Environmental Resources Management

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27 March 2009

Mr. Jerry Wickham
Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

Subject: Site Investigation Work Plan
Lucasey Site- 2744 East 11th Street, Oakland

Dear Mr Wickham:

Environmental Resources Management (ERM) is pleased to present this work plan for additional site investigation for the Lucasey site in Oakland, California on behalf of Lucasey Manufacturing Company.

BACKGROUND

Substantial soil and groundwater investigation has been previously conducted at the Lucasey Manufacturing site. The scope of work presented in this work plan is designed to fill data gaps identified by Alameda County Environmental Health (ACEH) in their letter of 1 October 2008 to Lucasey Manufacturing Corporation.

RECENT ENVIRONMENTAL INVESTIGATIONS

The most recent investigation work at the Lucasey site was conducted by Clearwater Group (Clearwater). Clearwater conducted a passive soil vapor sampling (Gore-sorber®) program and installed three free product recovery wells. Results of this work were documented in a report entitled "Results of Gore-Sorber® Soil Sampling Survey and Recovery Well Installation" (18 August 2008). In response to this report, ACEH requested submittal of a work plan to address the following issues:

- Define the horizontal and vertical extent of free product and the extent of soil and groundwater contamination, particularly to the south and west of the site;

- Collect soil vapor samples to evaluate the potential for vapor intrusion to indoor air for the surrounding residential properties;

- Present results from development and sampling of the three product recovery wells;

- Discuss the feasibility of free product recovery or pilot testing for the three product recovery wells.

SITE OBSERVATIONS

ERM visited the site on 19 February 2009 to inspect the three product recovery wells. Each well was opened and gauged with an interface probe and bailer. No visible product or odor was observed in any of the wells either by interface probe alarm or observation of water removed from the wells with bailers. No samples were collected during this site visit. Water levels were observed to be approximately 7 to 8.5 feet below ground surface (bgs).

PROPOSED SCOPE

Based on the discussion above, ERM proposes the following scope of work:

DEVELOPMENT AND SAMPLING OF THREE PRODUCT RECOVERY WELLS

ERM cannot find any evidence to indicate that the three product recovery wells installed in March 2008 were ever developed. Therefore prior to collecting water samples, the wells will be developed using a truck-mounted development rig equipped with a submersible pump, airlift equipment, a bailer, and/or a vented surge block. Well development will begin by alternately bailing and swabbing the well to settle the sand pack and remove fine-grained materials. Swabbing will consist of raising and lowering a surge block inside the well below the water table. The wells will then be purged of water by a truck-mounted bailer or a submersible pump. At least 10 well volumes will be evacuated from each well during development, and electrical conductivity, pH, temperature, and turbidity will be monitored at regular intervals during evacuation. The well development information will be recorded on a well development form.

Low-flow sampling of each well will then be conducted following the Standard Operating Procedures (SOP) in Attachment A.

Samples will be analyzed for TPH extractable by SW 8015 by McCampbell Analytical. The lab will be directed to follow the gravity separation protocol in Attachment B prior to extraction of the samples to ensure that the true dissolved phase of the samples is measured. Following the gravity separation procedure, samples will undergo silica gel cleanup prior to analysis. Separate sample aliquots will also be analyzed without silica gel cleanup. This separate analysis will provide information on the presence of polar compounds that are evidence of intrinsic biodegradation of the petroleum.

SOIL VAPOR SAMPLING

To evaluate the potential for indoor air impacts from soil and groundwater at the Lucasey site, soil vapor sampling will be conducted at locations shown on Figure 1.

Soil vapor sampling activities will be implemented in accordance with the following guidance documents:

- *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air (* 15 December 2004, revised 7 February 2005, Department of Toxic Substances Control and California Regional Water Quality Control Board-Los Angeles Region); and

- *Advisory – Active Soil Gas Investigations* (28 January 2003, Department of Toxic Substances Control).

Soil vapor samples will be collected at 12 locations (ASV-1 to ASV-12). A direct-push rig will be utilized to facilitate the collection of soil vapor samples from a minimum of 5 feet bgs. As discussed above, water levels in the three product recovery wells were observed to be from 7 to 8.5 feet bgs. Soil vapor samples will be collected with 1-liter Summa canisters equipped with flow controllers with a pre-set sampling rate of 200 milliliters per minute (mL/min) (5 minute sample time for a 1-liter Summa canister). Samples will be analyzed via Modified EPA Method TO-15 for benzene, toluene, ethylbenzene, xylenes, and naphthalene, and for oxygen, carbon dioxide, and methane using Method ASTM D-1946.

Detailed procedures that will be followed for collection of the vapor samples are included in the SOP in Attachment C.

FEASIBILITY OF FREE PRODUCT REMOVAL

Based on observations made during the site visit of 19 February 2009, no free product was observed in the three existing wells. The wells were installed in the areas where previous data was interpreted as indicating the highest concentrations of product in soil. In order to determine whether free product removal is feasible, the wells will be developed and sampled as discussed above. The report documenting this field work will discuss the results and observations of this work and provide recommendations for any further analyses or pilot studies.

DEFINE THE EXTENT OF FREE PRODUCT AND SOIL AND GROUNDWATER CONTAMINATION

As discussed above, it is unclear whether free product is present at the site, however, development and sampling of the three existing wells will be conducted to determine whether free product is present in the areas considered to be potential sources of the product. The results of this investigation will be used to determine what additional investigation, if any, is needed to define contamination at the site. The documentation report will contain recommendations for further investigation.

SCHEDULE

Upon approval by the ACEH, we are prepared to begin mobilization for this work. A report documenting the results will be submitted within 60 days of ACEH approval.

Please direct any comments or questions to me at (925)279-3240. Thank you for your consideration.

Jerry Wickham
27 March 2009

Sincerely,

John Moe
Project Manager

Paul Hausmann
Partner-in-Charge

JCM/Enclosures

Cc: Bruce Flushman
Scott Rickman
Chris Lucasey

CAD File:	Drawn By:	Date:	Project No.
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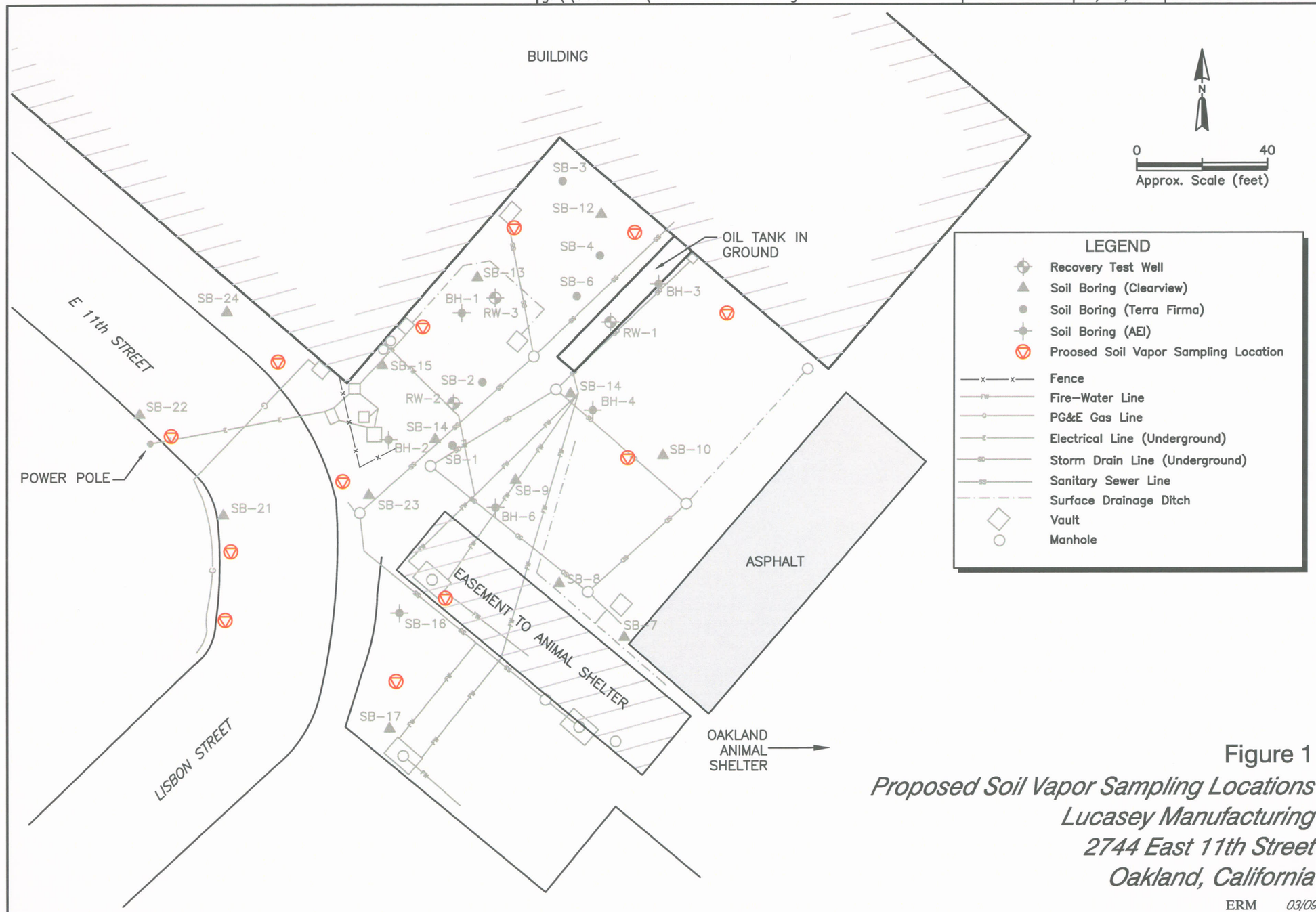

Figure 1

Proposed Soil Vapor Sampling Locations
Lucasey Manufacturing
2744 East 11th Street
Oakland, California

ERM 03/09

Jerry Wickham
27 March 2009

ATTACHMENT A

LOW FLOW WATER SAMPLING

STANDARD OPERATING PROCEDURE

1.0 *PURPOSE AND SCOPE*

The purpose of this document is to define the standard operating procedure (SOP) for collection of ground water samples by low-flow purge technique. The ultimate goal of the sampling program is to obtain samples that meet acceptable standards of accuracy, precision, comparability, representativeness, and completeness. All steps that could affect tracking, documentation, or integrity of samples are explained in sufficient detail to allow all sampling personnel to collect samples that are reliable and consistent.

This SOP describes equipment, field procedures, sample containers, decontamination, documentation, storage, holding times, and field quality assurance/quality control (QA/QC) procedures necessary to collect ground water samples from monitoring wells and temporary sampling points by low-flow purge technique.

This plan is to be strictly followed when low-flow sampling is the specified sample collection method, and any modification to the procedure shall be approved by the Project Manager (PM) in advance.

2.0 *RESPONSIBILITIES AND QUALIFICATIONS*

The PM is responsible for assigning project staff to conduct sampling activities at the site. The PM also ensures that all project personnel follow this and any other appropriate SOPs.

The project staff assigned to the ground water sampling task is responsible for completing all tasks according to this and other appropriate procedures. All staff members are responsible for reporting deviations from the procedure or nonconformance to the PM or Project QA/QC Officer.

Only qualified personnel shall be allowed to perform ground water sampling. At a minimum, ERM employees qualified to perform ground water sampling are required to:

- Read this SOP;
- Indicate to the PM that they understand all procedures contained in this SOP;
- Have completed the OSHA 40-hour training course and/or 8-hour refresher course, as appropriate; and
- Have ground water sampling experience generally consistent with the procedures described in this SOP.

3.0 SAMPLE COLLECTION PROCEDURES

3.1 EQUIPMENT LIST

Sample bottles will be obtained from the analytical laboratory for the requested sample analyses. Extra sample containers will be obtained in case of breakage or other problems. Trip blanks will also be obtained from the analytical laboratory.

Typical equipment list for low-flow purge technique sampling:

- Personal protective equipment, including nitrile or powderless surgical gloves and safety glasses;
- Photoionization detector (PID) or flame ionization detector (FID);
- Water level probe;
- Disposable high-density polyethylene (HDPE) tubing and silicon tubing;
- Pumps;
  - Peristaltic pump
  - Bladder pump
- Water quality meter equipped with probes for measuring pH, specific conductivity, and temperature;
- Additional probes for measuring oxidation-reduction potential, dissolved oxygen, and turbidity may also be utilized;
- In-line flow-through cell;
- Ground Water Sample Collection Data Forms;
- Data recording sheets;
- Field notebook;
- Chain-of-Custody (COC) forms;
- Labels;
- Appropriate sample containers;
- Self-sealing plastic bags;
- Cooler;
- Ice or frozen ice packs;

- Spray bottle for deionized water;
- Deionized water; and
- 55-gallon drums or other type of portable storage container.

Equipment used during decontamination:

- Alconox detergent (or equivalent);
- Deionized water;
- Containers, brushes, paper towels, plastic sheeting; and
- Personal protective equipment, including nitrile or powderless surgical gloves and safety glasses.

3.2 *SAMPLING PROCEDURE*

This section describes the sequence of events to be followed for well purging and sample collection for the low-flow purge sampling technique.

3.2.1 *Equipment Decontamination*

Before any purging or sampling activities begin at a well, all non-disposable equipment shall be decontaminated. Details of decontamination procedures are given in Section 5.0.

3.2.2 *Low-Flow Purging*

Static water levels shall be measured for each well immediately before well purging. Water levels will be measured with a decontaminated electronic measuring probe. Water levels will be measured from the elevation reference point marked on the PVC well casing. The measuring process will be repeated until consecutive water level measurements agree to within 0.01 foot. If floating product is historically known to occur in a well or if there is reason to believe there will be floating product in a new well, an interface probe will be used to measure the depth to water and the thickness of the floating material.

Low-flow purging and sampling methods will be used to obtain representative groundwater samples while minimizing the amount of purge water generated.

Monitoring wells will be purged and sampled according to the following field protocol:

1. Note well condition and any unusual conditions of the area immediately surrounding the well.
2. In unpaved areas, place a clean plastic sheet around the well to prevent surface soils from coming in contact with purging and sampling equipment if no dedicated pump system is present in well.
3. Remove well cover and unlock cap.
4. If necessary, evacuate any standing water within well box prior to removing inner well caps.
5. When inner well caps are removed, perform head space analysis using a PID or FID.
6. Measure and record depth to static water level from measuring point on PVC inner well casing. Repeat the measurement process until values agree within 0.01 foot. Indicate time of measurement.
7. Record total depth of well (measured during water level measurement process).
8. Attach a fresh length of disposable polyethylene (or equivalent) tubing to the outlet of the decontaminated pump. If sampling for natural attenuation parameters, use a peristaltic pump or a bladder pump with no metal parts. If using a bladder pump, lower the pump slowly into the well to minimize the mixing of casing water and the suspension of any silt at the bottom of the well. Place the pump near the middle or slightly above the middle of the screened interval. If using a peristaltic pump, lower the tubing into the well such that the tubing intake is placed within the well screen interval. (Note: these initial steps are only necessary if using a non-dedicated pump.)
9. Connect the discharge end of the tube into the in-line flow-through cell. Connect a second piece of polyethylene tubing from the in-line flow-through cell discharge to a bucket or other receptacle for collecting purge water.
10. Purge at 100 to 500 milliliters per minute; the goal is to minimize draw-down in the well (ideally less than 10 centimeters draw-down). Measure the depth to water to ensure the draw-down within the well does not exceed 10 centimeters.
11. To minimize delays in field parameter stabilization and potential bias in analytical testing results, any vents or other potential sources of air bubbles in the pump discharge tubing or in-line flow-through cell should be identified and sealed off (or otherwise isolated) prior to purging or as soon as possible after purging begins.
12. Record water quality parameter measurements (temperature, pH, specific conductance, dissolved oxygen, oxidation/reduction potential,

and turbidity) using the in-line flow cell. Take readings every 3 to 5 minutes.

13. Stop purging when the following parameters have stabilized for three successive readings or when at least one well casing volume has been purged:
    - Temperature: ±1 degree Celsius;
    - pH: ±0.1 unit;
    - Specific conductance: ±10 percent; and
    - Dissolved oxygen or turbidity: ±10 percent.

The data shall be recorded on a Ground Water Sample Collection Data Form for each well and temporary sampling point that is sampled. The Field Data Collection Form will document the following information, at a minimum:

- FID and/or PID measurements in the head space;
- Decontamination procedures;
- Initial depth to water;
- Purge method and rate;
- Physical parameters of the purged water;
- Depth-to-water measurements during purging;
- Volume of water purged prior to sample collection; and
- Disposal method of purged water.

Evacuated well water will be placed into a 55-gallon drum or portable tank and stored on site in a secured area until disposal. A drum log shall be completed each time a drum is used. Necessary precautions shall be taken to prevent spilling of drummed water, and drums or portable tanks shall not be left overnight at well locations outside a fenced area at the site.

3.2.3 *Ground Water Sample Collection*

After the well-purging criteria are satisfied, ground water sample collection can begin. The following sampling procedure is to be followed at each well:

1. Label sample containers (see section 4.2.1 for instruction).
2. Don clean nitrile or powderless surgical gloves immediately before obtaining sample.

a. Disconnect the in-line flow cell and collect samples directly into sample bottles. Maintain a slow linear flow with as little aeration as possible.

3. After each sample is collected, place the bottles in self-sealing plastic bags and immediately place the bags in a chilled cooler with ice or frozen ice packs.
4. Record sample number, time of sampling, location, and sampler name on the Ground Water Sample Collection Data Form and COC form.
5. If using a non-dedicated pump, remove pump and tubing from well, discard disposable tubing, and decontaminate the pump as described in Section 5.0.
6. Replace well cap, close well cover, and lock well.
7. Complete the COC form for transportation of samples to laboratory.
8. Hand deliver or ship samples to the laboratory on the same day they are collected, or as soon afterwards as possible.

3.2.4 *Quality Assurance/Quality Control Samples*

To identify potential errors, four types of QC samples may be included for analysis. All QC samples are labeled and sent to the laboratory along with the actual samples for analysis. The four types of QC samples are described in the following sections.

3.2.4.1 *Trip Blanks*

Trip blanks check for contamination due to handling, transport, contact with other samples during storage, or laboratory error. A VOA bottle set is filled with deionized water by the laboratory. This set is taken to the field, labeled with company name, date, and cooler ID, and stored with the other samples until they are delivered for analysis to the laboratory. Trip blanks are opened by laboratory personnel only. One trip blank set is sent per cooler of samples for volatiles analysis per day.

3.2.4.2 *Field Duplicates*

Sometimes referred to as a split or replicate, a field duplicate is a check on field and laboratory precision. Two consecutive samples are filled at the same sampling location. One is labeled as the actual well sample and the other is labeled as a duplicate sample. Preservation and shipping of samples and their duplicates are identical. One duplicate will be submitted per 10 samples, or one per sampling event if fewer than 10 samples are collected.

3.2.4.3 *Rinsate Samples*

Equipment rinsate blanks verify that chemicals are not being carried from one sample to the next when non-disposable equipment is being used for sample collection. The non-disposable equipment is first decontaminated with deionized water. Deionized water is then poured through the decontaminated equipment into sample bottles.

Rinsate samples will not be collected for wells to which specific or disposable sampling equipment (bailer or pump) has been dedicated, as no likelihood of transferring chemicals to other samples exists.

3.2.4.4 *Matrix Spikes*

Matrix spikes are used to assess precision and accuracy of the analytical method on various matrices. For this procedure, duplicate samples are collected at a well and spiking is done by the laboratory. Samples are labeled as matrix spikes for the laboratory.

4.0 SAMPLE HANDLING

4.1 CONTAINERS, PRESERVATION, AND HOLDING TIMES

Certified clean sample containers and trip blanks will be obtained from the contract analytical laboratory. The bottles will be labeled to indicate the type of analysis to be performed, and necessary preservatives will be present in the bottles when received from the laboratory.

Table 1 summarizes the sampling containers, preservation, and holding times for the potential types of analyses.

4.2 SAMPLE TRACKING

Documents for tracking the samples are generated in the field. This documentation includes field notes, sample labeling, and COC forms.

4.2.1 *Sample Labeling*

Each sample will be labeled prior to collection. The sample label will be filled out with waterproof ink. At a minimum, each sample label will contain the following information:

- Company name;
- Site/project name;
- Sample number (well location);
- Parameters for analysis;
- Date and time of collection;
- Preservative; and
- Sampler's signature (or initials).

Information pertinent to field survey measurements (water level, pH, specific conductivity, and temperature) and sampling will be recorded on the Ground Water Sample Collection Data Forms and/or in the field notebook. The ERM field staff is responsible for the data sheets and notebook.

4.2.2 *Chain-of-Custody Forms*

A COC form will be filled out in the field and will accompany every shipment of samples to the analytical laboratory. The purpose of the COC form is to document possession of a sample from the time of collection in the field to its final disposal by the laboratory.

Each COC form will contain the following information:

- Company name;
- Site/project name and number;
- Sample identifications;
- Requested analysis for each sample;
- Date and time of sample collection;
- Preservative; and
- Sampler's name and signature.

The laboratory will enter the following information on the COC form once the samples have been delivered to the laboratory:

- Name of persons receiving the sample;
- Date of sample receipt; and
- Sample condition.

All corrections to the COC record will be initialed and dated by the person making the corrections.

Each COC form will include signatures of the appropriate individuals indicated on the form. The originals will follow the samples to the laboratory and copies documenting each custody change will be received and kept on file by ERM. All COC forms will be maintained on file by ERM until final disposition of the samples.

5.0 *EQUIPMENT DECONTAMINATION*

Decontamination will be performed on all non-dedicated sampling equipment that may contact potentially contaminated water, including water level probes and flow-through cells. Clean nitrile gloves or powderless surgical gloves are to be worn during decontamination.

Each piece of non-dedicated sampling equipment will be decontaminated before use at each well. Plastic sheeting will be laid down around each well during evacuation/sampling to protect decontaminated equipment from contact with the ground. The decontamination procedure for most equipment will be as follows:

- Disassemble equipment, as appropriate;
- Wash equipment in an Alconox (or equivalent) and water solution using a brush or clean cloth to ensure removal of all contaminants;
- Rinse equipment in fresh tap water;
- Rinse again with deionized water; and
- Dry equipment with paper towel and place in clean plastic, if appropriate.

The effectiveness of these decontamination procedures will be verified by vigorous QA/QC protocols, including blanks, duplicates, and/or spikes.

6.0 *INSTRUMENT CALIBRATION*

Mechanical equipment used during sampling may include water quality meters, PID or FID, and pump. Before going into the field, the sampler will verify that all of these are operating properly. In addition, the water quality meters and PID/FID require daily calibration. If these field instruments require periodic recalibration by the manufacturer, they will be returned accordingly and a record will be kept of the procedure. Calibration times and appropriate readings will be recorded in the field notebook and/or on data collection forms.

7.0 DOCUMENTATION

Thorough documentation in the field is required to ensure proper labeling and tracking of samples, identify potential sources of error, and maintain accountability among field personnel.

The following information will be included in the field notes and/or on data collection forms:

General Information

- Names of personnel;
- Weather;
- Personal protective equipment used;
- Date and time of sampling;
- Location and well number;
- Condition of the well;
- Times that procedures and measurements are completed;
- Calibration of meters at start of day;
- Decontamination times;
- PID or FID readings (if taken);
- Initial static water level and total well depth; and
- Calculations (e.g., calculation of evacuated volume).

Sampling Information

- Volume of water evacuated before sampling;
- Water quality parameter measurements recorded during evacuation (note times and cumulative volume of purged water);
- General description of sample procedures;
- Time of sample collection;
- Number of samples collected;
- Order in which sample bottles were filled;
- Sample identification numbers;
- Preservation and storage of samples;
- Filtration performed, if any;

- Record of any QC samples from site;
- Any irregularities or problems that may have a bearing on sampling quality; and
- Type of sampling equipment.

Table 1 Sample Containers, Preservatives, and Holding Times for Test Parameters

Parameter	Container	Preservative	Lab Holding Times
Total Petroleum Hydrocarbons (Extractable)	1-liter amber glass bottles with Teflon-lined cap	Refrigerate at 4° ±2°C	Extract within 7 days from collection date/analyze within 14 days from sample extraction date
Total Petroleum Hydrocarbons (Purgeable)	40 ml vial with Teflon faced septa cap	Acidity to pH of <2 with hydrochloric acid. Refrigerate at 4° ±2°C	Analysis performed within 14 days from sample collection date

Jerry Wickham
27 March 2009

ATTACHMENT B

GRAVITY SEPARATION PROTOCOL

STANDARD OPERATING PROCEDURE

Zemo & Associates LLC
986 Wander Way
Incline Village, NV 89451
Tel/Fax: 775-831-6179
dazemo@zemoassociates.com

Protocol for Gravity Separation of Groundwater Samples to Isolate the Water Phase

Groundwater samples may contain non-dissolved petroleum resulting from entrained sheen and/or entrained petroleum-affected soil particles. The objective of this procedure is to separate the oil phase and the particulate matter solid phase from the water phase prior to extraction and analysis of the sample. In this way, the analysis will better represent the true dissolved-phase of the sample. The success of this procedure depends on many factors, including adequate time for separation, and complete exclusion of the oil and particulate matter phases from the collected water phase.

For groundwater samples to be analyzed for semi-volatiles (e.g., extractable TPH, PAHs):

1. Pour the raw groundwater sample into a glass separatory funnel of adequate volume.
2. Allow the sample to separate and equilibrate for a minimum of 48 hours. Keep the sample refrigerated during the separation period.
3. After the separation period, the analyst will observe the sample to confirm that the water phase is visually clear. If the water is not visually clear, additional separation time may be required.
4. Open the bottom stopcock of the funnel and allow all of the particulate matter that collected at the bottom to run completely through; discard.
5. Collect an adequate sample volume of the water phase from the bottom of the funnel without including any of the oil phase and place into appropriate containers.
6. Add surrogates to water phase sample and extract as per requested method.

For groundwater samples to be analyzed for volatiles (e.g., purgeable TPH, BTEX, etc.):

1. Store the 40-ml VOA vials upside-down in the refrigerator for a minimum of 48 hours.
2. After the separation period, the vials must remain in the upside-down position while the septum is punctured by the hypodermic needle and the water phase is subsampled. The analyst should keep the needle tip within the water phase and must avoid both the solid and oil phases with the needle tip during subsampling.

Jerry Wickham
27 March 2009

ATTACHMENT C

SOIL VAPOR SAMPLING

Memorandum

Environmental
Resources
Management

1777 Botelho Drive
Suite 260
Walnut Creek, CA 94596
(925) 946-0455
(925) 946-9968 (fax)

ERM®

Active Soil Vapor Sampling

Prior to soil vapor sample collection, the necessary permits will be obtained from Alameda County, and USA will be notified at least 48 hours prior to the commencement of drilling activities. In addition, a private underground utility locator will clear all drilling locations.

Soil vapor sampling activities will be implemented in accordance with the 15 December (revised 7 February 2005) 2005 *Interim Final Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air* and the *Advisory – Active Soil Gas Investigations* (28 January 2003) documents developed by the Department of Toxic Substances Control (DTSC) and the California Environmental Protection Agency.

A direct-push rig will be utilized to facilitate the collection of soil vapor samples from at least 5 feet below ground surface (bgs), as recommended in the DTSC advisory. Soil vapor samples will be collected with 1-liter Summa canisters equipped with flow controllers with a pre-set sampling rate of 200 milliliters per minute (mL/min) (5 minute sample time for a 1-liter Summa canister). The following procedures should be followed during sample collection:

- A direct-push rig will be utilized to advance drilling rods to a total depth of 5 feet bgs. Once the sampling rods are advanced to total depth, they will be pulled back approximately 6 inches, creating an annular space for vapor sampling. Clear, disposable, Teflon tubing (0.25-inch outer diameter) will then be inserted through the rods and attached to a screened sampling tip with a threaded connection containing a rubber gasket.

- Following the installation of the sampling line, a seal of hydrated bentonite should be emplaced around the drilling rod at ground surface to isolate the subsurface conditions from conditions above-ground. Care should be taken to ensure that the bentonite is not over-hydrated to avoid introducing water down into the borehole. To allow for subsurface conditions to equilibrate, soil vapor sampling should not be initiated for **at least 30 minutes**. Note the equilibration start and end time in the field notes.

- During this time, calculate the volume of the sample tubing and the annular space around the sampling tip to determine the purge volume.

Also, measure the initial vacuum in the Summa canister with a separate vacuum gauge (other than the one on the flow controller) and record the result in the field notes.

- Following equilibration, attach a low-flow vacuum pump and flow meter to the sampling line, following a T-valve. Using the vacuum pump, purge three purge volumes of air from the sampling line at a flow rate of 200 ml/min. Note the purge volume and time in the field notes.

- Following purging, remove the vacuum pump and flow meter from the sampling line and attach the Summa canister and flow controller. While connecting the flow controller to the Summa canister, wrap Teflon tape around in the inside and outside of the Swagelok fittings. When connecting the sample line to the flow controller, be sure you are using pink rubber ferrels and not stainless steel ferrels. Wrap the outside of each of the connections with uncooked biscuit dough.

- Open the valve on the Summa canister and begin sample collection. Note the sample start time in the field notes.

- During the course of the 5 minute sample time, conduct a leak test by holding a cleaning wipe containing isopropyl alcohol near each connection in the sampling train. Double bag the wipes to be used during the leak test and store them away from any of the sampling equipment. Change gloves before and after conducting the leak test to minimize cross-contamination. Seal all used wipes and gloves in two ziplock baggies and store away from all sampling equipment.

- After 5 minutes, or when the vacuum gauge on the Summa canister reads approximately 5 inches of mercury (in Hg), close the valve and disconnect the tubing. Measure the final vacuum in the Summa canister with a separate vacuum gauge and record the result in the field notes. Make note of the sample end time.

- Be sure to completely fill out the sample tags on all of the Summa canisters.

After each soil gas sample is collected, the sample tubing should be removed and discarded. Soil vapor probes will be decontaminated between each sample using a water and Liquinox solution and triple-

rinsed with potable water. Following sample collection, each borehole will be abandoned using granulated bentonite chips, hydrated with water. Borings should be topped at ground surface with concrete dyed black to match the surrounding ground cover.

The following samples will also be collected for QA/QC purposes:

- One ambient air sample – collect from one of the sample locations. Document the location in the field notes.

- One trip blank sample – complete the sample label/tag and keep with the other Summa cannisters.

- One duplicate sample – collect with a duplicate sampling "T" from any location.

Soil vapor samples will be sent to Air Toxics Ltd., a California-certified laboratory in Folsom, California, for analysis by United States Environmental Protection Agency (USEPA) Method TO-15.