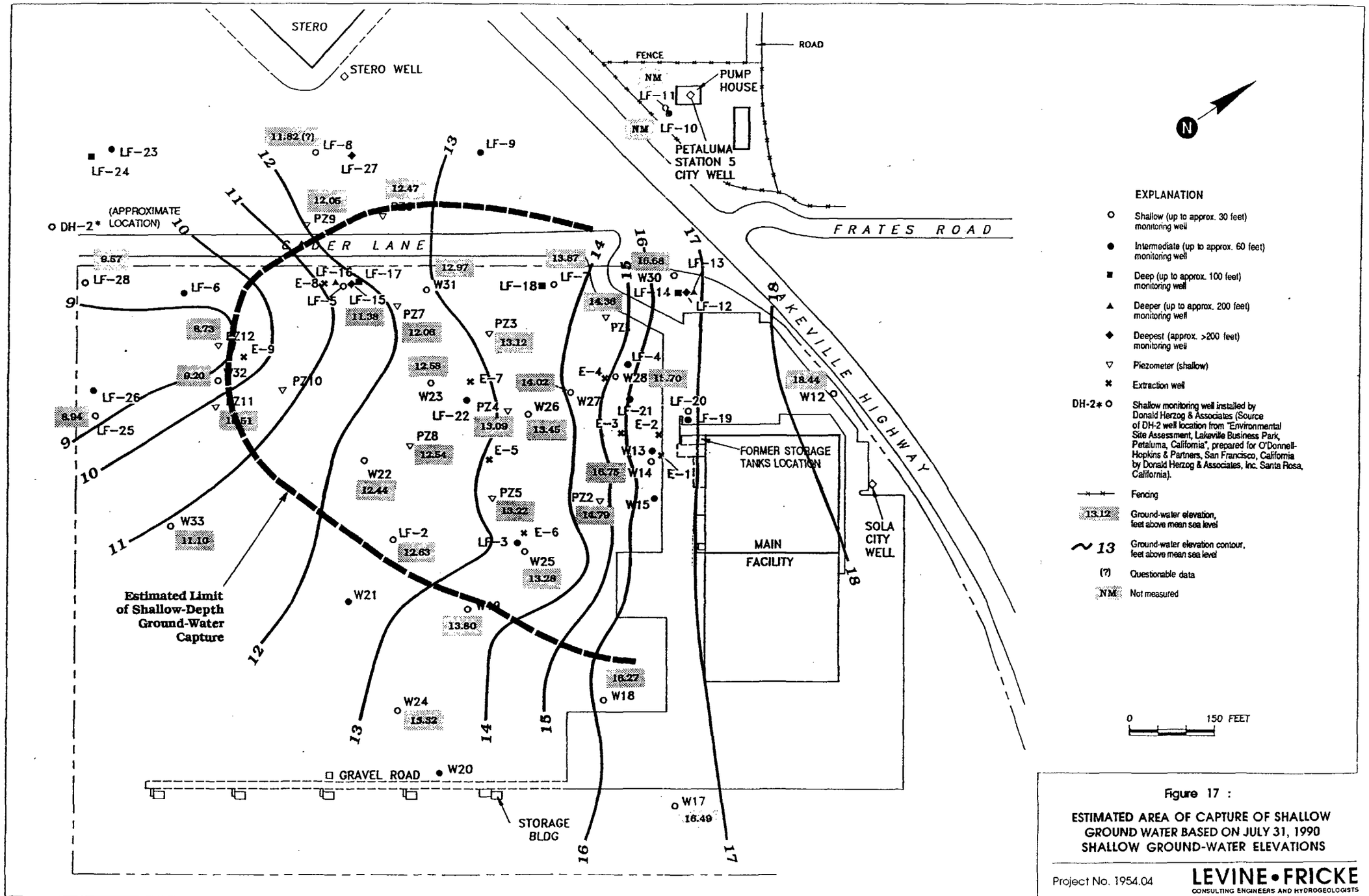


Figure 17 :

ESTIMATED AREA OF CAPTURE OF SHALLOW GROUND WATER BASED ON JULY 31, 1990 SHALLOW GROUND-WATER ELEVATIONS

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GWT89JMS

JS28NOV90jc

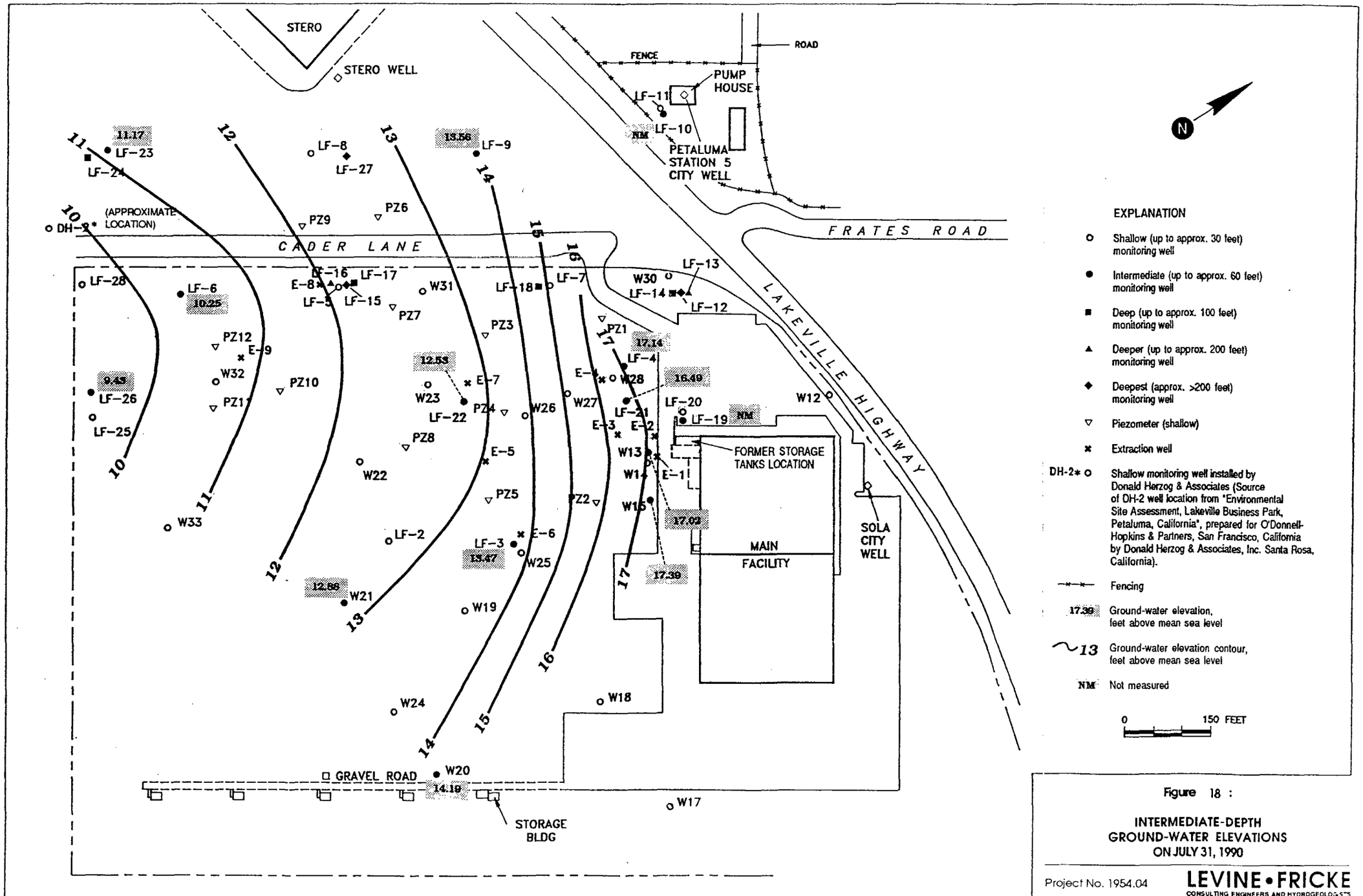


Figure 18 :

INTERMEDIATE-DEPTH GROUND-WATER ELEVATIONS ON JULY 31, 1990

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GWT89JMS

JSS14NOV90jc

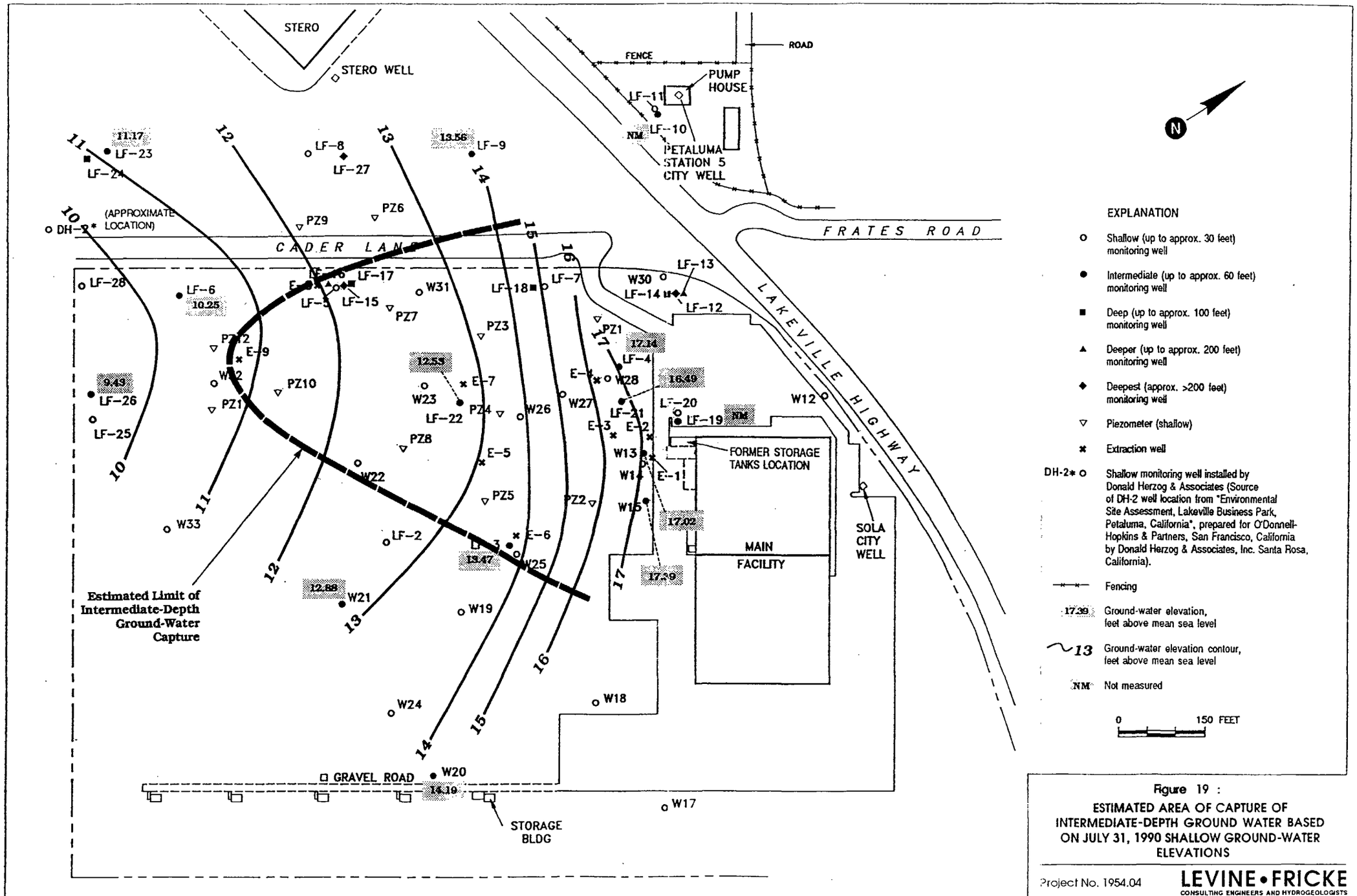


Figure 19 :
ESTIMATED AREA OF CAPTURE OF INTERMEDIATE-DEPTH GROUND WATER BASED ON JULY 31, 1990 SHALLOW GROUND-WATER ELEVATIONS

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GWT89.MS

JSS28NOV90jc

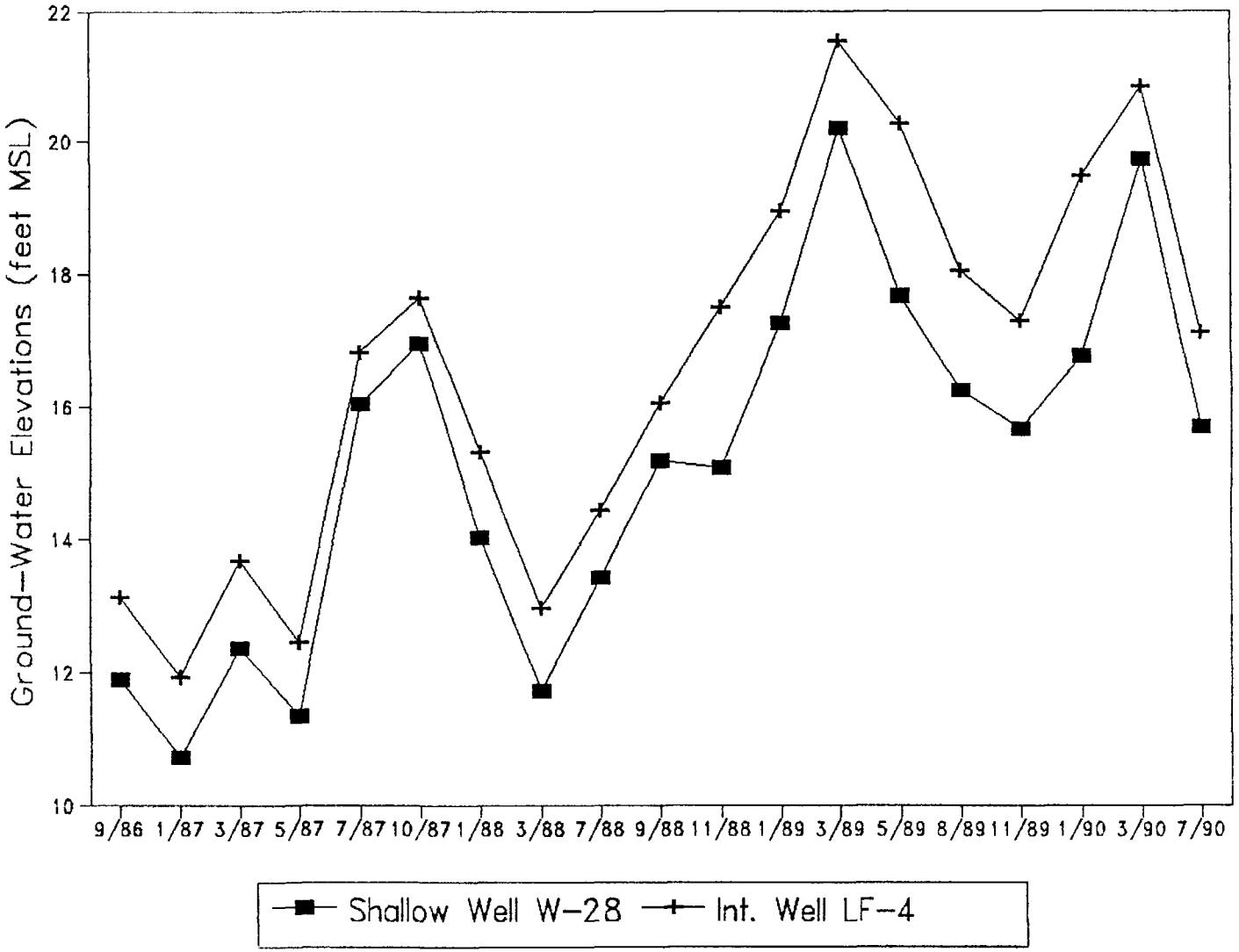


Figure 20 : HYDROGRAPHS FOR SHALLOW WELL W-28 AND INTERMEDIATE WELL LF-4

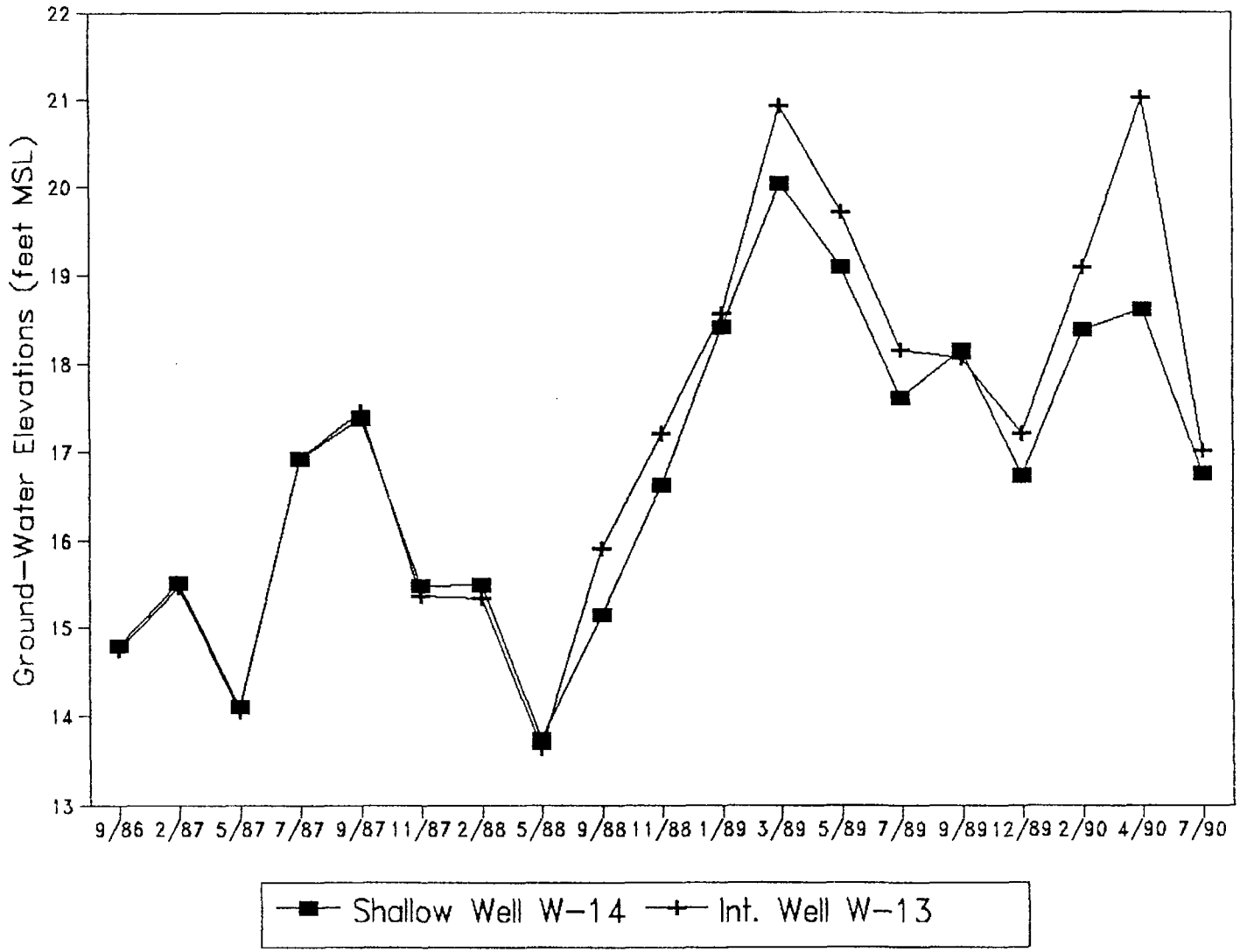


Figure 21 : HYDROGRAPHS FOR SHALLOW WELL W-14 AND INTERMEDIATE WELL W-13

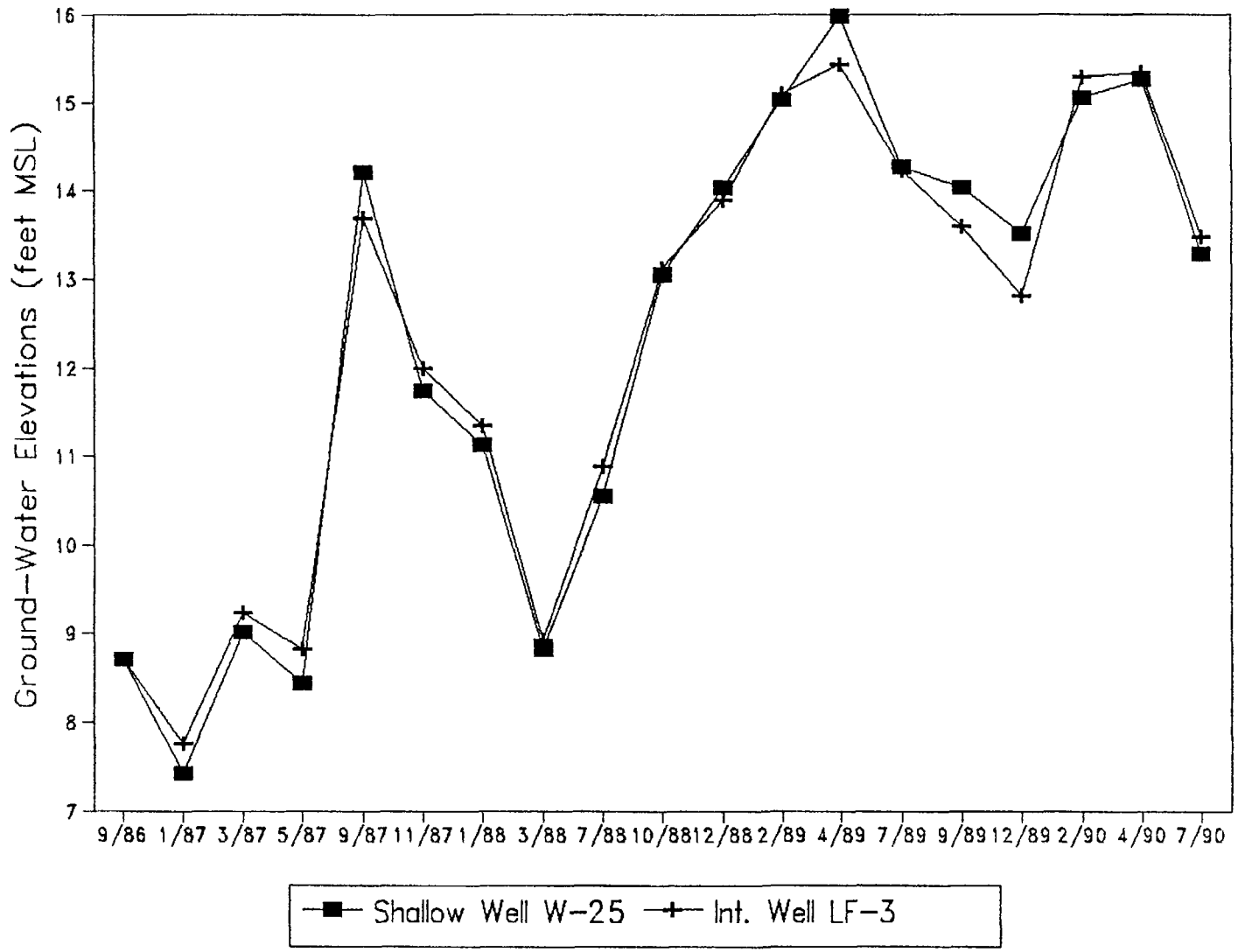


Figure 22 : HYDROGRAPHS FOR SHALLOW WELL W-25 AND INTERMEDIATE WELL LF-3

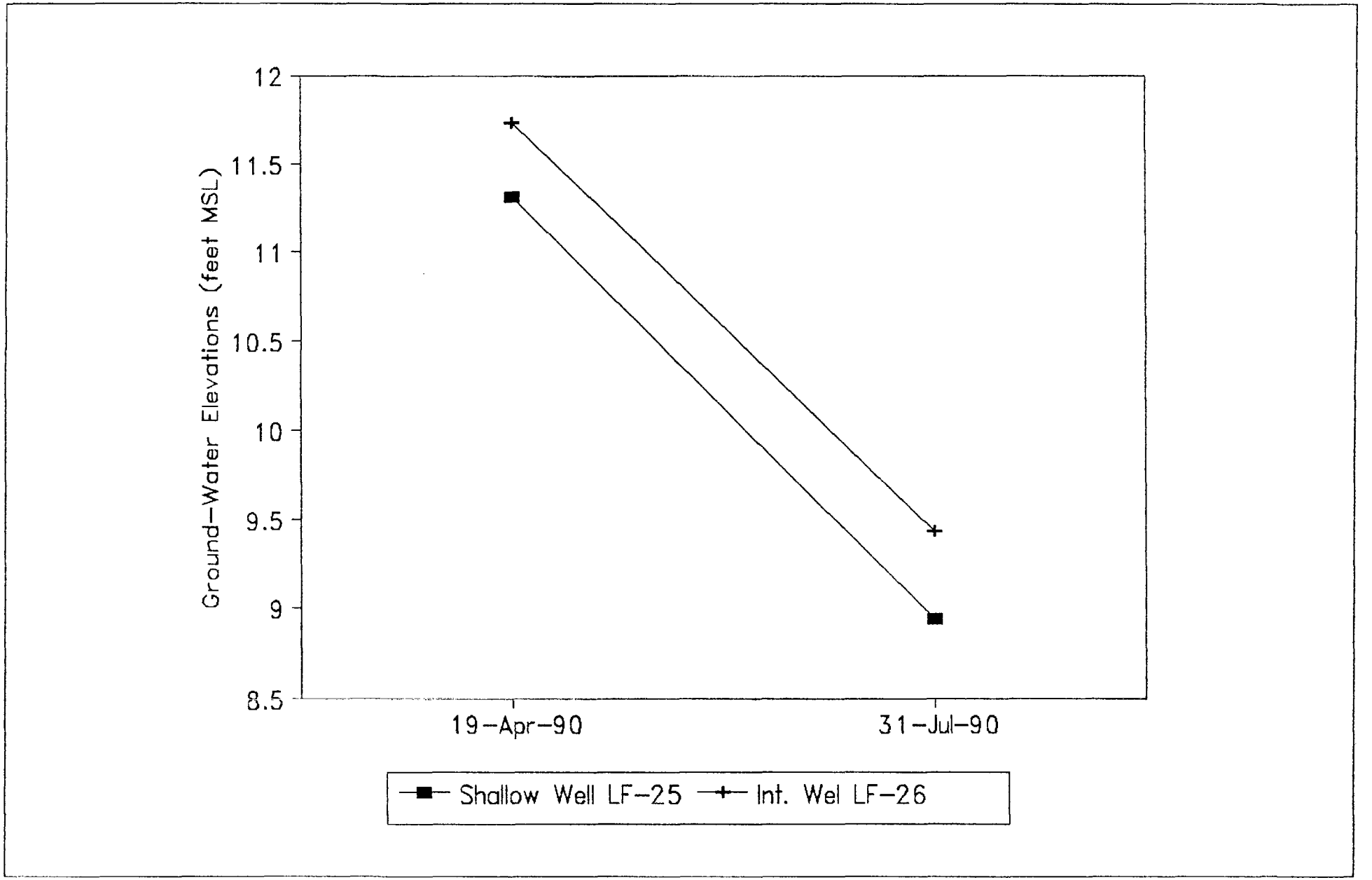


Figure 23 : HYDROGRAPHS FOR SHALLOW WELL LF-25 AND INTERMEDIATE WELL LF-26

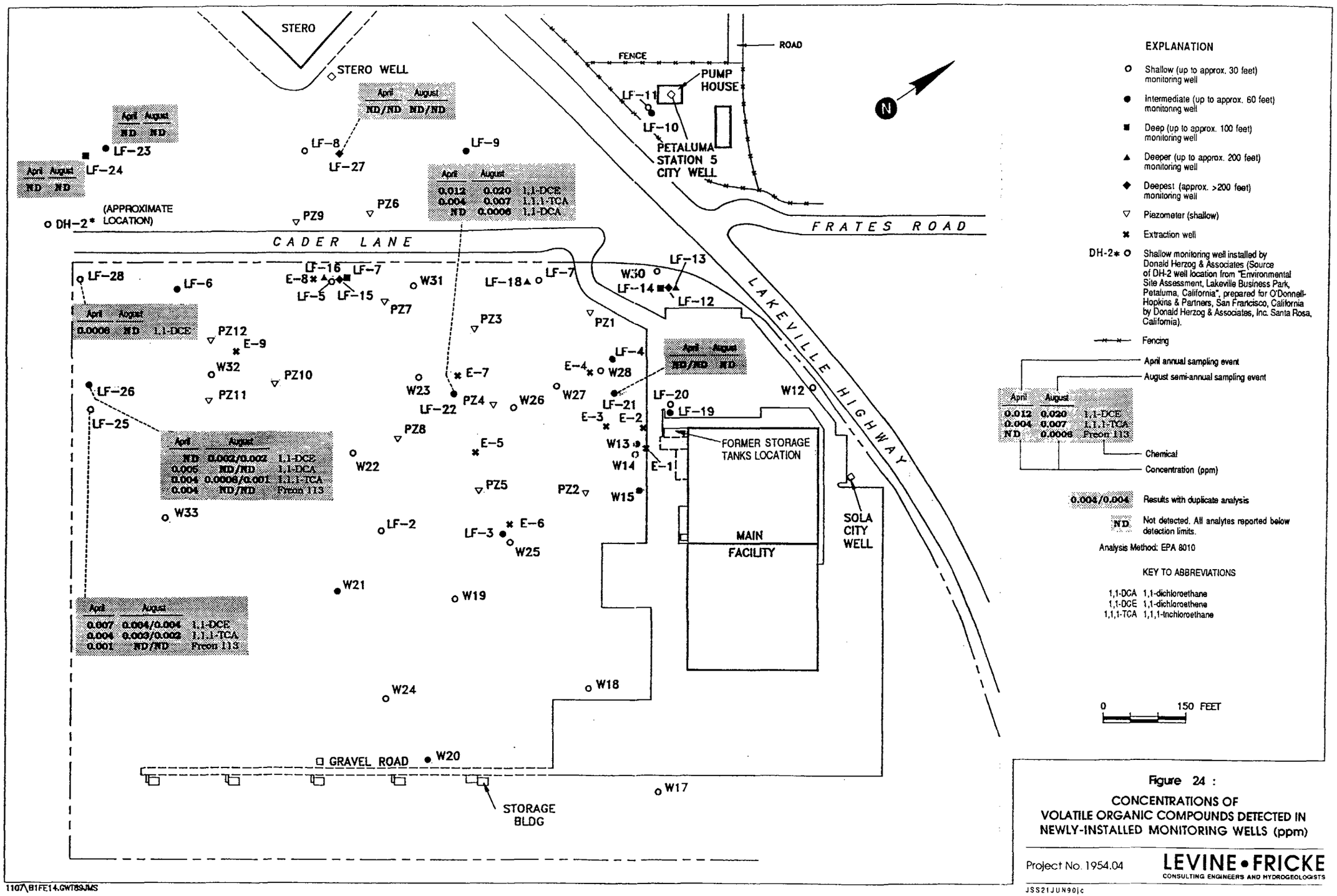


Figure 24 :

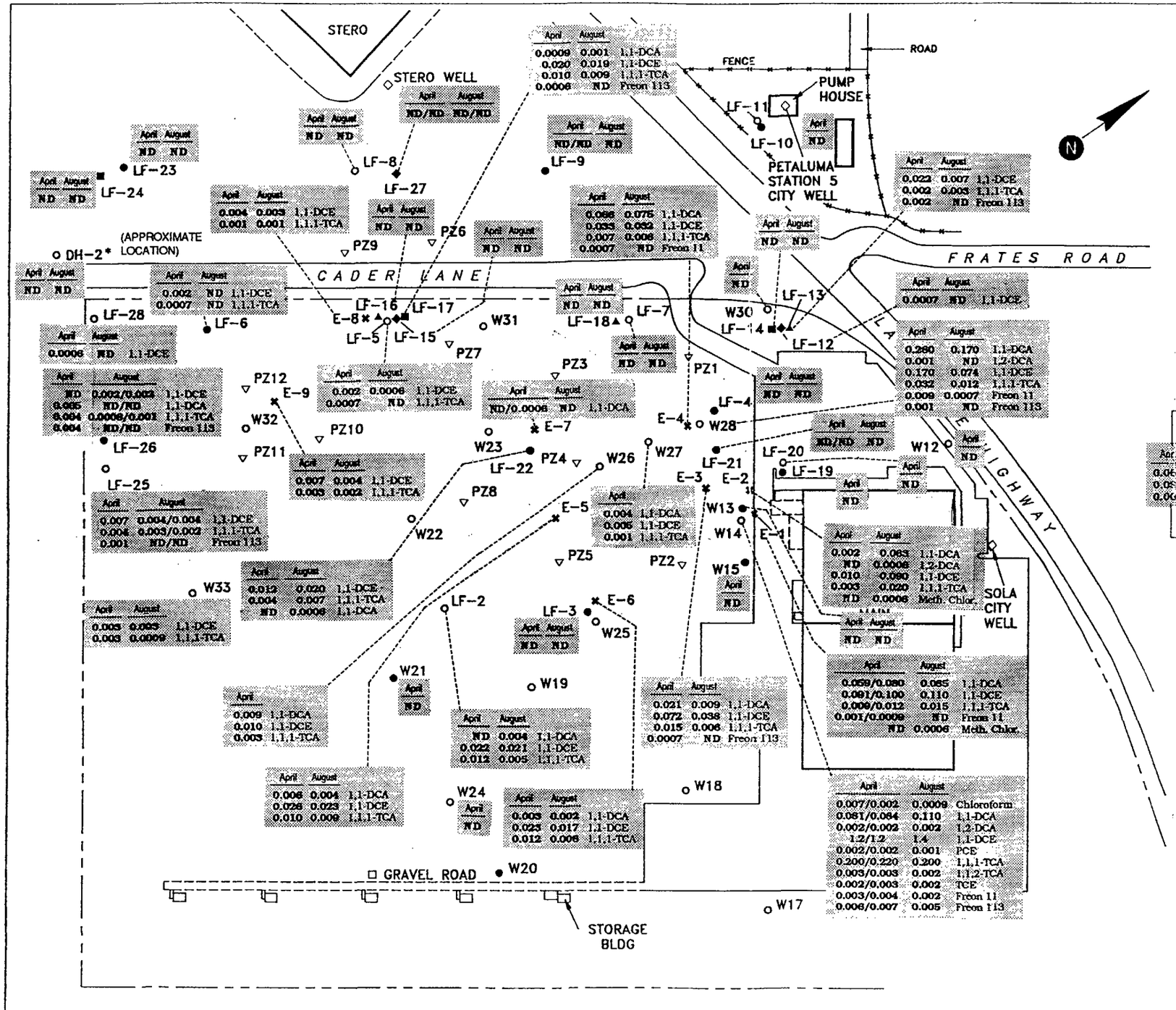
CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS DETECTED IN NEWLY-INSTALLED MONITORING WELLS (ppm)

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GWT89JMS

JSS21JUN90|c



EXPLANATION

- ○ Shallow (up to approx. 30 feet) monitoring well
- ● Intermediate (up to approx. 60 feet) monitoring well
- ■ Deep (up to approx. 100 feet) monitoring well
- ▲ Deeper (up to approx. 200 feet) monitoring well
- ◆ Deepest (approx. >200 feet) monitoring well
- ▽ Piezometer (shallow)
- ✖ Extraction well
- DH-2* ○ Shallow monitoring well installed by Donald Herzog & Associates (Source of DH-2 well location from "Environmental Site Assessment, Lakeville Business Park, Petaluma, California", prepared for O'Donnell-Hopkins & Partners, San Francisco; California by Donald Herzog & Associates, Inc. Santa Rosa, California).
- Fencing

April / August — April annual sampling event; August semi-annual sampling event

Chemical — Concentration (ppm)

0.002/0.002 — Results with duplicate analysis

ND — Not detected. All analytes reported below detection limits.

Analysis Method: EPA 8010

KEY TO ABBREVIATIONS

PCE	Tetrachloroethene
TCE	Trichloroethene
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethene (cis and/or trans)
1,1,1-TCA	1,1,1-trichloroethane
1,1,2-TCA	1,1,2-trichloroethane
Meth. Chlor.	Methylene Chloride

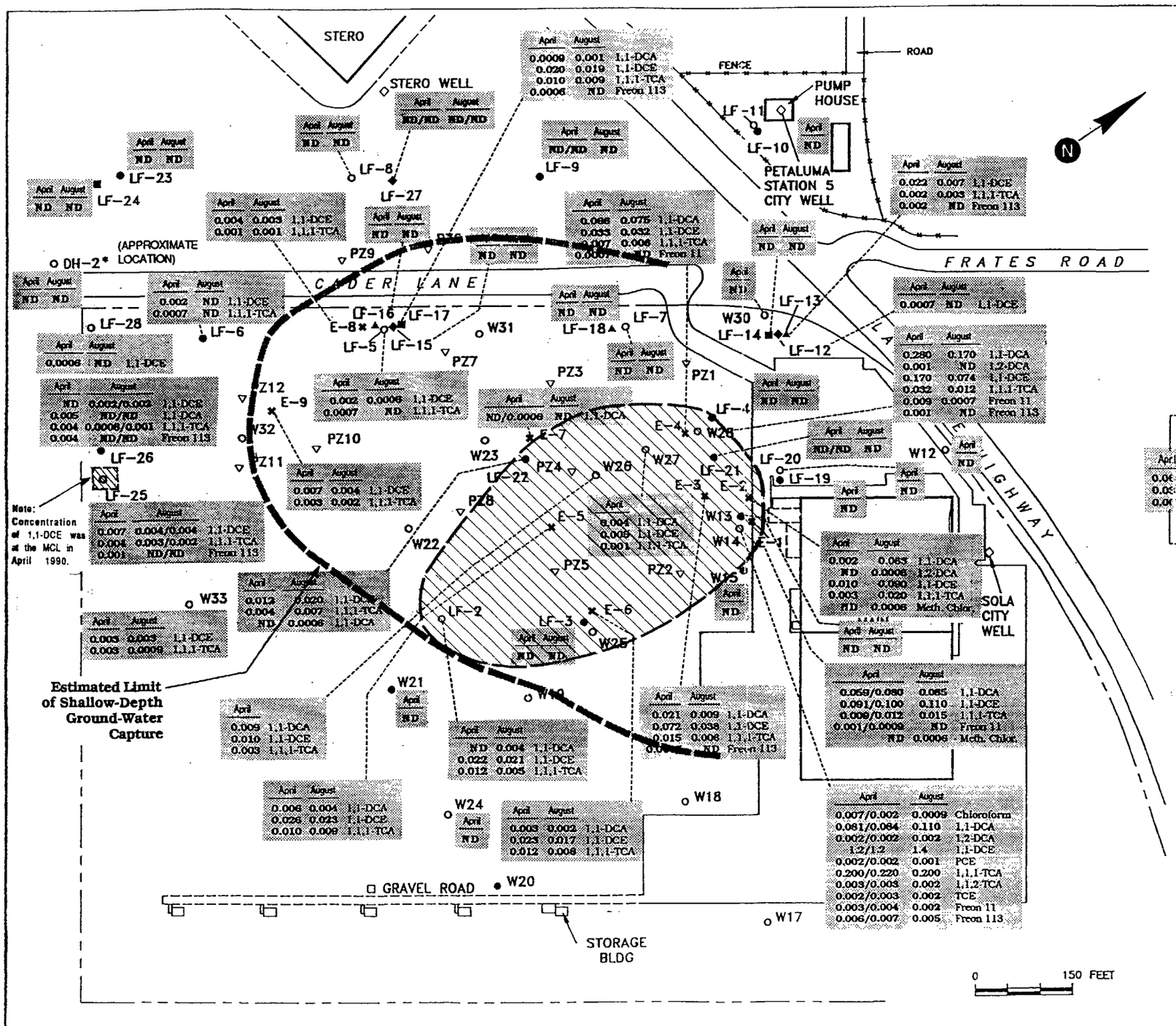
Figure 25 :
CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS DETECTED IN GROUND WATER (ppm) APRIL AND AUGUST 1990

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GWT89JMS

JSS27SEP90jc



EXPLANATION

- ○ Shallow (up to approx. 30 feet) monitoring well
- ● Intermediate (up to approx. 60 feet) monitoring well
- ■ Deep (up to approx. 100 feet) monitoring well
- ▲ Deeper (up to approx. 200 feet) monitoring well
- ◆ Deepest (approx. >200 feet) monitoring well
- ▽ Piezometer (shallow)
- ✖ Extraction well
- DH-2* ○ Shallow monitoring well installed by Donald Herzog & Associates (Source of DH-2 well location from "Environmental Site Assessment, Lakeville Business Park, Petaluma, California", prepared for O'Donnell-Hopkins & Partners, San Francisco, California by Donald Herzog & Associates, Inc. Santa Rosa, California).
- Fencing

April	August	Chemical
0.006	0.075	1,1-DCA
0.003	0.032	1,1-DCE
0.007	0.006	1,1,1-TCA

April annual sampling event

August semi-annual sampling event

Concentration (ppm)

0.002/0.002 Results with duplicate analysis

ND Not detected. All analytes reported below detection limits.

Analysis Method: EPA 8010

KEY TO ABBREVIATIONS

PCE	Tetrachloroethene
TCE	Trichloroethene
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethene (cis and/or trans)
1,1,1-TCA	1,1,1-trichloroethane
1,1,2-TCA	1,1,2-trichloroethane
Meth. Chlor.	Methylene Chloride

Estimated area of shallow ground water with concentrations of VOCs greater than MCLs.

Figure 26 :

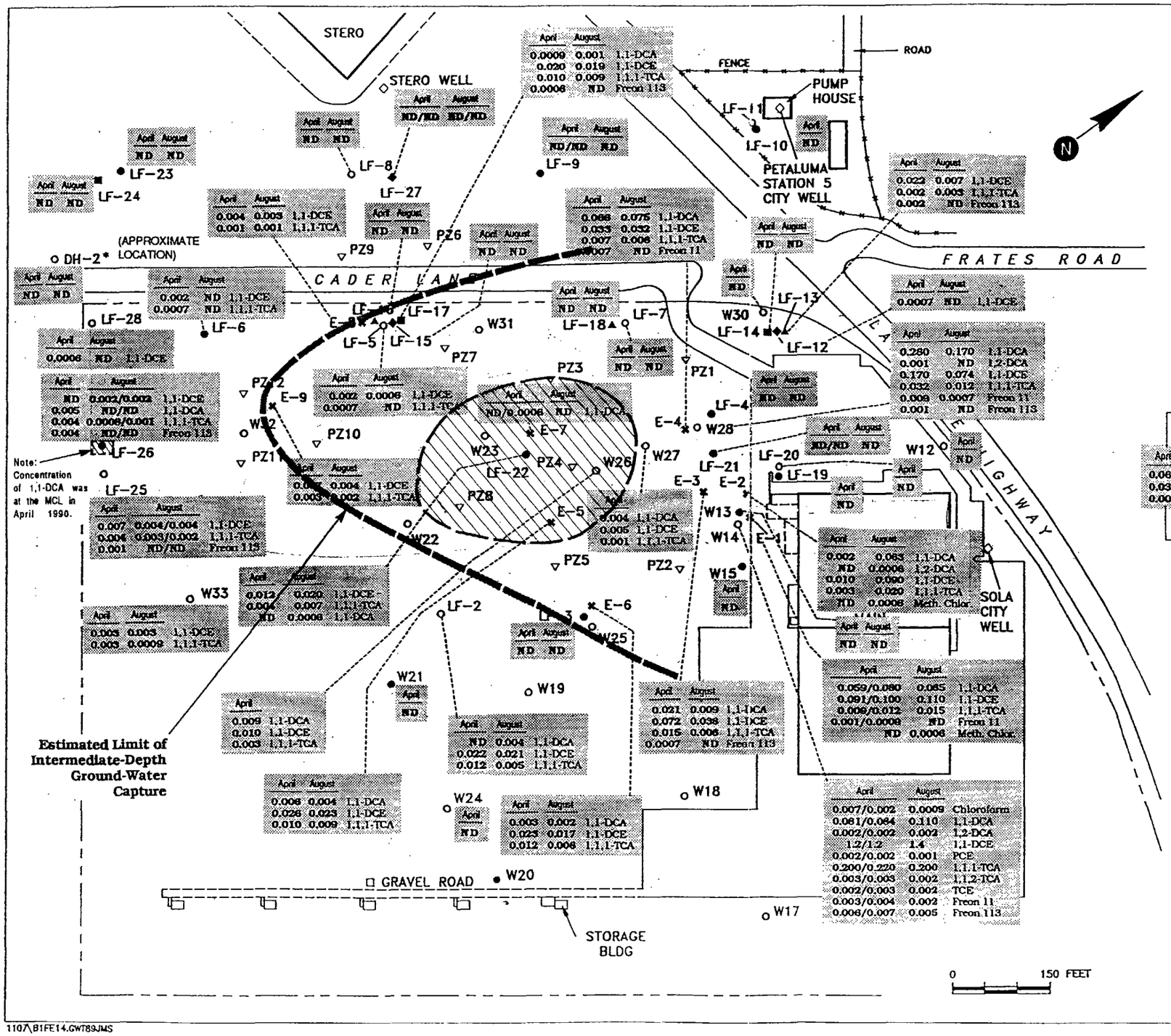
ESTIMATED EXTENT OF CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS GREATER THAN MCLs IN SHALLOW-DEPTH GROUND WATER, APRIL AND AUGUST 1990

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GW789JMS

1954.04JS30NOV90jc



EXPLANATION

- ○ Shallow (up to approx. 30 feet) monitoring well
- ● Intermediate (up to approx. 60 feet) monitoring well
- ■ Deep (up to approx. 100 feet) monitoring well
- ▲ Deeper (up to approx. 200 feet) monitoring well
- ◆ Deepest (approx. >200 feet) monitoring well
- ▽ Piezometer (shallow)
- ✖ Extraction well
- DH-2* ○ Shallow monitoring well installed by Donald Herzog & Associates (Source of DH-2 well location from "Environmental Site Assessment, Lakeville Business Park, Petaluma, California", prepared for O'Donnell-Hopkins & Partners, San Francisco, California by Donald Herzog & Associates, Inc. Santa Rosa, California).
- Fencing

April annual sampling event
August semi-annual sampling event

April	August	
0.066	0.075	1,1-DCA
0.033	0.032	1,1-DCE
0.007	0.006	1,1,1-TCA

Chemical
Concentration (ppm)

0.002/0.002 Results with duplicate analysis

ND Not detected. All analytes reported below detection limits.

Analysis Method: EPA 8010

KEY TO ABBREVIATIONS

PCE	Tetrachloroethene
TCE	Trichloroethene
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethene (cis and/or trans)
1,1,1-TCA	1,1,1-trichloroethane
1,1,2-TCA	1,1,2-trichloroethane
Meth. Chlor.	Methylene Chloride

Estimated area of intermediate ground water with concentrations of VOCs greater than MCLs.

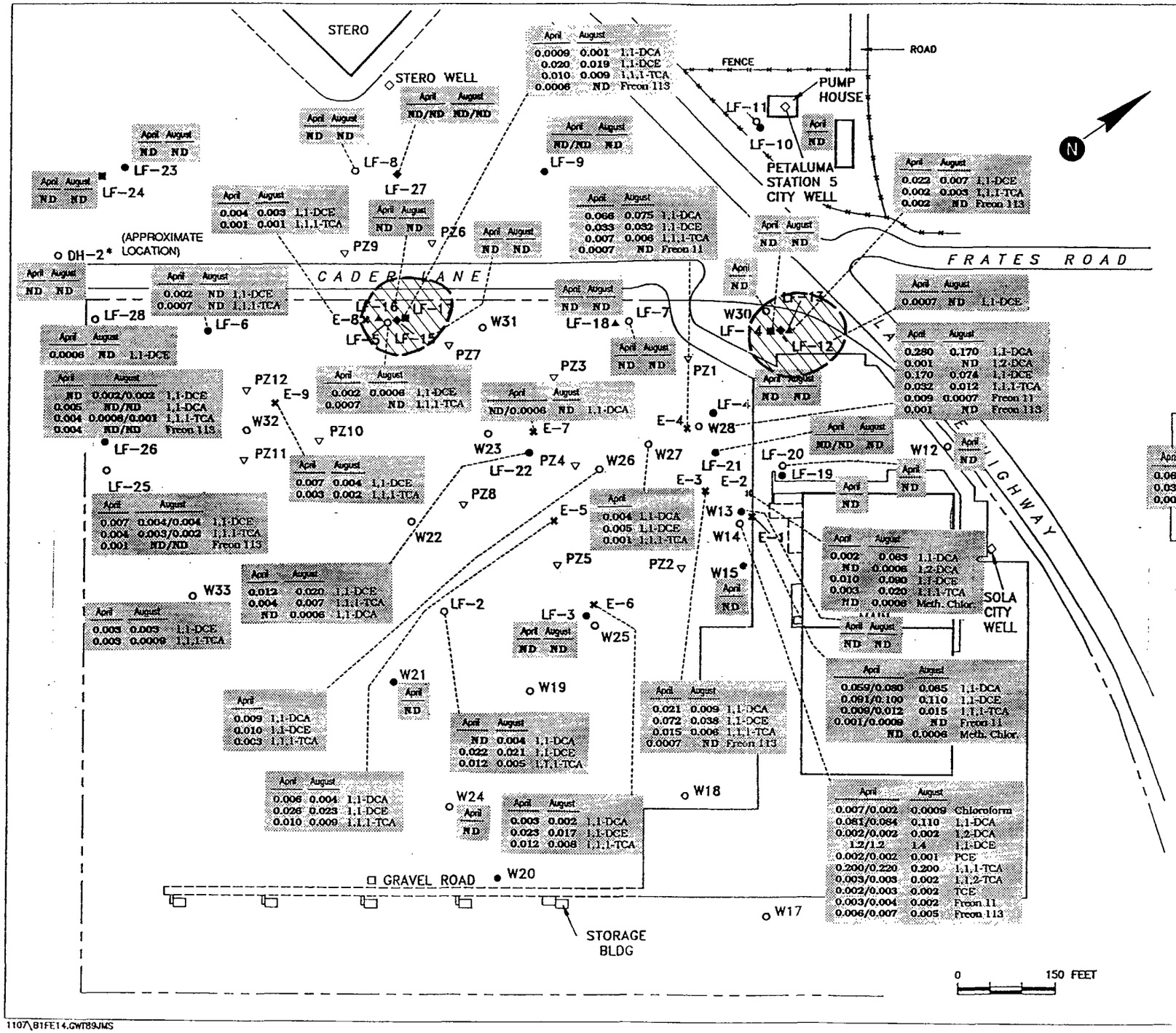
Figure 27 :
ESTIMATED EXTENT OF CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS GREATER THAN MCLs IN INTERMEDIATE-DEPTH GROUND WATER, APRIL AND AUGUST 1990

Project No. 1954.04

LEVINE • FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

110/B1FE14.GWT89JMS

1954.04/SS30NOV90c



EXPLANATION

- ○ Shallow (up to approx. 30 feet) monitoring well
- ● Intermediate (up to approx. 60 feet) monitoring well
- ■ Deep (up to approx. 100 feet) monitoring well
- ▲ Deeper (up to approx. 200 feet) monitoring well
- ◆ Deepest (approx. >200 feet) monitoring well
- ▽ Piezometer (shallow)
- ✖ Extraction well
- DH-2* ○ Shallow monitoring well installed by Donald Herzog & Associates (Source of DH-2 well location from "Environmental Site Assessment, Lakeville Business Park, Petaluma, California", prepared for O'Donnell-Hopkins & Partners, San Francisco, California by Donald Herzog & Associates, Inc. Santa Rosa, California).
- Fencing

April	August	Chemical
0.066	0.075	1,1-DCA
0.033	0.032	1,1-DCE
0.007	0.006	1,1,1-TCA

April annual sampling event
August semi-annual sampling event
Chemical
Concentration (ppm)

0.002/0.002 Results with duplicate analysis

ND Not detected. All analytes reported below detection limits.

Analysis Method: EPA 8010

KEY TO ABBREVIATIONS

PCE	Tetrachloroethene
TCE	Trichloroethene
1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCA	1,2-dichloroethene (cis and/or trans)
1,1,1-TCA	1,1,1-trichloroethane
1,1,2-TCA	1,1,2-trichloroethane
Meth. Chlor.	Methylene Chloride

Estimated area of deep and deeper ground water with concentrations of VOCs greater than MCLs.

Figure 28 :
ESTIMATED EXTENT OF CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS GREATER THAN MCLs IN DEEP AND DEEPER GROUND WATER, APRIL AND AUGUST 1990

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1107\B1FE14.GWT89JMS

1954.04JS30NOV90jc

APPENDIX A

LABORATORY DATA SHEETS

(Laboratory QA/AC Data Available on Request)

MED-TOX ASSOCIATES, INC.

ENVIRONMENTAL & OCCUPATIONAL HEALTH SERVICES
3440 Vincent Road Pleasant Hill, CA 94523 • (415) 930-9090 • FAX# (415) 930-0256

LABORATORY ANALYSIS REPORT

SOLA OPTICAL
1500 CADER LANE
P.O. BOX 6002
PETALUMA, CA 94953-6002
ATTN: MARK ADAMS

REPORT DATE: 09/20/90

DATE SAMPLED: 09/10-11/90

DATE RECEIVED: 09/11/90

CLIENT ID NO: 1954.09

MED-TOX JOB NO: 9009049

ANALYSIS OF: WATER SAMPLES

See attached for results

RECEIVED
SEP 2 1 1990
LEVINE-FRICKE

Michael Lynch, Manager
Organic Laboratory

Results FAXed to Scott Seyfried (Levine-Fricke/Roseville) 09/17/90

SOLA OPTICAL

CLIENT ID: LF-9
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/10/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-01A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/13/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-9D
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/10/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-02A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/16/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-5
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/10/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-03A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/16/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	0.6	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-6-FB
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/10/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-04A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/13/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-6
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/10/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-05A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/13/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: W-14
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/10/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-06A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/13-14/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	**67-66-3**	**0.9**	**0.5**
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	**75-34-3**	**110**	**0.5**
1,2-Dichloroethane	**107-06-2**	**2**	**0.5**
1,1-Dichloroethene	**75-35-4**	**1,400**	**0.5**
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	**127-18-4**	**1**	**0.5**
1,1,1-Trichloroethane	**71-55-6**	**200**	**0.5**
1,1,2-Trichloroethane	**79-00-5**	**2**	**0.5**
Trichloroethene	**79-01-6**	**2**	**0.5**
Trichlorofluoromethane	**75-69-4**	**2**	**0.5**
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-12
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/11/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-07A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/14/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-13
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/11/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-08A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/14/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	**75-35-4**	**7**	**0.5**
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	**71-55-6**	**3**	**0.5**
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: W-28
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/11/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-09A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/14/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	**75-34-3**	**170**	**0.5**
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	**75-35-4**	**74**	**0.5**
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	**71-55-6**	**12**	**0.5**
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	**75-69-4**	**0.7**	**0.5**
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: W-33
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/11/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-10A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/14/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	3	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	0.9	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: TB
CLIENT JOB NO: 1954.09
DATE SAMPLED: 09/10/90
DATE RECEIVED: 09/11/90
REPORT DATE: 09/20/90

MED-TOX LAB NO: 9009049-11A
MED-TOX JOB NO: 9009049
DATE ANALYZED: 09/14/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

K-2 S-1

CHAIN OF CUSTODY / ANALYSES REQUEST FORM

Project No.: 1954.09	Field Logbook No.:	Date: 9/10/90	Serial No.: 0531
Project Name: Sola	Project Location: Petaluma		
Sampler (Signature): [signature]			9009049

Samplers: NRN, STW

SAMPLES						ANALYSES								REMARKS
SAMPLE NO.	DATE	TIME	LAB SAMPLE NO.	NO. OF CON-TAINERS	SAMPLE TYPE	EPA 601	EPA 624	EPA 8010				HOLD	RUSH	
LF-9	9/10/90	11:45	01A,B	2	water			X						
LF-9D	9/10/90	11:50	02A,B	2	water			X						
LF-5	9/10/90	12:25	03A,B	2	water			X						
LF-6-FB	9/10/90	12:58	04A,B	2	water			X						
~~LF-9D-TB~~	~~9/10/90~~	~~13:00~~	~~[illegible]~~	~~2~~	~~water~~									
LF-6	9/10/90	13:10	05A,B	2	water			X						
~~[illegible]~~	~~9/10/90~~	~~STW~~	~~[illegible]~~											
W-14	9/10/90	16:20	06A,06B	2	water			X						
LF-12	9/11/90	10:00	07A,07B	2	water			X						
LF-13	9/11/90	10:45	08A,08B	2	water			X						
W-28	9/11/90	12:15	09A,09B	2	water			X						
W-33	9/11/90	13:00	10A,B	2	water			X						
TB	9/10/90	13:00	11A,B	2	water			X						

RECEIVED BY: (Signature) [signature]	DATE 9/11/90	TIME 16:15	RECEIVED BY: (Signature) L. St John	DATE 9/11/90	TIME 16:15
RECEIVED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
RECEIVED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
LAB COMMENTS:			LAB COMMENTS:		

SOLA OPTICAL USA, INC.
1500 Cader Lane
P.O. Box 6002
Petaluma, CA 94953-6002
(707) 763-9911

Analytical Laboratory: Med Tox
(415) 930-9090
3440 Vincent
Pleasant Hill, CA

Shipping Copy (White) Lab Copy (Yellow) File Copy (Pink) Field Copy (Gold)

MED-TOX ASSOCIATES, INC.

ENVIRONMENTAL & OCCUPATIONAL HEALTH SERVICES
3440 Vincent Road Pleasant Hill, CA 94523 • (415) 930-9090 • FAX# (415) 930-0256

LABORATORY ANALYSIS REPORT

SOLA OPTICAL
1500 CADER LANE
P.O. BOX 6002
PETALUMA, CA 94953-6002
ATTN: MARK ADAMS

REPORT DATE: 09/21/90

DATE SAMPLED: 08/29-31/90

DATE RECEIVED: 08/31/90

CLIENT ID NO: 1954.09

MED-TOX JOB NO: 9008163

ANALYSIS OF: WATER SAMPLES

See attached for results

RECEIVED
SEP 24 1990
LEVINE-FRICKE

Michael Lynch
Michael Lynch, Manager
Organic Laboratory

Results FAXed to Scott Seyfried (Levine-Fricke/Roseville) 09/17/90

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-22
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-01A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/07/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	**75-34-3**	**0.6**	**0.5**
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	**75-35-4**	**20**	**0.5**
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	**71-55-6**	**7**	**0.5**
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-4
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-02A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/07/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-4FB
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-03A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/07/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0:5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: D4-2
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/31/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-04A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/07-09/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: LF-3
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/31/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-05A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/07/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: LF-3FB
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/31/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-06A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/07/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-2
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/31/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-07A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/09/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	**75-34-3**	**4**	**0.5**
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	**75-35-4**	**21**	**0.5**
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	**71-55-6**	**5**	**0.5**
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: W-13
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/31/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-08A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/07/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: TB-2
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/31/90
REPORT DATE: 09/21/90

MED-TOX LAB NO: 9008163-09A
MED-TOX JOB NO: 9008163
DATE ANALYZED: 09/07/90
INSTRUMENT: G

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

R-2, S-2

CHAIN OF CUSTODY / ANALYSES REQUEST FORM

9008163

Project No.: 1954.09	Field Logbook No.:	Date: 8/30/90	Serial No.: 0054
Project Name: SOLA Optical	Project Location: Petaluma, CA		
Sampler (Signature): Natalie R Nielsen			

SAMPLES						ANALYSES								Samplers: AML/NRN
SAMPLE NO.	DATE	TIME	LAB SAMPLE NO.	NO. OF CON-TAINERS	SAMPLE TYPE	EPA 601	EPA 624	EPA 8010				HOLD	RUSH	REMARKS
LF-22	8/30	15:50	01A, 01B	2 VOA				✓						Normal Turn Around
LF-4	8/30	16:20	02A 02B					✓						
LF-4 FB	"	16:10	03A 03B					✓						
DH-2	8/31	8:55	04A 04B					✓						
LF3		12:00	05A 05B					✓						
LF-3 FB		9:15	06A 06B					✓						
LF-2		10:10	07A 07B					✓						
W13		10.45	08A 08B					✓						
TB-2	8/29	9:36	09A 09B	"				✓						

RECEIVED BY: (Signature) Natalie R Nielsen	DATE 8/31/90	TIME 13:00	RECEIVED BY: (Signature) Galen St John	DATE 8/31/90	TIME 13:00
RECEIVED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
RECEIVED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
LAB COMMENTS:			LAB COMMENTS:		

SOLA OPTICAL USA, INC.
1500 Cader Lane
P.O. Box 6002
Petaluma, CA 94953-6002
(707) 763-9911

Analytical Laboratory: Med Tox

ing (Whi Lab (Yell Copy) Fle py ((

MED-TOX ASSOCIATES, INC.

ENVIRONMENTAL & OCCUPATIONAL HEALTH SERVICES
3440 Vincent Road Pleasant Hill, CA 94523 • (415) 930-9090 • FAX# (415) 930-0256

LABORATORY ANALYSIS REPORT

SOLA OPTICAL
1500 CADER LANE
P.O. BOX 6002
PETALUMA, CA 94953-6002
ATTN: MARK ADAMS

CLIENT ID NO: 1954.09

REPORT DATE: 09/18/90

DATE SAMPLED: 08/28-30/90

DATE RECEIVED: 08/30/90

MED-TOX JOB NO: 9008154

ANALYSIS OF: WATER SAMPLES

See attached for results

Michael Lynch, Manager
Organic Laboratory

Results FAXed to Scott Seyfried (Levine-Fricke/Roseville) 09/13/90

SOLA OPTICAL

CLIENT ID: LF-27
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/28/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-01A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/4/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-27D
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/28/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-02A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-25
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-03A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	4	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	3	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-26D
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-04A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	2	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	1	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: LF-26
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-05A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	**75-35-4**	**2**	**0.5**
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	**71-55-6**	**0.8**	**0.5**
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-25D
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-06A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	4	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	2	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-28
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-07A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: LF-15
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-08A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: LF-17
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-09A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	1	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	19	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	9	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: LF-17FB
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-10A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: LF-21
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/29/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-11A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: LF-18
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-12A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: LF-14
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-13A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: LF-24
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-14A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: LF-23
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-15A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: LF-8
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-16A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
I,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: LF-7
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/30/90
DATE RECEIVED: 08/30/90
REPORT DATE: 09/18/90

MED-TOX LAB NO: 9008154-17A
MED-TOX JOB NO: 9008154
DATE ANALYZED: 09/04/90
INSTRUMENT: H

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

CHAIN OF CUSTODY / ANALYSES REQUEST FORM 900815

Project No.: 1954.09	Field Logbook No.:	Date: 8/29/90	Serial No.: 0052
Project Name: SOLA OPTICAL	Project Location: PETALUMA		
Sampler (Signature): Andrew M. Tofi			

SAMPLES						ANALYSES								Samplers: AML / NRN
SAMPLE NO.	DATE	TIME	LAB SAMPLE NO.	NO. OF CONTAINERS	SAMPLE TYPE	EPA 601	EPA 624	EPA 8010				HOLD	RUSH	REMARKS
✓ LF-27	8/28	16:25	9008154-1A-1B	2 VOA				✓						NORMAL TURN AROUND
✓ LF-27D	"	16:30	2A,2B					✓						
~~[illegible]~~	~~[illegible]~~		~~[illegible]~~					✓						
~~[illegible]~~	~~[illegible]~~		~~[illegible]~~					✓						
✓ LF-25	8/29	11:15	3A 3B					✓						
✓ LF-26D	8/29	10:55	4A,4B					✓						
✓ LF-26	8/29	10:50	5A,5B					✓						
✓ LF-25D	8/29	11:20	6A,6B					✓						
✓ LF-28	8/29	12:10	7A,7B					✓						
LF-15	8/29	15:35	8A,8B					✓						C.O.C. seals intact
✓ LF-17		10:05	9A,9B					✓						on all samples
✓ LF-17FB		10:00	10A,10B					✓						received - DSH
LF-21	✓	16:15	11A,11B					✓						
LF-18	8/30	10:15	12A,12B					✓						
LF-14	"	11:05	13A,13B					✓						

RECEIVED BY: (Signature) Andrew M. Tofi	DATE 8/30/90	TIME 15:20	RECEIVED BY: (Signature) LaVon Stilfohn	DATE 8/30/90	TIME 15:20
RECEIVED BY: (Signature) LaVon Stilfohn	DATE 8/30/90	TIME 4:50	RECEIVED BY: (Signature)	DATE	TIME
RECEIVED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
LAB COMMENTS:			LAB COMMENTS:		

SOLA OPTICAL USA, INC.
1500 Cader Lane
P.O. Box 6002
Petaluma, CA 94953-6002
(707) 763-9911

Analytical Laboratory: MeD TOX

Shipping Copy (White) Lab Copy (Yellow) File Copy (Pink) Field Copy (Gold)

CHAIN OF CUSTODY / ANALYSES REQUEST FORM 9008154

Project No.: 1954.09	Field Logbook No.:	Date: 8/30/90	Serial No.: 0053
Project Name: SOLA Optical	Project Location: Petaluma, CA		
Sampler (Signature): Natalie Rieber			

SAMPLES						ANALYSES								Samplers: AML/NRN
SAMPLE NO.	DATE	TIME	LAB SAMPLE NO.	NO. OF CON-TAINERS	SAMPLE TYPE	EPA 601	EPA 624	EPA 8010				HOLD	RUSH	REMARKS
LF-24	8/30	14:10	14A,14B	2 VOA				✓						NORMAL TURN AROUND
LF-23	"	14:35	15A,15B					✓						
LF-8	8/30	14:55	16A,16B					✓						
LF-7	"	15:15	17A,17B					✓						

RECEIVED BY: (Signature) Andrew M. Joffe	DATE 8/30/90	TIME 15:20	RECEIVED BY: (Signature) LaVon St John	DATE 8/30/90	TIME 15:20
RECEIVED BY: (Signature) LaVon St John	DATE 8/30/90	TIME 4:50	RECEIVED BY: (Signature)	DATE	TIME
RECEIVED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
LAB COMMENTS:			LAB COMMENTS:		

SOLA OPTICAL USA, INC.

1500 Cader Lane
P.O. Box 6002
Petaluma, CA 94953-6002
(707) 763-9911

Analytical Laboratory: MedTox

Sampling C... White ... Lab C... Yellow ... Copy ... Field Copy (Gold)

MED-TOX ASSOCIATES, INC.

ENVIRONMENTAL & OCCUPATIONAL HEALTH SERVICES
3440 Vincent Road Pleasant Hill, CA 94523 • (415) 930-9090 • FAX# (415) 930-0256

LABORATORY ANALYSIS REPORT

SOLA OPTICAL
1500 CADER LANE
P.O. BOX 6002
PETALUMA, CA 94953-6002
ATTN: MARK ADAMS

REPORT DATE: 09/14/90

DATE SAMPLED: 08/27-28/90

DATE RECEIVED: 08/28/90

CLIENT ID NO: 1954.09

MED-TOX JOB NO: 9008143

ANALYSIS OF: WATER SAMPLES

See attached for results

Michael Lynch, Manager
Organic Laboratory

Results FAXed to Scott Seyfried (Levine-Fricke/Novato) 09/11/90

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: E-9
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/27/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-01A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	4	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	2	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: E-8
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/27/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-02A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	3	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	1	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: E-7
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/27/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-03A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: E-6
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/27/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-04A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29-09/06/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	2	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	17	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	8	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: E-5
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/27/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-05A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	4	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	23	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	9	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: E-1
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/28/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-06A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	85	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	110	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	0.6	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	15	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: E-2
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/28/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-07A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	63	0.5
1,2-Dichloroethane	107-06-2	0.6	0.5
1,1-Dichloroethene	75-35-4	90	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	0.6	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	20	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: E-3
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/28/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-08A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	9	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	38	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	6	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC.

SOLA OPTICAL

CLIENT ID: E-4
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/28/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-09A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29-09/06/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	75	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	32	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	6	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

SOLA OPTICAL

CLIENT ID: LF-16
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/28/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-10A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29-09/06/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

MED-TOX ASSOCIATES, INC

SOLA OPTICAL

CLIENT ID: TB
CLIENT JOB NO: 1954.09
DATE SAMPLED: 08/28/90
DATE RECEIVED: 08/28/90
REPORT DATE: 09/14/90

MED-TOX LAB NO: 9008143-11A
MED-TOX JOB NO: 9008143
DATE ANALYZED: 08/29/90
INSTRUMENT: 8

EPA METHOD 8010 (WATER MATRIX)
HALOGENATED VOLATILE ORGANICS

COMPOUND	CAS #	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
Bromodichloromethane	75-27-4	ND	0.5
Bromoform	75-25-2	ND	0.5
Bromomethane	74-83-9	ND	0.5
Carbon Tetrachloride	56-23-5	ND	0.5
Chlorobenzene	108-90-7	ND	0.5
Chloroethane	75-00-3	ND	0.5
2-Chloroethyl Vinyl Ether	110-75-8	ND	0.5
Chloroform	67-66-3	ND	0.5
Chloromethane	74-87-3	ND	0.5
Dibromochloromethane	124-48-1	ND	0.5
1,2-Dichlorobenzene	95-50-1	ND	0.5
1,3-Dichlorobenzene	541-73-1	ND	0.5
1,4-Dichlorobenzene	106-46-7	ND	0.5
Dichlorodifluoromethane	75-71-8	ND	0.5
1,1-Dichloroethane	75-34-3	ND	0.5
1,2-Dichloroethane	107-06-2	ND	0.5
1,1-Dichloroethene	75-35-4	ND	0.5
1,2-Dichloroethene, total	540-59-0	ND	0.5
1,2-Dichloropropane	78-87-5	ND	0.5
cis-1,3-Dichloropropene	10061-01-5	ND	0.5
trans-1,3-Dichloropropene	10061-02-6	ND	0.5
Methylene Chloride	75-09-2	ND	0.5
1,1,2,2-Tetrachloroethane	79-34-5	ND	0.5
Tetrachloroethene	127-18-4	ND	0.5
1,1,1-Trichloroethane	71-55-6	ND	0.5
1,1,2-Trichloroethane	79-00-5	ND	0.5
Trichloroethene	79-01-6	ND	0.5
Trichlorofluoromethane	75-69-4	ND	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ND	0.5
Vinyl Chloride	75-01-4	ND	0.5

ND = Not Detected

R-3 5,1

CHAIN OF CUSTODY / ANALYSES REQUEST FORM

90081.2

Project No.: 1754.09	Field Logbook No.:	Date: 8/28/90	Serial No.: 0051
Project Name: SOLA OPTICAL	Project Location: PETALUMA		
Sampler (Signature): [signature]			

SAMPLES						ANALYSES								Samplers: AML / NRN
SAMPLE NO.	DATE	TIME	LAB SAMPLE NO.	NO. OF CONTAINERS	SAMPLE TYPE	EPA 601	EPA 624	EPA 1010				HOLD	RUSH	REMARKS
E-9	8/27	13:35	01 A B	2 VOA	G.W.									NORMAL TURN AROUND
E-8		13:44	2 A B											
E-7		13:56	3 A B											
E-6		14:10	4 A B											
E-5		14:18	5 A B											
E-1	8/28	8:20	6 A B											
E-2		8:25	7 A B											
E-3		8:25	8 A B											
E-4		8:25	9 A B											
LF-16		12:30	10 A B											
TB			11 A B											

RECEIVED BY: (Signature) [signature]	DATE 8/28/90	TIME 14:40	RECEIVED BY: (Signature) [signature]	DATE 8/28/90	TIME
RECEIVED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
RECEIVED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	DATE	TIME
LAB COMMENTS:			LAB COMMENTS:		

SOLA OPTICAL USA, INC.
1500 Cader Lane
P.O. Box 6002
Petaluma, CA 94953-6002
(707) 763-9911

Analytical Laboratory: MET TOX

Shipping Copy (White) Lab Copy (Yellow) File Copy (Pink) Field Copy (Gold)

APPENDIX B

Selected Figures from the Levine•Fricke Report Entitled:

"Results of Hydraulic Testing of Sediments in the Vicinity of the Sola Optical USA, Inc. Facility, Petaluma, California," dated January, 1988

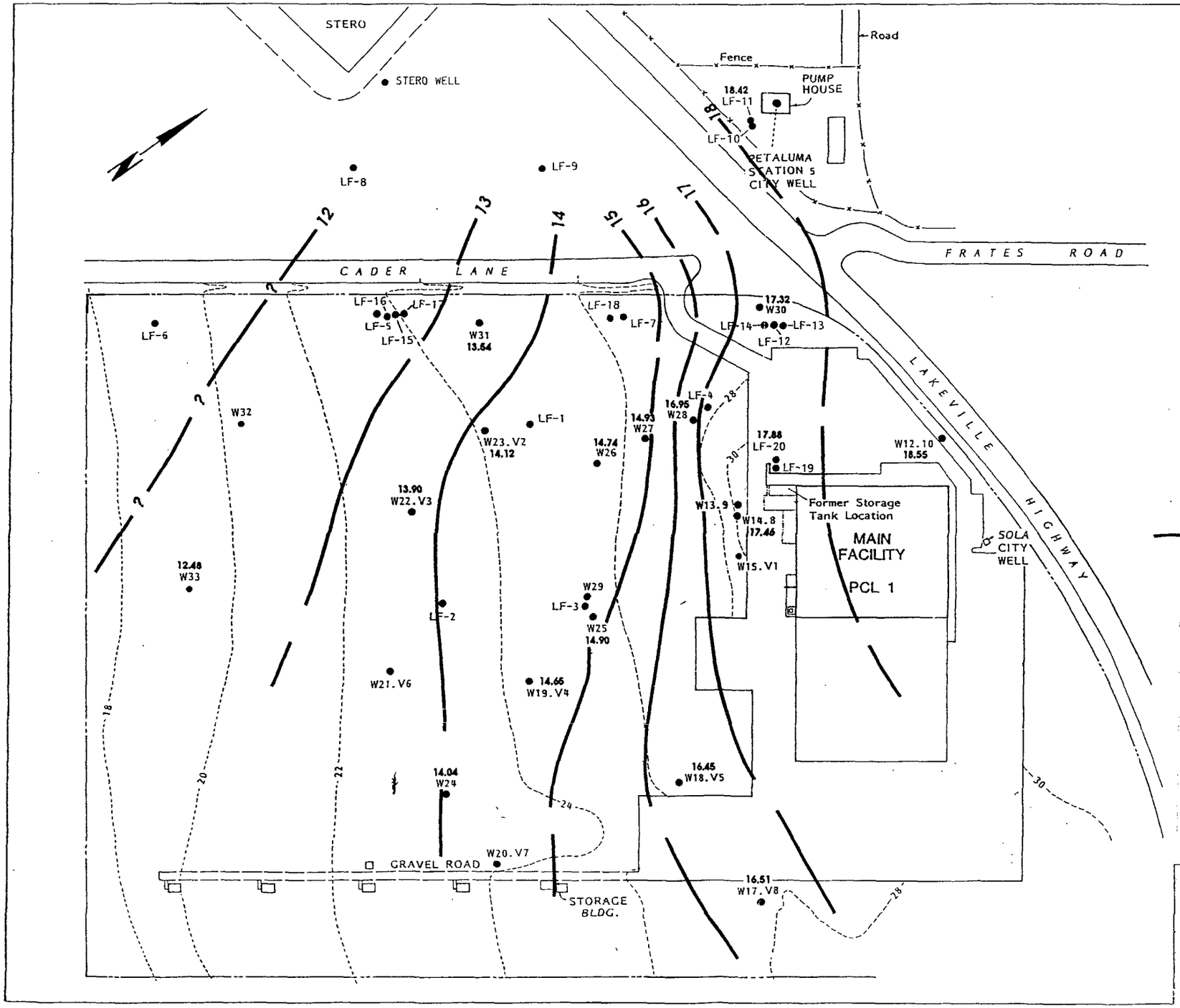


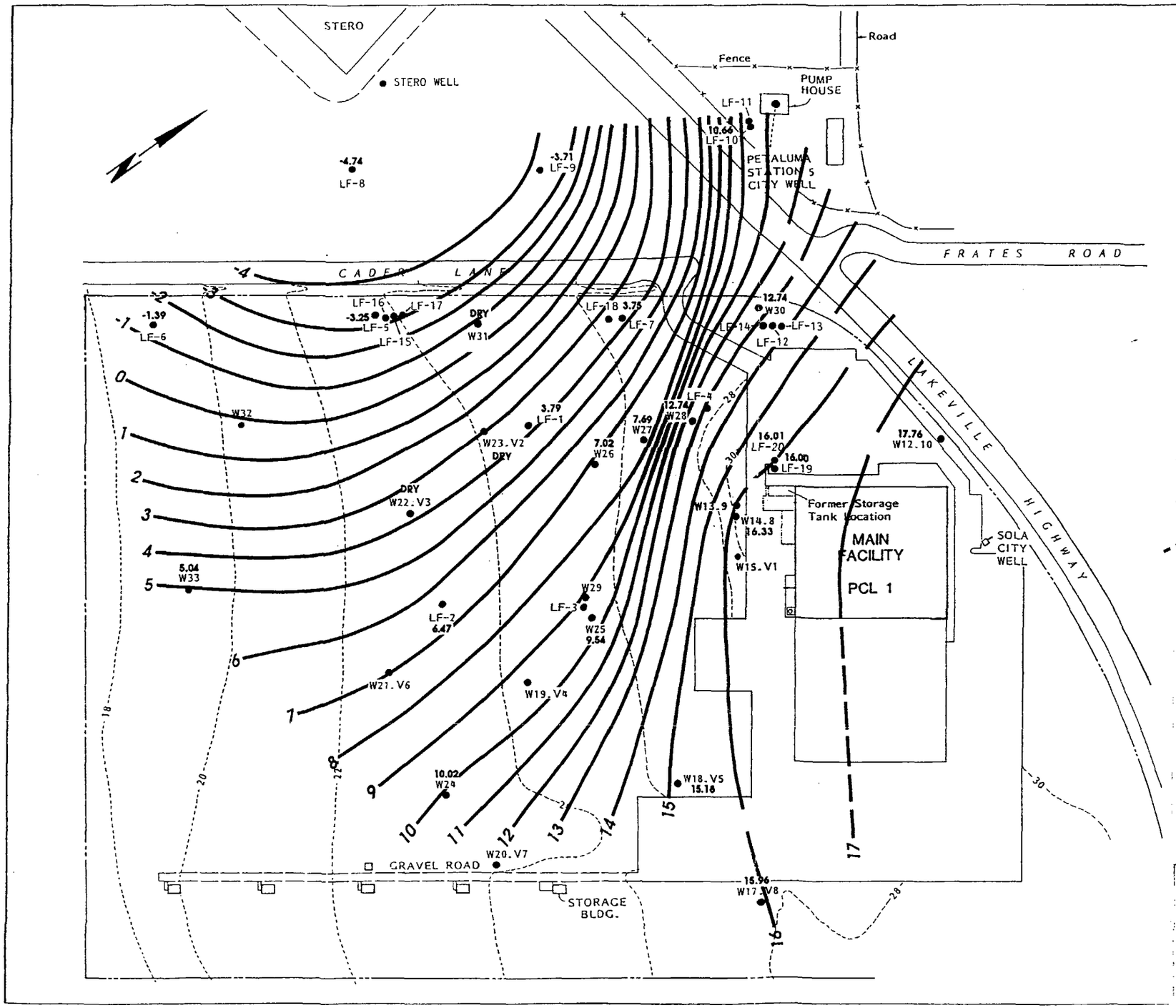
Figure B-1 :

GROUND-WATER ELEVATION IN SHALLOW SEDIMENT INTERVAL (LESS THAN 25 FEET IN DEPTH) PRIOR TO START-UP OF STATION 5 WELL ON 29 OCTOBER 1987

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.04NOV26'90jc



EXPLANATION

- ● Monitoring well location
- ---24-- Line of equal ground-surface elevation (feet)
- x——x Fencing
- 0.24 Ground-water elevation (feet)
- —16 Line of equal ground-water elevation; dashed where approximate (feet)

NOTE: Only those wells present in October 1989 are shown on this figure. Refer to Figure 2 for current site plan.

0 50 100 200 300 FEET

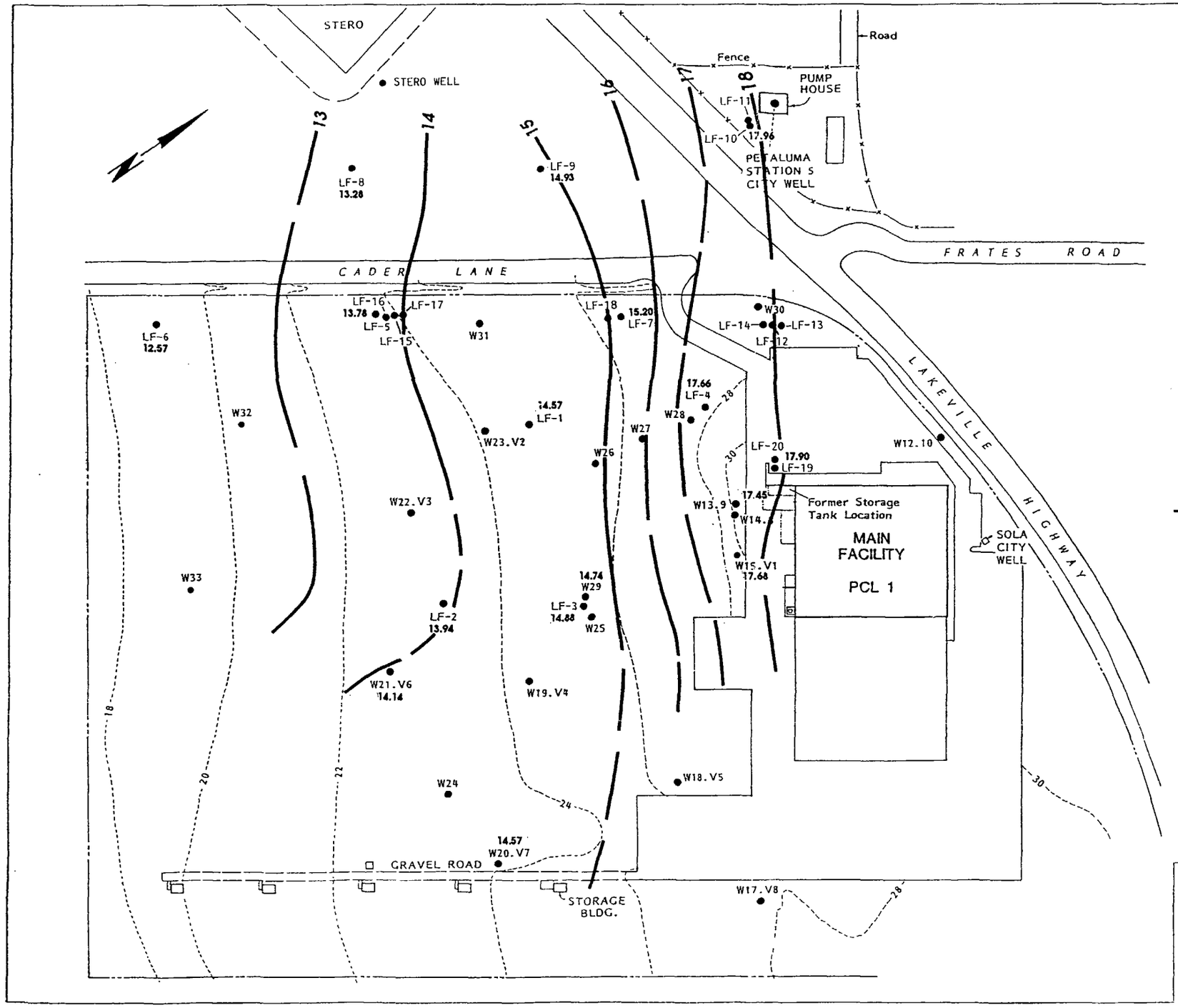
Figure B-2 :

SHALLOW GROUND-WATER (WATER TABLE) ELEVATION MEASURED 50 DAYS AFTER START-UP OF STATION 5 WELL ON 18 DECEMBER 1987

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.04NOV2690c



EXPLANATION

- ● Monitoring well location
- 24 Line of equal ground-surface elevation (feet)
- ×——× Fencing
- 14.57 Ground-water elevation (feet)
- —13 Line of equal ground-water elevation; dashed where approximate (feet)

NOTE: Only those wells present in October 1989 are shown on this figure. *Refer to Figure 2* for current site plan.

0 50 100 200 300 FEET

Figure B-3 :

GROUND-WATER ELEVATION IN INTERMEDIATE SEDIMENT INTERVAL (25 TO 65 FEET IN DEPTH) PRIOR TO START-UP OF STATION 5 WELL ON 29 OCTOBER 1987

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.04NOV26'90jc

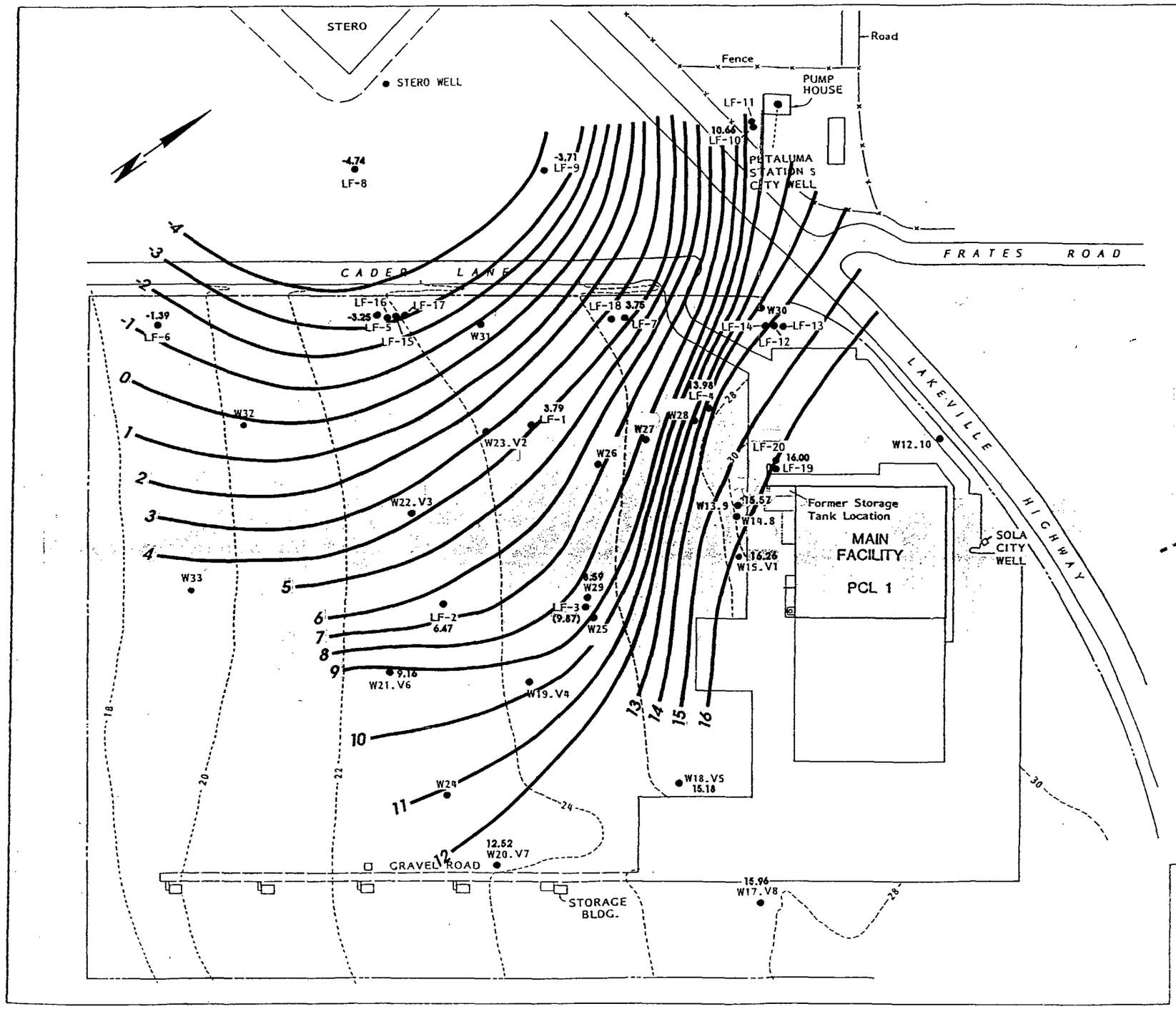


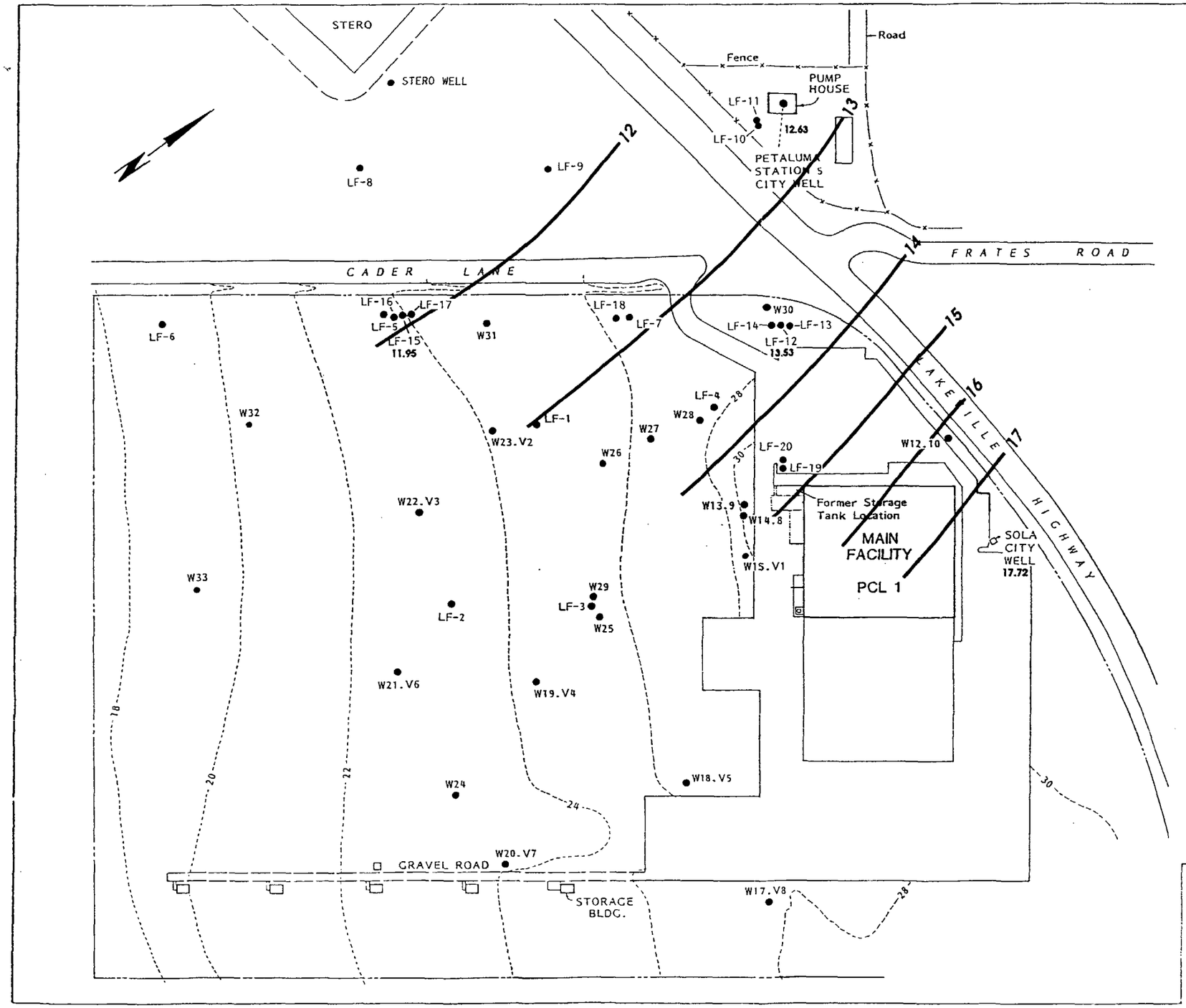
Figure B-4 :

GROUND-WATER ELEVATION IN INTERMEDIATE SEDIMENT INTERVAL (25 TO 65 FEET IN DEPTH) ON 18 DECEMBER 1987

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.04NOV2690jc



EXPLANATION

- ● Monitoring well location
- 24 Line of equal ground-surface elevation (feet)
- ×——× Fencing
- 13.53 Ground-water elevation (feet)
- 13 Line of equal ground-water elevation (feet).

NOTE: Only those wells present in October 1989 are shown on this figure. Refer to Figure 2 for current site plan.

0 50 100 200 300 FEET

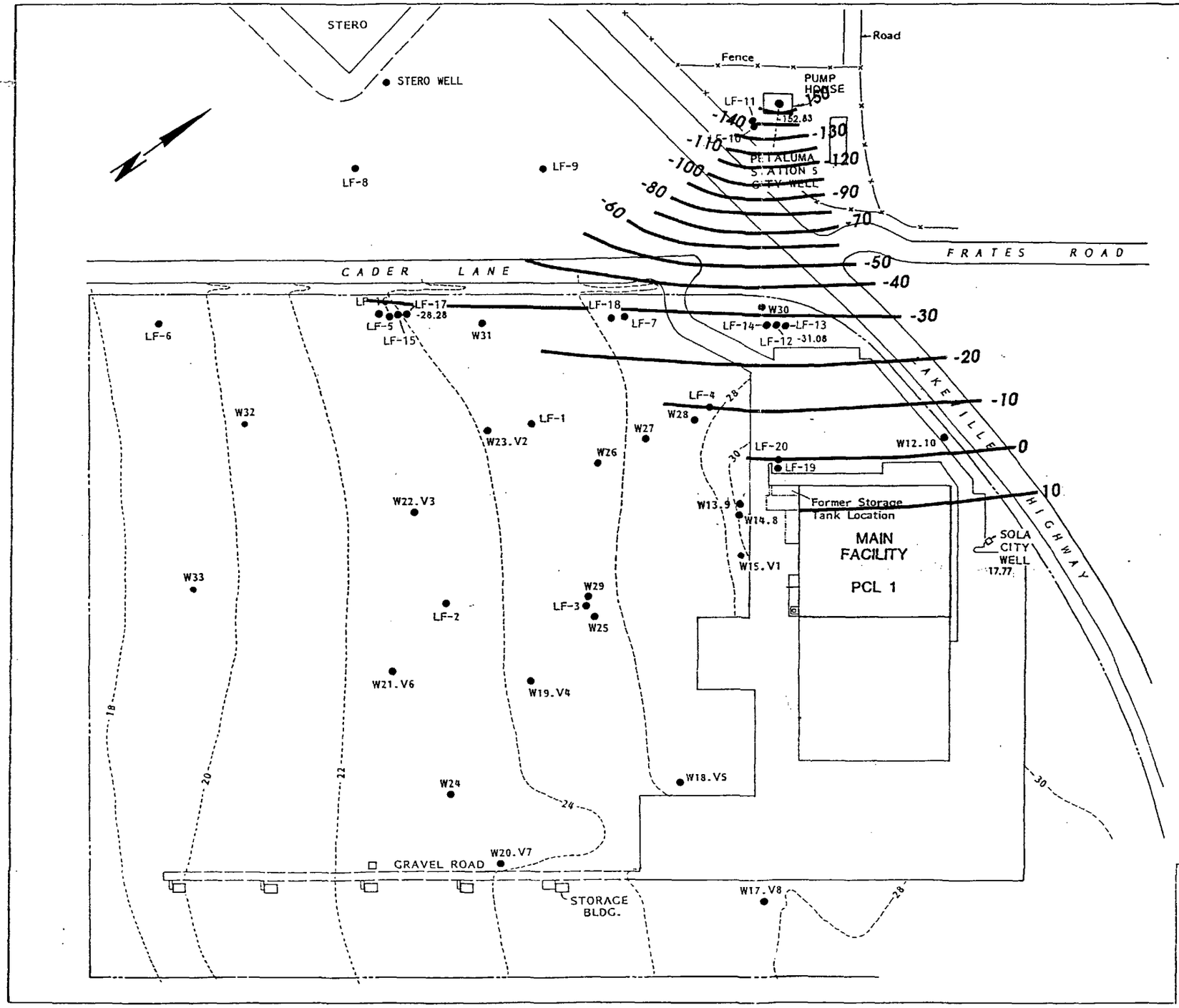
Figure B-5 :

GROUND-WATER ELEVATION IN DEEPEST SEDIMENT INTERVAL (GREATER THAN 190 FEET IN DEPTH) PRIOR TO START-UP OF STATION 5 WELL ON 29 OCTOBER 1987

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.04NOV26'90jc



EXPLANATION

- ● Monitoring well location
- 24 Line of equal ground-surface elevation (feet)
- Fencing
- -31.08 Ground-water elevation (feet)
- -40 Line of equal ground-water elevation : dashed where approximate (feet)

NOTE: Only those wells present in October 1989 are shown on this figure. Refer to Figure 2 for current site plan.

0 50 100 200 300 FEET

Figure B-6 :

GROUND-WATER ELEVATION IN DEEPEST SEDIMENT INTERVAL (GREATER THAN 190 FEET IN DEPTH) ON 18 DECEMBER 1987

Project No. 1954.04

LEVINE•FRICKE
CONSULTING ENGINEERS AND HYDROGEOLOGISTS

1954.04NOV2690jc