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Alameda County
Environmental Health

4 June 2008

Mr. Steven Plunkett
ACHCS-EHS
1131 Harbor Way Parkway, Ste. 250
Alameda, CA 94502-6577

Project No.: 055101
Via Email/mail: steven.plunket@acgov.org
Via Email/Mail: ridgerat10@aol.com

Re: Workplan for Additional Drive-Sampling & Analysis at 50 Hegenberger Loop, Oakland, California

INTRODUCTION

This document describes the tasks that will be undertaken at the above-referenced site (Figures 1 and 2) for:

- Drive-sampling of one hole;
- Soil sampling and analysis and, if present, grab water sampling and analysis;
- Analysis of selected soil samples and water samples, if collected; and
- Technical reporting.

For this next stage of work, one drive-sample hole, down-gradient of the former Underground Storage Tank (UST) tankpit (TP#2) will be installed and sampled for analysis.

SITE BACKGROUND

The former USTs (2) were removed in the fall of 1995 by DC Engineering. Below is an excerpt from their report:

> *"On, or about, October 15, 1995 Cottle Engineering was hired to perform the removal of two 2,000 gallon single walled steel underground gasoline storage tanks at W.E. Lyons Construction Co., 50 Hegenberger Loop, Oakland, California, 94621.*
>
> *On, or about, October 18, 1995, Cottle Engineering applied for an underground tank removal permit from the Alameda County Health Department, Hazardous Materials Division. And after receiving the County permit, applied to the City of Oakland Fire Department for a tank removal permit on November 2,1995. After issuance of the tank removal permits, we scheduled the tank removal with the inspectors for November 14, 1995 and began removal of the concrete over the tanks on the morning of November 13, 1995.*

The excavation was barricaded to prevent entry by unauthorized personnel during the performance of the work. During excavation of the tanks, the excavated soil appeared to be clean and free from petroleum contamination, and was stockpiled on site for future use as backfill for the tank pit with the exception of a small amount of soil which displayed an odor of gasoline and was segregated from the other, clean spoil.

At approximately 11:15 a.m., November 14,1995 the tanks were prepared for removal by the introduction of dry ice at a ratio of 2.5 pounds per 100 gallons of tank volume. Approximately two hours after the introduction of dry ice, the tank's atmospheres were tested for %LEL and %Oxygen, in the presence of the inspectors.

At approximately 1:15 p.m., these readings had reached levels that were unacceptable to the inspectors, and additional dry ice was added to each tank. After the tanks reached acceptable readings of %LEL and %Oxygen the tanks were removed from their excavations and the outer walls inspected for signs of corrosion and/or leakage. Upon visual inspection, the tanks appeared to be in good condition with no visible signs of corrosion or perforations of the tank walls. However, tank no. 2 displayed signs of overfilling indicated by gasoline on the outer tank wall, which caused the tar wrap to disintegrate.

Immediately following visual inspection of the tanks, they were loaded on a truck operated by H & H Environmental Services and transported to their licensed disposal facility in San Francisco, California for further processing and destruction.

Immediately following the removal of the tank from the excavation, one soil sample was taken from each end of the tank excavations in an area just below the end of each tank at a depth of approximately 9-10 feet below ground surface. A four point composite sample was also taken from the spoil pile generated during excavation of the tank. The samples were properly collected, packaged, and transported to McCampbell Analytical in Pacheco, California for analyses. The samples were analyzed for Total petroleum Hydrocarbons as Gasoline (TPHg); and Benzene, Toluene, Xylenes, and Ethylbenzene (BTXE). The analytical reports indicated that in the two samples taken from the tank excavation no. 1 and from the spoil pile, the above named constituents were not detected. The sample WL-1 from the small contaminated spoil pile indicated gasoline at 2,800 parts per million (ppm); sample WL-5 indicated 7.1 ppm of gasoline; and sample WL-4 indicated 2,000 ppm of gasoline.[1]

Based upon the findings of the analytical testing, we recommend aeration of the small contaminated spoil pile and excavation of additional soil from the no. 2 tank pit in the area where sample no. WL-4 was taken and aeration of that spoil as well. Confirmatory sampling from the bottom of the tank pit as well as from the aerated soil will be necessary to determine the effectiveness of the additional excavation and the aeration process[2]*.*

Once it is confirmed that all contaminated materials have been aerated from the soil to levels of 10 ppm or below, the aerated soil can be used for backfill material at the site and a site closure can be requested from the local oversight agency."

[1] This sample was from the small stockpile that came from TP#2, not TP#1. It is confusing in their report, but our research has determined it came from TP#2.

[2] The sampling and analysis of the aerated soil was not performed and was the rationale for requesting soil borings in 2005. According to Mr. Gary Lyons, this soil (~5 yards) was placed in the upper 4 feet of the excavation, at least 6 feet above groundwater.

The excavation for UST #2 was closed approximately 100 days after UST removal, after the soil was aerated for 90 days.

In April 1996, the Alameda County Health Care Services – Environmental Health Services (ACHCS-EHS) wrote a letter to request that the small amount of contaminated soil from tank #2 be aerated and confirmation sampled prior to re-use as backfill material. They further requested that UST #2 tankpit (TP#2) be over-excavated and resampled for chemical analysis, including groundwater, if encountered. The letter is excerpted below:

> *"I last spoke with you on November 30, 1995 after the removal of the two underground tanks at the above site. After review of the analytical data from the removals a number of items were discussed and agreed upon. Among these were:*
>
> 1 *Most of the stockpiled soils from Tank 1 and Tank 2 were not contaminated and could be reused to backfill the pit from Tank #1 (TP#1). Also, there was only minor petroleum contamination observed in soil samples from Tank pit 1 and no further work would be required in this area*
>
> 2 *A small amount of stockpiled soil from Tank 2 was contaminated with gasoline and would need to be aerated and resampled prior to reuse.*
>
> 3 *The north end of Tank 2 detected elevated levels of gasoline and BTEX (benzene, toluene, ethylbenzene, xylenes) which should be overexcavated and resampled. Also, based on the shallow groundwater at this site, should groundwater be encountered during overexcavation and water sample should be taken for chemical analysis.*
>
> *Based on our conversation, I anticipated that this work was being scheduled. To date, our office has not received a work plan nor have we been informed of any further action at this site. Therefore, you are requested to send a work plan to address the above items (#2&3). Please submit your work plan to our office* ***within 30 days or by May 28,1996.***
>
> *This is a formal request for technical reports pursuant to the California Water Code and the Health and Safety Code. Failure to submit the requested reports may subject W. E. Lyons Construction to appropriate civil liability."*

In August 2002, DC Engineering wrote a letter in response to a letter from EHS. An excerpt of the letter follows:

> *"My company was hired by Mr. Lyons to perform the tank removal at his site on Hegenberger Loop in Oakland in October of 1995. I was onsite during most of the construction tasks and remember some of the work we performed. We still have the project file and have forwarded copies to Me. Lyons at his request.*
>
> *Mr. Lyons contacted me recently with regards to a letter he received from you concerning the clean up of this site and forwarded the letter to me. Subsequently I spoke to you on the phone and found the final sample results in the files. Please see the attached copy for your records. I extracted the water sample from the tank excavation on September 5,1996 at the request of Mr. Lyons in an effort to complete the project. The water was not present during the original tank removal project and the origin of the water could be from multiple reasons. (Rain, Tidal Action, Perched, etc.) As you can see, there was very low levels of gasoline present in the water.*

Me. Lyons did not use our company to perform the clean up of any contaminated soil or water and believe he performed those tasks with the help of someone else as he mentioned he had close ties with another environmental firm that would help him during the original removal project. However, we did place the soil in the back of this property for treatment prior to leaving the site. Cottle Engineering was hired to perform the removal and disposal of the tanks only and the later water sampling was performed additional to the original contract."

In December 2002, the EHS wrote a letter about closing the site. An excerpt of this letter follows:

"Alameda (County Environmental Health, Local Oversight Program (LOP), has begun our review of the referenced site for formal closure recommendation. Our recent concern regarding the analysis of MTBE was satisfied with the additional analytical results submitted,[3] however, it appears that there is still an outstanding issue. A pile(s) was generated during the tank removal (WL1) and during the over-excavation of tankpit pit #2, whose disposition is still unaccounted. You were given the option to dispose of this soil or resample after aeration for possible reuse. Which option did you choose? Please submit a copy of either the soil disposal receipt or a copy of the analysis of soil after re-sampling?"

In April 2005, the EHS wrote another letter about review of the site. The excerpted information is below:

"Alameda County Environmental Health has reviewed the files regarding the above referenced site. However, We need additional information from you in order to complete our evaluation. We request that you address the following technical comments and submit the technical report requested below.

TECHNICAL COMMENTS

1. ***MTBE in soil and groundwater-*** *Please collect a soil and groundwater sample and analyze for MTBE. The sample must be taken downgradient and in the proximity of the former USTs. You may establish groundwater gradient by studying of the available neighboring sites.*

2. ***Site Map-*** *Please provide a scaled site map with all samples and their historical and currant concentrations of the constituents.*

3. ***Summary Tables-*** *Please provide separate cumulative data tables that include soil and groundwater analytical results for all compounds that were analyzed at this site. For clarity please tabulate your cumulative soil and groundwater data per monitoring point then sorted by date. Include these tables in the report requested below.*

4. ***Benzene concentration-*** *Please collect and analyze an additional soil/groundwater sample In WL4 area where Benzene has been detected at up to 8.5 PPM in soil."*

Gary Lyons contracted The Consulting Group (TCG) to address this letter and to expedite the closure of the site. In August 2005, TCG submitted a Workplan to the ACHCS-EHS for their

[3] In this letter, the concern about MTBE was alleviated with the submittal of additional lab results.

review and approval. The ACHCS-EHS approved the Workplan with some modifications in a letter, dated 31 October 2005. The modification was that the borings should go to 25 feet below grade (fbg) instead of 10 fbg in two borings and 4 fbg in the third.[4] The drive-sample holes were installed, as shown on Figure 3, on 5 December 2005. Soil sampling results indicated that :

1 Except for the 7.5-fbg sample in boring B-3, all GRO results were below their residential Environmental Screening Level (rESL),
2 Except for the 7.5-fbg in boring B-3, all Ethyl-Benzene results were below their rESL, and
3 No other analyzed compounds were above their respective rESLs.

Grab groundwater sampling results indicated that:

1 Borings B-1 and B-2 were below rESLs for the compounds tested, and
2 Boring B-3 was above the rESL for GRO and Benzene.

We recommended:

Only the 7.5-fbg-soil sample from B-3 contains concentrations for TPH-GRO and Benzene that exceed ESLs. All other compounds tested are below their ESLs for both soil and groundwater. With this in mind, the site should be closed due to:

1. Source has been removed,
2. Natural-degradation of these compounds has been shown to work at sites in the Bay Area and has been recommended for sites of low-risk[5],
3. The area has been covered with a barrier (concrete) thereby retarding the percolation of surface water from rainfall, and
4. When you consider the use of this water as a drinking water, it is restricted by sanitary and treatment requirements.

Therefore, the application of beneficial uses or non-degradation to groundwater in this area would seem to be too restrictive, and has been stated so by others in Senate Bill 1764 Advisory Committee Recommendations Report.[6]

While the ACHCS-EHS took our recommendation under advisement, they did not agree with it and requested:

1 A 2000-ft well survey for County wells and State wells,
2 Sampling and analysis of irrigation well on-site,
3 Revised Figures, and
4 Boring logs for the three drive-sample holes.

[4] While in theory we agreed with this depth, we were very emphatic with the case officer that depth would be a function of soil types, soil-type differences, and confining layers.

[5] LLNL Reports, 1995.

[6] Section 8 – Beneficial Use Designations and Water Quality Objectives, pp 12.

All four of these items were performed and forwarded to the ACHCS-EHS to meet their requirements for closure.

The tasks results:

- The well survey indicated that there were no registered wells within the 2000-ft radius,
- The irrigation well was sampled and analyzed, and was non-detectable (ND) for all compounds tested,
- The Figures were revised, and
- Boring logs for B-1 through B-3 were prepared.

The ACHCS-EHS did not issue a closure at this point, as expected, but instead reviewed the file again and issued a letter, dated 24 April 2008, requesting further work at the site. The letter requested:

1 ***"Soil Boring Locations.*** *Due to the lack of soil and groundwater data associated with former tank pit #I, soil borings must be installed to evaluate the extent of contamination at this location. Furthermore, soil excavated during the tank removal was aerated on site and returned to the excavation without proper confirmation sampling. Composite soil samples collected from the soil stock-pile removed during the excavation -prior to aeration- detected TPHg at concentrations of up to 2,800 parts per million (ppm). At least one soil boring shall be advanced in the former tank pit to evaluate if soil and groundwater contamination is present. In addition, soil and groundwater sampling is required at the former dispenser island to evaluate the extent of soil and groundwater contamination at this location.*

Tank Pit #2: During the advancement of soil borings B-1 through B-3 a moderate hydrocarbon odor was detected in soil. There is a potential for the downward migration of petroleum hydrocarbon contamination due to water level fluctuations beneath the site. Additionally, soil samples collected from soil boring B-3, which is in the projected downgradient direction from the former tank pit detected TPHg at concentrations of up to 690 ppm. No additional soil borings were advanced downgradient of B-3 to evaluate the lateral extent of contamination. We request that you propose a scope of work in the Work Plan requested below to define the lateral and vertical extent of soil and groundwater contamination beneath your site.

2 ***Soil Sampling and Analysis.*** *During the soil boring installation, soil samples should be screened with a PID and examined for visible staining and hydrocarbon odor. Any interval where staining, odor, or elevated PID readings occur a soil sample is to be collected and submitted for laboratory analysis. If no staining, odor, or elevated PID readings are observed, soil sample are to be collected from each boring at 5 foot interval and the capillary fringe, where groundwater is first encountered, at changes in lithology and at the total depth of the boring at least 20 feet below ground surface.*

Soil samples collected during the investigation are to be analyzed for TPHg and TPHd by EPA Method 8015M or 8260, BTEX, EDB, EDC, MtBE, TAME, ETBE, DIPE, and TBA by EPA Method 8260. Please present the results from the soil sampling in the Soil and Groundwater Investigation Report requested below.

3 ***Groundwater Sampling and Analysis.*** *All groundwater samples collected during the investigation are to be analyzed for TPHg, TPHd by EPA Method 8015M or 8260, BTEX, EDB,*

EDC, MtBE, TAME, ETBE, DIPE, TBA by EPA Method 8260. Please present the results from the soil and groundwater sampling in the Soil and Groundwater Investigation Report requested below.

4 ***Figures and Tables.*** *Summary tables presenting all current and historical soil and groundwater analytical data shall be prepared for your site (including soil and groundwater data from the UST excavation). In addition, figures showing confirmation soil sampling locations during UST removal, soil boring locations with boring ID #, location of two former USTs and appurtenance (including dispenser island), site buildings and adjacent parcels and roads, a scale with clear legend must also be prepared. Additionally, we recommend you consider using an aerial photo as a base map. Please present the updated figures and tables in the report requested below."*

In our scope-of-work, described below, we are only proposing to install one drive-sample hole, approximately 7 feet down-gradient, of drive-sample hole B-3. The rationale for this is as follows:

1 During the removal of the USTs, TP#1 was backfilled under the supervision of an inspector from the ACHCS-EHS. Any impacted soil from this location was set aside for aeration and not used in TP#1 backfilling. TP#1 has not been an issue during this whole process, until now, but as is stated in the Site Background, by the inspector "Most of the stockpiled soils from Tank 1 and Tank 2 were not contaminated and could be reused to backfill the pit from Tank #1 (TP#1). Also, there was only minor petroleum contamination observed in soil samples from Tank pit 1 and no further work would be required in this area". As far as our client and we are concerned, TP#1 is a closed issue and should not be reopened without further discussion and rationale as to the inspector who oversaw the closure and backfilling being wrong. This also goes for the dispenser, which was part of the footprint, and was part of the removal process that was inspected and cleared.

2 TP#2 was over excavated and this soil was set aside for aeration prior to sampling for analysis. The sampling and analysis was not performed as requested, which prompted the three drive-sample holes that were installed in 2005. The results indicate that soil within the footprint of the UST and dispenser were slightly impacted, but below their respective rESLs. Only the drive-sample hole outside the footprint contained a soil sample that exceeded the rESLs at 7.5 fbg.

3 The original drive-sample holes were stopped at 16 fbg to avoid cross-contamination of the lower zone. This was done as a protection to our client, the County, and us. We are only recommending a depth of 10 fbg for the next drive-sample hole for this same reason as well as the only impacted soil sample in B-3 above rESLs was at 7.5 fbg. The two samples below this depth (10 fbg and 13 fbg) were either ND or below regulated levels.

SITE GEOLOGY AND HYDROGEOLOGY

The site is located in the San Francisco Bay region approximately 0.5 miles east of the San Francisco Bay. The site sits at approximately 7 feet-above mean sea level (ft-amsl). The land slopes to the west towards the San Francisco Bay.

The site is located on Quaternary Alluvium. The upper 5 to 15 ft generally consist of unconsolidated gravel, sand, silt, and clay. Groundwater in the area is brackish and cannot be used for drinking water. The direction of the shallow groundwater flow is usually to the west towards the San Francisco Bay.[7]

SCOPE-OF-WORK

The objective of this work is to obtain data upon which site closure will be completed. The data from the one drive-sample hole will be used in conjunction with previous data and other information available from the site. Typically, those data can include:

a) Source definition
b) Quantity of materials released
c) Initial soil and ground water levels of concern
d) Mitigation actions taken, including natural attenuation
e) Soil level now compared to initial levels
f) Projected future releases or lack thereof
g) Assessment and declaration of acceptable risk basis for approval

The drive-sampling and analysis will be performed in accordance with the attached (Attachment 1) standard operating procedures (SOPs), the American Society of Testing Materials (ASTM), practice standard #E1903, State of California Requirements, Alameda County Public Works Agency (ACPWA), and the EHS guidelines.

The rationale for the following investigation may be summarized as the minimum amount of information that must be gathered to offer conclusions and recommendations pertaining to the protection of health and environmental impairments due to soil or groundwater pollution involving fuels.

[7] There are no registered wells within 2000-ft of the site, including the one on-site well. Since there are no registered wells in the area, we are unable to determine or verify groundwater flow direction in the area. The regional flow is to the north-northwest on this side of route 880 according to the ACPWA.

Workplan and Permit Preparation

This document represents the Workplan, which will be submitted to ACHCS-EHS for review, comment, and approval. The Workplan will also be sent to the ACPWA for their files.

As part of the permit application process, TCG will complete the ACPWA - Site Hazard Information Form. We will also complete an ACPWA soil boring permit application. Both of these documents will be sent to the ACHCS-EHS after approval of Workplan and application of the boring permit.

The data quality objectives for this study must support the determination of lateral and vertical extent of migration of chemicals of concern. These data are not intended to serve alone as the clearance data that would defend a no further action recommendation. Specific objectives of these data include US EPA, State of California, or local requirements for:

a. Standard sampling protocol
b. Standard analytical methods
c. Standard data reporting

As are noted below.

Cement Core-holes

Any concrete core-holes that are required will be cut by W. E. Lyons, of Oakland, California, under the supervision of TCG.

Drive-Sampling

The drive samples are to be performed by Precision, of Richmond, California, under TCG supervision and guidance. TCG has chosen the location of drive-sampling hole based on previous investigation results (Figures 3 and 4), topography in the immediate vicinity and estimated groundwater flow direction. The selection of location may vary due to field conditions.

Once the core-hole is in place, Precision will continuous-core (4-ft butyrate liner runs) down to 10 fbg in the hole. Soil samples (up to 4 samples with one from the bottom of the hole) will be collected after reviewing the entire core. The samples will be collected in butyrate sample tubes. After the soil samples are collected, the open hole will be allowed to stand open for one hour to determine if water is present. If water accumulates in this hole then a grab groundwater sample will be collected. For water the sample, the sampling jars will be three 40-ml VOA vials (GRO, FOs, and aromatics), two amber liters (DRO and MORO), and two 250-milliliter plastic jars (LUFT metals).

Once collected, the soil samples (~4-inches/sample) will be sealed with Teflon®-lined plastic caps, labeled, and placed on ice until delivery to a state-certified laboratory. The same post-sampling procedures will be used for the grab groundwater sample.

Cuttings from the drive-sampling will be handled as prescribed in SOP 2b (attached).

Analysis

The soil and water samples will be delivered to Test America (TA) of Pleasanton, California, a state-certified laboratory, under strict Chain-of-Custody (COC) procedures. The soil samples will be analyzed using EPA Method 8260, EPA 8015M, and EPA 6010/6020. The analytical methods employed will be the same as for groundwater.

TCG will review the sample results and offer the client recommendations for acceptance. The rule of thumb, used by TCG, for needing further action in soil will be the ESLs. Once determined, ACHCS-EHS will be informed of this evaluation and their comments will be sought and addressed by TCG pending client agreement. All parties will agree before additional analysis is performed or additional samples are taken for analysis.

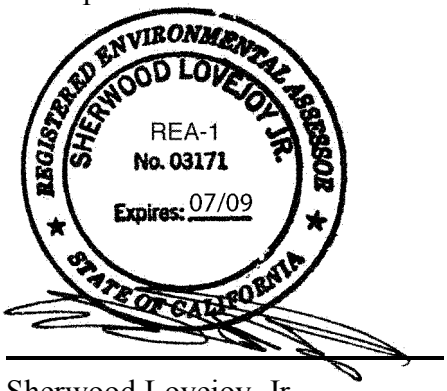
Reporting

Once the field and laboratory tasks have been performed, the results of this task will be reported by TCG in a standard report format delivered to client. The client, after review and approval, will give a copy of this report to the EHS and the ACPWA. The report will document the work performed and support recommendations for the future.

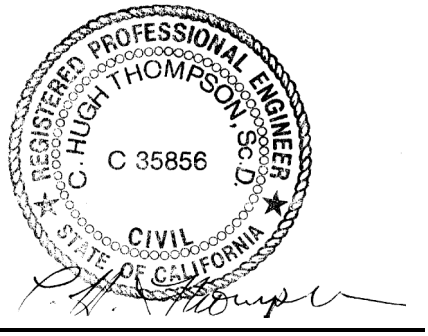
TCG appreciates this opportunity to be of service to you and looks forward to working with you on this project. Please feel free to contact us at **415.381.2560** regarding any questions you may have concerning this proposal.

Sincerely,
The Consulting Group

Jeanine C. Lovejoy
Principal – Owner



Sherwood Lovejoy, Jr.
Principal

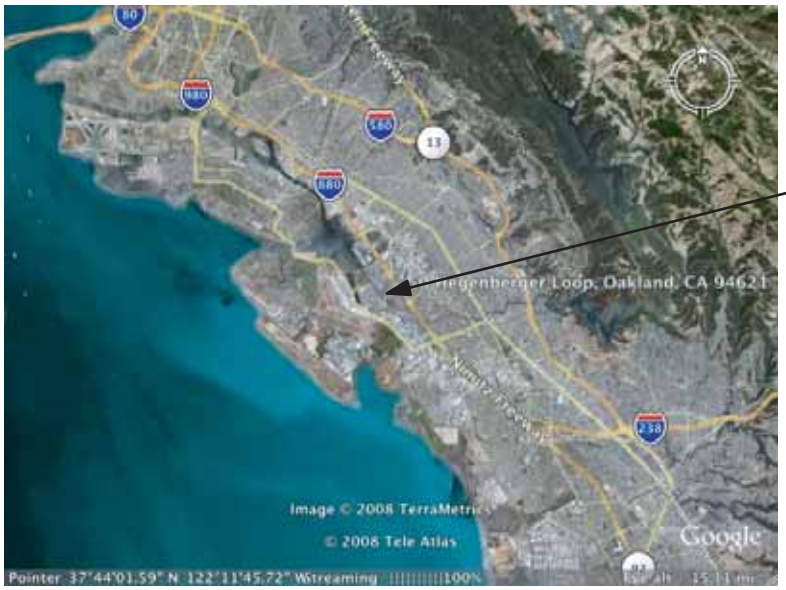


C. Hugh Thompson
Principal

Figures: 1 - Site Location Map
2 - Site Layout Map w/Proposed Drive-Sampling Location
3 – D-S Locations with Cross-Section Line
4 - Cross-Section A - A' Color Guide & Volatile Hydrocarbons Results (mg/kg)

Attachment 1 - Selected Standard Operating Procedures

FIGURES



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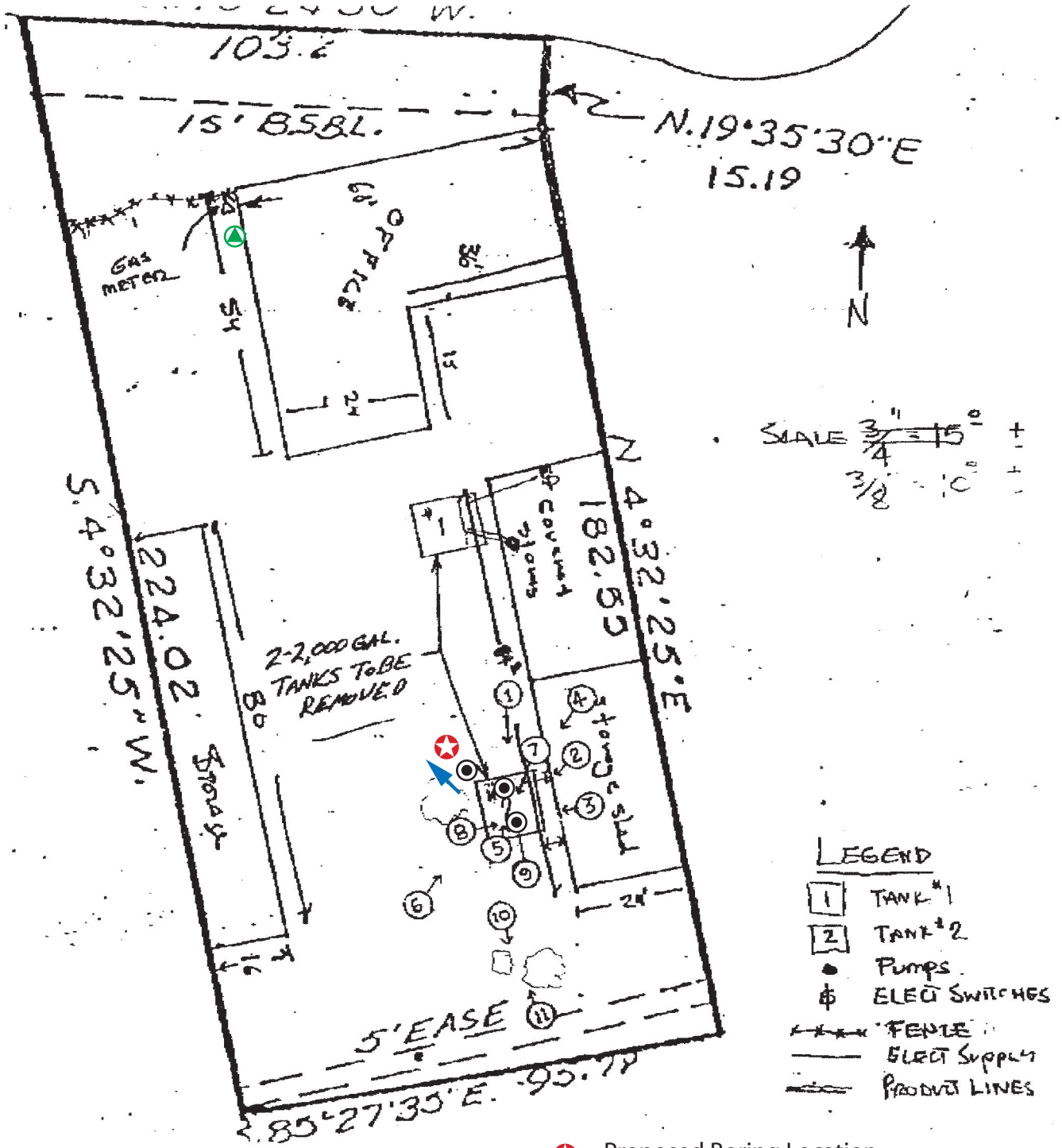
Job No.	085101
Date	27 May 2008
Drawn by	RC
Rev	SL
Apprvd	SL

Project
50 Hegenburger Loop Oakland, CA.
Site Location
for: W.E. Lyons Construction
50 Hegenburger Loop, Oakland CA.

N

Figure
1



- Proposed Boring Location
- Well Location
- Estimated GW Flow Direction
- Drive-Sample Holes (approximate)

(source: W. E. Lyons, 2005)

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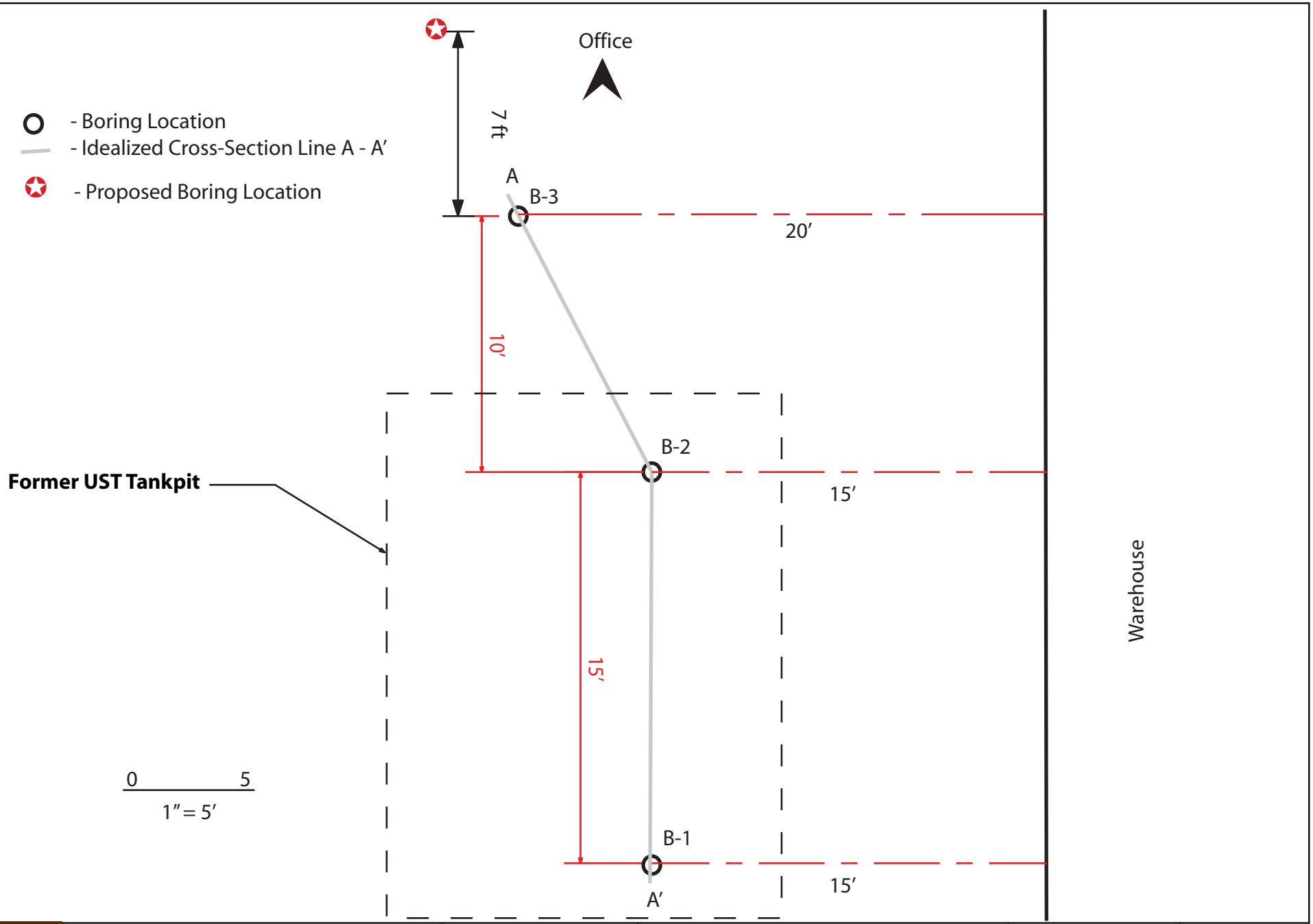
Job No.	Date	Drawn by	Rev.	Apprvd.
085101	28 May 08	RC	WL	WL

Project: **Site Layout w/ D-S and Well Locations**
Soil Sampling & Analysis
50 Hegenberger Loop
for W. E. Lyons Construction
50 Hegenberger Loop, Oakland CA

N

Figure **2**



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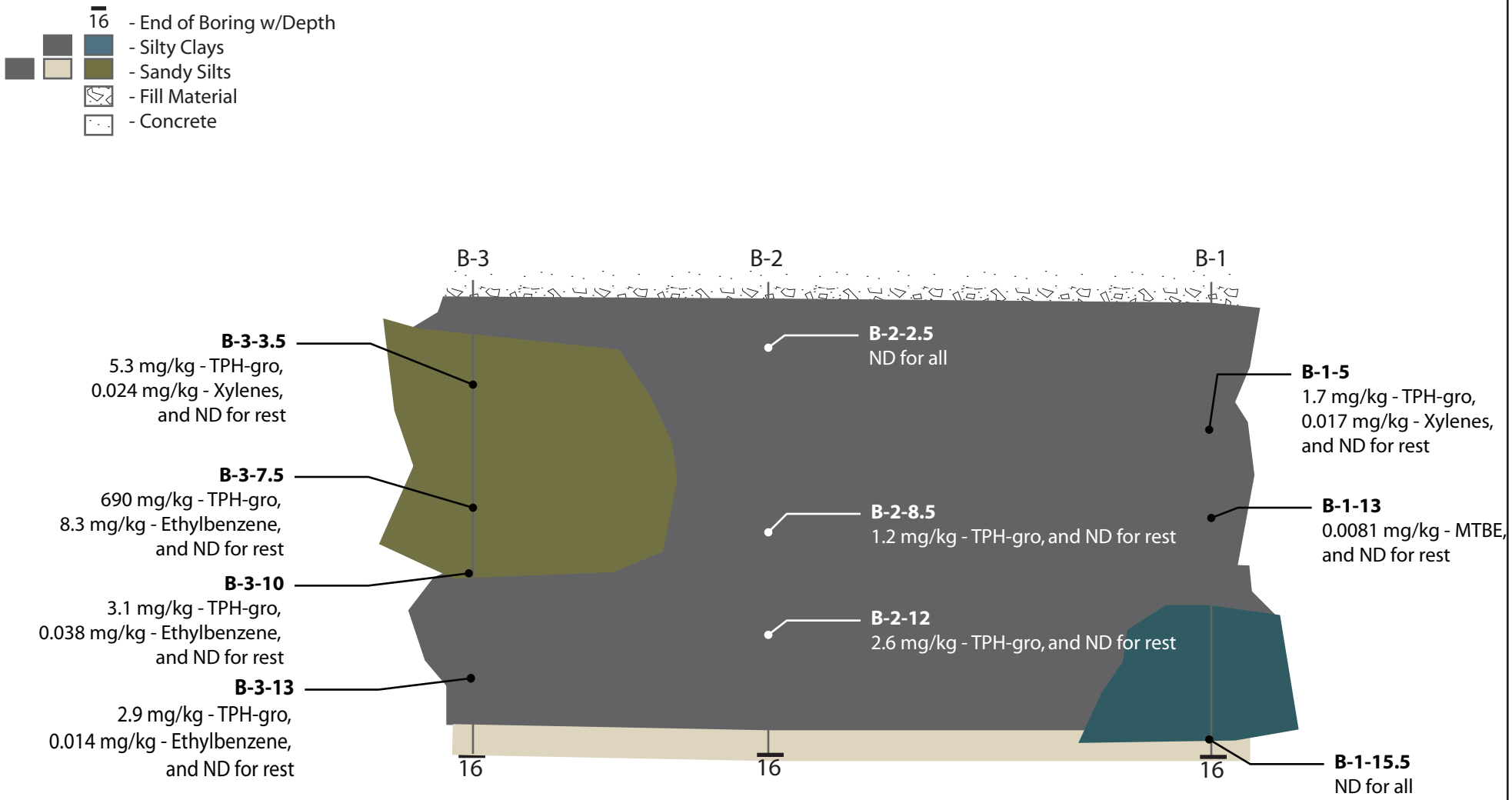
Project

D-S Locations w/Cross-section line
Soil Sampling & Analysis
50 Hegenberger Loop
for W. E. Lyons Construction
50 Hegenberger Loop, Oakland CA

N

Figure

3



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Project

Cross-Section A - A' Color Guide &
Volatile Hydocarbons Results (mg/kg)
50 Hegenberger Loop
for W. E. Lyons Construction
50 Hegenberger Loop, Oakland CA

N

Figure

4

ATTACHMENT 1

SOP 2b – SOIL & GRAB GROUNDWATER SAMPLING WITH GEOPROBE®

Soil samples for chemical analysis are collected in thin-walled Butyrate tubes. The tubes are 4 feet long by 2-inch diameter. The 4-foot core is reviewed and the location of a soil sample is selected by visual observation and photo-ionization detection (PID).

One soil sample collected at each sampling interval is analyzed in the field using a photo ionization detector (PID), a flame ionization detector (FID), or an explosion meter. The purpose of this field analysis is to qualitatively determine the presence or absence of hydrocarbons or halocarbons and to help establish which soil samples will be analyzed at the laboratory. The soil sample is sealed in a zip-lock plastic bag and placed in the sun to enhance volatilization of any hydrocarbons in the sample. The data is recorded on drill logs at the depth corresponding to the sampling point.

Other soil samples are collected to document the lithology and stratigraphy and estimate the relative permeability of the subsurface materials. All drive-sampling equipment are steam-cleaned before use at each site and between holes on-site to minimize the potential for cross-contamination.

The sampling equipment consists of Teflon® or steam-cleaned PVC bailer. Forty-milliliter (ml) glass volatile-organic-analysis (VOA) vials, with Teflon septa, are used as sample containers for volatile organic compound (VOC) analysis. For other analyses, the appropriate EPA-approved sampling containers are used.

The groundwater sample is decanted into each preserved VOA vial in such a manner that there is a meniscus at the top of the vial. The cap is quickly placed over the top of the vial and securely tightened. The VOA vial is then inverted and tapped to see if air bubbles are present. If none are present, the sample is labeled and refrigerated for delivery under chain-of-custody to the laboratory. Label information should include a sample identification number, job identification number, date, time, type of analysis requested, and the sampler's name.

A trip blank is prepared at the laboratory and placed in the transport cooler. It remains with the cooler and is placed on hold pending any anomalous results. A field blank is prepared in the field when sampling equipment is not dedicated. The field blank is prepared after a pump or bailer used in a well is steam-cleaned, before use in a second well, and is analyzed along with the other samples. The field blank demonstrates the quality of in-field cleaning procedures to prevent cross-contamination.

To minimize the potential for cross-contamination between wells, all the well purging and water sampling equipment that is not dedicated to a well is triple-rinsed between each well. As a second precautionary measure, samples are collected in order of least to highest concentrations as established by previous analyses.

All the soil is put in DOT-approved drums (drilling cuttings) for storage pending analytical results. Once results are available, soil disposal is determined. The soil is disposed of at the appropriate landfill(s) or re-used according to State, regional and/or local requirements.

SOP-8 - LIQUID LEVEL GAUGING USING WATER LEVEL METER OR INTERFACE PROBE

The complete list of field equipment for liquid level gauging is assembled in the Technical office prior to departure to the field. This includes the probe(s), light filter(s), and product bailer(s) to be used for liquid levels (tested in test well before departure). The field kit also includes cleaning supplies (buckets, TSP, spray bottles, and deionized water) to clean the equipment between gauging wells.

When using the water level probe to gauge liquid levels, the probe tip is lowered into the well until the unit sounds. The top-of-casing (TOC) point is determined. This point is marked with a dot or a groove, is an obvious high point on the casing, or is the north side of the casing. The place on the probe-cord that corresponds with this TOC point is marked and an engineer's tape is used to measure the distance between the probe end and marking on the cord. This measurement is then recorded on the liquid level data sheet as depth to water (DTW).

When using the interface probe to gauge liquid levels, clamping it to the metal stovepipe or another metal object nearby first grounds the probe. When no ground is available, reproducible measurements can be obtained by clipping the ground lead to the handle of the interface probe case. After grounding the probe, the top of the well casing is fitted with a light filter to insure that sunlight does not interfere with the operation of the probe's optical mechanisms. The probe tip is then lowered into the well and submerged in the groundwater. An oscillating (beeping) tone indicates that the probe is in water. The probe is slowly raised until either the oscillating tone ceases or becomes a solid tone. In either case, this is the depth-to-groundwater (DTW) measurement. The solid tone indicates that floating hydrocarbons are present on top of the groundwater. To determine the thickness of the floating hydrocarbons, the probe is slowly raised until the solid tone ceases. This is the depth-to-floating hydrocarbon (DTFH) measurement. The process of lowering and raising the probe must be repeated several times to insure accurate measurements. DTW and DTFH measurements are recorded in hundredths of feet on the liquid level data sheet. When floating hydrocarbons are found in a well, a bottom-loading product bailer must be lowered partially through the water/liquid hydrocarbon interface to confirm the thickness of floating hydrocarbons on the water surface. This measurement is recorded on the data sheet as liquid hydrocarbon thickness (PT).

In order to avoid cross contamination of wells during the liquid level gauging process, wells are gauged in a clean to dirty order (where this information is available). In addition, any gauging equipment is cleaned with TSP and water and thoroughly rinsed with deionized water before daily use, before gauging another well on a site, and at the completion of daily use.

SOP-10 - SAMPLE LABELING & CHAIN-OF-CUSTODY

To ensure correct analysis and integrity of any sample, correct sample labeling and the accompaniment of a chain-of-custody (COC) form with all samples from the field to the designated analytic laboratory is mandatory. The label of a sample must include, at a minimum, the following items:

- Sample identification number
- Location of sample collection
- Date and time of sample collection
- Name of sampler
- Analysis required

Once this data has been put on the sample container, it must be transferred to the COC. A COC accompanies every shipment of samples and establishes the documentation necessary to trace sample possession, as well as evidence of collection, shipment, laboratory receipt, analysis requested and laboratory custody until the time of disposal. The COC form must include, at a minimum, the following items:

- Sample identification number
- Location of sample collection
- Date and time of sample collection
- Analysis required
- Sample type
- Sample container type
- Preservative used, if any
- Names of all samplers
- Signatures of personnel relinquishing and receiving samples
- Laboratory name and address
- Laboratory sample number and log number (recorded by laboratory personnel)
- Company contact name and project number
- Sample condition and temperature (recorded by laboratory personnel)

Sample transfer and shipment is always accompanied by a COC. The initial preparation of the COC occurs in the office and completed in the field by the personnel collecting the samples. Each sample is assigned a unique identification number that represents the specific sampling location. The identification numbers are entered on the COC accompanied by the requested analysis, preservative used, if any, type of sample collected, and type of sample container. Any special instructions are included here.

If the field personnel deliver the samples to the laboratory, they will at that time sign the COC form and relinquish the samples. At this point, the Quality Control Coordinator, or the representative for the laboratory, will check to make sure all samples are present and note the

condition and integrity of each sample. After all samples have been documented as received by the laboratory personnel, they will sign the COC form and issue the delivering personnel a copy. The laboratory with the analytic data report should also return a copy of the signed COC form.

If the samples are delivered by courier, or other commercial carrier, the container of samples shall be sealed, and a custody tape will be applied to the container to seal it and to signal any tampering with the container. The courier will sign the COC taking ownership of the samples that the samplers have relinquished by also signing the COC. The receipt form the courier will be attached to the COC copy retained by the relinquishing personnel and serve as an extension of the COC.

Any changes to a COC must be initialed and copies of the revised COC must be distributed to all appropriate personnel.