HORIZON ENVIRONMENTAL INC.

Specialists in Site Assessment, Remedial Testing, Design and Operation

May 26, 2009

Mr. Jerry Wickham, Haz Mat Specialist
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, California 94502

Subject: **Soil Gas Survey Work Plan**
Former Beacon Station No. 12574 — RWQCB Case No. 01-0167
22315 Redwood Road, Castro Valley, California — ACDEH: RO0000355

Mr. Wickham:

On behalf of Ultramar Inc. (Ultramar), Horizon Environmental (Horizon) has prepared this letter work plan for a soil gas survey (SGS) at the subject site (Site) located in Castro Valley, as shown on the Site Vicinity Map (Figure 1). The Alameda County Department of Enviromental Health (ACDEH) requested a work plan for a SGS in a letter dated January 8, 2009 (attached). The purpose of the SGS is to provide soil gas data to evaluate potential vapor exposure pathways at the Site, and to evaluate the potential human health risks from potentially affected onsite and offsite areas.

Site Description and Background

The Site is located on the southwestern corner of the intersection of Redwood Road and Grove Way in Castro Valley, California, as depicted on the Site Plan (Figure 2). The Site is bounded by Grove Way to the north, a vacant building to the south, Redwood Road to the east, and private residences to the west. Existing site facilities include a 7/11 convenience store and other commercial businesses situated in the western portion of the Site extending to the property line, and a parking lot and landscaping areas situated in the central and eastern portions of the Site. Former site facilities included four former fuel underground storage tanks (USTs) located in the southeastern portion of the property that were removed by Ultramar in 1987, and three former fuel USTs located to the west of the former Ultramar USTs that were removed by Shell Oil Company sometime prior to 1981 when Ultramar occupied the property (Acton, Mickelson, van Dam, Inc., November 1994).

There are currently five groundwater monitoring wells (MW-1 through MW-4 and MW-6) associated with this Site. Wells MW-1 through MW-4 are located within the property boundaries, while well MW-6 is located offsite to the south of the property on an adjoining property. Well MW-5 was destroyed by a third party during offsite construction activities. Locations of these and other pertinent site features are shown on the Site Map (Figure 2).

Quarterly groundwater monitoring and sampling has been performed at the Site since 1992. Historical groundwater level data has indicated that groundwater has been present beneath the Site between the depths of approximately 14 to 22 feet below surface grade (bsg), and the direction of groundwater flow has been consistently to the south-southwest beneath the Site. Recent groundwater quality data has indicated gasoline-impacted groundwater present in wells MW-1 and MW-2, with sheen periodically observed in well MW-2.

Soil Gas Survey

The work plan for the SGS was developed on the basis of procedures recommended in the California Environmental Protection Agency (Cal-EPA) Advisory-Active Soil Gas Investigations (2003) and the Department of Toxic Substances Control (DTSC/Cal-EPA) Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (2005) and procedures developed by the Los Angeles RWQCB Guidelines.

Five onsite soil gas sampling locations and two offsite soil gas sampling locations, as shown on Figure 2, were selected on the basis of accessibility in the area of the estimated impacted groundwater plume based on recent groundwater monitoring data collected in February 2009. To increase the likelihood of adequate soil permeability, soil gas sampling will not be conducted during or immediately after a significant rain event (e.g., ½ inch or greater).

The first three feet of each boring will be hand-augered to prevent conflicts with underground utilities. The proposed SGS should be conducted in conformance with the attached Horizon Field Methods and Procedures for Soil Gas Investigations and shall consist of the following tasks:

Task 1 Obtain right-of entry (ROE) agreements from the offsite property owners for access to set temporary soil gas sampling probes; obtain boring permits (one per each property) from the Alameda County Public Works Agency (ACPWA); retain an accredited mobile laboratory to conduct required vapor analyses; notify Underground Services Alert (USA) to mark underground utility locations; notify the property owners of the proposed work to minimize impact to the existing tenants; update the site-specific Health and Safety Plan.

Task 2 Advance five onsite direct-push borings (SG-1 through SG-5) and two offsite direct-push borings (SG-6 and SG-7) and set temporary soil gas sampling probes at the locations shown on Figure 2; set sampling probes to a maximum depth of approximately 5 feet bsg; install a sand pack adjacent to the soil gas sample inlet and bentonite seal above the sand pack to the surface to prevent ambient air intrusion from occurring.

Task 3 Allow at least 40 minutes after completion of the installation of the one-inch diameter soil gas probes for subsurface conditions to equilibrate prior to conducting a purge volume test, leak test, and collecting soil gas samples;

conduct purge volume and leak tests prior to collecting soil gas samples; conduct leak test utilizing the tracer compound isopropyl alcohol; purge and sample at flow rates less than 200 milliliters per minute (ml/min) utilizing dedicated plastic syringes; abort sampling if flow rates are less than 10 ml/min or vacuum exceeds 10 inches of mercury; select an adjacent soil gas sampling location if the soil gas sampling was aborted. After completion of the soil gas sampling, the temporary soil gas sampling probes will be removed and the borings will be backfilled with hydrated bentonite and/or neat cement.

Analyze soil gas samples for the following: total petroleum hydrocarbons as gasoline (TPHg), the volatile aromatics benzene, toluene, ethylbenzene, total xylenes (BTEX), and the fuel additive methyl-t-butyl ether (MTBE) utilizing Environmental Protection Agency (EPA) Method 8260B; analyze for the leak detection tracer compound isopropyl alcohol; request analytical reporting limits to be, at most, the values for volatile organic compounds (VOC) in shallow soil gas listed in the environmental screening levels (ESLs) presented in Table E (Interim Final San Francisco Bay RWQCB - November 2007).

Task 4 Compare the analytical results of the soil gas sampling locations with the ESL values for soil gas, a copy of which is included in this work plan.

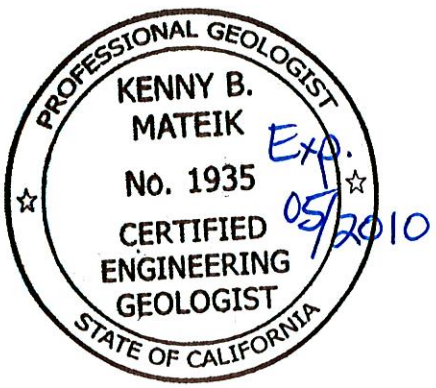
Task 5 Prepare a report which summarizes the results of the SGS and evaluates risk to human health; include a Risk-Based Corrective Action evaluation of the potential exposure pathways, if the results of the soil gas survey indicate completed exposure pathways.

If you have any questions please contact Horizon at (916) 939-2170.

Sincerely,
HORIZON ENVIRONMENTAL INC.

Gary D. Barker
Senior Project Manager

Kenny B. Mateik
Professional Geologist, C.E.G. No. 1935



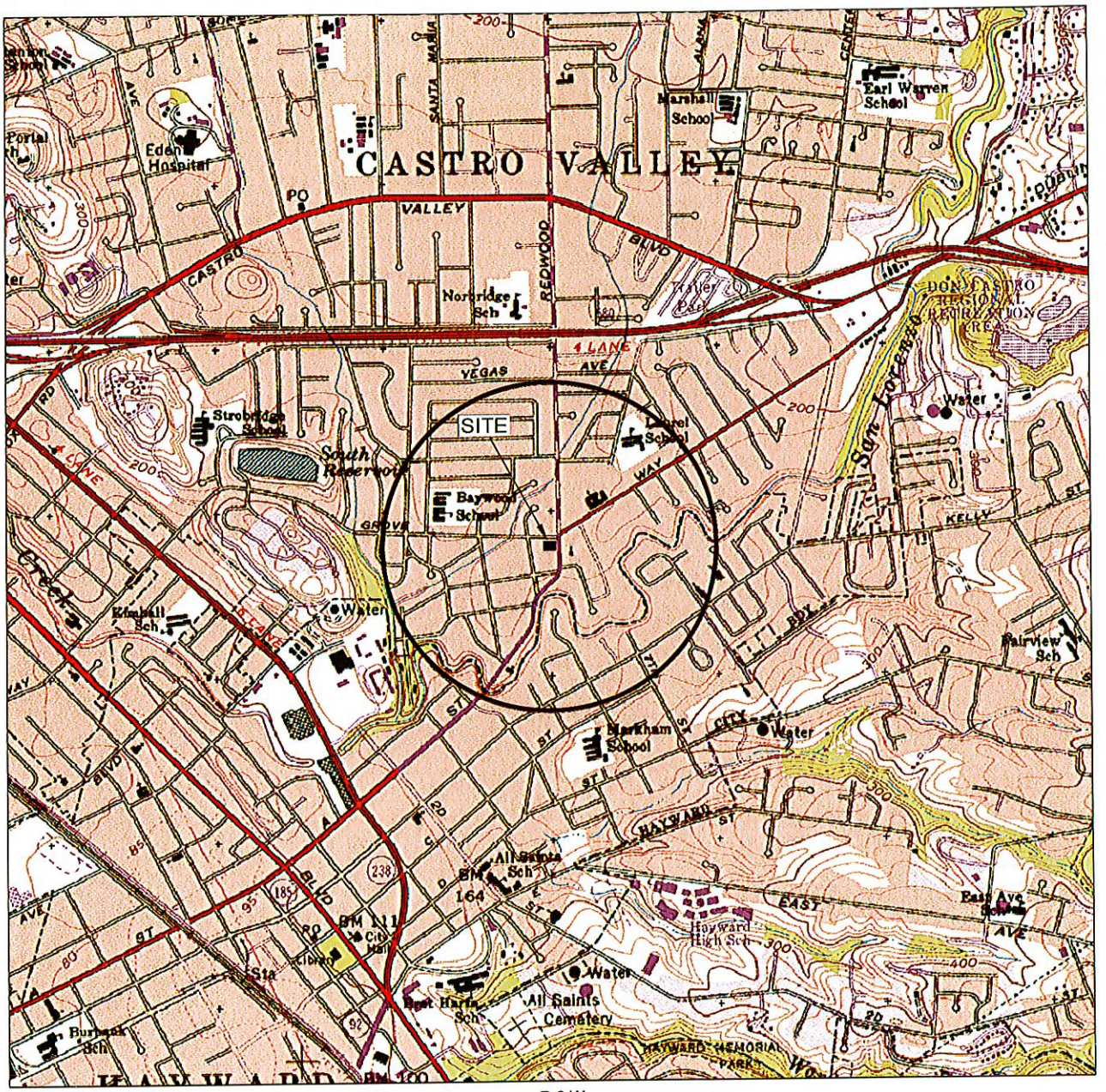
Attachments:

Figure 1: Site Vicinity Map
Figure 2: Site Plan with Proposed Soil Gas Sampling Locations

ACDEH Correspondence
Horizon Field Methods and Procedures

Table E (Interim Final San Francisco Bay Regional Water Quality Control Board-November 2007)

c: Mr. C. Shay Wideman, Valero Energy Corp.
Mr. Bill Courtney, Property Manager
Mr. Allen Shin, Banya Investment LLC



T.3 S.

R.2 W.

GENERAL NOTES:
BASE MAP FROM U.S.G.S.
HAYWARD, CA.
7.5 MINUTE TOPOGRAPHIC
PHOTOREVISED 1980

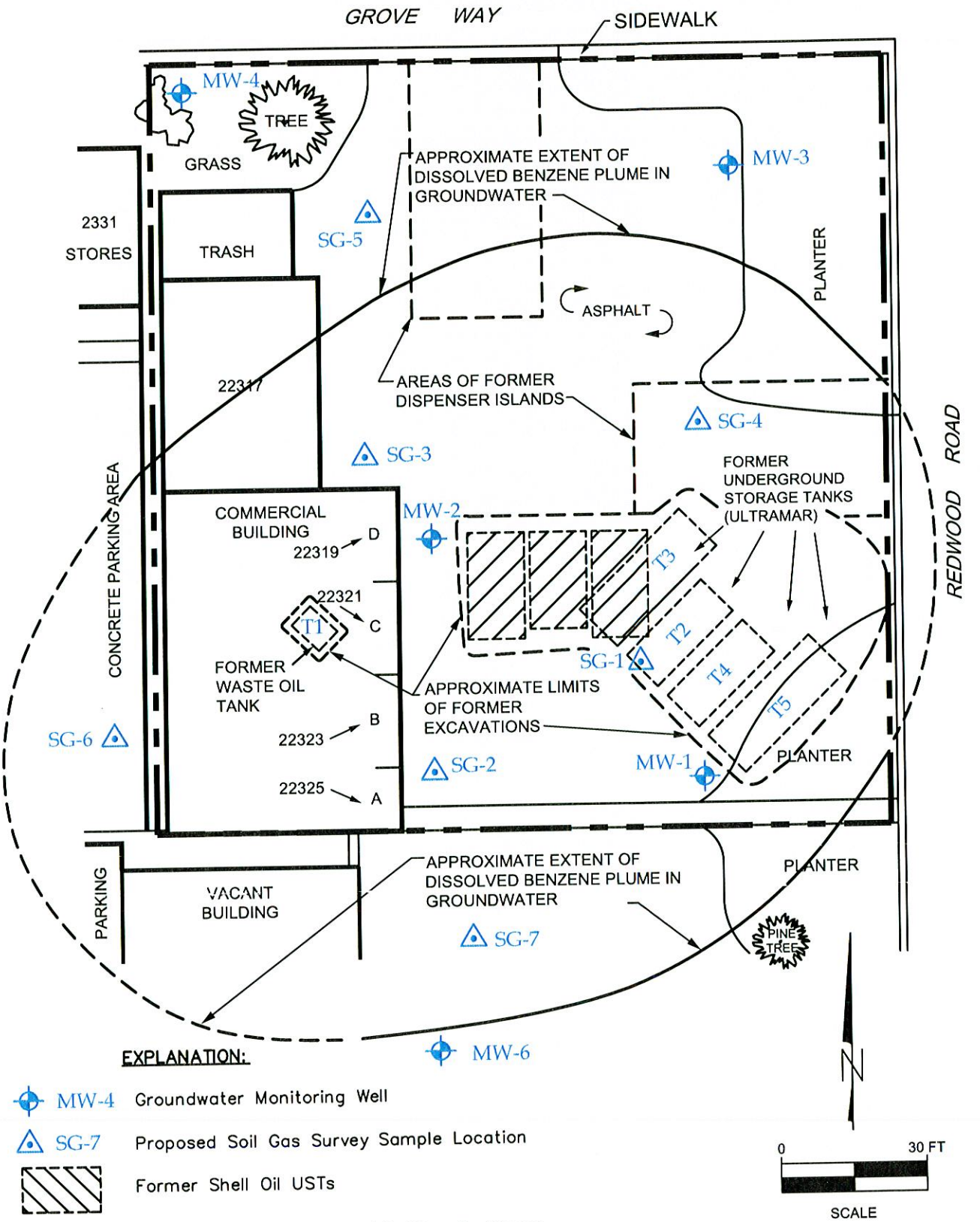
QUADRANGLE LOCATION

0 2000 FT

SCALE 1:24,000

NORTH

HORIZON ENVIRONMENTAL INC.		SITE LOCATION MAP	FIGURE 1
Project Number: 1574.41 Prepared By: K. Liptak Reviewed By: K. Mateik	Drawn By: M. LaCoste Date: 10/7/04 Revised Date:	FORMER BEACON STATION NO. 12574 22315 REDWOOD ROAD CASTRO VALLEY, CA.	



Source: Figure Modified From Survey Drawing Prepared By Others For Ultramar

HORIZON ENVIRONMENTAL INC.		SITE MAP WITH PROPOSED SOIL GAS SAMPLING LOCATIONS FORMER BEACON STATION NO. 12574 22315 REDWOOD ROAD CASTRO VALLEY, CA.	FIGURE 2
Project Number: 1574.21 Prepared By: K. Mateik Reviewed By: G. Barker	Drawn By: C. Bechtell Date: 05/09 Revised Date:		

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) 337-93

January 8, 2009

Mr. Robert Ehlers
Valero
685 West Third Street
Hanford, CA 93230

Castro Group LLC
2021 Francisco Street
Berkeley, CA 94709-2213

Ms. Mary Moore
EMB Group LLC & Mary Moore
Re Trust 611 Marlin Court
Redwood City, CA 94065-1214

Mr. Allen Shin
Banya Investments LLC
3011 Cabrillo Avenue
San Ramon, CA 94583

Mr. Paul Wilson
1238 Stanyan Street
San Francisco, CA 94117

Subject: Fuel Leak Case No. RO0000355 and Geotracker Global ID T0600100155, Beacon #12574, 22315 Redwood Road, Castro Valley, CA 94546

Dear Mr. Ehlers, Castro Group LLC, Ms. Moore, Mr. Shin, and Mr. wILSON:

Alameda County Environmental Health (ACEH) staff has reviewed the fuel leak case file for the above-referenced site including the recently submitted document entitled, *"Letter Work Plan for Remedial Testing,"* and dated December 11, 2008. The *"Letter Work Plan for Remedial Testing,"* which was prepared by Horizon Environmental, Inc., proposes conducting short-term, high-vacuum, dual-phase extraction testing. The proposed scope of work for DPE testing is generally acceptable and may be implemented as proposed.

We request that you address the following technical comments, perform the proposed work, and send us the technical reports requested below.

TECHNICAL COMMENTS

1. **Use of Monitoring Wells for Remedial Testing.** Dual-phase extraction is proposed from existing monitoring wells MW-1 and MW-2. The use of existing monitoring wells may limit the effectiveness of the remedial testing because the wells are not optimally constructed for extraction, are not necessarily located in the most contaminated areas, and are screened over a 20-foot interval. We request that the evaluation of the DPE testing include discussion of the potential limitations due to the use of existing monitoring wells. Any proposal for additional DPE testing must include extraction wells designed for optimal effectiveness that are located within the areas where the largest mass of residual hydrocarbons are believed to be present. Please present your results and recommendations in the Dual-phase Extraction Testing Report requested below.

2. **Potential Vapor Intrusion.** The concentrations of fuel hydrocarbons in soil and groundwater at the site exceed Environmental Screening Levels (San Francisco Bay Regional Water Quality Control Board May 2008) for potential vapor intrusion to indoor air and also exceed Tier 2 criteria calculated in the risk-based corrective action analysis conducted for the site in 1996 and 1998 (El Dorado Environmental, *"Risk-based Corrective Action Tier 1 and Tier 2 Analyses,"* dated December 21, 1996 and *"Supplement to Risk-based Corrective Action Tier 1 and Tier 2 Analyses,"* dated March 29, 1999). Therefore, an evaluation of potential vapor intrusion to indoor air that includes soil vapor sampling must be conducted for the site and potentially affected off-site areas. Please present your plans for soil vapor sampling in the Soil Vapor Sampling Work Plan requested below.

3. **Groundwater Monitoring.** Please continue the groundwater monitoring program on the current semi-annual basis. However, additional analyses are required for the site. In addition to the current analytes of TPHg, BTEX, and MTBE, all groundwater samples must be analyzed for fuel additives TBA, ETBE, TAME, DIPE, 1,2-DCA, and EDB using EPA Method 8260. Please present the groundwater sampling results in the Groundwater Monitoring Reports requested below.

TECHNICAL REPORT REQUEST

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

- **April 13, 2009** – First Quarter 2008, Semi-Annual Groundwater Monitoring Report
- **May 26, 2009** – Dual-phase Extraction Testing Report and Soil Vapor Sampling Work Plan
- **October 13, 2009** – Third Quarter 2009, Semi-Annual Groundwater Monitoring Report

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

ACEH's Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of reports in electronic form. The electronic copy replaces paper copies and is expected to 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 Instructions." 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. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for all 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 monitoring wells, and other data to the Geotracker database over the Internet. Beginning July 1, 2005, these same reporting requirements were added to Spills, Leaks, Investigations, and Cleanup (SLIC) sites. Beginning July 1, 2005, electronic submittal of a complete copy of all reports for all sites is 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 or send me an electronic mail message at jerry.wickham@acgov.org.

Sincerely,

Jerry Wickham, California PG 3766, CEG 1177, and CHG 297
Senior Hazardous Materials Specialist

Enclosure: ACEH Electronic Report Upload (ftp) Instructions

cc: Gary Barker, Horizon Environmental, Inc., 4970 Windplay Drive, #C5, El Dorado Hills, CA 95762

Donna Drogos, ACEH
Jerry Wickham, ACEH
File

HORIZON ENVIRONMENTAL INC.
FIELD METHODS AND PROCEDURES

SOIL GAS INVESTIGATION
HYDRAULIC OR MANUALLY- DRIVEN SAMPLING PROBES

The following section describes field methods and procedures that will be completed by Horizon Environmental Inc. (Horizon) personnel in performance of this project.

1.0 HEALTH AND SAFETY PLAN

Fieldwork performed by Horizon and subcontractors at the site will be conducted according to guidelines established in a Site Health and Safety Plan (SHSP). The SHSP is a document that describes the hazards that may be encountered in the field and specifies protective equipment, work procedures, and emergency information. A copy of the SHSP will be at the site and available for reference by appropriate parties during work at the site.

2.0 UNDERGROUND UTILITY SURVEY

Prior to commencement of work on site, Horizon will contact Underground Service Alert (USA) to set up an underground utility survey. USA contacts the owners of the various utilities in the vicinity of the site to have the utility owners mark the locations of their underground utilities. Work associated with borings and monitoring well installations will be preceded by manual hand augering to avoid contact with underground utilities.

3.0 SOIL GAS SAMPLING PROTOCOL

Installation of probes rods and sampling for soil gas investigation will be performed under the supervision of a Horizon geologist. All metal and non-metal tools and parts utilized during probe installation and soil gas sampling will be in good working condition, decontaminated or new, dedicated parts. A Post-Run Tubing (PRT) system consisting of a PRT expendable point holder, a PRT adapter and PRT Teflon or Nylaflow tubing will be used to insert, seal and convey soil gas from the target depth to the surface. The PRT expendable point holder will be driven into the ground using a truck-mounted Geoprobe® direct-push sampling rig or by an electric hammer ahead of a one-inch outside diameter (OD) stainless steel probe rod until it is advanced to the proposed target depth. The PRT adapter will be fitted at the end of a selected length of an inert 1/8-inch OD Nylaflow tubing approximately 5 feet longer than the embedded length of the probe rods. The Nylaflow tubing will be fitted inside a protective, disposable, outer 1/4-inch OD Teflon or polyethylene tubing, and will be threaded down the center of the probe rods and connected to a sampling port just above the expandable (drop off) tip.

A dedicated 50 cubic centimeter (cc) syringe will be connected to the 1/8-inch Nylaflow tubing at the surface via an on/off valve. Prior to opening the vapor sampling port, a vacuum test of the tubing and PRT connection will be performed using the syringe to place a vacuum on the system to check for integrity of the connections. While holding back pressure via the syringe, the probe rod will be retracted to open the vapor sampling port. The probe rod will be retracted until the back pressure is released, indicating the presence of in-situ soil gas vapor. The target depth and the actual depth of the rod will be recorded. The probe rod will be sealed at the surface with granular and hydrated bentonite and vapor pressure inside the Nylaflow tubing allowed to equilibrate for a minimum 20 minutes before sampling.

A tracer compound for leak testing, typically difluoroethane, iso-propanol, or butane, will be sprayed around the sampling apparatus from the ground surface up to and including the sampling syringe. The tracer will be dispensed around the base and top of the probe rod and along the tubing train during sample collection. If the tracer compound is detected in the sample, another soil gas sample will be collected.

Soil gas will be withdrawn from the end of the inert Nylaflow tubing that runs from the sampling tip to the surface using a dedicated 50 cc glass syringe or an air-tight canister (Summa) under vacuum connected via an on/off valve. The probe tip and sampling tubing will be nominally purged by a purge volume test as described below. A sample of in-situ soil gas will be withdrawn and immediately transferred to the mobile laboratory for analysis within minutes of collection. For off-site analysis, soil gas samples will be collected in Summa canisters or in Tedlar bags when allowed.

4.0 PURGE VOLUME TEST

A site specific purge volume test will be conducted at the beginning of the soil gas investigation to purge ambient air from the sampling system. Three different volumes will be purged and sampled (nominally 1, 3 and 7 purge volumes) and analyzed immediately to determine the volume amount with the highest concentration. Therefore, the optimum purge volume will be achieved and utilized during the entire soil gas investigation.

5.0 SAMPLE FLOW RATE

Sample collection will be timed so that the soil gas flow rate does not exceed 200 milliliters per minute (mL/min). This will be accomplished by withdrawing the plunger on the syringe at a constant rate of 3 milliliters per second (mL/sec). The sample collector will record collection time and any resistance to sample flow felt on the syringe during collection.

If soil gas is contained in Summa canisters, a flow controller pre-calibrated to a flow rate of maximum 200 mL/min will be utilized at the end of the 1/8-inch OD polyethylene conveyance tubing and tight-fitted to the canister. The collector will record the initial and final collection time and vacuum readings.

5.0 SPECIAL CONSTITUENT SAMPLING – TETRAETHYL LEAD

Battery-operated sampling pumps will be pre-calibrated by the licensed analytical lab to extraction flow rate of one liter per minute (L/min). Dedicated sampling tubes containing resin mesh separated and contained by silylated glass wool plugs will be attached with flexible tubing to the intake end of the sampler pump, and the opposite end of the tube will be broken and immediately attached to the 1/4-inch OD Nylaflow probe tubing. Sampling will proceed at the known flow rate for a calculated time interval to allow passing of a predetermined amount of soil gas to meet the required reporting limit qualification. The glass sample tube will be capped, securely packed and shipped under chain of custody to the licensed laboratory for analysis by NIOSH Method 2533.

6.0 BOREHOLE ABANDONMENT AND SURFACE RESTORATION

After completion of sampling, the borehole shall be backfilled from total depth to surface with cement grout. The pavement surface shall be restored to pre-existing conditions utilizing either cold patch for surrounding asphalt paving or quick-set cement tinted to match the surrounding concrete paving.

Table E. Environmental Screening Levels (ESLs)
Indoor Air and Soil Gas
(Vapor Intrusion Concerns)

	Indoor Air Screening Levels		[2]Shallow Soil Gas Screening Levels	
Chemical	[1]Residential Land Use ($\mu g/m^3$)	Commercial/ Industrial Land Use Only ($\mu g/m^3$)	[1]Residential Land Use ($\mu g/m^3$)	Commercial/ Industrial Land Use Only ($\mu g/m^3$)
Acenaphthene	4.4E+01	6.1E+01	4.4E+04	1.2E+05
Acenaphthylene	2.2E+01	3.1E+01	2.2E+04	6.1E+04
Acetone	6.6E+02	9.2E+02	6.6E+05	1.8E+06
Aldrin				
Anthracene	2.2E+02	3.1E+02	2.2E+05	6.1E+05
Antimony				
Arsenic				
Barium				
Benzene	8.4E-02	1.4E-01	8.4E+01	2.8E+02
Benzo(a)anthracene				
Benzo(b)fluoranthene				
Benzo(k)fluoranthene				
Benzo(g,h,i)perylene				
Benzo(a)pyrene				
Beryllium				
1,1-Biphenyl				
Bis(2-chloroethyl) ether	7.4E-03	1.2E-02	7.4E+00	2.5E+01
Bis(2-chloroisopropyl) ether	3.4E-03	5.8E-03	3.4E+00	1.2E+01
Bis(2-ethylhexyl) phthalate				
Boron				
Bromodichloromethane	1.4E-01	2.3E-01	1.4E+02	4.6E+02
Bromoform (Tribromomethane)				
Bromomethane	1.0E+00	1.5E+00	1.0E+03	2.9E+03
Cadmium				
Carbon tetrachloride	1.9E-02	3.1E-02	1.9E+01	6.3E+01
Chlordane				
p-Chloroaniline				
Chlorobenzene	2.1E+02	2.9E+02	2.1E+05	5.8E+05
Chloroethane	2.1E+01	2.9E+01	2.1E+04	5.8E+04
Chloroform	4.6E-01	7.7E-01	4.6E+02	1.5E+03
Chloromethane	1.9E+01	2.6E+01	1.9E+04	5.3E+04
2-Chlorophenol	3.7E+00	5.1E+00	3.7E+03	1.0E+04
Chromium (total)				
Chromium III				
Chromium VI				
Chrysene				
Cobalt				
Copper				
Cyanide	1.5E+01	2.0E+01	1.5E+04	4.1E+04
Dibenz(a,h)anthracene				
Dibromochloromethane				
1,2-dibromo-3-chloropropane	1.3E-03	2.2E-03	1.3E+00	4.3E+00
1,2-Dibromoethane	4.1E-03	6.8E-03	4.1E+00	1.4E+01
1,2-Dichlorobenzene	4.2E+01	5.8E+01	4.2E+04	1.2E+05

Table E. Environmental Screening Levels (ESLs)
Indoor Air and Soil Gas
(Vapor Intrusion Concerns)

	Indoor Air Screening Levels		[2]Shallow Soil Gas Screening Levels	
Chemical	[1]Residential Land Use ($\mu g/m^3$)	Commercial/ Industrial Land Use Only ($\mu g/m^3$)	[1]Residential Land Use ($\mu g/m^3$)	Commercial/ Industrial Land Use Only ($\mu g/m^3$)
1,3-Dichlorobenzene	2.2E+01	3.1E+01	2.2E+04	6.1E+04
1,4-Dichlorobenzene	2.2E-01	3.7E-01	2.2E+02	7.4E+02
3,3-Dichlorobenzidine				
Dichlorodiphenyldichloroethane (DDD)				
Dichlorodiphenyldichloroethene (DDE)				
Dichlorodiphenyltrichloroethane (DDT)				
1,1-Dichloroethane	1.5E+00	2.6E+00	1.5E+03	5.1E+03
1,2-Dichloroethane	9.4E-02	1.6E-01	9.4E+01	3.1E+02
1,1-Dichloroethene	4.2E+01	5.8E+01	4.2E+04	1.2E+05
cis-1,2-Dichloroethene	7.3E+00	1.0E+01	7.3E+03	2.0E+04
trans-1,2-Dichloroethene	1.5E+01	2.0E+01	1.5E+04	4.1E+04
2,4-Dichlorophenol				
1,2-Dichloropropane	2.4E-01	4.1E-01	2.4E+02	8.2E+02
1,3-Dichloropropene	1.5E-01	2.6E-01	1.5E+02	5.1E+02
Dieldrin				
Diethyl phthalate				
Dimethyl phthalate				
2,4-Dimethylphenol				
2,4-Dinitrophenol				
2,4-Dinitrotoluene				
1,4-Dioxane				
Dioxin (2,3,7,8-TCDD)				
Endosulfan				
Endrin				
Ethylbenzene	9.8E-01	1.6E+00	9.8E+02	3.3E+03
Fluoranthene				
Fluorene	2.9E+01	4.1E+01	2.9E+04	8.2E+04
Heptachlor				
Heptachlor epoxide				
Hexachlorobenzene				
Hexachlorobutadiene				
γ-Hexachlorocyclohexane (Lindane)				
Hexachloroethane				
Indeno(1,2,3-c,d)pyrene				
Lead				
Mercury (elemental)	1.9E-02	2.6E-02	1.9E+01	5.3E+01
Methoxychlor				
Methylene chloride	5.2E+00	8.7E+00	5.2E+03	1.7E+04
Methyl ethyl ketone	1.0E+03	1.5E+03	1.0E+06	2.9E+06
Methyl isobutyl ketone	6.3E+02	8.8E+02	6.3E+05	1.8E+06
Methyl mercury				
2-Methylnaphthalene				
tert-Butyl methyl ether	9.4E+00	1.6E+01	9.4E+03	3.1E+04
Molybdenum				

Table E. Environmental Screening Levels (ESLs)
Indoor Air and Soil Gas
(Vapor Intrusion Concerns)

	Indoor Air Screening Levels		[2]Shallow Soil Gas Screening Levels	
Chemical	[1]Residential Land Use ($\mu g/m^3$)	Commercial/ Industrial Land Use Only ($\mu g/m^3$)	[1]Residential Land Use ($\mu g/m^3$)	Commercial/ Industrial Land Use Only ($\mu g/m^3$)
Naphthalene	7.2E-02	1.2E-01	7.2E+01	2.4E+02
Nickel				
Pentachlorophenol				
Perchlorate				
Phenanthrene	2.2E+01	3.1E+01	2.2E+04	6.1E+04
Phenol				
Polychlorinated biphenyls (PCBs)				
Pyrene	2.2E+01	3.1E+01	2.2E+04	6.1E+04
Selenium				
Silver				
Styrene	1.9E+02	2.6E+02	1.9E+05	5.3E+05
tert-Butyl alcohol				
1,1,1,2-Tetrachloroethane	3.2E-01	5.4E-01	3.2E+02	1.1E+03
1,1,2,2-Tetrachloroethane	4.2E-02	7.0E-02	4.2E+01	1.4E+02
Tetrachloroethene	4.1E-01	6.9E-01	4.1E+02	1.4E+03
Thallium				
Toluene	6.3E+01	8.8E+01	6.3E+04	1.8E+05
Toxaphene				
TPH (gasolines)	1.0E+01	1.4E+01	1.0E+04	2.9E+04
TPH (middle distillates)	1.0E+01	1.4E+01	1.0E+04	2.9E+04
TPH (residual fuels)				
1,2,4-Trichlorobenzene	8.3E-01	1.2E+00	8.3E+02	2.3E+03
1,1,1-Trichloroethane	4.6E+02	6.4E+02	4.6E+05	1.3E+06
1,1,2-Trichloroethane	1.5E-01	2.6E-01	1.5E+02	5.1E+02
Trichloroethene	1.2E+00	2.0E+00	1.2E+03	4.1E+03
2,4,5-Trichlorophenol	7.3E+01	1.0E+02	7.3E+04	2.0E+05
2,4,6-Trichlorophenol				
Vanadium				
Vinyl chloride	3.1E-02	5.2E-02	3.1E+01	1.0E+02
Xylenes	2.1E+01	2.9E+01	2.1E+04	5.8E+04
Zinc				

Notes:

1. Category "Residential Land Use" generally considered adequate for other sensitive uses (e.g., day-care centers, hospitals, etc.)
2. Soil Gas: Screening levels based on soil gas data collected below a building or the ground surface. Intended for evaluation of potential indoor-air impacts.

Soil gas data should be collected and evaluated at all sites with significant areas of VOC-contaminated soil. Screening levels also apply to areas over of contaminated groundwater.

TPH -Total Petroleum Hydrocarbons. TPH ESLs must be used in conjunction with ESLs for related chemicals (e.g., BTEX, PAHs, oxidizers, etc.).