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**PROPOSED WORK PLAN
FOR EVALUATION FOR A SOIL
CLEANUP LEVEL CONCENTRATION
AT THE CALMAR FACILITY
CITY OF INDUSTRY, CALIFORNIA**

**August 25, 1995
LF 2455.00-15**

 **LEVINE • FRICKE**
ENGINEERS, HYDROGEOLOGISTS & APPLIED SCIENTISTS

 Printed on recycled paper

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AT THE CALMAR FACILITY
CITY OF INDUSTRY, CALIFORNIA**

INTRODUCTION

At the request of Calmar, Inc., Levine•Fricke is submitting this Work Plan for a Soil Cleanup Level Concentration at the Calmar facility located at 333 South Turnbull Canyon Road in the City of Industry, Los Angeles County, California ("the Site"; Figure 1). Based on previous investigations conducted at the Site, the California Regional Water Quality Control Board, Los Angeles Region (RWQCB) requested a work plan to conduct soil remediation at the Site in a letter to Calmar dated June 21, 1995.

Background

The RWQCB requested a remediation work plan for the area of the Site near the southwest corner of the Calmar plant, near nested vapor probe well LFSB4/NVP4 (Figure 2). Subsurface investigations in this area have shown that soils beneath this portion of the Site have been affected by chlorinated volatile organic compounds (VOCs). VOCs were detected in the soil matrix and in soil vapor in boring LFSB4/NVP4. The VOC with the highest concentrations was tetrachloroethene (PCE) at 9.1 parts per billion (ppb) to 210 ppb in the soil matrix, and at 6 micrograms per liter of air ($\mu\text{g}/\text{l}$) to 2,000 $\mu\text{g}/\text{l}$ in soil vapor.

The other analytes detected in soil samples and soil vapor were trichloroethene (TCE), 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethylene (1,1-DCE), and 1,1,1-trichloroethylene (1,1,1-TCA). Concentrations of these VOCs were generally low at less than 79 ppb in the soil matrix and less than 20 $\mu\text{g}/\text{l}$ in soil vapor.

The RWQCB requested a remediation plan based on the concentrations of PCE in ground water in monitoring well MW-3, which is located approximately 60 feet hydraulically downgradient from LFSB4/NVP4. Between 1992 and 1993, ground-water levels at the Site rose 6 to 8 feet. In well MW-3, an increase in the concentration of PCE (from 160 ppb to 410 ppb) corresponded with the rise in ground-water levels. This corresponding rise in

ground-water levels and PCE concentrations indicated, in the opinion of the RWQCB, that PCE concentrations in the vadose zone were continuing to impact ground-water quality.

OBJECTIVE AND SCOPE OF WORK

The objective for the tasks conducted in this work plan are to develop a cleanup level concentration for PCE in soil that will protect ground-water quality to the California maximum contamination level (MCL) for PCE.

The following specific tasks are proposed as the scope of work:

- Task 1: Evaluation for a Soil Cleanup Level Concentration
- Task 2: Data Evaluation and Report Preparation
- Task 3: Project Management

Task 1: Evaluation for a Soil Cleanup Level Concentration

Soil chemical transport modeling will be conducted to assess the potential remedial goal for PCE in soils in the remediation area. Based on soil matrix and vapor data, and on the corresponding rise in ground-water levels and PCE concentrations in ground water, the fate and transport of PCE is considered the primary criterion for evaluating cleanup goals for affected soils.

Two models will be used in this study: the Seasonal Soil Compartment Model (SESOIL), developed by Arthur D. Little Inc. (1984) for the U.S. Environmental Protection Agency (U.S. EPA), Office of Toxic Substances; and the analytical transient one-, two-, and three-dimensional (AT123D) model, developed in 1981 by the Oak Ridge National Laboratory of Tennessee for the Department of Energy and the U.S. EPA Office of Toxic Substances. SESOIL is a mathematical soil compartment model designed for long-term environmental hydrologic, sediment, and pollutant fate simulations. AT123D was designed for estimating the transportation of dissolved chemicals in ground water.

SESOIL Model

The SESOIL model will be used to assess the potential fate and transport of residual PCE within the soil profile above the ground-water table. Results of the SESOIL model will then be used as input data to the AT123D model to evaluate PCE concentrations in ground water. The SESOIL model requires input data that are grouped into the following four classes:

- climatologic data, including average monthly temperature, rainfall, and evaporation
- soil property data, including the average soil porosity, intrinsic permeability, soil moisture content, total organic content, bulk density, and soil thickness
- chemical property information for PCE, including its water solubility, Henry's Law coefficients, and distribution coefficients. This information will be obtained from the U.S. EPA Graphical Exposure Modeling Services (PCGEMS) package.
- the initial mass of PCE in each of the major soils at the Site. Analytical data obtained from soil samples collected at the Site were used to calculate a total benzene mass for each of the simulated layers.

AT123D Chemical Transport Model

The AT123D model was designed to estimate the transport of dissolved chemicals in ground water. The model considers the effects of advection, dispersion, chemical absorption to the saturated sediments, and chemical degradation.

The AT123D model input data include the porosity, hydraulic conductivity, hydraulic gradient, longitudinal lateral and vertical dispersivity of the saturated sediments, and chemical properties such as the distribution coefficient for each chemical. Chemical property data will be obtained from PCGEMS. Physical property data for saturated sediments at the Site will be obtained from field and analytical data or estimated for the aquifer material.

Soil-material leachate concentration and duration of the chemical leakage to ground water are important input data requirements for this model. This information is generated automatically by the SESOIL model during each simulation period. SESOIL simulation runs will result in a maximum simulated PCE concentration of the soil-water leachate at the end of each simulated year.

In order to evaluate the long-term impact of PCE-affected soil-water leachate on water quality in saturated sediments beneath the Site, SESOIL will be run for a total simulation period of 15 years. The soil water at the end of each year, beginning at year one, will be input to the AT123D model.

Task2: Data Evaluation and Report Preparation

A report will be prepared that summarizes the data and presents our interpretations and assessments. The report will include detailed descriptions of the methodologies used to

collect the data, our evaluation and interpretation of the data, and the rationale for all conclusions reached.

The report will include a recommended soil cleanup level concentration for PCE. The soil cleanup level will be based on the fate and transport modeling, with the objective of protecting ground-water quality to the MCL for PCE (5 ppb).

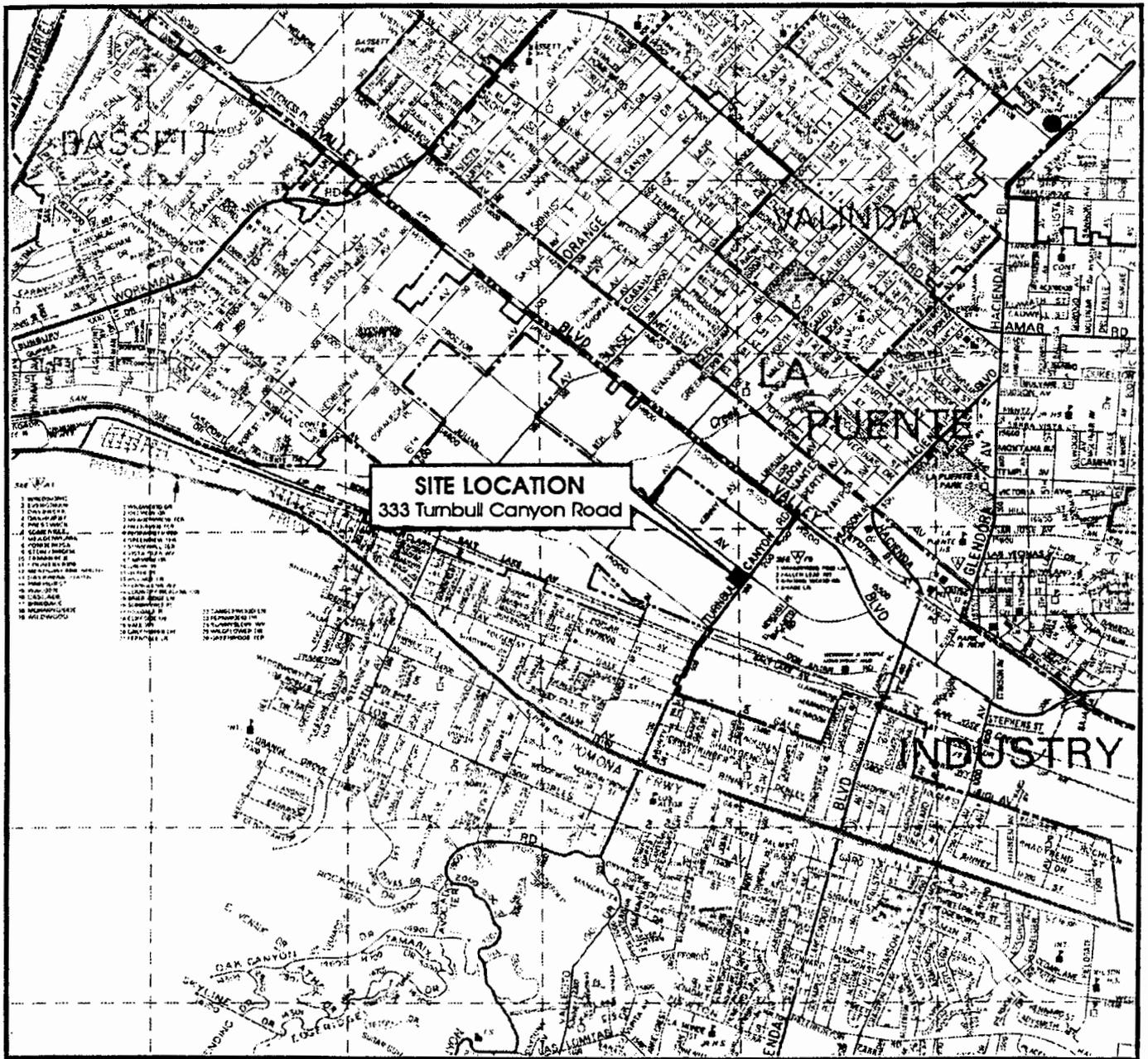
Task 3: Project Management

Project management includes activities conducted on Calmar's behalf that are not directly related to the individual tasks outlined above. These activities may include, but are not limited to, progress reporting to Calmar, in-house project meetings, regulatory agency interfacing, cost tracking, and scheduling.

David Field, R.G., Senior Associate Hydrogeologist, will be the Project Director. As such, he will be the primary contact for Calmar and will be responsible for all technical and administrative aspects of the project. JoAnn Weber, R.G., C.H.G., Senior Project Geologist, will be the task manager for the evaluation of a soil cleanup level concentration for PCE.

SCHEDULE

Based on the schedule established by Calmar and Levine•Fricke, the modeling will take approximately two to three weeks to complete. A report summarizing the results of this scope of work will be completed approximately three weeks after completion of the modeling.

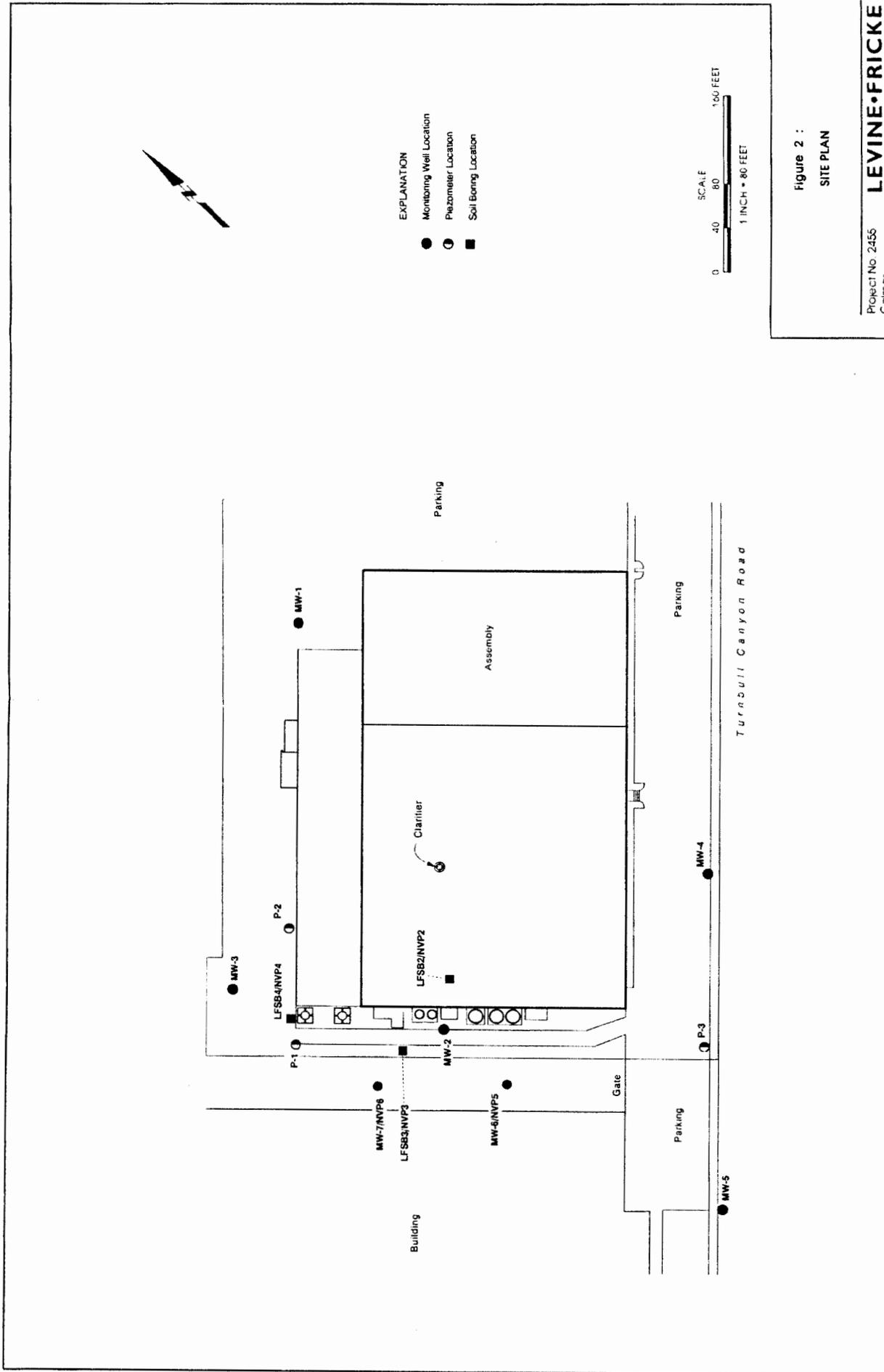


MAP SOURCE: Thomas Bros. Guide, Los Angeles County, California, p. 48,85, 1991.

Figure 1 : SITE VICINITY

Project No. 2455.02
 Calmar-City of Industry

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- EXPLANATION
- Monitoring Well Location
 - Piezometer Location
 - Soil Boring Location

SCALE
 0 40 80 160 FEET
 1 INCH = 80 FEET

Figure 2 :
 SITE PLAN

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CALIFORNIA REGIONAL WATER
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LOS ANGELES REGION

**Results of Second Vapor Extraction Pilot Test
at Calmar, Inc.
333 South Turnbull Canyon Road
City of Industry, California**

**October 23, 1998
LFR 2455-01-400**

Prepared for
California Regional Water Quality Control Board
Los Angeles Region
101 Centre Plaza Drive
Monterey Park, California 91754

October 23, 1998

2455.01-400

Yi Lu, Ph.D., R.G.
California Regional Water Quality Control Board
Los Angeles Region
101 Centre Plaza Drive
Monterey Park, California 91754

Subject: Results of Second Vapor Extraction Pilot Test at Calmar, Inc.,
333 South Turnbull Canyon Road, City of Industry, California
(RWQCB File No. 102.0055)

Dear Dr. Lu:

This letter presents the procedures and results of the second vapor extraction pilot test performed by Levine·Fricke·Recon Inc. (LFR) on July 28, 1998, at the Calmar facility located at 333 South Turnbull Canyon Road in the City of Industry, California ("the Site"). This test was conducted to evaluate the potential feasibility of vapor extraction at the Site. We believe this test also satisfied the provisions and comments of your June 19, 1997 letter regarding approval of the Remedial Action Plan (RAP) for the Site.

Field Work

On July 16 and 27, 1998, an LFR geologist supervised the installation of eight vapor extraction wells at the Site (Figure 1). Copies of boring logs with well construction details are attached. These wells were installed to monitor the radial influence of vacuums applied to vapor extraction wells during pilot testing. One soil boring was continuously sampled from the surface to first groundwater, which was encountered at approximately 27 feet below ground surface (bgs). Lithologic logging confirmed the presence of soils of high clay content in the top 10 feet of the pilot test vicinity, with mostly fine-grained sands extending beneath this clay layer to the depth of first groundwater (27 feet bgs).

On July 28, 1998, an LFR engineer supervised the performance of a one-day vapor extraction pilot test. This pilot test was performed to collect data needed to evaluate the estimated radial influence, estimated vapor flow rate, and estimated mass recovery rate. A vacuum was placed on vapor well VE4, screened only in the near-surface clayey soils, and on nested vapor well VE6D, screened only within the deeper fine-grained sands. Responses to the applied vacuums were monitored at surrounding well locations (Figure 1).

Estimated Radial Influence

A vacuum of approximately 140 inches of water was placed on well VE4 and monitored for six hours. Responses to the vacuum applied on well VE4 were monitored at vapor wells VE5, VE6S, VE7, and VE8 (Figure 1). These wells are screened only within near-surface clayey soils and surround extraction well VE4 at radial distances of 5 to 10 feet. Pilot testing did not provide evidence that soil vapors at these locations were influenced by the vacuum applied at vapor well VE4.

Three levels of vacuum (40, 80, and 120 inches of water) were placed on well VE6D and monitored for two hours. Responses to the vacuum applied on well VE6D were monitored at vapor wells VE12, VE13, and VE14. These wells are screened only within the deeper sandy soils of the pilot test vicinity and surround well VE6D at radial distances ranging from 22 to 34 feet. Vacuum responses measured at these wells ranged from 2 to 5 percent of the vacuum applied at well VE6D. Since these values should represent a close approximation of steady-state conditions, an estimated radial influence of 25 feet can be applied as an indicator of the area covered by a vapor extraction well screened in this lithology.

Estimated Vapor Flow Rates

Estimated vapor flow rates from well VE4 ranged from 0.45 to 0.80 standard cubic feet per minute (scfm), without any noticeable trends. Estimated soil permeability values ranged from 0.04 to 0.08 Darcys, representative of the clayey soils observed during soil sampling.

Estimated vapor flow rates measured from well VE6D ranged from 26 to 76 scfm, with higher flow rates generated at the higher applied vacuums. Estimated soil permeability values ranged from 6 to 7 Darcys, representative of the fine sandy soils observed during sampling.

Estimated Mass Removal Rates

One soil-vapor sample was collected from well VE6D near the completion of pilot testing. To satisfy the provisions of your June 19, 1997 letter regarding the RAP for the Site, the soil-vapor sample was collected in a Summa canister and promptly delivered to a stationary laboratory for analysis. The sample was analyzed by Apollo Analytics (Apollo) of Costa Mesa, California, for volatile organics by GC/MS using EPA Method TO-14, and for total nonmethane hydrocarbons by ASTM D2887.

The following vapor analytical results from VE6D were provided by Apollo:

Detected VOCs in Soil Vapor	VOC Concentration (µg/l)	PQL (µg/l)
Tetrachloroethene (PCE)	22	0.200
Trichloroethene (TCE)	0.77	0.200
1,1-Dichloroethene (1,1-DCE)	0.320	0.200
Total Nonmethane Organics	9.16	0.65

The estimated initial mass removal rates are 0.15 pound of PCE per day and 0.005 pound of TCE per day. These mass removal rates would typically decrease dramatically during full-scale VES after several pore volumes have been purged.

Recommendations

Low concentrations of PCE were detected in soil vapor during the vapor extraction test. Additionally, concentrations of PCE have been low in soil analyses and groundwater concentrations of PCE have been declining for the past four years. Therefore, as discussed with RWQCB staff, LFR recommends an evaluation of remediation by natural attenuation (RNA) be conducted at the Site as an alternative remedial action. This evaluation will follow the U.S. Environmental Protection Agency's 1996 published technical protocol for RNA. The findings of the RNA evaluation, as well as the results of the first and second pilot tests, will be added as an addendum to the plan for remedial action that was previously submitted to the RWQCB. A work plan to conduct the RNA evaluation is included in Appendix A.

We would like to meet with you in the near future to discuss the results of the pilot test and the proposed RNA evaluation. If you have any further questions, please do not hesitate to contact either of the undersigned at (949) 955-1390.

Sincerely,



Steve H. Winners
Project Engineer



Martin E. Hamann, R.G., C.H.G.
Senior Hydrogeologist

Attachments

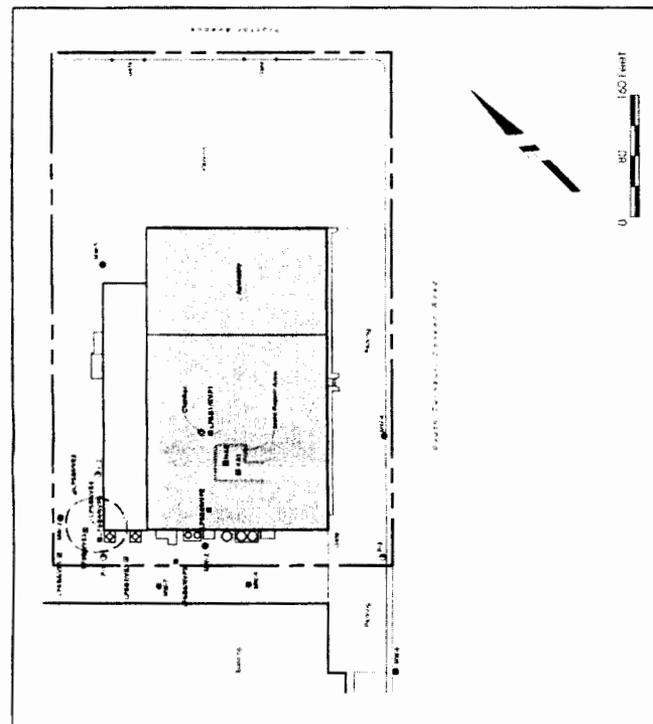
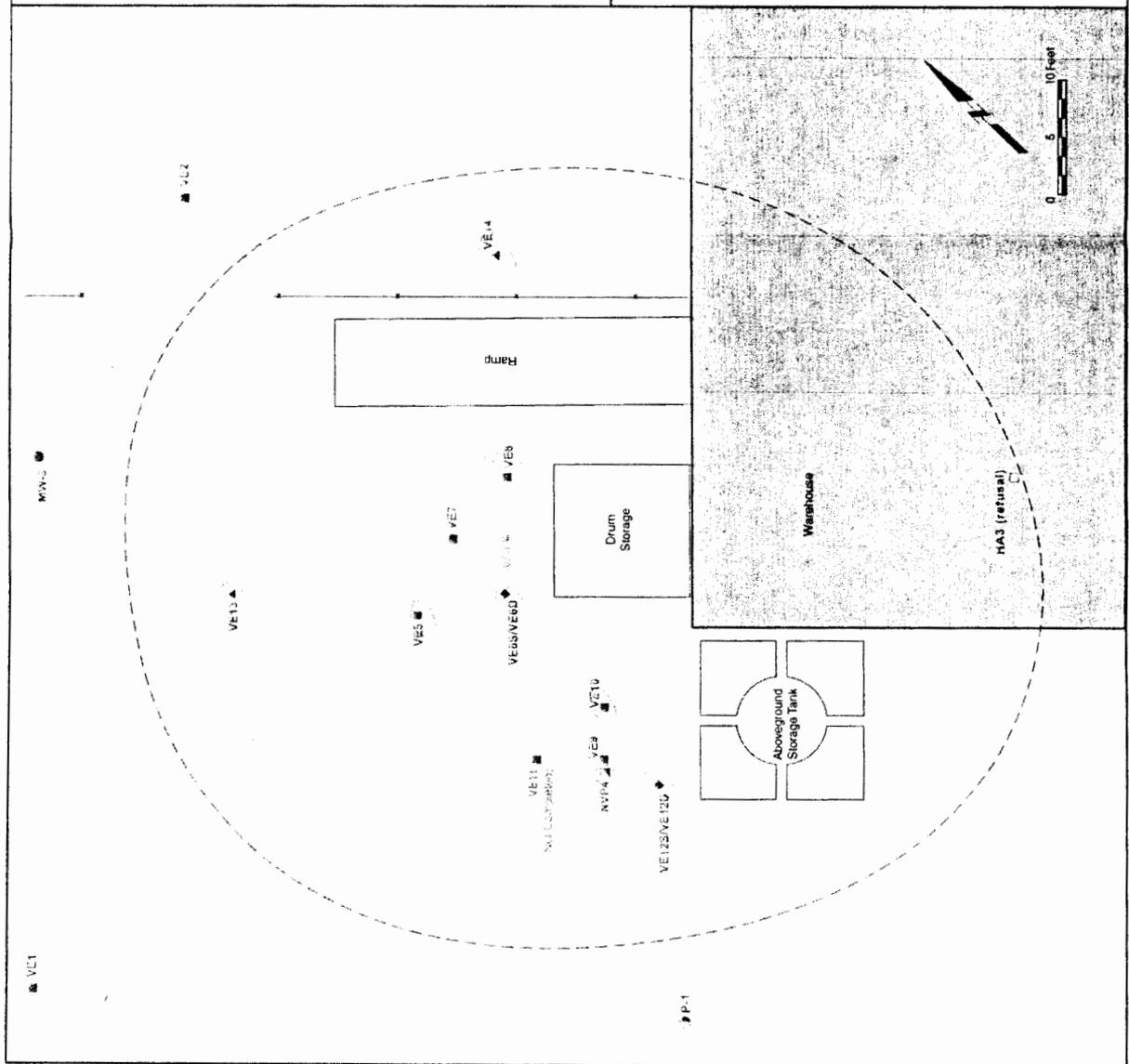
cc: Frank Ellis, Calmar
Lauren Alterman, Counsel, SGC

Field Data Sheet
 Vapor Extraction Pilot Test
 Calmar Facility, City of Industry
 LFR 2455.01

Time (###):	800	845	900	930	1000	1030	1100	1130	1200	1300
Extraction Well Number:	VE4	VE4	VE4	VE4	VE4	VE4	VE4	VE4	VE4	VE4
Applied Vacuum ("H ₂ O):	0	-138	-138	-138	-140	-140	-140	-140	-140	-140
Observed Flow Rate (scfm):	0	0.70	0.74	0.65	0.55	0.50	0.80	0.45	0.55	0.55
Vapor Temperature (°F):	--	83.0	82.0	83.0	85.0	94.6	105.0	104.3	105.5	107.6
VOC Concentration (ppmv):	--	1.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vapor O ₂ Content (%):	--	--	--	--	--	--	--	--	--	--
Vapor CO ₂ Content (%):	--	--	--	--	--	--	--	--	--	--
Vapor CH ₄ Content (%):	--	--	--	--	--	--	--	--	--	--
Barometric Pressure ("H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE4 (+ / - "H ₂ O):	+0.35	--	--	--	--	--	--	--	--	--
VE5 (+ / - "H ₂ O):	+0.65	-0.05	0	0	0	0	0	+0.02	+0.02	+0.02
VE6 - Shallow (+ / - "H ₂ O):	0	0	0	0	0	0	0	0	0	0
VE6 - Deeper (+ / - "H ₂ O):	0	-0.05	0	-0.02	0	+0.04	+0.03	+0.05	+0.02	+0.04
VE7 (+ / - "H ₂ O):	0	0	0	0	0	0	0	0	0	0
VE8 (+ / - "H ₂ O):	0	0	0	0	0	0	0	0	0	0
VE9 (+ / - "H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE10 (+ / - "H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE11 (+ / - "H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE12 - Shallow (+ / - "H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE12 - Deeper (+ / - "H ₂ O):	0	0	0	0	+0.01	0	+0.01	+0.04	0	+0.04
VE13 (+ / - "H ₂ O):	0	-0.04	0	0	0	+0.01	+0.03	-0.06	+0.02	+0.06
VE14 (+ / - "H ₂ O):	0	0	0	0	0	0	+0.02	+0.05	+0.02	+0.06

Field Data Sheet
 Vapor Extraction Pilot Test
 Calmar Facility, City of Industry
 LFR 2455.01

Time (###):	1330	1430	1445	1500	1515	1530	1545	1600	1615	1630
Extraction Well Number:	VE4	VE4	VE6D							
Applied Vacuum ("H ₂ O):	-140	-140	0	-120	-40	-40	-80	-80	-120	-120
Observed Flow Rate (scfm):	0.55	0.45	0	75.0	26.1	26.7	53.0	53.0	75.0	76.0
Vapor Temperature (°F):	112.6	117	--	79.2	84.0	83.3	80.0	87.6	76.5	75.6
VOC Concentration (ppmv):	0.0	0.0	--	--	--	0.2	0.0	0.0	0.0	0.0
Vapor O ₂ Content (%):	--	--	--	--	--	--	--	--	--	--
Vapor CO ₂ Content (%):	--	--	--	--	--	--	--	--	--	--
Vapor CH ₄ Content (%):	--	--	--	--	--	--	--	--	--	--
Barometric Pressure ("H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE4 (+/- "H ₂ O):	--	--	-0.47	-1.50	-2.5	-1.80	-2.0	-2.9	-3.5	-4.0
VE5 (+/- "H ₂ O):	+0.02	+0.06	+0.02	-2.40	-1.80	-1.50	-2.2	-2.6	-3.5	-3.6
VE6 - Shallow (+/- "H ₂ O):	0	0	0	0	0	0	0	0	0	0
VE6 - Deeper (+/- "H ₂ O):	+0.05	+0.05	--	--	--	--	--	--	--	--
VE7 (+/- "H ₂ O):	0	0	-0.02	-0.04	-0.02	-0.02	-0.02	-0.02	-0.04	-0.04
VE8 (+/- "H ₂ O):	0	0	0	0	0	0	0	0	0	0
VE9 (+/- "H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE10 (+/- "H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE11 (+/- "H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE12 - Shallow (+/- "H ₂ O):	--	--	--	--	--	--	--	--	--	--
VE12 - Deeper (+/- "H ₂ O):	+0.03	+0.05	-0.08	-5.5	-2.5	-2.5	-4.0	-4.5	-6.0	-6.0
VE13 (+/- "H ₂ O):	+0.06	+0.06	0	-5.5	-2.5	-2.0	-4.0	-4.0	-5.8	-6.0
VE14 (+/- "H ₂ O):	+0.06	+0.08	0	-1.8	-1.0	-0.7	-1.3	-1.5	-2.0	-2.0



- EXPLANATION**
- Property Boundary
 - Shallow Vapor Well Location (clay)
 - Shallow Vapor Well Location (clay and sand)
 - Deep Vapor Well Location (sand)
 - Monitoring Well Location
 - Piezometer Location
 - Nested Vapor Probe Location
 - Approximate Extent of On-Site Chlorinated Hydrocarbon-Affected Soil

Camara, City of Industry

Vapor Extraction Well Locations

Levine-Fricke-Recon
Project No. 2455

Figure 1

APPENDIX A

Work Plan to Conduct RNA Evaluation

October 23, 1998

2455.01

Yi Lu, Ph.D., R.G.
California Regional Water Quality Control Board
Los Angeles Region
101 Centre Plaza Drive
Monterey Park, California 91745

Subject: Approach and Work Plan to Evaluate Remediation by Natural Attenuation at the Calmar Facility, City of Industry, California

Dear Dr. Lu:

At the request of Calmar, Inc., Levine·Fricke·Recon (LFR) has prepared this work plan to conduct an evaluation of remediation by natural attenuation (RNA) at the Calmar facility located at 333 Turnbull Canyon Road, City of Industry, California ("the Site"; Figure 1). The California Regional Water Quality Control Board, Los Angeles Region (RWQCB) has required that Calmar conduct remedial actions to address tetrachloroethene (PCE) in soil and groundwater beneath the Site. This scope of work has been developed to meet that requirement.

We understand that Calmar's objectives for conducting work at the Site are to:

1. evaluate the feasibility of using RNA as the remedial approach
2. evaluate whether enhanced degradation may be appropriate for the Site
3. collect data to help separate PCE-affected groundwater at the Site from PCE in groundwater from other sources

Based on relatively low concentrations of PCE in soil matrix and soil gases and declining concentrations of PCE in groundwater over the past 4 years at the Site, RNA may be a viable remedial approach for the Site. This approach includes collecting data to evaluate RNA as a remedial approach following U.S. Environmental Protection Agency (U.S. EPA) guidelines. These data will also be used to assess whether an enhanced bioremediation approach may be appropriate for the Site.

Protocols for evaluating RNA are defined in the U.S. EPA document "Technical Protocol For Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater," November 1996 (the guidance document). The guidance document describes a step-by-step approach for evaluating RNA as a valid remedial alternative. Part of this approach includes comparing the feasibility of other

reasonable remedial actions to RNA. If RNA is found to be feasible and other actions are deemed to be less feasible, then RNA can be selected as the remedial action for the Site.

An RNA study requires monitoring of downgradient wells to evaluate whether chemical concentrations are increasing, decreasing, or stable. Because the area where PCE is an issue is near the hydraulically downgradient edge of the Site, data from existing wells at other sites will need to be acquired or additional wells will need to be installed.

Historically, monitoring well MW-3, at the northern boundary of the Site (Figure 2), has had the highest concentrations of PCE. Since 1995, groundwater elevations have risen approximately 15 feet. This rise resulted in a shift in the local groundwater gradient from northwesterly to north. Consequently, PCE concentrations have decreased in MW-3 and have slightly increased in monitoring well P2, which is north of the PCE source area.

To select data collection locations for the RNA evaluation, we recommend that some integration of data from the Site with data from other nearby sites be conducted prior to initiating field work. This kind of more regional evaluation has not been conducted to date by LFR. LFR has compiled a database of groundwater quality information for the mouth of the Puente Valley. Using these data, a more regional groundwater gradient and flow direction can be evaluated, and data from downgradient sites can be evaluated to determine whether existing wells on other properties may be useful for Calmar's RNA study.

Specific Tasks for RNA Evaluation

The following tasks are proposed to accomplish the scope of work outlined above:

Task 1: Evaluate Regional Data

Data from the Site and nearby sites will be evaluated to develop a more regional picture in the vicinity of the Calmar site. For the purposes of this scope of work, the evaluation will be limited to data from the Calmar, Acorn, Hysol, and Physicians Formula sites, along with a limited data set from the Benchmark site. From these data, plots of PCE and TCE plumes from comparable time periods in the past 5 years will be constructed for the Site and local vicinity. Groundwater elevation maps will also be constructed to evaluate gradients and flow directions through time. Additionally, concentration trends through time from key monitoring wells in the area will be graphed. This data evaluation will be used to determine whether data from other sites may be useful for the RNA evaluation or if additional wells need to be installed for the RNA study.

Task 2: Monitoring Well Installation

Based on the results of the data evaluation in Task 1, locations for additional monitoring wells may be selected. Without the benefit of the data evaluation, the exact number of wells that may be needed cannot be determined. Because PCE in groundwater at the Site occurs near the

downgradient boundary of the Site, new wells will may need to be installed offsite. This will require cooperation with the downgradient property owner(s), and the ability to install these wells will be dependent on owner cooperation and drill rig access. LFR will consult with the RWQCB about the selected RNA monitoring points before proceeding with the evaluation.

The wells will be constructed of 2-inch diameter PVC casing. Installing small diameter wells will reduce well installation and waste disposal costs, and lower micro-purge times for the RNA evaluation (see Task 3 below). Groundwater is currently at a depth of approximately 26 feet below ground surface (bgs). Based on this depth to groundwater, the wells are expected to be approximately 40 feet deep. The wells will be constructed with 15 feet of screen into groundwater and 10 feet of screen above groundwater to allow for possible future variations in groundwater levels similar to those previously observed at the Site.

Task 3: Groundwater Sampling and Analysis for RNA Evaluation

Groundwater sampling and analysis will be conducted to provide data that will be used to assess:

- whether or not biodegradation is a significant attenuation mechanism at the Site and, if so, what type of biodegradation is taking place
- whether the plume is in a predominantly expanding, stable, or shrinking mode

Geochemical indicators of biodegradation will be collected to help evaluate whether RNA is an appropriate remediation approach for the Site, or whether an engineered remediation approach such as enhanced biodegradation may be more appropriate and feasible to meet remediation goals for the Site.

The groundwater sampling and analysis will be conducted in two phases. The first phase will consist of collecting a one-time "snapshot" of geochemical conditions in the aquifer. These data will be used to assess the relative magnitude and type of biodegradation processes that may be active at the Site. The second phase will consist of quarterly monitoring for halogenated volatile organic compounds (HVOCs) for a period of approximately two years at selected wells to assess trends in concentrations over space and time. These trend data will be used to evaluate whether the plume is in an expanding, stable, or shrinking mode.

First Phase: Collection of Geochemical Data

Geochemical data will be collected to assess the magnitude and type of biodegradation processes that are likely active within the plume. In general, HVOCs undergo biodegradation via the following processes: direct metabolism, cometabolism, and reductive dehalogenation. Geochemical data collected during this phase of the investigation will be used to semi-quantitatively assess the magnitude of biodegradation taking place in the plume, as well as to evaluate which type of biodegradation is likely dominant in the plume.

Purging

Prior to collecting groundwater samples for geochemical analysis, the subject monitoring well will be purged using a very slow purging rate (i.e. a micropurge) in order to minimize disturbance of the water sample prior to analysis. It is anticipated that a Grundfoss rediflow pump will be used to purge water from the monitoring wells at a purging rate of approximately 0.1 gallon per minute (gpm).

Purged water will be routed through a flow-through cell that will allow the purged water to come into contact with a dissolved oxygen (DO), electrical conductivity (EC), oxidation/reduction potential (ORP), and pH meter without coming into contact with the atmosphere. These meter readings will be taken to help determine when purging has been completed.

Chemical Analysis

After purging has been completed, collected groundwater samples will be analyzed for the following parameters:

Analyte	Method	Analyzed in the Field or Laboratory
Dissolved Oxygen	Meter reading taken in flow-through cell	Field
Oxidation/reduction potential	Meter reading taken in flow-through cell	Field
pH	Meter reading taken in flow-through cell	Field
Electrical Conductivity	Meter reading taken in flow-through cell	Field
Nitrate	EPA Method 300	Fixed Laboratory
Nitrite	Colorimetric Hach Method	Field
Sulfate	EPA Method 300	Fixed Laboratory
Sulfide	Colorimetric Hach Method	Field
Ferrous Iron	Colorimetric Hach Method	Field
Chloride	SM 4500	Fixed Laboratory
Alkalinity	EPA Method 310	Fixed Laboratory
Methane	GC/FID in headspace	Fixed Laboratory
Total Organic Carbon	EPA Method 415.1	Fixed Laboratory
Chlorinated halocarbons (including PCE, TCE, DCE, and vinyl chloride)	EPA Method 8260	Fixed Laboratory
Ethane/ethylene	GC/FID	Fixed Laboratory

BTEX Compounds	EPA Method 8260	Fixed Laboratory
----------------	-----------------	------------------

Second Phase: Longer Term Monitoring

Data from the first phase, historic water quality data, and data collected during Task 1 will be used to establish a monitoring program to evaluate concentration trends and assess the status of the plume. Solely for the purposes of the RNA evaluation, at least one upgradient well, two "mid plume" wells, and one downgradient well will be recommended for quarterly sampling for a period of at least two years to establish a meaningful trend. These trend data will be used to assess plume stability, and for evidence of a loss of HVOC mass in the plume over time.

Calmar is currently conducting semiannual monitoring of all ten wells at the Site. Results are presented to the RWQCB in an annual data report. Based on historic groundwater quality results, our opinion is that three to four of the wells currently being monitored do not add significantly to an understanding of the PCE issue at the Site, and these wells should be eliminated from the monitoring program. With the implementation of RNA, Levine-Fricke-Recon recommends that only those wells necessary for the RNA evaluation be included in future monitoring efforts at the Site. Based on the results of the data evaluation discussed above in Task 1, Levine-Fricke-Recon will provide the RWQCB with a list of wells that will be included in the RNA evaluation, and which wells should be eliminated from the monitoring program. All existing wells and new wells would continue to be included in the measurement of groundwater elevations each monitoring period.

Task 4: Data Evaluation

Geochemical data will be analyzed for evidence of biodegradation and to evaluate the likely dominant mechanism of biodegradation that may be active in the plume. This evaluation will focus on determining whether or not naturally occurring attenuation is adequate to meet remediation goals for the Site, or whether some type of engineered or enhanced bioremediation or other engineered approach may be appropriate to meet Site remediation goals.

Depending on the results obtained during Task 3, this data analysis may include:

- plotting geochemical data to assess spatial trends in the indicator parameters
- analytical modeling of the plume using different biodegradation rates to determine the best match with actual data
- development and graphic illustration of a site conceptual model describing the sources and fate and transport of HVOCs in the aquifer
- completion of a screening-level type risk evaluation of HVOCs in groundwater at the Site
- cost estimating and feasibility study to compare RNA with engineered approaches

Task 5: Report Preparation and Regulatory Meeting

A report will be prepared that summarizes the data and presents our interpretations and assessments from the RNA evaluation. The report will include detailed descriptions of the methodologies used to collect the data, our evaluation and interpretation of the data, and the rationale for all conclusions reached. LFR staff will attend a meeting with the RWQCB to discuss the results of this evaluation after RWQCB review of the report.

If you have any questions about this work plan, please call Scott Seyfried, Senior Associate Hydrogeologist, in our Sacramento area office at (916) 786-0320, or me in our Irvine office at (949) 955-1390.

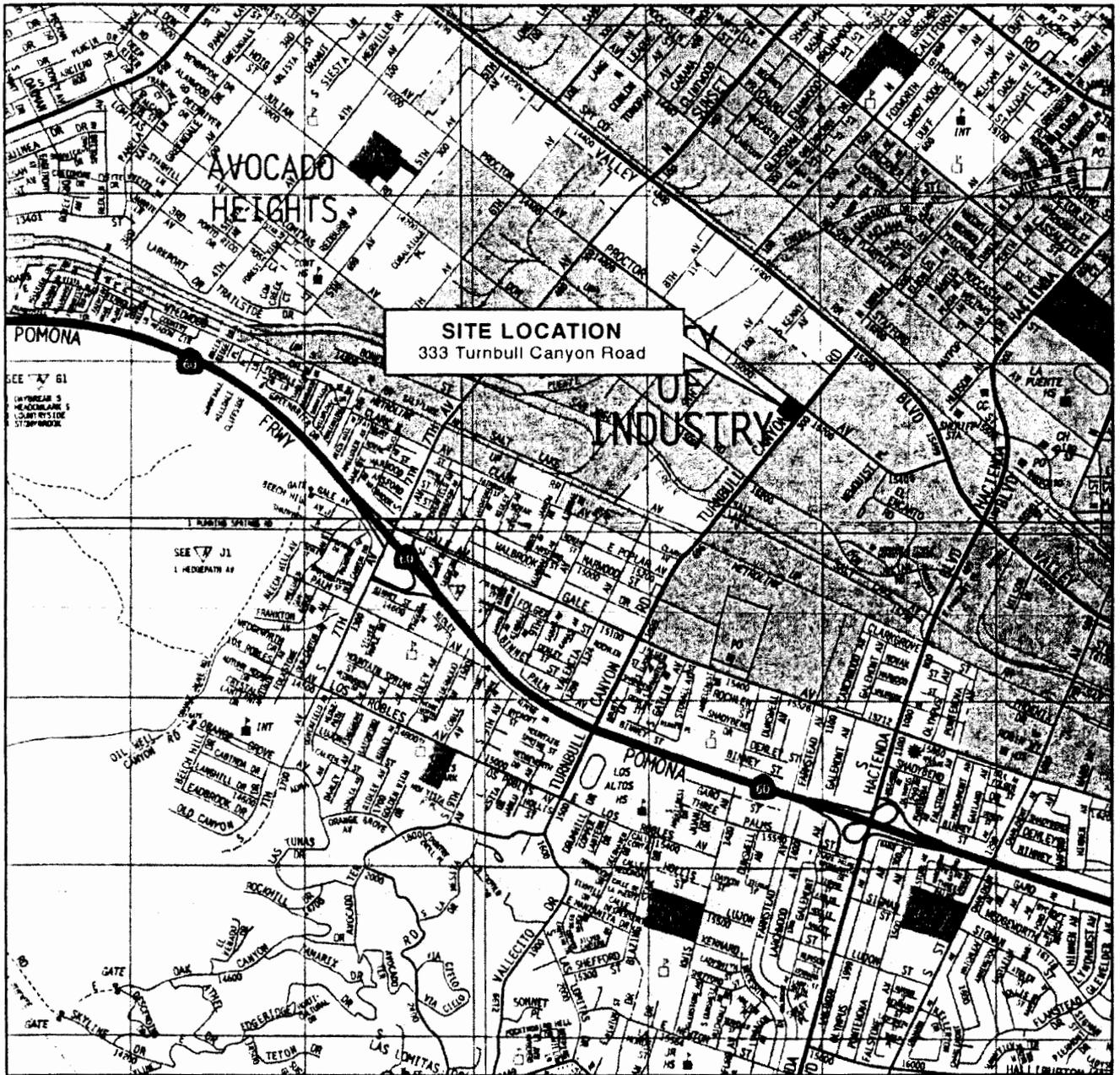
Sincerely,



David E. Field, R.G.
Principal Geologist

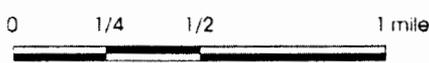
cc: Aldie Johnson, Calmar
James Smith, Saint Gobain, Inc.
Maria Hoye, Latham & Watkins

Attachments



SITE LOCATION
333 Turnbull Canyon Road

Reproduced with permission granted by Thomas Bros. Maps®
MAP SOURCE: Thomas Bros Guide®, Los Angeles County, California, pp 637, 638, 677 & 678 , 1996



Site Vicinity

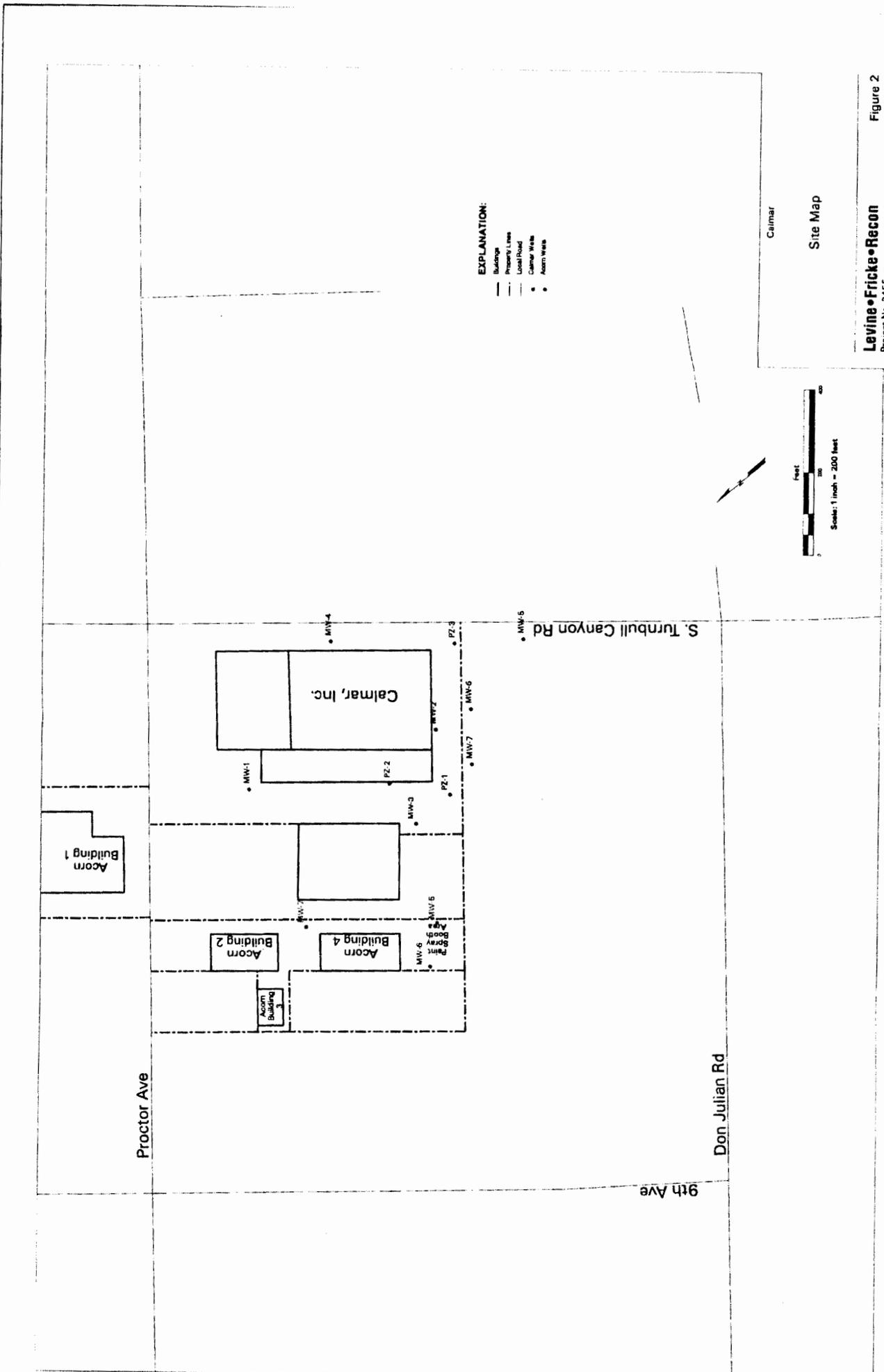
Levine-Fricke-Recon

Project No. 2455

Calmar

Figure 1

2455-70_112196MEH:scj



- EXPLANATION:**
- Building
 - - - Property Lines
 - - - Local Road
 - Calmar Well
 - Acorn Well

Calmar
Site Map

Levine • Fricke • Recon
Project No. 2455



PHONE (714) 751-3210 FAX (714) 751-6414

2960 AIRWAY AVENUE, SUITE B-101 COSTA MESA, CALIFORNIA 92626

AAI RFS #: 9820904

August 6, 1998

Levine Fricke
1920 Main Street, Suite 750
Irvine, CA 92714

Project Name: Calmar
Project Number: 2455.01-400

Attention: Steve Winners

Apollo Analytics Inc., has received the following sample(s):

<u>Date Received</u>	<u>Quantity</u>	<u>Matrix</u>
July 28, 1998	1	Air/Canister

Due to a sudden breakdown on the GC/MS equipment. The sample received was subcontracted to Performance Analytical Inc. for EPA TO-14, fixed gases and total non-methane HC. The subcontractor is an approved California Department of Health Services laboratory. For your reference, Performance Analytical Inc. original report is enclosed.

The results of these analyses and the quality control are enclosed. If you have any questions please do not hesitate to call (714) 751-3210.

Leon Levan
Laboratory Manager

VOLATILE ORGANIC ANALYSIS

CLIENT NAME: Levine Fricke
PROJECT #: 2455.01-400
PROJECT NAME: Calmar
MATRIX: Air/Canister
SAMPLE VOLUME: 1.00 Liter
INITIAL PRESSURE: 0.0
FINAL PRESSURE: 0.0
DILUTION FACTOR: 1.00

CLIENT SAMPLE ID: Method Blank
AAI RFS# 9820904
AAI ID#: Method Blank

DATE SAMPLED: 7/28/98
DATE RECEIVED: 7/28/98
DATE ANALYZED: 7/30/98

ANALYTICAL METHOD: EPA TO14 (GC/MS)

CAS NUMBER	COMPOUND	CONCENTRATION			
		ug/m3	PQL	ppb	PQL
74-87-3	Chloromethane	ND	1.0	ND	0.49
74-83-9	Bromomethane	ND	1.0	ND	0.26
75-01-04	Vinyl Chloride	ND	1.0	ND	0.39
75-00-3	Chloroethane	ND	1.0	ND	0.38
75-69-4	Trichlorofluoromethane	ND	1.0	ND	0.18
75-35-4	1,1-Dichloroethene	ND	1.0	ND	0.25
76-13-1	Trichlorotrifluoroethane	ND	1.0	ND	0.13
75-09-2	Methylene Chloride	ND	1.0	ND	0.29
75-35-3	1,1-Dichloroethane	ND	1.0	ND	0.25
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ND	0.25
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ND	0.25
67-66-3	Chloroform	ND	1.0	ND	0.21
71-55-6	1,1,1-Trichloroethane	ND	1.0	ND	0.19
56-23-5	Carbon Tetrachloride	ND	1.0	ND	0.16
71-43-2	Benzene	ND	1.0	ND	0.31
107-06-2	1,2-Dichloroethane	ND	1.0	ND	0.25
79-01-6	Trichloroethene	ND	1.0	ND	0.19
78-87-5	1,2-Dichloropropane	ND	1.0	ND	0.22
10061-02-6	trans-1,3-Dichloropropene	ND	1.0	ND	0.22
108-88-3	Toluene	ND	1.0	ND	0.27
10061-01-5	cis-1,3-Dichloropropene	ND	1.0	ND	0.22
79-00-5	1,1,2-Trichloroethane	ND	1.0	ND	0.19
127-18-4	Tetrachloroethene	ND	1.0	ND	0.15
108-90-7	Chlorobenzene	ND	1.0	ND	0.22
100-41-4	Ethylbenzene	ND	1.0	ND	0.23
1330-20-7	m,p-Xylene	ND	1.0	ND	0.23
95-47-6	o-Xylene	ND	1.0	ND	0.23
100-42-5	Styrene	ND	1.0	ND	0.24
79-34-5	1,1,2,2-Tetrachlorethane	ND	1.0	ND	0.15
541-73-1	1,3-Dichlorobenzene	ND	1.0	ND	0.17
106-46-7	1,4-Dichlorobenzene	ND	1.0	ND	0.17
95-50-1	1,2-Dichlorobenzene	ND	1.0	ND	0.17
67-64-1	Acetone	ND	1.0	ND	0.42
78-93-3	2-Butanone	ND	1.0	ND	0.34
108-10-1	4-methyl-2-pentanone	ND	1.0	ND	0.24
591-78-6	2-Hexanone	ND	1.0	ND	0.24
75-15-0	Carbon Disulfide	ND	1.0	ND	0.32
1634-04-4	Methyl tert-Butyl Ether	ND	1.0	ND	0.28
108-05-4	Vinyl Acetate	ND	1.0	ND	0.00
75-27-4	Bromodichloromethane	ND	1.0	ND	0.15
124-48-1	Dibromochloromethane	ND	1.0	ND	0.12
106-93-4	1,2-Dibromoethane	ND	1.0	ND	0.13
75-25-2	Bromoform	ND	1.0	ND	0.10

TR - Detected Below Indicated Reporting Limit

ND- Not detected

VOLATILE ORGANIC ANALYSIS

CLIENT NAME: Levine Fricke
PROJECT #: 2455.01-400
PROJECT NAME: Calmar
MATRIX: Air/Canister
SAMPLE VOLUME: 0.005 Liter
INITIAL PRESSURE: -1.5
FINAL PRESSURE: 3.5
DILUTION FACTOR: 1.38

CLIENT SAMPLE ID: CAS-004-072898
AAI RFS# 9820904
AAI ID#: 9820904-001

DATE SAMPLED: 7/28/98
DATE RECEIVED: 7/28/98
DATE ANALYZED: 7/30/98

ANALYTICAL METHOD: EPA TO14 (GC/MS)

CAS NUMBER	COMPOUND	CONCENTRATION			
		ug/m3	PQL	ppb	PQL
74-87-3	Chloromethane	ND	200	ND	98
74-83-9	Bromomethane	ND	200	ND	52
75-01-04	Vinyl Chloride	ND	200	ND	79
75-00-3	Chloroethane	ND	200	ND	76
75-69-4	Trichlorofluoromethane	ND	200	ND	36
75-35-4	1,1-Dichloroethene	320	200	82	51
76-13-1	Trichlorotrifluoroethane	ND	200	ND	26
75-09-2	Methylene Chloride	ND	200	ND	58
75-35-3	1,1-Dichloroethane	ND	200	ND	50
156-60-5	trans-1,2-Dichloroethene	ND	200	ND	51
156-59-2	cis-1,2-Dichloroethene	ND	200	ND	51
67-66-3	Chloroform	ND	200	ND	41
71-55-6	1,1,1-Trichloroethane	ND	200	ND	37
56-23-5	Carbon Tetrachloride	ND	200	ND	32
71-43-2	Benzene	ND	200	ND	63
107-06-2	1,2-Dichloroethane	ND	200	ND	50
79-01-6	Trichloroethene	770	200	140	38
78-87-5	1,2-Dichloropropane	ND	200	ND	44
10061-02-6	trans-1,3-Dichloropropene	ND	200	ND	44
108-88-3	Toluene	ND	200	ND	53
10061-01-5	cis-1,3-Dichloropropene	ND	200	ND	44
79-00-5	1,1,2-Trichloroethane	ND	200	ND	37
127-18-4	Tetrachloroethene	22,000	200	3,200	30
108-90-7	Chlorobenzene	ND	200	ND	44
100-41-4	Ethylbenzene	ND	200	ND	46
1330-20-7	m,p-Xylene	ND	200	ND	46
95-47-6	o-Xylene	ND	200	ND	46
100-42-5	Styrene	ND	200	ND	47
79-34-5	1,1,2,2-Tetrachlorethane	ND	200	ND	29
541-73-1	1,3-Dichlorobenzene	ND	200	ND	34
106-46-7	1,4-Dichlorobenzene	ND	200	ND	34
95-50-1	1,2-Dichlorobenzene	ND	200	ND	34
67-64-1	Acetone	ND	200	ND	84
78-93-3	2-Butanone	ND	200	ND	68
108-10-1	4-methyl-2-pentanone	ND	200	ND	49
591-78-6	2-Hexanone	ND	200	ND	49
75-15-0	Carbon Disulfide	ND	200	ND	64
1634-04-4	Methyl tert-Butyl Ether	ND	200	ND	56
108-05-4	Vinyl Acetate	ND	200	ND	57
75-27-4	Bromodichloromethane	ND	200	ND	30
124-48-1	Dibromochloromethane	ND	200	ND	24
106-93-4	1,2-Dibromoethane	ND	200	ND	26
75-25-2	Bromoform	ND	200	ND	20

TR - Detected Below Indicated Reporting Limit
 ND- Not detected

ANALYTICAL RESULTS

AAI RFS #: 9820904

Date(s) Sampled: 7/28/98

Date(s) Analyzed: 7/31/98

Analytical Method: EPA 25C

Chemist: Performance Analytical

Client Name: Levine Fricke

Project Name: Calmar

Project #: 2455.01-400

Matrix: Air/Canister

Volume Analyzed: 0.50 ml

Pi I = 0.0

Pf I = 0.0

D.F. = 1.00

Total Non-Methane Organics

Reporting

Limit

(ppm, v/v)

AAI ID Number	Client ID Number	(as Methane) (ppm,v/v)	Reporting Limit (ppm, v/v)
9820904 -001	Method Blank	ND	1.0

TR - Detected Below Indicated Reporting Limit

ND- Not detected

ANALYTICAL RESULTS

AAI RFS #: 9820904

Date(s) Sampled: 7/28/98

Date(s) Analyzed: 7/31/98

Analytical Method: EPA 25C

Chemist: Performance Analytical

Client Name: Levine Fricke

Project Name: Calmar

Project #: 2455.01-400

Matrix: Air/Canister

Volume Analyzed: 0.50 ml

PII = -1.5

PfI = 3.5

D.F. = 1.38

Total Non-Methane Organics

AAI ID Number	Client ID Number	(as Methane) (ppm, v/v)	Reporting Limit (ppm, v/v)
9820904 -001	CAS-004-072898	14	1.0

TR - Detected Below Indicated Reporting Limit

ND- Not detected

ANALYTICAL RESULTS

AAI RFS #: 9820904

Client Name: Levine Fricke
 Project Name: Calmar
 Project #: 2455.01-400
 Matrix: Air/Canister

Date(s) Sampled: 7/28/98
 Date(s) Analyzed: 8/6/98
 Analytical Method: GC/TCD
 Chemist: PAI

Volume Analyzed: 0.10 ml

Pi I = 0.0

Pf I = 0.0

D.F. = 1.00

Reporting
 Limit
 (% v/v)

CAS #	COMPOUND	Units	PAI Method Blank	Reporting Limit (% v/v)
7782-44-7	Oxygen	(%, v/v)	ND	0.100
7727-37-9	Nitrogen	(%, v/v)	ND	0.100
630-08-0	Carbon Monoxide	(%, v/v)	ND	0.100
74-82-8	Methane	(%, v/v)	ND	0.100
124-38-9	Carbon Dioxide	(%, v/v)	ND	0.100

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

ANALYTICAL RESULTS

AAI RFS #: 9820904

Client Name: Levine Fricke
 Project Name: Calmar
 Project #: 2455.01-400
 Matrix: Air/Canister

Date(s) Sampled: 7/28/98
 Date(s) Analyzed: 8/6/98
 Analytical Method: GC/TCD
 Chemist: PAI

Volume Analyzed: 0.10 ml

P11 = -1.5

Pf1 = 3.5

D.F. = 1.38

CAS #	COMPOUND	Units	CAS-004-072898	Reporting
			9820904 -001	Limit (%, v/v)
7782-44-7	Oxygen	(%, v/v)	14.1	0.100
7727-37-9	Nitrogen	(%, v/v)	84.5	0.100
630-08-0	Carbon Monoxide	(%, v/v)	ND	0.100
74-82-8	Methane	(%, v/v)	ND	0.100
124-38-9	Carbon Dioxide	(%, v/v)	1.37	0.100

TR = Detected Below Indicated Reporting Limit

ND = Not Detected



Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS
PAGE 1 OF 2

Client : Apollo Analytics, Inc.

Client Sample ID : N/A
PAI Sample ID : PAI Method Blank

Test Code : GC/MS EPA TO-14
Analyst : Cindy Yoon
Instrument : HP5973/Fekmar AUTOCAN Elite
Matrix : Summa Canister
Date Sampled : N/A
Date Received : N/A
Date Analyzed : 7/30/98
Volume(s) Analyzed : 1.00 Liter

PI1 = 0.0 PI2 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT	REPORTING LIMIT	RESULT	REPORTING LIMIT
		$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	ppb	ppb
74-87-3	Chloromethane	ND	1.0	ND	0.49
75-01-4	Vinyl Chloride	ND	1.0	ND	0.39
74-83-9	Bromomethane	ND	1.0	ND	0.26
75-00-3	Chloroethane	ND	1.0	ND	0.38
67-64-1	Acetone	ND	1.0	ND	0.42
75-69-4	Trichlorofluoromethane	ND	1.0	ND	0.18
75-35-4	1,1-Dichloroethane	ND	1.0	ND	0.25
75-09-2	Methylene chloride	ND	1.0	ND	0.29
76-13-1	Trichlorotrifluoroethane	ND	1.0	ND	0.13
75-15-0	Carbon Disulfide	ND	1.0	ND	0.32
156-60-5	trans-1,2-Dichloroethene	ND	1.0	ND	0.25
75-34-3	1,1-Dichloroethane	ND	1.0	ND	0.25
1634-04-4	Methyl tert-Butyl Ether	ND	1.0	ND	0.28
108-05-4	Vinyl Acetate	ND	1.0	ND	0.28
78-93-3	2-Butanone	ND	1.0	ND	0.34
156-59-2	cis-1,2-Dichloroethene	ND	1.0	ND	0.25
67-66-3	Chloroform	ND	1.0	ND	0.21
107-06-2	1,2-Dichloroethane	ND	1.0	ND	0.25
71-55-6	1,1,1-Trichloroethane	ND	1.0	ND	0.19
71-43-2	Benzene	ND	1.0	ND	0.31
56-23-5	Carbon Tetrachloride	ND	1.0	ND	0.16
78-87-5	1,2-Dichloropropane	ND	1.0	ND	0.22

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by: RCG

Date: 7/31/98


Performance Analytical Inc.

Air Quality Laboratory

RESULTS OF ANALYSIS

PAGE 2 OF 2

Client : Apollo Analytics, Inc.

Client Sample ID : N/A

PAI Sample ID : PAI Method Blank

 Test Code : GC/MS EPA TO-14
 Analyst : Cindy Yoon
 Instrument : HP5973/Tekmar AUTOCAN Elite
 Matrix : Summa Canister

 Date Sampled : N/A
 Date Received : N/A
 Date Analyzed : 7/30/98
 Volume(s) Analyzed : 1.00 Liter

Pi 1 = 0.0 Pf 1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT	REPORTING LIMIT	RESULT	REPORTING LIMIT
		$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	ppb	ppb
75-27-4	Bromodichloromethane	ND	1.0	ND	0.15
79-01-6	Trichloroethene	ND	1.0	ND	0.19
10061-01-5	cis-1,3-Dichloropropene	ND	1.0	ND	0.22
108-10-1	4-Methyl-2-pentanone	ND	1.0	ND	0.24
10061-02-6	trans-1,3-Dichloropropene	ND	1.0	ND	0.22
79-00-5	1,1,2-Trichloroethane	ND	1.0	ND	0.19
108-88-3	Toluene	ND	1.0	ND	0.27
591-78-6	2-Hexanone	ND	1.0	ND	0.24
124-48-1	Dibromochloromethane	ND	1.0	ND	0.12
106-93-4	1,2-Dibromoethane	ND	1.0	ND	0.13
127-18-4	Tetrachloroethene	ND	1.0	ND	0.15
108-90-7	Chlorobenzene	ND	1.0	ND	0.22
100-41-4	Ethylbenzene	ND	1.0	ND	0.23
1330-20-7	m- & p-Xylenes	ND	1.0	ND	0.23
75-25-2	Bromoform	ND	1.0	ND	0.10
100-42-5	Styrene	ND	1.0	ND	0.24
95-47-6	o-Xylene	ND	1.0	ND	0.23
79-34-5	1,1,2,2-Tetrachloroethane	ND	1.0	ND	0.15
541-73-1	1,3-Dichlorobenzene	ND	1.0	ND	0.17
106-46-7	1,4-Dichlorobenzene	ND	1.0	ND	0.17
95-50-1	1,2-Dichlorobenzene	ND	1.0	ND	0.17

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

 Verified by : RC

 Date : 7/31/98



Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS
PAGE 1 OF 2

Client : Apollo Analytics, Inc.

Client Sample ID : 9820904-001
PAI Sample ID : P9801302-001

Test Code : GC/MS EPA TO-14
Analyst : Cindy Yoon
Instrument : HP5973/Tokmar AUTOCAN Elite
Matrix : Summa Canister

Date Sampled : 7/30/98
Date Received : 7/30/98
Date Analyzed : 7/30/98
Volume(s) Analyzed : 0.005 Liter

PI 1 = -1.5 PI 1 = 3.5
D.F. = 1.38

CAS #	COMPOUND	RESULT	REPORTING LIMIT	RESULT	REPORTING LIMIT
		$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	ppb	ppb
74-87-3	Chloroethane	ND	200	ND	98
75-01-4	Vinyl Chloride	ND	200	ND	79
74-83-9	Bromomethane	ND	200	ND	52
75-00-3	Chloroethane	ND	200	ND	76
67-64-1	Acetone	ND	200	ND	84
75-69-4	Trichlorofluoromethane	ND	200	ND	36
75-35-4	1,1-Dichloroethane	320	200	82	51
75-09-2	Methylone chloride	ND	200	ND	58
76-13-1	Trichlorotrifluoroethane	ND	200	ND	26
75-15-0	Carbon Disulfide	ND	200	ND	64
156-60-5	trans-1,2-Dichloroethene	ND	200	ND	51
75-34-3	1,1-Dichloroethane	ND	200	ND	50
1634-04-4	Methyl tert-Butyl Ether	ND	200	ND	56
108-05-4	Vinyl Acetate	ND	200	ND	57
78-93-3	2-Butanone	ND	200	ND	68
156-59-2	cis-1,2-Dichloroethene	ND	200	ND	51
67-66-3	Chloroform	ND	200	ND	41
107-06-2	1,2-Dichloroethane	ND	200	ND	50
71-55-6	1,1,1-Trichloroethane	ND	200	ND	37
71-43-2	Benzene	ND	200	ND	63
56-23-5	Carbon Tetrachloride	ND	200	ND	32
78-87-5	1,2-Dichloropropane	ND	200	ND	44

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : RC

Date : 7/31/98



Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

PAGE 2 OF 2

Client : Apollo Analytics, Inc.

Client Sample ID : 9820904-001

PAI Sample ID : P9801302-001

Test Code : GCMS EPA TO-14
Analyst : Cindy Yoon
Instrument : HP5973/Tekmar AUTOCAN Elite
Matrix : Summa Canister

Date Sampled : 7/30/98
Date Received : 7/30/98
Date Analyzed : 7/30/98
Volume(s) Analyzed : 0.005 Liter

Pi 1 = -1.5

Pf 1 = 3.5

D.F. = 1.38

CAS #	COMPOUND	RESULT	REPORTING LIMIT	RESULT	REPORTING LIMIT
		$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	ppb	ppb
75-27-4	Bromodichloromethane	ND	200	ND	30
79-01-6	Trichloroethene	770	200	140	38
10061-01-5	cis-1,3-Dichloropropene	ND	200	ND	44
108-10-1	4-Methyl-2-pentanone	ND	200	ND	49
10061-02-6	trans-1,3-Dichloropropene	ND	200	ND	44
79-00-5	1,1,2-Trichloroethane	ND	200	ND	37
108-88-3	Toluene	ND	200	ND	53
591-78-6	2-Hexanone	ND	200	ND	49
124-48-1	Dibromochloromethane	ND	200	ND	24
106-93-4	1,2-Dibromoethane	ND	200	ND	26
127-18-4	Tetrachloroethene	22,000	200	3,200	30
108-90-7	Chlorobenzene	ND	200	ND	44
100-41-4	Bibenzene	ND	200	ND	46
1330-20-7	m- & p-Xylenes	ND	200	ND	46
75-25-2	Bromoform	ND	200	ND	20
100-42-5	Styrene	ND	200	ND	47
95-47-6	o-Xylene	ND	200	ND	46
79-34-5	1,1,2,2-Tetrachloroethane	ND	200	ND	29
541-73-1	1,3-Dichlorobenzene	ND	200	ND	34
106-46-7	1,4-Dichlorobenzene	ND	200	ND	34
95-50-1	1,2-Dichlorobenzene	ND	200	ND	34

TR = Detected Below Indicated Reporting Limit

ND = Not Detected

Verified by : RG

Date : 7/21/98



Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS
PAGE 1 OF 1

Client : Apollo Analytics, Inc.

Client Sample ID : N/A
PAI Sample ID : PAI Method Blank

Test Code : EPA 25C
Instrument : HP5890A/FID/TCA
Analyst : Wade Henton
Matrix : Summa Canister
Date Sampled : N/A
Date Received : N/A
Date Analyzed : 7/31/98
Volume(s) Analyzed : 0.50 ml

Pi 1 = 0.0 Pf 1 = 0.0
D.F. = 1.00

CAS #	COMPOUND	RESULT ppm, v/v	REPORTING LIMIT ppm, v/v
	Total Non-Methane Organics (as Methane)	ND	1.0

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by: RG

Date: 7/31/98



Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS
PAGE 1 OF 1

Client : Apollo Analytics, Inc.

Client Sample ID : 9820904-001
PAI Sample ID : P9801302-001

Test Code : EPA 25C
Instrument : HP5890A/FID/TCA
Analyst : Wade Henton
Matrix : Summa Canister

Date Sampled : 7/30/98
Date Received : 7/30/98
Date Analyzed : 7/31/98
Volume(s) Analyzed : 0.50 ml

Pi 1 = -1.5 Pf 1 = 3.5

D.F. = 1.38

CAS #	COMPOUND	RESULT ppm, v/v	REPORTING LIMIT ppm, v/v
	Total Non-Methane Organics (as Methane)	14	1.0

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : KG
Date : 7/31/98



Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS

PAGE 1 OF 1

Client : Apollo Analytics, Inc.

Client Sample ID : N/A
PAI Sample ID : PAI Method Blank

Test Code : GC/TCD
Instrument : HP5890/TCD #1
Analyst : Wade Henton
Matrix : Summa Canister

Date Sampled : N/A
Date Received : N/A
Date Analyzed : 8/6/98
Volume(s) Analyzed : 0.10 ml

Pi1 = 0.0 Pf1 = 0.0

D.F. = 1.00

CAS #	COMPOUND	RESULT (%, v/v)	REPORTING LIMIT (%, v/v)
7782-44-7	Oxygen	ND	0.100
7727-37-9	Nitrogen	ND	0.100
630-08-0	Carbon Monoxide	ND	0.100
74-82-8	Methane	ND	0.100
124-38-9	Carbon Dioxide	ND	0.100

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : KA

Date : 8/6/98



Performance Analytical Inc.
Air Quality Laboratory

RESULTS OF ANALYSIS
PAGE 1 OF 1

Client : Apollo Analytics, Inc.

Client Sample ID : 9820904-001
PAI Sample ID : P9801302-001

Test Code : GC/TCD
Instrument : HP5890/TCD #1
Analyst : Wade Henton
Matrix : Summa Canister

Date Sampled : 7/30/98
Date Received : 7/30/98
Date Analyzed : 8/6/98
Volume(s) Analyzed : 0.10 ml

Pi 1 = -1.5 Pfi 1 = 3.5 D.F. = 1.38

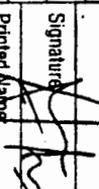
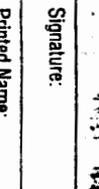
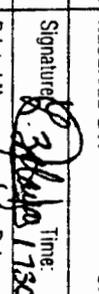
CAS #	COMPOUND	RESULT (%, v/v)	REPORTING LIMIT (%, v/v)
7782-44-7	Oxygen	14.1	0.100
7727-37-9	Nitrogen	84.5	0.100
630-08-0	Carbon Monoxide	ND	0.100
74-82-8	Methane	ND	0.100
124-38-9	Carbon Dioxide	1.37	0.100

TR = Detected Below Indicated Reporting Limit
ND = Not Detected

Verified by : KA

Date : 8/6/98

Chain of Custody

PROJECT MANAGER: Steve Winfield		COMPANY: LeVine-Fricke-Lecol (LFL)	
ADDRESS: 1920 Main St, # 750 LeVine, CA 92614		PHONE #: (949) 955-1390 FAX #: (949) 955-0683	
BILL TO: LFL - STEVE WINFIELD		COMPANY: LFL	
ADDRESS: SET ASIDE		PHONE NUMBER: (949) 955-1390	
SAMPLERS: (Signature) 		DATE: 7/28/98	
SAMPLE ID: CAS-004-072998	TIME: 1630	MATRIX: Air	LAB ID: -001
PROJECT INFORMATION			
PROJECT NUMBER: 2455.01-400	TOTAL NUMBER OF CONTAINERS: 1	CHAIN OF CUSTODY SEALS Y/N/NA: N/A	
PROJECT NAME: CUMAL	INTACT? Y/N/NA: Y	RECEIVED GOOD (COND/COLD): Y	
PURCHASE ORDER NUMBER:	AAI RFS #: 9820904		
SHIPPED VIA: TAT: <input checked="" type="checkbox"/> 24HR <input type="checkbox"/> 48HR <input type="checkbox"/> 1WK <input type="checkbox"/> 2WKS			
Comments: Per LeVine LFL			
SAMPLE RECEIPT			
SAMPLE DISPOSAL INSTRUCTIONS			
RELINQUISHED BY: 1. 		RELINQUISHED BY: 2. 	
Signature: _____ Time: 1730		Signature: _____ Time: _____	
Printed Name: <u>Steve Winfield</u> Date: 7/28/98		Printed Name: _____ Date: _____	
Company: LFL		Company: _____	
RECEIVED BY: 1. _____		RECEIVED BY: 2. _____	
Signature: _____ Time: _____		Signature: _____ Time: _____	
Printed Name: _____ Date: _____		Printed Name: _____ Date: _____	
Company: _____		Company: _____	
RECEIVED BY: 3. 		RECEIVED BY: _____	
Signature: _____ Time: 1730		Signature: _____ Time: _____	
Printed Name: <u>LETICIA DELA YEA</u> Date: 7/28/98		Printed Name: _____ Date: _____	
Company: Apollo Analytics, Inc.		Company: _____	