CONESTOGA-ROVERS
& ASSOCIATES

5900 Hollis Street, Suite A, Emeryville, California 94608
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www.CRAworld.com

July 20, 2007

Mr. Jerry Wickham
Alameda County Environmental Health Services (ACEHS)
1131 Harbor Bay Parkway
Alameda, CA 94502

Re: **Site Investigation Workplan**
Former Texaco Service Station (Chevron Site # 307233)
2259 First Street
Livermore, CA

Dear Mr. Wickham:

On behalf of Chevron Environmental Management Company (Chevron), Conestoga-Rovers & Associates (CRA), is submitting this Site Investigation Workplan in response to a request made by Alameda County Environmental Health Services (ACEHS) in a letter dated February 20, 2007. ACEHS asked Chevron to conduct an additional site investigation following the removal of two orphan tanks from beneath Mills Square Park (Attachment A). The investigation objective is to evaluate hydrocarbon impact from the previous service station activities.

SITE BACKGROUND

The site is currently Mills Square Park, owned by the City of Livermore and located on the east corner of First Street and North Livermore Avenue in Livermore, California. Topography around the site slopes gently to the north at an elevation of approximately 485 feet above mean sea level (Figure 1). The site is primarily covered with grass and trees with a concrete walkway.

Aerial photos indicate that the site was a retail service station prior to 1973. The earliest available aerial photograph was from 1959. This photo shows a station building located on the southern edge of the property and two dispenser islands located on the western portion of the property (Figure 2). The 1973 aerial photograph indicates that the station building and dispenser island had been removed and only a paved lot remained. By 1978, the property had been redeveloped as a park. The park remains in the same configuration as indicated on the 1978 aerial photo. These aerial photographs are presented as Attachment A.

PREVIOUS ENVIRONMENTAL WORK

September 2003 Investigation: The City of Livermore Engineering Division, as part of a redevelopment plan, requested Fugro West, Inc. (Fugro) to investigate soil and groundwater conditions in Mills Square Park for the purpose of evaluating the potential presence of petroleum hydrocarbons resulting from the historical use of the site as a service station. Total petroleum hydrocarbons as gasoline (TPHg) and total petroleum hydrocarbons as diesel (TPHd) were detected in only one soil sample at concentrations of 3.5 milligrams per kilogram (mg/kg) and

9.6 mg/kg, respectively. TPHg and TPHd were detected in groundwater at maximum concentrations of 18,000 micrograms per liter (µg/l) and 42,000 µg/l, respectively. Benzene was not detected in soil, but was detected in groundwater at a maximum concentration of 140 µg/l. Total lead was detected in all soil samples at 3 feet below grade (fbg), at a maximum concentration of 3,700 mg/kg.

September 2005 UST Removal: In September 2005, an orphan underground storage tank (UST) was encountered beneath the sidewalk on the southwest corner of the site. Under the direction of the Pleasanton-Livermore Fire Department, the UST was removed, soil samples were collected, and the excavated soil was backfilled into the excavation pit. According to Consolidated Engineering Laboratories' *Environmental Sampling, Testing and Evaluation of Soil* report, dated October 4, 2005, soil beneath the UST contained maximum concentrations of 1,200 mg/kg TPHg, 4,100 mg/kg TPHd, and 54 mg/kg total petroleum hydrocarbons as motor oil (TPHmo). Chevron was not involved with the tank removal and was contacted later by ACEHS to investigate whether any other USTs remained in Mills Square Park.

August 2006 Geophysical Investigation: Cambria Environmental Technology, Inc. (Cambria), now CRA, contracted with NORCAL Geophysical Consultants, Inc. to determine if any USTs still remained in place. Two suspected tanks were identified in the southwest corner of the park, measuring approximately 5 by 7 feet and located approximately 3 fbg.

September and October 2006 Site Investigation: Woodward Drilling Company, Inc. (Woodward) advanced five borings in the vicinity of the former dispenser islands and suspected USTs. The highest hydrocarbon concentrations detected were 8,700 mg/kg TPHg, 3,000 mg/kg TPHd, 1,400 mg/kg TPHmo and 14 mg/kg benzene. The maximum lead concentration was 65.4 mg/kg at 5 fbg. No groundwater was encountered to the total explored depth of 40 fbg.

June 2007 Site Investigation: On June 20, 2007, CRA observed Gettler-Ryan Inc. (Gettler-Ryan) remove two 750-gallon single-wall steel gasoline USTs (Tank 1 and Tank 2) and approximately 27 feet of associated product piping. CRA collected seven compliance soil samples from beneath the ends and middle of both Tank 1 and Tank 2 and from below the opening of a group of pipes protruding into the northwestern wall of the tank pit. No TPHg was detected in any sample. TPHd and TPHmo were detected at maximum concentrations of 2,800 mg/kg and 11,000 mg/kg, respectively. Lead was detected at a maximum concentration of 1170 mg/kg at 8 fbg.

PROPOSED SCOPE OF WORK

To investigate potential preferential pathways and to define the plume extent, CRA proposes to advance two cone penetration testing (CPT) borings on North Livermore Avenue, two GeoProbe® borings within the park, and install one nested vapor probe along the building (Peet's Coffee) perimeter on the southeast boundary of the park

at the locations identified on Figure 2. CPT borings will be advanced to approximately 50 fbg or to the depth of first encountered groundwater. GeoProbe® borings will be advanced to approximately 40 fbg. Vapor probe boring depths will not exceed 11 fbg.

To meet the objective of this investigation, CRA proposes the following tasks:

Site Health and Safety Plan: CRA will prepare a site health and safety plan to protect site workers. The plan will be reviewed and signed by all site workers/visitors and kept onsite at all times.

Permits: CRA will obtain boring permits from the Zone 7 Water District, and any other required permits from the City of Livermore prior to field activities.

Underground Utility Location: CRA will contact Underground Service Alert to identify potential utilities in the vicinity of all proposed boring locations. A subsurface utility locating contractor will also be retained to clear each individual boring location. Per Chevron safety standards, each boring will be cleared to eight fbg using an air-knife assisted vacuum rig or hand auger.

CPT and Soil Borings: CRA proposes to advance 2 CPT borings (CPT-1 and CPT-2) to approximately 50 fbg or until groundwater is encountered. CRA will also advance 2 GeoProbe® borings to 40 fbg within Mills Square Park. Grab groundwater samples will be collected at first encountered groundwater. Soil samples will be collected every 10 feet starting from 5 fbg to total depth, and additionally at areas of obvious hydrocarbon impact, lithologic change, and in the capillary fringe zone. Samples will be labeled, placed on ice, and transported to a Chevron-approved laboratory under proper chain of custody. Upon completion, the borings will be filled with Portland type I/II grout using a tremie pipe then patched to match the existing surface. CRA's *Standard Field Procedures for Cone Penetrometer Testing and Sampling* and *Standard Field Procedures for GeoProbe® Soil and Groundwater Sampling* are presented as Attachments B and C.

Vapor Probes: CRA will install nested probes at 5 fbg and 10 fbg in one boring to be advanced along the outside of the building housing Peet's Coffee at the south corner of Mills Square Park (Figure 2). It is estimated that the total depth of the boring will not exceed 11 fbg. Soil samples will be collected using a hand-auger above 8 fbg and using a split-spoon sampler at depths greater than 8 fbg.

Vapor Probes Construction and Sampling: Vapor probes will be constructed of 6-inch screen attached to ¼-inch Teflon tubing. Each probe will be placed at the desired depth and surrounded by a sand pack. Each probe will be isolated from the others by a bentonite grout mixture. Collection of soil vapor samples will be conducted at least 48 hours after the placement of the probes. Samples from soil vapor points will be collected using flow meters and 1-liter Summa™ canisters connected to the sampling tubing at each vapor point. A battery powered air pump with attached vacuum-chamber and Tedlar™ bag will be used to purge an appropriate volume from the sampling

point tubing. After purging, the valve between the purge pump and Summa™ canister will be closed and the Summa™ canister valve will be opened. The vacuum of the Summa™ canister will be used to draw the soil vapor through the flow controller until a negative pressure of approximately 5-inches of Hg is observed on the vacuum gauge. In accordance with the Department of Toxic Substances Control (DTSC) *Advisory-Active Soil Gas Investigations* guidance document, dated January 28, 2003, leak testing will be performed during sampling. After sampling, the Summa™ canisters will be packaged and sent to the Air Toxics laboratory under chain-of-custody for analysis. Standard Field Procedures for Soil Vapor Probe Installation and Sampling are presented as Attachment D.

Chemical Analysis: Soil and groundwater samples will be analyzed for the following:

- TPHg by modified EPA Method 8015M;
- Benzene, toluene, ethylbenzene, and xylene (BTEX), fuel oxygenates, and lead scavengers 1,2-dichloroethane (1,2-DCA) and 1,2-dibromoethane (EDB) by EPA Method 8260B;
- Lead by EPA Method 6010B; and
- Physical parameters including moisture content, bulk density, total porosity, air- and water-filled porosity, organic carbon and effective permeability in undisturbed soil samples.

Vapor Chemical Analysis: Vapor samples will be analyzed for the following:

- TPHg by EPA Method TO-3;
- BTEX, fuel oxygenates, and lead scavengers 1,2-DCA and EDB, naphthalene and helium (for leak check) by EPA Method TO-15; and
- O_2 and CO_2 by ASTM 1946 (GC/TCD).

Soil and Water Disposal: Soil and water produced during field activities will be temporarily stored on site in 55-gallon drums. Following review of analytic results, the soil and water will be transported to an appropriate Chevron-approved facility for disposal.

Reporting

Upon completion of field activities and review of the analytic results, CRA will prepare an investigation report that, at a minimum, will contain:

- Descriptions of the drilling and sampling methods;
- Boring logs;
- Tabulated analytic results for soil, groundwater, and soil vapor samples;
- A discussion of hydrocarbon distribution;
- Analytic reports and chain-of-custody forms;
- Conclusions and recommendations.

Schedule

The above scope of work will be implemented after receipt of written concurrence from ACEHS and with the approval of the City of Livermore so that this work does not impact any city activities already scheduled in the downtown area. An investigation report will be submitted approximately six weeks after receiving the analytic data.

CLOSING

We appreciate the opportunity to work with you on this project. Please contact Charlotte Evans at (510) 420-3351 or Satya Sinha at (925) 842-9876 if you have any questions or comments regarding this work.

Sincerely,
Conestoga-Rovers & Associates

Charlotte Evans

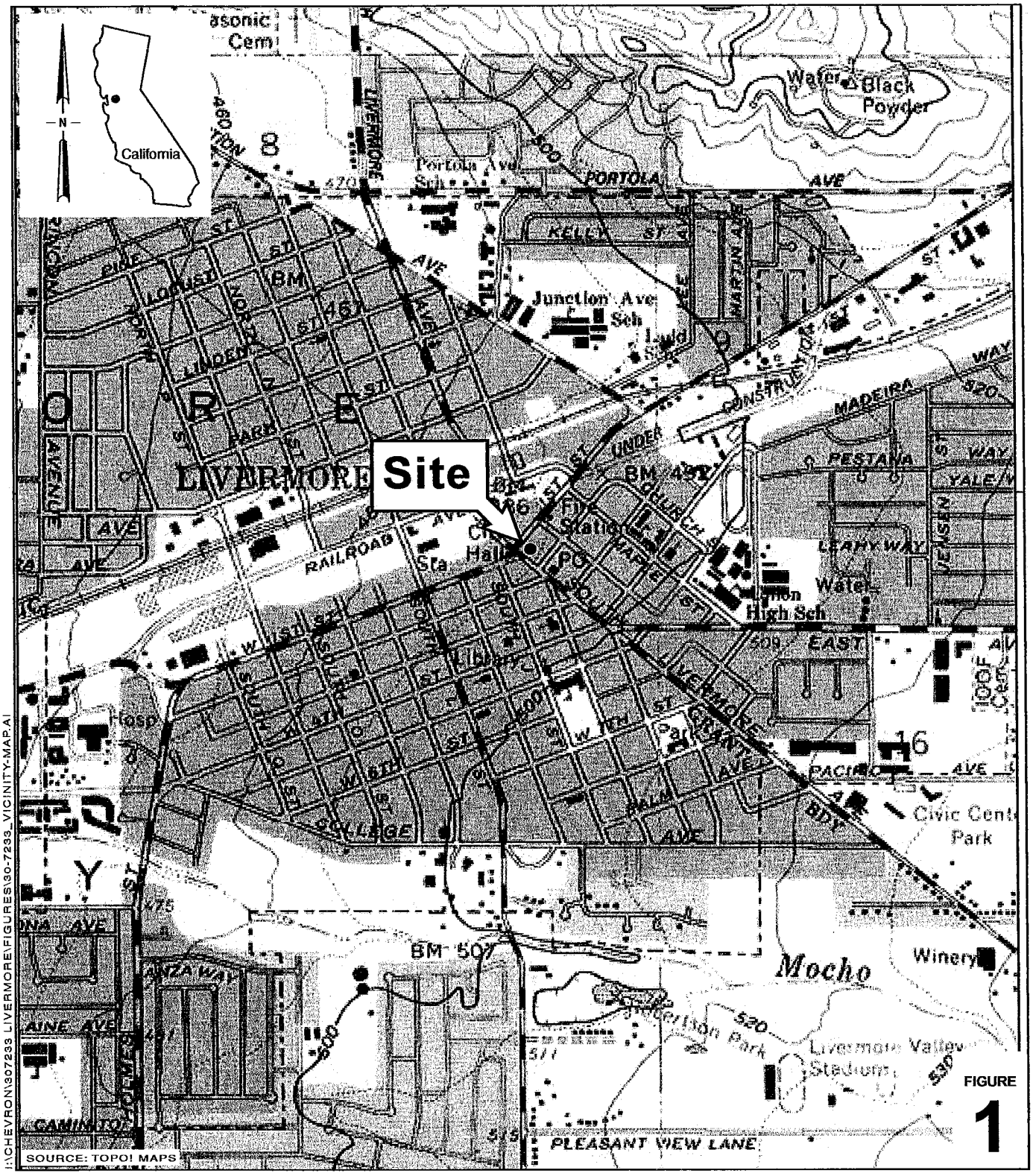
Robert Foss, P.G. #7445

Figures: 1 – Vicinity Map
2 – Site Plan with Proposed Boring Locations

Attachments: A – Regulatory Correspondence
B – Standard Field Procedures for CPT Sampling
C – Standard Field Procedures for Geoprobe Borings
D – Standard Field Procedures for Soil Vapor Probe Installation and Sampling

cc: Mr. Satya Sinha, Chevron Environmental Management Company, 6001 Bollinger Canyon Road, San Ramon, CA 94583
Chris Davidson, City of Livermore Economic and Redevelopment, 1052 South Livermore Avenue, Livermore, CA 94550

07/20/07



I:\CHEVRON\307233 LIVERMORE\FIGURES\30-7233_VICINITY-MAP.AI

FIGURE 1

0 1/8 1/4 1/2 1

SCALE : 1" = 1/4 MILE

Chevron Service Station 30-7233

2259 First Street

Livermore, California

CONESTOGA-ROVERS & ASSOCIATES

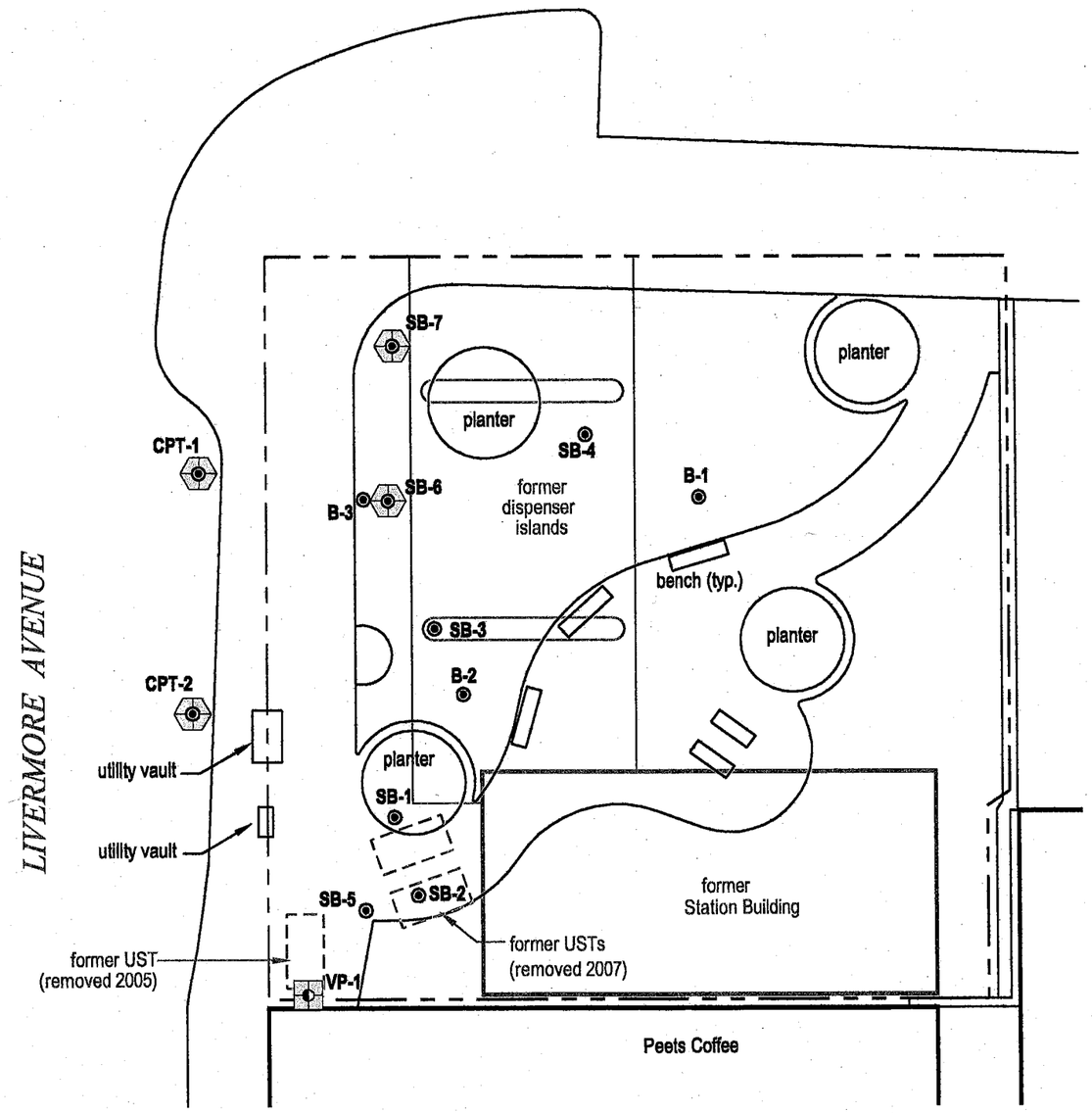
Vicinity Map

07/20/07

Site Plan with Proposed Boring Locations

EXPLANATION

- SB-1 ◉ Soil boring location
- B-1 ◉ Soil boring location (Fugro 2003)
- SB-6 ⬢ Proposed soil boring location
- CPT-1 ⬢ Proposed CPT location
- VP-1 ⊞ Proposed vapor probe location



0 10 20 40

Scale (ft)

Basemap modified from Aerial photographs

FIGURE **2**

Former Chevron Station 30-7233

2259 First Street

Livermore, California

CONESTOGA-ROVERS & ASSOCIATES

I:\307233 LIVERMORE\FIGURES\30-7233_SITEPLAN.DWG

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ATTACHMENT A

ACEHS Letter, dated February 20, 2007

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

February 20, 2007

Mr. Satya Sinha
Chevron Environmental Management Company
6001 Bollinger Canyon Rd., K2256
San Ramon, CA 94583-2324

Ms. Chris Davidson
City of Livermore Economic Development
1052 S. Livermore Ave.
Livermore, CA 94550

Subject: Fuel Leak Case No. RO0002908 and Geotracker Global ID T0600196622, Mill Square Park, 2259 First Street, Livermore, CA 94550

Dear Mr. Sinha and Ms. Davidson:

In correspondence dated January 30, 2007, Alameda County Environmental Health (ACEH) staff requested that you prepare plans to remove suspected underground storage tanks at the site and conduct additional site investigation. This request was based upon the results from a geophysical investigation and soil borings conducted at the site in September and October 2006. We recently became aware of results from a previous investigation conducted at the site during September 2003. Results from the September 2003 investigation are presented in a report entitled, "Soil and Groundwater Investigation Report," dated January 6, 2004, that was prepared by Fugro West, Inc. for the City of Livermore Engineering Division. The January 6, 2004, report, which was discovered as an attachment to a drilling permit (see attachment), is not in the ACEH case files and the results do not appear to have been reported to a regulatory agency. The investigation results presented in the January 6, 2004 report indicate that elevated concentrations of fuel hydrocarbons were detected in groundwater and lead was detected at an elevated concentration in a shallow soil sample collected in Mill Square Park. Reporting of these results is a regulatory requirement that does not appear to have been met by the City of Livermore. In addition, these results were not made available for review during the planning of the 2006 site investigation conducted by Chevron. During the 2006 site investigation, Chevron conducted sampling and analysis for metals at four soil borings in the park. However, all of the 2006 soil samples were collected below the depth at which an elevated concentration of lead was detected in the September 2003 investigation. In light of the September 2003 results, additional investigation of metals in shallow soils is required.

We request that you address the following technical comments, perform the proposed work, and send us the reports described below. We also request that you submit the January 6, 2004 report in its entirety as well as results from any other environmental investigations that may have been conducted at the site. Furthermore, if environmental site investigations were conducted at other sites in downtown Livermore and the results not previously submitted to a regulatory agency, we request that you also submit those results to ACEH within 15 days of the date of this letter.

TECHNICAL COMMENTS

1. **Lead in Shallow Soil.** During the September 2003 investigation, lead was detected at a concentration of 3,600 milligrams per kilogram in a soil sample collected at a depth of 3 feet bgs. The January 6, 2004 report speculated that the source of lead in soil was fill material in Mill Square Park. During the 2006 site investigation, no soil samples were collected for metals analysis at a depth shallower than 5 feet bgs. In the Work Plan for Site Investigation requested below by March 7, 2007, please propose soil sampling and metals analysis to define the extent of elevated concentrations of lead in shallow soil at the site.

2. **Elevated Concentrations of Petroleum Hydrocarbons in Groundwater.** Total petroleum hydrocarbons (TPH) as gasoline were detected in groundwater at concentrations up to 18,000 micrograms per liter (µg/L). TPH as diesel was detected at concentrations up to 42,000 µg/L. Please review the results presented in the January 6, 2004 report in order to plan additional investigation of the extent of groundwater contamination. Please propose additional site investigation activities in the Work Plan for Site Investigation requested below to define the horizontal and vertical extent of soil and groundwater contamination at the site. Please consider the use of cone penetrometer borings oriented along transects for investigation of the extent of contamination.

TECHNICAL REPORT REQUEST

Please submit technical reports to Alameda County Environmental Health (Attention: Jerry Wickham), according to the following schedule:

- **March 5, 2007** – Copy of Entire January 6, 2004 Report Entitled, "Soil and Groundwater Investigation, Regional Performing Arts Theater Site, Livermore, California"
- **March 7, 2007** – Underground Tank Closure Plan submitted to Livermore-Pleasanton Fire Department with copy to ACEH
- **March 7, 2007 for site investigation activities to be conducted simultaneously with tank and soil removal** – Work Plan for Site Investigation
- **April 24, 2007** – Removal of Suspected USTs and Contaminated Soil
- **No later than 30 days following tank removal for any site investigation activities to be conducted following tank and soil removal** – Work Plan for Site Investigation

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

ELECTRONIC SUBMITTAL OF REPORTS

The Alameda County Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of all reports in electronic form to the county's ftp site. Paper copies of reports will no longer be accepted. The electronic copy replaces the paper copy and will be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program ftp site are provided on the attached "Electronic Report Upload (ftp) Instructions." Please do not submit reports as attachments to electronic mail.

Submission of reports to the Alameda County ftp site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) Geotracker website. Submission of reports to the Geotracker website does not fulfill the requirement to submit documents to the Alameda County ftp site. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitor wells, and other data to the Geotracker database over the Internet. Beginning July 1, 2005, electronic submittal of a complete copy of all necessary reports was required in Geotracker (in PDF format). Please visit the SWRCB website for more information on these requirements (http://www.swrcb.ca.gov/ust/cleanup/electronic_reporting).

PERJURY STATEMENT

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6735, 6835, and 7835.1) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately registered or certified professional. For your submittal to be considered a valid technical report, you are to present site specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this fuel leak case meet this requirement.

UNDERGROUND STORAGE TANK CLEANUP FUND

Please note that delays in investigation, later reports, or enforcement actions may result in your becoming ineligible to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse you for the cost of cleanup.

AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

If you have any questions, please call me at (510) 567-6791.

Sincerely,

Jerry Wickham, P.G.
Hazardous Materials Specialist

cc: Colleen Winey, QIC 80201
Zone 7 Water Agency
100 North Canyons Parkway
Livermore, CA 94551

Danielle Stefani
Livermore-Pleasanton Fire Department
3560 Nevada Street
Pleasanton, CA 94566

John Rigter
Livermore-Pleasanton Fire Department
3560 Nevada Street
Pleasanton, CA 94566

Robert Foss
Cambria Environmental Technology, Inc.
5900 Hollis Street, Suite A
Emeryville, CA 94608

Donna Drogos, ACEH
Jerry Wickham, ACEH
File

ATTACHMENT B

Standard Field Procedures for Cone Penetrometer Testing and Sampling

CRA

STANDARD FIELD PROCEDURES FOR CONE PENETROMETER TESTING AND SAMPLING

This document describes Conestoga-Rovers & Associates (CRA's) standard field methods for Cone Penetrometer Testing (CPT) and direct-push soil and groundwater sampling. These procedures are designed to comply with Federal, State and local regulatory guidelines.

Use of CPT for logging and soil and groundwater sampling requires separate borings. Typically an initial boring is advanced to estimate soil and groundwater characteristics as described below. To collect soil samples a separate boring must be advanced using a soil sampling device. If groundwater samples are collected, another separate boring must be advanced using a groundwater sampling device. Specific field procedures are summarized below.

Cone Penetrometer Testing (CPT)

Cone Penetrometer Testing is performed by a trained geologist or engineer working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG). Cone Penetrometer Tests (CPT) are carried out by pushing an integrated electronic piezocone into the subsurface. The piezocone is pushed using a specially designed CPT rig with a force capacity of 20 to 25 tons. The piezocones are capable of recording the following parameters:

Tip Resistance (Qc)
Sleeve Friction (Fs)
Pore Water Pressure (U)
Bulk Soil Resistivity (rho)- with an added module

A compression cone is used for each CPT sounding. Piezocones with rated load capacities of 5, 10 or 20 tons are used depending on soil conditions. The 5 and 10 ton cones have a tip area of 10 sq. cm. and a friction sleeve area of 150 sq. cm. The 20 ton cones have a tip area of 15 sq. cm. and a friction sleeve area of 250 sq. cm. A pore water pressure filter is located directly behind the cone tip. Each of the filters is saturated in glycerin under vacuum pressure prior to penetration. Pore Pressure Dissipation Tests (PPDT) are recorded at 5 second intervals during pauses in penetration. The equilibrium pore water pressure from the dissipation test can be used to identify the depth to groundwater.

The measured parameters are printed simultaneously on a printer and stored on a computer disk for future analysis. All CPTs are carried out in accordance with ASTM D-3441. A complete set of baseline readings is taken prior to each sounding to determine any zero load offsets.

The inferred stratigraphic profile at each CPT location is included on the plotted CPT logs. The stratigraphic interpretations are based on relationships between cone bearing (Qc) and friction ratio (Rf). The friction ratio is a calculated parameter (Fs/Qc) used in conjunction with the cone bearing to identify the soil type. Generally, soft cohesive soils have low cone bearing pressures and high friction ratios. Cohesionless soils (sands) have high cone bearing pressures and low friction ratios. The classification of soils is based on correlations developed by Robertson et al (1986). It is not always possible to clearly identify a soil type based on Qc and Rf alone. Correlation with existing soils information and analysis of pore water pressure measurements should also be used in determining soil type.

CPT and sampling equipment are steam-cleaned or washed prior to work and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent. Groundwater samples are decanted into appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4° C, and transported under chain-of-custody to the laboratory.

After the CPT probes are removed, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate groundwater depth and quality and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e., sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or separate-phase hydrocarbon saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e., cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Sampling

Soil samples are collected from borings driven using hydraulic push technologies. A minimum of one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples can be collected near the water table and at lithologic changes. Samples are collected using samplers lined with polyethylene or brass tubes driven into undisturbed sediments at the bottom of the borehole. The ground surface immediately adjacent to the boring is used as a datum to measure sample depth. The horizontal location of each boring is measured in the field relative to a permanent onsite reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned or washed prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes chosen for analysisare trimmed of excess soil and capped with Teflon[7] tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chainof-custody to a State-certified analytic laboratory.

Field Screening

After a soil sample has been collected, soil from the remaining tubing is placed inside a sealed plastic bag and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector measures volatile hydrocarbon vapor concentrations in the bag=s headspace, extracting the vapor through a slit in the plastic bag. The measurements are used along with the field observations, odors, stratigraphy, and groundwater depth to select soil samples for analysis.

Grab Groundwater Sampling

Groundwater samples are collected from the open borehole using bailers, advancing disposable Tygon[7] tubing into the borehole and extracting groundwater using a diaphragm pump, or using a hydro-punch style sampler with a bailer or tubing. The groundwater samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4° C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory quality assurance/quality control (QA/QC) blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

ATTACHMENT C

Standard Field Procedures for GeoProbe®

Soil and Groundwater Sampling

STANDARD FIELD PROCEDURES FOR GEOPROBE® SAMPLING

This document describes Conestoga-Rovers & Associates' standard field methods for GeoProbe® soil and ground water sampling. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate ground water depth and quality and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e., sand, silt, clay or gravel)
- Approximate percentage of each grain sizecategory,
- Color,
- Approximate water or separatephase hydrocarbon saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e., cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Sampling

GeoProbe® soil samples are collected from borings driven using hydraulic push technologies. Prior to drilling, the first 8 ft of the boring are cleared using an air or water knife and vacuum extraction. This minimizes the potential for impacting utilties.

A minimum of one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples can be collected near the water table and at lithologic changes. Samples are collected using samplers lined with polyethylene or brass tubes driven into undisturbed sediments at the bottom of the borehole. The ground surface immediately adjacent to the boring is used as a datum to measure sample depth. The horizontal location of each boring is measured in the field relative to a permanent on-site reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned or washed prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling, and Transport

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon® tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chainof-custody to a State-certified analytic laboratory.

Field Screening

After a soil sample has been collected, soil from the remaining tubing is placed inside a sealed plastic bag and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable GasTech® or photo ionization detector measures volatile hydrocarbon vapor concentrations in the bag's headspace, extracting the vapor through a slit in the plastic bag. The measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Grab Ground Water Sampling

Ground water samples are collected from the open borehole using bailers, advancing disposable Tygon® tubing into the borehole and extracting ground water using a diaphragm pump, or using a hydro-punch style sampler with a bailer or tubing. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4° C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory quality assurance/quality control (QA/QC) blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

CONESTOGA-ROVERS
& ASSOCIATES

ATTACHMENT D

Standard Field Procedures for Soil Vapor Probe Installation and Sampling

STANDARD FIELD PROCEDURES FOR SOIL VAPOR PROBE INSTALLATION AND SAMPLING

DIRECT PUSH AND VAPOR POINT METHODS

This document describes Conestoga-Rovers & Associates' standard field methods for soil vapor sampling. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil vapor samples are collected and analyzed to assess whether vapor-phase subsurface contaminants pose a threat to human health or the environment.

Direct Push Method for Soil Vapor Sampling

The direct push method for soil vapor sampling uses a hollow vapor probe, which is pushed into the ground, rather than augured, and the stratigraphy forms a vapor seal between the surface and subsurface environments ensuring that the surface and subsurface gases do not mix. Once the desired soil vapor sampling depth has been reached, the field technician installs disposable polyethylene tubing with a threaded adapter that screw into the bottom of the rods. The screw adapter ensures that the vapor sample comes directly from the bottom of the drill rods and does not mix with other vapor from inside the rod or from the ground surface. In addition, hydrated bentonite is placed around the sampling rod and the annulus of the boring to prevent ambient air from entering the boring. The operator then pulls up on the rods and exposes the desired stratigraphy by leaving an expendable drive point at the maximum depth. The required volume of soil vapor is then purged through the polyethylene tubing using a standard vacuum pump. The soil vapor can be sampled for direct injection into a field gas chromatograph, pumped into inert tedlar bags using a "bell jar" sampling device, or allowed to enter a Summa vacuum canister. Once collected, the vapor sample is transported under chain-of-custody to a state-certified laboratory. The ground surface immediately adjacent to the boring is used as a datum to measure sample depth. The horizontal location of each boring is measured in the field relative to a permanent on-site reference using a measuring wheel or tape measure. Drilling and sampling equipment is washed between samples with trisodium phosphate or

an equivalent EPA-approved detergent. Once the sampling is completed, the borings are filled to the ground surface with neat cement.

Shallow Soil Vapor Point Method for Soil Vapor Sampling

The shallow soil vapor point method for soil vapor sampling utilizes a hand auger or drill rig to advance a boring for the installation of a soil vapor sampling point. Once the boring is hand augered to the final depth, a 6-inch slotted probe, capped on either end with brass or Swagelok fittings, is placed within 12-inches of number 2/16 filter sand (Figure A). Nylon tubing of ¼-inch inner-diameter of known length is attached to the probe. A 2-inch to 12-inch layer of unhydrated bentonite chips is placed on top of the filter pack. Next pre-hydrated granular bentonite is then poured into the hole to approximately and topped with another 2-inch layer of unhydrated bentonite chips or concrete, depending if the boring will hold one probe or multiple probes. The tube is coiled and placed within a wellbox finished flush to the surface. Soil vapor samples will be collected no sooner than one week after installation of the soil-vapor points to allow adequate time for representative soil vapors to accumulate. Soil vapor sample collection will not be scheduled until after a minimum of three consecutive precipitation-free days and irrigation onsite has ceased. Figure B shows the soil vapor sampling apparatus. A measured volume of air will be purged from the tubing using a vacuum pump and a tedlar bag. Immediately after purging, soil-vapor samples will be collected using the appropriate size Summa canister with attached flow regulator and sediment filter. The soil-vapor points will be preserved until they are no longer needed for risk evaluation purposes. At that time, they will be destroyed by extracting the tubing, hand augering to remove the sand and bentonite, and backfilling the boring with neat cement. The boring will be patched with asphalt or concrete, as appropriate.

Vapor Sample Storage, Handling, and Transport

Samples are stored and transported under chain-of-custody to a state-certified analytic laboratory. Samples should never be cooled due to the possibility of condensation within the canister.