CONESTOGA-ROVERS & ASSOCIATES
5900 Hollis Street, Suite A
Emeryville, California 94608
Telephone: (510) 420-0700 Fax: (510) 420-9170
www.CRAworld.com

TRANSMITTAL

DATE: April 27, 2009

REFERENCE NO.: 312002

PROJECT NAME: **Former Signal Oil Station #20-6145**

ACEHS RO #0454

TO: Mr. Steven Plunkett
Alameda County Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

RECEIVED
9:25 am, Apr 29, 2009
Alameda County
Environmental Health

Please find enclosed:
☐ Draft
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QUANTITY	DESCRIPTION
1	Work Plan For Low Flow Air Sparging Pilot Test And Additional Soil Vapor Sampling

☐ As Requested
☐ For Your Use
☒ For Review and Comment
☐
☐

COMMENTS:
Please contact Charlotte Evans at: 510-420-3351 with any questions or comments.
Thank you.

Copy to: Mr. Ian Robb, Chevron
Mr. Rene Boisvert, Boulevard Equity Group

Completed by: Charlotte Evans
[Please Print]

Signed: CEvans

Filing: **Correspondence File**

Ian Robb
Project Manager
Marketing Business Unit

Chevron Environmental Management Company
6111 Bollinger Canyon Road
San Ramon, CA 94583
Tel (925) 543-2375
Fax (925) 543-2324
irobb@chevron.com

Alameda County Health Care Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Former Signal Oil Station No. 20-6145
800 Center Street
Oakland, CA

I have reviewed the attached work plan dated April 27, 2009.

I agree with the recommendations presented in the referenced work plan. This information in this work plan is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This work plan was prepared by Conestoga Rovers Associates, upon who assistance and advice I have relied.

This letter is submitted pursuant to the requirements of California Water Code Section 13267(b)(1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Sincerely,

Ian Robb
Project Manager

Attachment: Work Plan

WORK PLAN FOR LOW FLOW AIR SPARGING PILOT TEST AND ADDITIONAL SOIL VAPOR SAMPLING

FORMER SIGNAL OIL STATION #20-6145
800 CENTER STREET, OAKLAND, CALIFORNIA
Fuel Leak Case No. RO0454

Prepared For:
Mr. Steven Plunkett
Alameda County Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

Prepared by:
Conestoga-Rovers & Associates

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APRIL 27, 2009
REF. NO. 312002(5)
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WORK PLAN FOR LOW FLOW AIR SPARGING PILOT TEST AND ADDITIONAL SOIL VAPOR SAMPLING

FORMER SIGNAL OIL STATION #20-6145
800 CENTER STREET, OAKLAND, CALIFORNIA
Fuel Leak Case No. RO0454

Charlotte Evans

Andy Chan, P.E. #CH4925

REGISTERED PROFESSIONAL ENGINEER
ANDREW M.H. CHAN
No. CH4925
Exp 6/09
CHEMICAL
STATE OF CALIFORNIA

Prepared by:
Conestoga-Rovers & Associates

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APRIL 27, 2009
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1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) has prepared this *Work Plan for Low Flow Air Sparging (LFAS) Pilot Test and Additional Soil Vapor Sampling* on behalf of Chevron Environmental Management Company (Chevron) for the site referenced above. This work plan is prepared in response to Alameda County Environmental Health Services' (ACEH) letter dated March 16, 2009 requesting that Chevron submit a work plan for a pilot test of LFAS proposed for the site and that Chevron consider the need for additional soil vapor sampling locations (Appendix A). Site background information, the work plan for the LFAS pilot test, and the response to the request to consider additional soil vapor sampling are presented below.

1.2 SITE BACKGROUND

The site is a former Signal Oil gasoline service station located on the northeastern corner of the intersection of 8th street and Center Street in Oakland, California (Figure 1). The site was first developed as a service station in 1932 with four 1,000-gallon fuel underground storage tanks (USTs) and one used oil UST. These USTs were removed in 1973 when the station was closed. The site is currently undeveloped. Both commercial and residential properties are located in the vicinity of the site.

To date, a total of 52 soil borings, 17 groundwater monitoring wells and 6 soil vapor wells have been installed at the site. A chronological summary of activities conducted to date at the site is presented as Appendix B.

1.3 SITE GEOLOGY AND HYDROGEOLOGY

Subsurface lithology consists of medium permeability sand and silty sand to the maximum depth explored of 80 feet below grade (fbg). Silt, with thin clayey silt and silty clay stringers, occur between approximately 50 and 65 fbg. Local topography is relatively flat and the site is about 15 feet above mean sea level.

Groundwater beneath the site has been monitored quarterly since 1997. There are currently eight monitoring wells screened near the top of the water table: four onsite and four offsite. Nine additional wells monitor groundwater at discreet depths from 35 to 40 fbg, 55 to 60 fbg and 70 to 75 fbg. These deeper screened wells have monitored groundwater quarterly since 2007. Historical depth to groundwater in the shallow-screened wells ranges between 2.51 to 12.97 fbg. Shallow groundwater flow beneath the site is consistently toward the southwest. Deeper groundwater flows from southwest to northeast. The nearest surface water body is Oakland inner harbor, located approximately 1 mile south of the site.

2.0 LOW FLOW AIR SPARGING PILOT TEST

2.1 PILOT TEST OBJECTIVES

LFAS is an in-situ groundwater remediation technology involving the injection of air under pressure into a well screened entirely within the saturated zone. LFAS promotes biodegradation by increasing oxygen concentrations in the subsurface, stimulating aerobic biodegradation in the saturated and unsaturated zones. Furthermore, air is injected at a rate sufficiently low to not volatilize hydrocarbons from beneath the groundwater table into the vadose zone. The purpose of the pilot test is to obtain the necessary field data to confirm that LFAS is an appropriate remedial technology for this site.

2.2 PILOT TEST SET-UP

The proposed pilot test set-up will include a network of LFAS wells and piping connecting the wells to an oil-less air compressor for injecting air into the groundwater beneath the south-southeastern portion of the site. CRA will use an appropriately-sized air compressor to inject enough air into the LFAS wells to encourage the growth of hydrocarbon-degrading microorganisms, without stripping the constituents of concern from groundwater into the vapor phase.

2.2.1 LFAS WELLS INSTALLATIONS

CRA proposes installing seven LFAS wells in the south-southeastern portion of the site as shown on Figure 2. The locations and number of wells were chosen based on the area of elevated dissolved phase-hydrocarbons in groundwater and to provide sufficient overlapping coverage. LFAS well installation will comply with CRA's Standard Field Procedures for Remediation Well Installation, as presented in Appendix C. An equipment skid that houses the air compressor and the piping manifold will be located close to the LFAS wells. The piping that conveys the pressurized air between the equipment skid and the LFAS wells will be installed aboveground to easily be reconfigured, if necessary to facilitate site access and development of the property. The well and equipment layout is presented on Figure 2.

Details of each phase of the pilot test are presented as follows:

Permits: A drilling permit will be obtained from the Alameda County Public Works for installation of the LFAS wells.

Health and Safety Plan: A specific health and safety plan will be prepared for all field work. The plan will be reviewed and signed by all site workers and kept onsite at all times.

Utility Clearance: The proposed LFAS well locations will be marked and the locations cleared through Underground Services Alert and a private utility locator.

Well Installation & Construction: Under the supervision of a Registered Professional Geologist, the LFAS wells will be completed using hollow-stem auger equipment and 2-inch diameter Schedule 80 poly vinyl chloride (PVC) casing with a two-foot section screened with 0.01-inch slots followed by a two-foot blank casing. Based on historical soil boring and groundwater monitoring data, the LFAS wells will be installed to approximately 15 feet below grade (fbg). The well annulus will be packed with Lonestar #2/12 sand (or equivalent) from 2 feet below the screen to 1 foot above it, followed by a 2-foot thick bentonite seal and cement grout to grade. A proposed LFAS well construction diagram is presented in Figure 3. Actual well construction details will be based on field conditions observed at the time of drilling. The wells will be covered with a lid that will allow above ground piping but will also secure the well. Well location and top-of-casing elevation will be surveyed by a licensed land surveyor.

Well Development: The wells will be developed no sooner than 48 hours after the wells have been completed. The wells will not be included as part of the monitoring program.

Soil Sampling Protocol: Soil samples will be collected for soil characterization at approximately 5-foot intervals. CRA geologists will log collected soils using the modified Unified Soil Classification System. Based on the amount of previous soil data collected at the site, no soil samples will be sent for analysis, except for disposal purposes.

Waste Disposal: Soil cuttings generated will be placed in DOT drums and labeled appropriately. These wastes will be transported to the appropriate Chevron-approved disposal facility following receipt of analytical profile results.

2.2.2 EQUIPMENT INSTALLATION

Permits: Necessary construction permits will be obtained from the City of Oakland.

Equipment Installation: The LFAS wells will be connected via aboveground 1-inch piping to a central manifold near the air compressor. If utility connections cannot readily be obtained, the air compressor will be powered by a diesel generator. Figure 2 shows a conceptual equipment layout.

2.2.3 PILOT TEST OPERATION

In order to raise the concentration of dissolved-phase oxygen without stripping volatile hydrocarbons from groundwater to be carried into the vadoze zone, the system will inject air into each LFAS well at a relatively low flow rate, between 1 to 2 standard cubic feet per minute (scfm). Injection to each individual LFAS well will be pulsed. Flow channels will be established as a result of air flowing out of each well into groundwater. When the air flow is stopped, groundwater will enter the flow channels and mix with the added air, increasing the dissolved oxygen concentrations of groundwater. This pulsing effect will allow for better mixing of the air into the groundwater. The pulsing durations will be controlled with an automatic timer.

During start-up of the air injection system, air will be injected until dissolved oxygen (DO) readings in adjacent monitoring wells MW-1A and MW-2 reach at least 2 milligrams per liter (mg/L). Once the minimum DO is achieved, CRA will attempt to optimize the system so that higher DO concentrations can be achieved in these wells. These wells will be used to evaluate DO radius of influence for the air injection system.

Optimization and Data Collection: CRA anticipates conducting weekly operation and maintenance (O&M) site visits for the system for the initial 3 month period of the pilot test.

To evaluate the degradation processes within the plume, biological indicators (bioparameter) data will initially be collected from wells MW-3 and MW-4. The bioparameters to be measured will include DO, carbon dioxide, oxidation/reduction potential (ORP), ferrous iron, nitrate (as nitrogen), sulfate, and alkalinity. DO, carbon dioxide and ORP readings will be collected during each O&M visit to evaluate changes in aerobic conditions. The remaining bioparameters will be collected once prior to pilot test startup and once at the end of the first three months of the pilot test to evaluate if natural attenuation is also occurring through anaerobic processes. In addition to the bioparameter data, groundwater concentration trends will be used to evaluate system performance.

System Evaluation: The pilot test will be performed for a minimum period of 3 months. Upon the completion of the first 3 months of operation, the performance of the LFAS system will be evaluated to quantify the effectiveness of LFAS and to determine if additional testing is warranted.

2.3 SCHEDULE

The following proposed schedule is subject to change based on permitting processes, availability of equipment, and grant of access by the property owner. The schedule commences upon approval of this Work Plan:

- Four months for permit procurement, equipment fabrication, well and piping installation, and system commissioning;
- Three months of pilot testing;
- One month to receive and review pilot test analytical data; and
- Two months after receipt of all pilot test analytical data, submittal to ACEH of a report summarizing the pilot test results, including documentation describing field procedures, laboratory results, and boring logs, and recommendations.

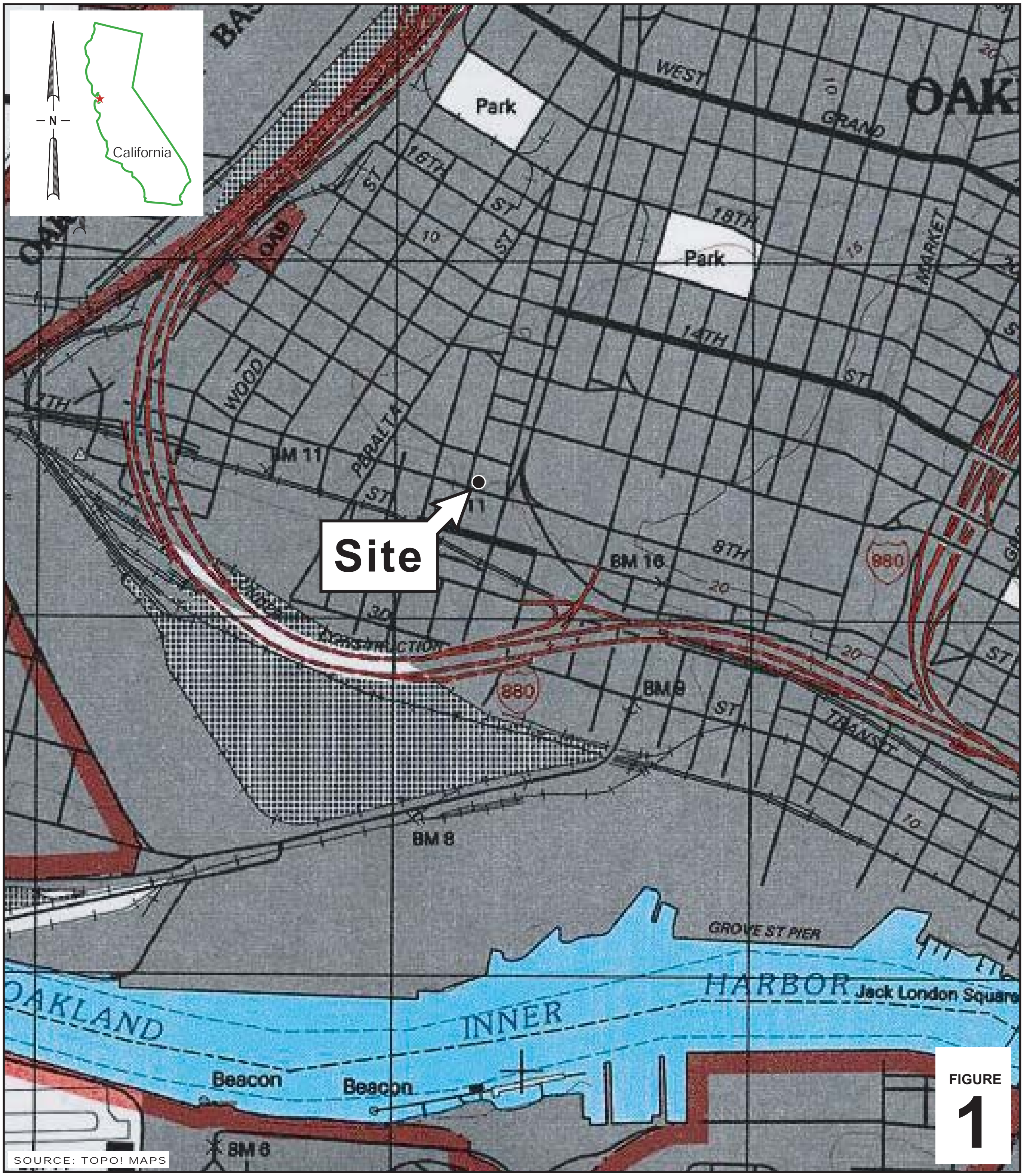
3.0 SOIL VAPOR SAMPLING

ACEH has requested that Chevron give consideration to taking additional soil vapor samples at locations between SW-3 and SW-4. We are unaware of any well designations of "SW-3 and SW-4" onsite, but believe that ACEH is referring to the sample locations of VP-3 and VP-4, in the area of post-excavation confirmation soil sampling with approximately 45 feet separating the vapor wells. As stated in CRA's submittal of October 30, 2008, sample locations were chosen to characterize the site based on the proposed building footprints and available groundwater monitoring data. Vapor wells were installed underneath the proposed building footprints, near groundwater monitoring wells with elevated TPHg and benzene concentrations, and in areas of elevated TPHg and benzene concentrations in soil. This spacing exceeds Department of Toxic Substances Control and California Environmental Protection Agency recommendations that "…soil gas sampling for future residential development should be conducted on a quarter acre spacing,"[1] or one probe for every 10,890 square feet (ft^2). The site is approximately 80 feet by 100 feet (8000 square feet) and 6 probes were installed onsite, with a spacing of approximately 1 probe per 1,335 ft^2. Our spacing is more than sufficient based on state guidances and therefore, it is not necessary for any additional soil vapor sampling locations.

1 Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air, December 15, 2004, revised February 7, 2005.

FIGURES

05/14/07



0 1/8 1/4 1/2 1

SCALE : 1" = 1/4 MILE

I:\SFO-SHARED\CHEVRON\206145 OAKLAND\FIGURES\VICINITY-MAP.AI

Chevron Station No. 206145

800 Center Street

Oakland, California

Vicinity Map

CONESTOGA-ROVERS & ASSOCIATES

NOTES:

EQUIPMENT CONSISTS OF:

1. 7 SPARGE WELLS DRILLED TO APPROXIMATELY 13 FEET BELOW GRADE
2. OILESS AIR COMPRESSOR, 30 CFM @ 15 PSI, INSIDE EQUIPMENT SKID
3. 1" SPARGE PIPING
4. EQUIPMENT SKID. 4 FEET WIDE BY 6 FEET LONG BY 4 FEET HIGH
5. DIESEL POWERED GENERATOR. 4 FEET WIDE BY 8 FEET LONG BY 6 FEET HIGH (IF NEEDED)

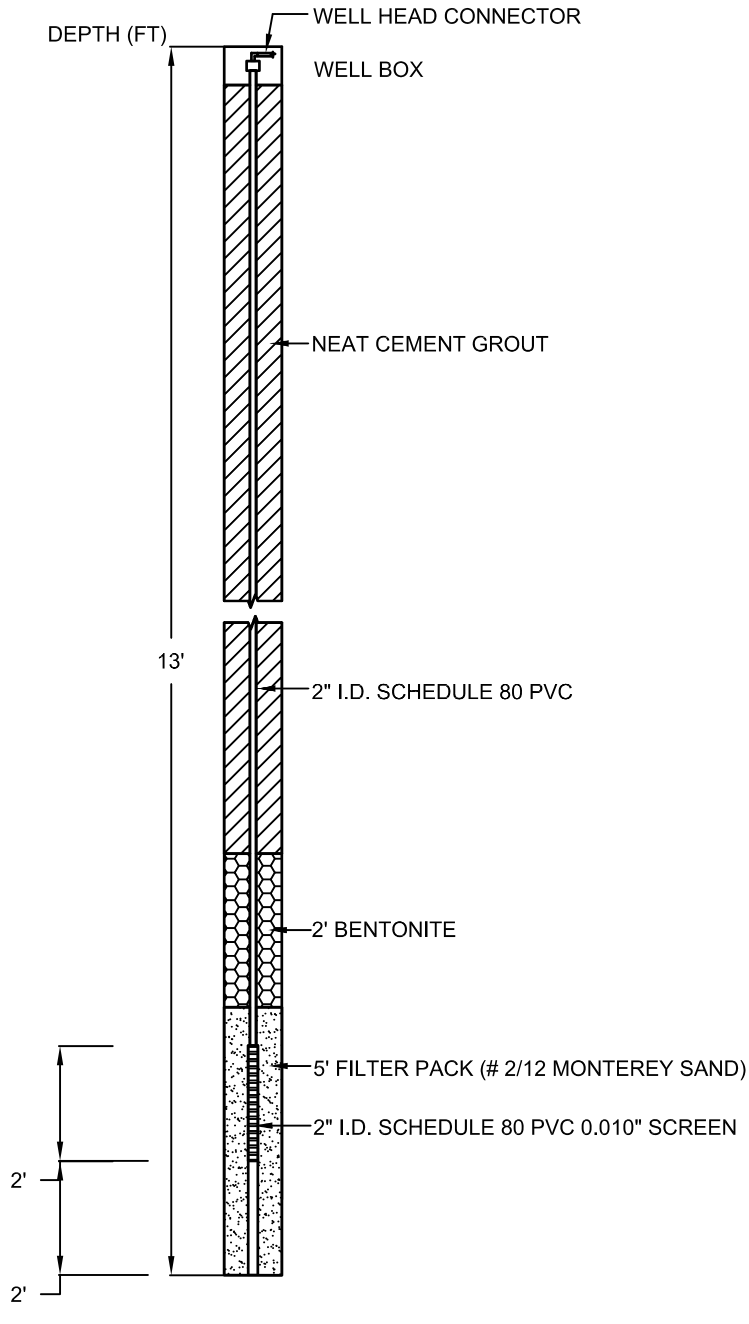
EXPLANATION

MW-9	Deep monitoring well location		Proposed remediation piping
MW-2	Shallow monitoring well location		Proposed air sparge well locations
	Destroyed well location		Air sparge radius of influence
VP-1	Vapor probe location		

FIGURE 2

SITE PLAN and PROPOSED LOW FLOW AIR SPARGE WELL LOCATIONS
FORMER CHEVRON SERVICE STATION 20-6145
800 CENTER STREET
Oakland, California

I:\CHEVRON\206145 OAKLAND\FIGURES\20-6145_SITEPLAN.DWG



NOT TO SCALE

FIGURE 3

PROPOSED SPARGE WELL CONSTRUCTION
FORMER SIGNAL OIL STATION #20-6145
800 CENTER STREET
Oakland, California

CRA

311202-2009-APRIL 6

APPENDIX A

LETTER FROM ALAMEDA COUNTY ENVIRONMENTAL HEALTH SERVICES

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

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

MAR 24 2009
EVANS

March 16, 2009

Mr. Ian Robb
6001 Bollinger Canyon Road K2256 B
PO Box 6012
San Ramon, CA 94583-2324

Mr. Rene Boisvert
Boulevard Equity Group
484 Lake Park Ave #246
Oakland, CA 94610-2730

Terrilla Sadler
618 Brooklyn Avenue
Oakland, CA 94606-1004

Subject: Fuel Leak Case No. RO0000454 (Global ID # T0600102230), Chevron #20-6145/Signal SS, 800 Center Street, Oakland CA 94607

Dear Mr. Robb, Mr. Boisvert and Terrella Sadler:

Alameda County Environmental Health (ACEH) staff has reviewed the case file for the above referenced site and the documents entitled "Soil Vapor Investigation Results" and "Response to Comments" dated November 18, 2008 and October 30, 2008, respectively, and prepared by Conestoga Rovers Associates (CRA). Results from the soil vapor sampling confirm that residual vapor phase contamination above ESLs remains in the vadose zone at concentrations of up to 120,000 µg/m^3 TPHg. CRA has proposed low flow air sparging as a remediation method to mitigate residual contamination in groundwater beneath the site. The proposed remedial method may be effective for the cleanup of residual contamination in groundwater, however the low flow air sparging remedial method will not address residual soil or soil vapor contamination.

Based on ACEH staff review of the case file, we request that you address the following technical comments and send us the reports described below.

TECHNICAL COMMENTS

1. **Corrective Action Plan (CAP) Recommendation for Low Flow Air Sparging.** The CAP proposes low flow air sparging (also known as biosparging) as a remedial method to reduce dissolved phase contamination in groundwater beneath the site. ACEH generally concur with the recommendation for the implementation of the pilot test for low flow air sparging. While low flow air sparging may be effective enhancing biodegradation of groundwater contamination, the proposed remedial method will not address residual contamination in soil or the vapor. Since residential redevelopment is proposed at this site, we request that you consider remediation activities that will also mitigate contamination in both soil and vapor. For that reason, we require that you evaluate other remedial methods that will reduce residual contamination in shallow soil and vapor. Please prepare a revised CAP that addresses remediation in all media including soil and vapor, and submit the revised CAP according to the schedule below.

   Post excavation confirmation sampling completed in November 2002 and soil boring data collected in January 2003 detected high levels of contamination -significantly above residential ESLs- at concentrations of up to 18,000 mg/kg TPHg, 3,400 mg/kg TPHd and 91 mg/kg benzene, 1,000 mg/kg toluene, 480 mg/kg ethylbenzene and 1,900 mg/kg xylenes in soil. It appears that a considerable mass of contaminated soil remains in place beneath the site. Therefore, we request that you evaluate if the residual contamination in all media will pose a risk for the proposed residential redevelopment of the property. Please present the results of your evaluation in the revised CAP requested below.

2. **Groundwater Contamination at Depth.** CRA maintains that remediation of the dissolved phase contamination at depth is not necessary, because groundwater analytical data indicate that contamination at depth has decreased significantly over time. Groundwater analytical data collected in May 2008 did not detect TPHg or benzene above laboratory reporting limits, while dissolved phase TPHd contamination was detected at maximum concentrations of up 120 µg/L. Furthermore, CRA recommends that the monitoring wells should be decommissioned. ACEH concurs that groundwater analytical data indicate that the concentrations of dissolved phase contamination at depth are decreasing. Consequently, you may consider reducing groundwater monitoring in the deeper wells to a semi-annual basis.

3. **Soil Vapor Sampling.** Additional soil vapor sampling competed in October 2008 detected contamination above residential ESLs at concentrations of up to 120,000 $\mu g/m^3$ TPHg. CRA states that the distribution of soil vapor sample points exceeds the recommendations in the December 2004 DTSC "Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air." The vapor points were chosen based on proposed building footprints and vapor points were installed in areas of elevated concentrations of TPHg and benzene in soil and groundwater. Due to the presence of high concentrations of TPHg detected during post excavation confirmation soil sampling we request that you consider additional soil vapor sample locations between to SW-3 and SW-4. Please submit you proposal for additional soil vapor sampling according to the schedule below.

TECHNICAL REPORT REQUEST

Please submit technical reports to Alameda County Environmental Health (Attention: Mr. Steven Plunkett), according to the following schedule:

- **April 27, 2009 –** Work Plan for Pilot Test and additional Soil Vapor Sampling
- **May 24, 2009 –** Revised Draft Corrective Action Plan

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/electronic_submittal/report_rqmts.shtml.

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) 383-1767 or send me an electronic mail message at steven.plunkett@acgov.org.

Sincerely,

Steven Plunkett
Hazardous Materials Specialist

Donna L. Drogos, PE
Supervising Hazardous Materials Specialist

cc: Charlotte Evans
CRA
5900 Hollis Street, Suite A
Emeryville, CA 94608

Leroy Griffin, Oakland Fire Department 250 Frank H. Ogawa Plaza, Ste. 3341, Oakland, CA 94612-2032 (sent via electronic mail to lgriffin@oaklandnet.com)
Donna Drogos, Steven Plunkett, File

APPENDIX B

PREVIOUS ENVIRONMENTAL WORK

SUMMARY OF PREVIOUS ENVIRONMENTAL WORK

***1989 Subsurface Investigation*:** In August 1989, Subsurface Consultants Inc. (Subsurface) advanced soil borings B1 through B5 to depths ranging from 4.5 to 26 feet below grade (fbg) in the vicinity of the former underground storage tanks (USTs), dispenser island, and sumps along the eastern property boundary. Temporary wells were installed in borings B1 and B3. The highest concentrations of total petroleum hydrocarbons as diesel (TPHd), total petroleum hydrocarbons as gasoline (TPHg), and benzene in soil were 14,000 milligrams per kilogram (mg/kg), 31,000 mg/kg, and 500 mg/kg, respectively. A soil sample collected from 3.5 fbg in boring B-5, near the former hydraulic hoist, contained 16,000 mg/kg oil and grease. No TPHd was detected in grab groundwater samples collected from borings B1 and B3. The groundwater sample from boring B3 contained benzene at a concentration of 340 micrograms per liter (µg/L). Additional information available in Subsurface's October 13, 1989 *Preliminary Hydrocarbon Contamination Assessment*.

***1995 Subsurface Investigation*:** In October 1995, Groundwater Technology Inc. (GTI) advanced borings SB-1 through SB-3 to 12 fbg and installed groundwater monitoring wells MW-1 through MW-4 to 15 fbg. The highest detected concentrations of TPHg and benzene in soil were 14,000 mg/kg and 120 mg/kg, respectively. Additional information available in GTI's November 14, 1995 *Additional Site Assessment Report*.

***1996 Subsurface Investigation*:** In March 1996, Pacific Environmental Group (PEG) advanced soil borings P-1 through P-9. The highest detected TPHg and benzene impacts in grab groundwater samples were found in boring P-2, located in Center Street at concentrations of 800,000 mg/kg and 13,000 mg/kg, respectively. The highest detected TPHg and benzene impacts in soil were found in boring P-3 at concentrations of 13,000 mg/kg and 41 mg/kg, respectively. In December 1996, PEG advanced offsite borings MW-5 through MW-8. All borings were converted into groundwater monitoring wells, except boring MW-8, because no evidence of petroleum hydrocarbons was observe in that boring. TPHg and benzene were not detected in any soil sample analyzed as part of this investigation. Additional information available in PEG's April 18, 1996 *Soil and Groundwater Investigation*.

1997 Soil Vapor Sampling: PEG advanced soil vapor points SV-1 through SV-5 to depths up to 12 fbg. The highest concentrations of TPHg and benzene in soil were 8,000 mg/kg and 52 mg/kg, respectively. The highest concentrations of TPHg and benzene in soil vapors were 50,000 µg/L and 65 µg/L, respectively. Hydrocarbon vapor concentrations in soil were highest in the interval between 6 and 10 fbg. Additional information available in PEG's January 24, 1997 *Soil and Groundwater Investigation*.

***1999/2001 Site Demolition*:** Gettler-Ryan, Inc. (G-R) conducted the removal of the dispenser island, sumps, the hydraulic hoist, building foundations, garbage enclosure, yard lights and asphalt. A 1,000-gallon UST, a 550-gallon used oil UST, and a buried 55-gallon drum (apparently a makeshift used oil UST) were encountered. This work was initiated in September 1999 and was postponed until April 2001, while Chevron and the property owner negotiated UST ownership. The 1,000-gallon UST, 550-gallon used oil UST, 55-gallon drum, and the hydraulic hoist were removed and compliance samples were collected and analyzed. The highest TPHg and benzene impacts in soil were found in soil from the former gasoline UST cavity at concentrations of 630 mg/kg and 10 mg/kg, respectively. Additional information available in Delta's May 21, 2001 *Compliance Soil Sampling During Removal of Underground Storage Tanks*.

***2002 Monitoring Well Installation*:** G-R installed groundwater monitoring well MW-8 offsite. No soil samples contained TPHd, TPHg, benzene, or methyl tertiary butyl ether (MTBE). Additional information available in Delta's April 11, 2002 *Monitoring Well Installation Report*.

***2002 Subsurface Investigation*:** G-R advanced soil borings GP-1 through GP-23 to approximately 12 fbg. Soil samples were collected at 5 and 10 fbg in each boring. The results were used to profile soil from the anticipated over-excavation event for landfill acceptance. Boring GP-9, at 10 fbg, contained the highest detected concentrations of TPHg and benzene in soil at 19,000 mg/kg and 83 mg/kg, respectively. The highest detected concentration of MTBE in soil was 170 mg/kg collected from boring GP-14 at 10 fbg. Additional information available in G-R's July 31, 2002 *Soil Borings*.

***2002 Over-excavation*:** G-R over-excavated soil in the areas of the former USTs, dispenser island, hydraulic lift, and sumps to a total depth of approximately 12 fbg, with a maximum depth of 14 fbg in one location, during November 2002. Approximately 1,584 tons of hydrocarbon-impacted soil were removed from the site and transported to Allied Waste Landfill in Manteca, California. Thirty-four confirmation soil samples were collected during the over-excavation. Well MW-1 was destroyed by over-excavation during this event. Prior to backfilling, approximately 900 pounds of oxygen releasing compound was placed in the bottom of the over-excavations, and Class II aggregate base was used for backfill. Additional information available in Delta's January 23, 2003 *Well Destruction, Over-Excavation and Soil Sampling Report*.

***2003 Soil Borings and Well installation*:** Delta Environmental Consultants (Delta) advanced soil borings GP-24 through GP-30 to approximately 16 fbg, with soil samples collected at 5, 10, and 15 fbg. Monitoring well MW-1A was installed near former monitoring well MW-1. The highest detected concentration of TPHd was 1,600 mg/kg collected from both boring GP-27 at 15 fbg and GP-30 at 10 fbg. Boring GP-30, at 10 fbg, contained the highest detected concentrations of TPHg, benzene, and MTBE in soil at 16,000 mg/kg, 92 mg/kg and 150 mg/kg, respectively. Additional information available in Delta's May 15, 2003 *Soil Boring and Well Installation Report*.

2004 Geoprobe and CPT Investigation: In October and November 2004, five CPT borings and nine Geoprobe borings were advanced to further define both lateral and vertical extents of hydrocarbon impacts beneath the site. All borings were conducted onsite except CPT-5 which was located offsite in Center Street. Both soil and grab groundwater samples were collected and analyzed. Vertical definition of hydrocarbons in soil was achieved between 15 and 20 fbg, with minor exceptions of single digit results of TPHg between 25 and 50 fbg. Analytic results of grab groundwater samples showed an unusual vertical profile of hydrocarbons in groundwater. It is surmised that these concentration may result from cross contamination during the boring process. Additional information in Cambria Environmental Technology's January 14, 2005 *Subsurface Investigation Report*.

2007 Well Installation and Subsequent Sampling: CRA installed nine clustered monitoring wells (MW-9 through MW-17) to further define the vertical profile of hydrocarbons beneath the site. Eight wells were screened from 35 to 40 fbg or from 55 to 60 fbg to achieve repeatable depth-discrete groundwater samples. Well MW-17 was screened from 70 to 75 fbg in an attempt to define the maximum depth of the hydrocarbon profile. TPHd concentrations in soil were greatest in MW-17 at 9.5 fbg. TPHg concentrations in soil were greatest at 9.5 fbg in MW-17 but were detected as deep as 49.5 fbg in MW-14. Benzene concentrations in soil were also highest at 7.2 mg/kg in MW-17 at 9.5 fbg. Hydrocarbons were detected in groundwater samples from all of the wells but were in general highest in MW-14 screened from 55-60 fbg. Subsequent groundwater monitoring and sampling events indicated that hydrocarbon concentrations were decreasing in these wells. CRA recommended adding these wells to the current quarterly monitoring and sampling schedule starting fourth quarter 2007. Additional information available in CRA's May 14, 2007 *Well Installation Report* and October 1, 2007 *Third Multi-Level Groundwater Monitoring Report*.

2008 Soil Vapor Probe Installation: On October 25, 2007 CRA installed soil vapor probes VP-1 through VP-6 and on November 6, 2007 collected soil vapor samples to evaluate the potential risk of vapor intrusion to proposed residential housing units. TPHg was detected above reporting limits in VP-1, VP-4 and VP-5. Maximum TPHg concentrations were detected in VP-5 at 2,100,000 micrograms per cubic meter ($\mu g/m^3$). Benzene was not detected above reporting limits in any of the samples. The report concludes that no remediation to lessen soil vapor risks is required based on the lack of carcinogenic constituents detected in soil vapor samples. Additional information available in CRA's January 23, 2008 *Feasibility Study/Corrective Action Plan Addendum*.

2008 Soil Vapor Investigation: On October 3, 2008, CRA re-sampled vapor wells VP-1 and VP-3 through VP-6 to confirm initial analytical results. VP-2 could not be sampled due to water in the tubing. TPHg was detected in VP-4 and VP-5 and was highest in VP-5 at 120,000 micrograms per cubic meter. No carcinogens, including benzene, were detected in any sample. Additional information available in CRA's November 18, 2008 *Soil Vapor Investigation Results*.

APPENDIX C

STANDARD FIELD PROCEDURES FOR REMEDIATION WELL INSTALLATION

Conestoga-Rovers & Associates

STANDARD FIELD PROCEDURES FOR REMEDIATION WELL INSTALLATION

This document presents standard field methods for drilling and sampling soil borings and installing remediation wells. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

SOIL BORING AND SAMPLING

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor or staining, and to collect samples for analysis at a State-certified laboratory. All borings are logged using the Unified Soil Classification System by a trained geologist working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG).

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or push technologies such as the Geoprobe. Prior to drilling, the first 8 ft of the boring are cleared using an air or water knife and vacuum extraction. This minimizes the potential for impacting utilities.

Soil samples are collected at least every five feet to characterize the subsurface sediments and for possible chemical analysis. Additional soil samples are collected near the water table and at lithologic changes. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments at the bottom of the borehole.

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

Sample Analysis

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

Field Screening

One of the remaining tubes is partially emptied leaving about one-third of the soil in the tube. The tube is capped with plastic end caps and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector (PID) measures volatile hydrocarbon vapor concentrations in the tube headspace, extracting the vapor through a slit in the cap. PID measurements are used along with the field observations, odors, stratigraphy and groundwater depth to select soil samples for analysis.

Grouting

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

REMEDIATION WELL INSTALLATION

Well Construction

Remediation wells are commonly installed for multi-phase extraction (MPE), soil vapor extraction (SVE), groundwater extraction (GWE), oxygenation, air sparging (AS), and vapor monitoring (VM). Well depths and screen lengths will vary depending upon several factors including the intended use of the well, groundwater depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines.

Well casing and screen are typically one to four inch diameter flush-threaded Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide. A rinsed and graded sand occupies the annular space between the boring and the well screen to about one to two feet above the well screen. A two foot thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I,II cement. Well-heads are typically connected with remediation piping set in traffic-rated vaults finished flush with the ground surface. Typical well screen intervals for each type of well are described below.

The well top-of-casing elevation is surveyed with respect to mean sea level and the well is surveyed for horizontal location with respect to an onsite or nearby offsite landmark.

MPE Wells: MPE wells are screened in the vadose zone targeting horizons with the highest hydrocarbon concentrations and a few feet into the saturated zone, targeting SPH on or submerged by the water table.

A vacuum is applied to the well casing and/or a ‘stinger’ (a one-inch diameter tube) placed in the well about 1 to 2 feet below the static fluid level. Vacuums can be adjusted to fine tune the performance of the well/system and to optimize the removal of SPH without excessive production of ground water.

SVE Wells: SVE wells are screened in the vadose zone targeting horizons with the highest hydrocarbon concentrations. SVE wells are also occasionally screened as concurrent soil vapor and groundwater extraction wells with screen interval above and below the water table.

GWE Wells: Groundwater extraction wells are typically screened ten to fifteen feet below the first water-bearing zone encountered. The well screen may or may not be screened above the water table depending upon whether the water bearing zone is unconfined or confined.

Oxygenation Wells: Oxygenation wells are installed above or below the water table to supply oxygen and enhance naturally occurring hydrocarbon biodegradation. Oxygenation wells installed in the vadose zone typically have well screens that are two to ten feet long and target horizons with the highest hydrocarbon concentrations. Oxygenation wells installed below the water table typically have a two foot screen interval set ten to fifteen ft below the water table.

AS Wells: Air sparging wells are installed below the water table and typically have a two foot screen interval set ten to fifteen feet below the water table.

VM Wells: Vapor monitoring wells are installed in the vadose zone to check for hydrocarbon vapor migration during air injection. The wells are typically constructed with short screens to target horizons through which hydrocarbon vapor migration could occur. These wells can also be constructed in borings drilled using push technologies such as the Geoprobe by using non-collapsible Teflon tubing set in small sand packed regions overlain by grout.

Well Development

Groundwater extraction wells are generally developed using a combination of groundwater surging and extraction. Surging agitates the groundwater and dislodges fine sediments from the sand pack. After about ten minutes of surging, groundwater is extracted from the well using bailing, pumping and/or reverse air-lifting through an eductor pipe to remove the sediments from the well. Surging and extraction continue until at least ten well-casing volumes of groundwater are extracted and the sediment volume in the groundwater is negligible. This process usually occurs prior to installing the sanitary surface seal to ensure sand pack stabilization. If development occurs after surface seal installation, then development occurs 24 to 72 hours after seal installation to ensure that the Portland cement has set up correctly.

All equipment is steam-cleaned prior to use and air used for air-lifting is filtered to prevent oil entrained in the compressed air from entering the well. Wells that are developed using air-lift evacuation are not sampled until at least 24 hours after they are developed.

Waste Handling and Disposal

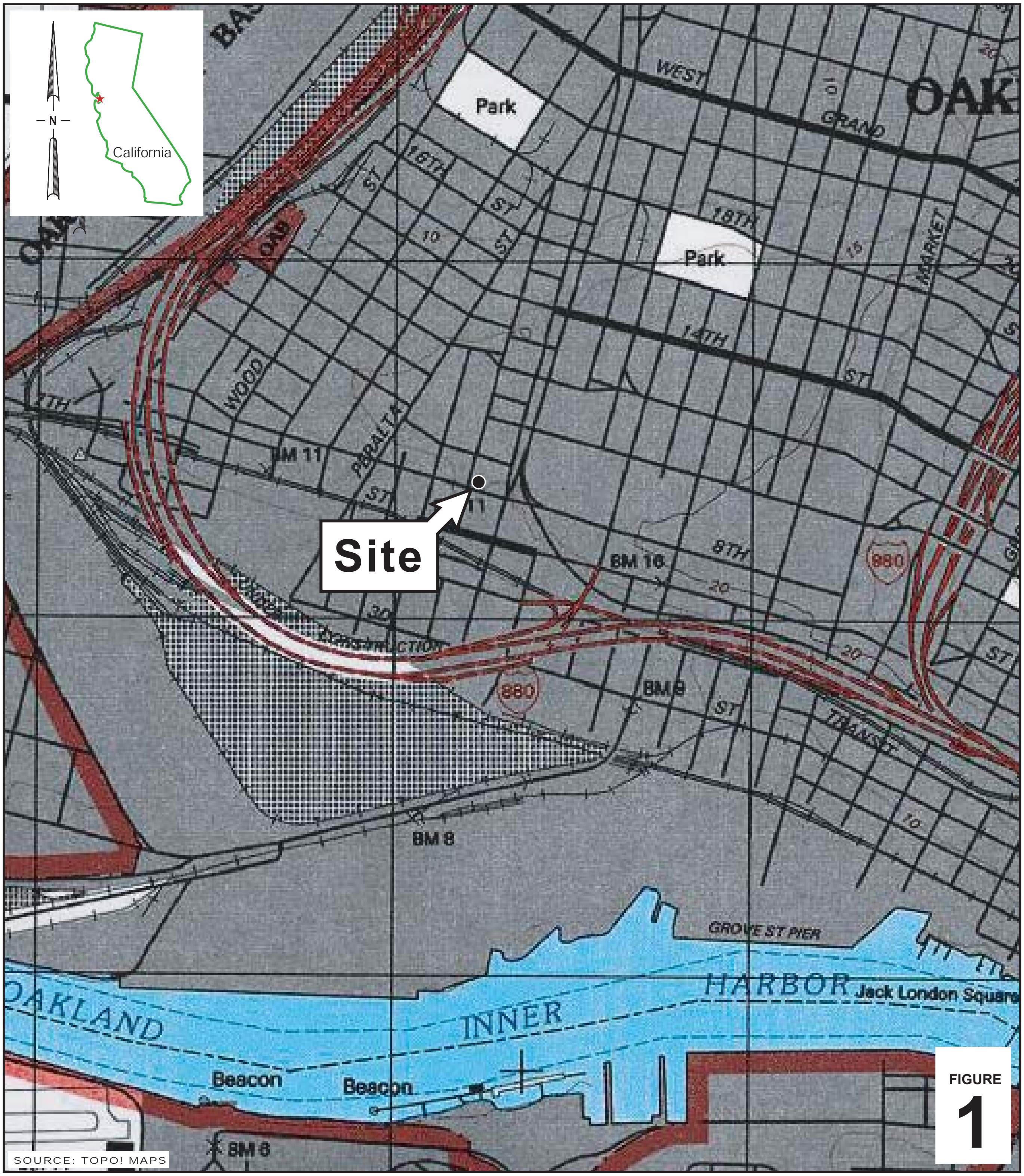
Soil cuttings from drilling activities are usually stockpiled onsite and covered by plastic sheeting. At least three individual soil samples are collected from the stockpiles and composited at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples in addition to any analytes required by the receiving disposal facility. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Groundwater removed during development and sampling is typically stored onsite in sealed 55-gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Upon receipt of analytic results, the water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.

I:\misc\Templates\SOPs\Remediation Well Installation.doc

FIGURES

05/14/07



0 1/8 1/4 1/2 1

SCALE : 1" = 1/4 MILE

I:\VSFO-SHARED\CHEVRON\206145 OAKLAND\FIGURES\VICINITY-MAP.AI

Chevron Station No. 206145

800 Center Street

Oakland, California

Vicinity Map

CONESTOGA-ROVERS & ASSOCIATES

NOTES:

EQUIPMENT CONSISTS OF:

1. 7 SPARGE WELLS DRILLED TO APPROXIMATELY 13 FEET BELOW GRADE
2. OILESS AIR COMPRESSOR, 30 CFM @ 15 PSI, INSIDE EQUIPMENT SKID
3. 1" SPARGE PIPING
4. EQUIPMENT SKID. 4 FEET WIDE BY 6 FEET LONG BY 4 FEET HIGH
5. DIESEL POWERED GENERATOR. 4 FEET WIDE BY 8 FEET LONG BY 6 FEET HIGH (IF NEEDED)

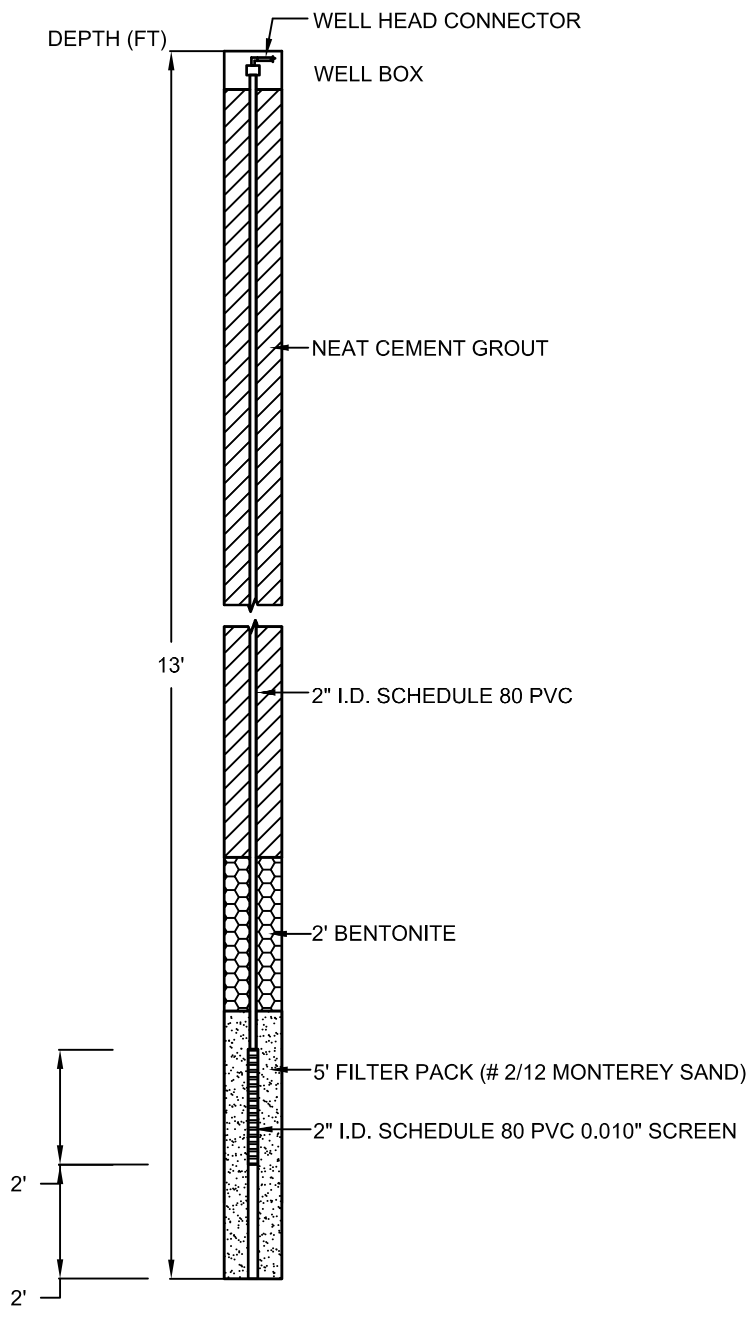
EXPLANATION

MW-9	Deep monitoring well location
MW-2	Shallow monitoring well location
	Destroyed well location
VP-1	Vapor probe location
	Proposed remediation piping
	Proposed air sparge well locations
	Air sparge radius of influence

FIGURE 2

SITE PLAN and PROPOSED LOW FLOW AIR SPARGE WELL LOCATIONS
FORMER CHEVRON SERVICE STATION 20-6145
800 CENTER STREET
Oakland, California

I:\CHEVRON\206145 OAKLAND\FIGURES\20-6145_SITEPLAN.DWG



NOT TO SCALE

FIGURE 3

PROPOSED SPARGE WELL CONSTRUCTION
FORMER SIGNAL OIL STATION #20-6145
800 CENTER STREET
Oakland, California

311202-2009-APRIL 6

APPENDIX A

LETTER FROM ALAMEDA COUNTY ENVIRONMENTAL HEALTH SERVICES

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

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

March 16, 2009

Mr. Ian Robb
6001 Bollinger Canyon Road K2256 B
PO Box 6012
San Ramon, CA 94583-2324

Mr. Rene Boisvert
Boulevard Equity Group
484 Lake Park Ave #246
Oakland, CA 94610-2730

Terrilla Sadler
618 Brooklyn Avenue
Oakland, CA 94606-1004

Subject: Fuel Leak Case No. RO0000454 (Global ID # T0600102230), Chevron #20-6145/Signal SS, 800 Center Street, Oakland CA 94607

Dear Mr. Robb, Mr. Boisvert and Terrella Sadler:

Alameda County Environmental Health (ACEH) staff has reviewed the case file for the above referenced site and the documents entitled "Soil Vapor Investigation Results" and "Response to Comments" dated November 18, 2008 and October 30, 2008, respectively, and prepared by Conestoga Rovers Associates (CRA). Results from the soil vapor sampling confirm that residual vapor phase contamination above ESLs remains in the vadose zone at concentrations of up to 120,000 µg/m^3 TPHg. CRA has proposed low flow air sparging as a remediation method to mitigate residual contamination in groundwater beneath the site. The proposed remedial method may be effective for the cleanup of residual contamination in groundwater, however the low flow air sparging remedial method will not address residual soil or soil vapor contamination.

Based on ACEH staff review of the case file, we request that you address the following technical comments and send us the reports described below.

TECHNICAL COMMENTS

1. **Corrective Action Plan (CAP) Recommendation for Low Flow Air Sparging.** The CAP proposes low flow air sparging (also known as biosparging) as a remedial method to reduce dissolved phase contamination in groundwater beneath the site. ACEH generally concur with the recommendation for the implementation of the pilot test for low flow air sparging. While low flow air sparging may be effective enhancing biodegradation of groundwater contamination, the proposed remedial method will not address residual contamination in soil or the vapor. Since residential redevelopment is proposed at this site, we request that you consider remediation activities that will also mitigate contamination in both soil and vapor. For that reason, we require that you evaluate other remedial methods that will reduce residual contamination in shallow soil and vapor. Please prepare a revised CAP that addresses remediation in all media including soil and vapor, and submit the revised CAP according to the schedule below.

   Post excavation confirmation sampling completed in November 2002 and soil boring data collected in January 2003 detected high levels of contamination -significantly above residential ESLs- at concentrations of up to 18,000 mg/kg TPHg, 3,400 mg/kg TPHd and 91 mg/kg benzene, 1,000 mg/kg toluene, 480 mg/kg ethylbenzene and 1,900 mg/kg xylenes in soil. It appears that a considerable mass of contaminated soil remains in place beneath the site. Therefore, we request that you evaluate if the residual contamination in all media will pose a risk for the proposed residential redevelopment of the property. Please present the results of your evaluation in the revised CAP requested below.

2. **Groundwater Contamination at Depth.** CRA maintains that remediation of the dissolved phase contamination at depth is not necessary, because groundwater analytical data indicate that contamination at depth has decreased significantly over time. Groundwater analytical data collected in May 2008 did not detect TPHg or benzene above laboratory reporting limits, while dissolved phase TPHd contamination was detected at maximum concentrations of up 120 µg/L. Furthermore, CRA recommends that the monitoring wells should be decommissioned. ACEH concurs that groundwater analytical data indicate that the concentrations of dissolved phase contamination at depth are decreasing. Consequently, you may consider reducing groundwater monitoring in the deeper wells to a semi-annual basis.

3. **Soil Vapor Sampling.** Additional soil vapor sampling competed in October 2008 detected contamination above residential ESLs at concentrations of up to 120,000 $\mu g/m^3$ TPHg. CRA states that the distribution of soil vapor sample points exceeds the recommendations in the December 2004 DTSC "Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air." The vapor points were chosen based on proposed building footprints and vapor points were installed in areas of elevated concentrations of TPHg and benzene in soil and groundwater. Due to the presence of high concentrations of TPHg detected during post excavation confirmation soil sampling we request that you consider additional soil vapor sample locations between to SW-3 and SW-4. Please submit you proposal for additional soil vapor sampling according to the schedule below.

TECHNICAL REPORT REQUEST

Please submit technical reports to Alameda County Environmental Health (Attention: Mr. Steven Plunkett), according to the following schedule:

- **April 27, 2009 –** Work Plan for Pilot Test and additional Soil Vapor Sampling
- **May 24, 2009 –** Revised Draft Corrective Action Plan

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/electronic_submittal/report_rqmts.shtml.

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) 383-1767 or send me an electronic mail message at steven.plunkett@acgov.org.

Sincerely,

Steven Plunkett
Hazardous Materials Specialist

Donna L. Drogos, PE
Supervising Hazardous Materials Specialist

cc: Charlotte Evans
CRA
5900 Hollis Street, Suite A
Emeryville, CA 94608

Leroy Griffin, Oakland Fire Department 250 Frank H. Ogawa Plaza, Ste. 3341, Oakland, CA 94612-2032 (sent via electronic mail to lgriffin@oaklandnet.com)
Donna Drogos, Steven Plunkett, File

APPENDIX B

PREVIOUS ENVIRONMENTAL WORK

SUMMARY OF PREVIOUS ENVIRONMENTAL WORK

***1989 Subsurface Investigation*:** In August 1989, Subsurface Consultants Inc. (Subsurface) advanced soil borings B1 through B5 to depths ranging from 4.5 to 26 feet below grade (fbg) in the vicinity of the former underground storage tanks (USTs), dispenser island, and sumps along the eastern property boundary. Temporary wells were installed in borings B1 and B3. The highest concentrations of total petroleum hydrocarbons as diesel (TPHd), total petroleum hydrocarbons as gasoline (TPHg), and benzene in soil were 14,000 milligrams per kilogram (mg/kg), 31,000 mg/kg, and 500 mg/kg, respectively. A soil sample collected from 3.5 fbg in boring B-5, near the former hydraulic hoist, contained 16,000 mg/kg oil and grease. No TPHd was detected in grab groundwater samples collected from borings B1 and B3. The groundwater sample from boring B3 contained benzene at a concentration of 340 micrograms per liter (µg/L). Additional information available in Subsurface's October 13, 1989 *Preliminary Hydrocarbon Contamination Assessment*.

***1995 Subsurface Investigation*:** In October 1995, Groundwater Technology Inc. (GTI) advanced borings SB-1 through SB-3 to 12 fbg and installed groundwater monitoring wells MW-1 through MW-4 to 15 fbg. The highest detected concentrations of TPHg and benzene in soil were 14,000 mg/kg and 120 mg/kg, respectively. Additional information available in GTI's November 14, 1995 *Additional Site Assessment Report*.

***1996 Subsurface Investigation*:** In March 1996, Pacific Environmental Group (PEG) advanced soil borings P-1 through P-9. The highest detected TPHg and benzene impacts in grab groundwater samples were found in boring P-2, located in Center Street at concentrations of 800,000 mg/kg and 13,000 mg/kg, respectively. The highest detected TPHg and benzene impacts in soil were found in boring P-3 at concentrations of 13,000 mg/kg and 41 mg/kg, respectively. In December 1996, PEG advanced offsite borings MW-5 through MW-8. All borings were converted into groundwater monitoring wells, except boring MW-8, because no evidence of petroleum hydrocarbons was observe in that boring. TPHg and benzene were not detected in any soil sample analyzed as part of this investigation. Additional information available in PEG's April 18, 1996 *Soil and Groundwater Investigation*.

1997 Soil Vapor Sampling: PEG advanced soil vapor points SV-1 through SV-5 to depths up to 12 fbg. The highest concentrations of TPHg and benzene in soil were 8,000 mg/kg and 52 mg/kg, respectively. The highest concentrations of TPHg and benzene in soil vapors were 50,000 µg/L and 65 µg/L, respectively. Hydrocarbon vapor concentrations in soil were highest in the interval between 6 and 10 fbg. Additional information available in PEG's January 24, 1997 *Soil and Groundwater Investigation*.

1999/2001 Site Demolition**:** Gettler-Ryan, Inc. (G-R) conducted the removal of the dispenser island, sumps, the hydraulic hoist, building foundations, garbage enclosure, yard lights and asphalt. A 1,000-gallon UST, a 550-gallon used oil UST, and a buried 55-gallon drum (apparently a makeshift used oil UST) were encountered. This work was initiated in September 1999 and was postponed until April 2001, while Chevron and the property owner negotiated UST ownership. The 1,000-gallon UST, 550-gallon used oil UST, 55-gallon drum, and the hydraulic hoist were removed and compliance samples were collected and analyzed. The highest TPHg and benzene impacts in soil were found in soil from the former gasoline UST cavity at concentrations of 630 mg/kg and 10 mg/kg, respectively. Additional information available in Delta's May 21, 2001 *Compliance Soil Sampling During Removal of Underground Storage Tanks*.

2002 Monitoring Well Installation**:** G-R installed groundwater monitoring well MW-8 offsite. No soil samples contained TPHd, TPHg, benzene, or methyl tertiary butyl ether (MTBE). Additional information available in Delta's April 11, 2002 *Monitoring Well Installation Report*.

2002 Subsurface Investigation**:** G-R advanced soil borings GP-1 through GP-23 to approximately 12 fbg. Soil samples were collected at 5 and 10 fbg in each boring. The results were used to profile soil from the anticipated over-excavation event for landfill acceptance. Boring GP-9, at 10 fbg, contained the highest detected concentrations of TPHg and benzene in soil at 19,000 mg/kg and 83 mg/kg, respectively. The highest detected concentration of MTBE in soil was 170 mg/kg collected from boring GP-14 at 10 fbg. Additional information available in G-R's July 31, 2002 *Soil Borings*.

2002 Over-excavation**:** G-R over-excavated soil in the areas of the former USTs, dispenser island, hydraulic lift, and sumps to a total depth of approximately 12 fbg, with a maximum depth of 14 fbg in one location, during November 2002. Approximately 1,584 tons of hydrocarbon-impacted soil were removed from the site and transported to Allied Waste Landfill in Manteca, California. Thirty-four confirmation soil samples were collected during the over-excavation. Well MW-1 was destroyed by over-excavation during this event. Prior to backfilling, approximately 900 pounds of oxygen releasing compound was placed in the bottom of the over-excavations, and Class II aggregate base was used for backfill. Additional information available in Delta's January 23, 2003 *Well Destruction, Over-Excavation and Soil Sampling Report*.

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Conestoga-Rovers & Associates

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Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor or staining, and to collect samples for analysis at a State-certified laboratory. All borings are logged using the Unified Soil Classification System by a trained geologist working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG).

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or push technologies such as the Geoprobe. Prior to drilling, the first 8 ft of the boring are cleared using an air or water knife and vacuum extraction. This minimizes the potential for impacting utilities.

Soil samples are collected at least every five feet to characterize the subsurface sediments and for possible chemical analysis. Additional soil samples are collected near the water table and at lithologic changes. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments at the bottom of the borehole.

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

Sample Analysis

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

Field Screening

One of the remaining tubes is partially emptied leaving about one-third of the soil in the tube. The tube is capped with plastic end caps and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector (PID) measures volatile hydrocarbon vapor concentrations in the tube headspace, extracting the vapor through a slit in the cap. PID measurements are used along with the field observations, odors, stratigraphy and groundwater depth to select soil samples for analysis.

Grouting

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

REMEDIATION WELL INSTALLATION

Well Construction

Remediation wells are commonly installed for multi-phase extraction (MPE), soil vapor extraction (SVE), groundwater extraction (GWE), oxygenation, air sparging (AS), and vapor monitoring (VM). Well depths and screen lengths will vary depending upon several factors including the intended use of the well, groundwater depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines.

Well casing and screen are typically one to four inch diameter flush-threaded Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide. A rinsed and graded sand occupies the annular space between the boring and the well screen to about one to two feet above the well screen. A two foot thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I,II cement. Well-heads are typically connected with remediation piping set in traffic-rated vaults finished flush with the ground surface. Typical well screen intervals for each type of well are described below.

The well top-of-casing elevation is surveyed with respect to mean sea level and the well is surveyed for horizontal location with respect to an onsite or nearby offsite landmark.

MPE Wells: MPE wells are screened in the vadose zone targeting horizons with the highest hydrocarbon concentrations and a few feet into the saturated zone, targeting SPH on or submerged by the water table.

A vacuum is applied to the well casing and/or a ‘stinger’ (a one-inch diameter tube) placed in the well about 1 to 2 feet below the static fluid level. Vacuums can be adjusted to fine tune the performance of the well/system and to optimize the removal of SPH without excessive production of ground water.

SVE Wells: SVE wells are screened in the vadose zone targeting horizons with the highest hydrocarbon concentrations. SVE wells are also occasionally screened as concurrent soil vapor and groundwater extraction wells with screen interval above and below the water table.

GWE Wells: Groundwater extraction wells are typically screened ten to fifteen feet below the first water-bearing zone encountered. The well screen may or may not be screened above the water table depending upon whether the water bearing zone is unconfined or confined.

Oxygenation Wells: Oxygenation wells are installed above or below the water table to supply oxygen and enhance naturally occurring hydrocarbon biodegradation. Oxygenation wells installed in the vadose zone typically have well screens that are two to ten feet long and target horizons with the highest hydrocarbon concentrations. Oxygenation wells installed below the water table typically have a two foot screen interval set ten to fifteen ft below the water table.

AS Wells: Air sparging wells are installed below the water table and typically have a two foot screen interval set ten to fifteen feet below the water table.

VM Wells: Vapor monitoring wells are installed in the vadose zone to check for hydrocarbon vapor migration during air injection. The wells are typically constructed with short screens to target horizons through which hydrocarbon vapor migration could occur. These wells can also be constructed in borings drilled using push technologies such as the Geoprobe by using non-collapsible Teflon tubing set in small sand packed regions overlain by grout.

Well Development

Groundwater extraction wells are generally developed using a combination of groundwater surging and extraction. Surging agitates the groundwater and dislodges fine sediments from the sand pack. After about ten minutes of surging, groundwater is extracted from the well using bailing, pumping and/or reverse air-lifting through an eductor pipe to remove the sediments from the well. Surging and extraction continue until at least ten well-casing volumes of groundwater are extracted and the sediment volume in the groundwater is negligible. This process usually occurs prior to installing the sanitary surface seal to ensure sand pack stabilization. If development occurs after surface seal installation, then development occurs 24 to 72 hours after seal installation to ensure that the Portland cement has set up correctly.

All equipment is steam-cleaned prior to use and air used for air-lifting is filtered to prevent oil entrained in the compressed air from entering the well. Wells that are developed using air-lift evacuation are not sampled until at least 24 hours after they are developed.

Waste Handling and Disposal

Soil cuttings from drilling activities are usually stockpiled onsite and covered by plastic sheeting. At least three individual soil samples are collected from the stockpiles and composited at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples in addition to any analytes required by the receiving disposal facility. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Groundwater removed during development and sampling is typically stored onsite in sealed 55-gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Upon receipt of analytic results, the water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.

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