Chevron

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Alameda County
Environmental Health

Stacie H. Frerichs
Team Lead
Marketing Business Unit

Chevron Environmental Management Company
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Tel (925) 842-9655
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July 16, 2009
(date)

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

Re: Chevron Facility #_9-0517_______

Address: 3900 Piedmont Avenue, Oakland, California________________________

I have reviewed the attached report titled *Work Plan for Additional Investigation*________________________________ and dated July 16, 2009.

I agree with the conclusions and recommendations presented in the referenced report. The information in this report is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by Conestoga-Rovers & Associates, upon whose 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.

Sincerely,

SH Frerichs

Stacie H. Frerichs
Project Manager

Enclosure: Report

CONESTOGA-ROVERS
& ASSOCIATES

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July 16, 2009

Reference No. 611995

Mr. Steven Plunkett
Alameda County Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Re: Work Plan for Additional Site Investigation
Former Chevron Service Station No. 9-0517
3900 Piedmont Avenue
Oakland, California
LOP Case #RO0000138

Dear Mr. Plunkett:

Conestoga-Rovers & Associates (CRA) has prepared this *Work Plan for Additional Site Investigation* for the site referenced above on behalf of Chevron Environmental Management Company (Chevron). CRA previously prepared and submitted to Alameda County Environmental Health (ACEH) the November 24, 2008, *Site Investigation Report* (report) presenting the results of the most recent investigation at the site. The purpose of the investigation was to further evaluate the offsite extent of impacted groundwater. As described in the report, the drilling of four borings was originally proposed; however, only one boring (SB-2) could be completed due to shallow drilling refusal or the presence of numerous underground utilities. Low concentrations of total petroleum hydrocarbons as gasoline (TPHg) (540 micrograms per liter [μg/L]) and methyl tertiary butyl ether (MTBE) (1 μg/L) were detected in the groundwater sample collected from boring SB-2; based on the MTBE detection, at least a portion of the impacted groundwater appeared to be from an offsite source.

A response has not been received from ACEH regarding the findings of the report to date. Therefore, to continue to move the site forward in a timely manner, CRA has prepared this work plan that proposes additional investigation we anticipate will be required for case closure. CRA proposes advancing two additional borings to further evaluate downgradient groundwater quality; and the installation and sampling of three shallow soil vapor wells to evaluate potential vapor intrusion concerns at the site. The site description and background, and the details of the proposed investigation are presented in the following sections.

SITE DESCRIPTION AND BACKGROUND

The site is located on the eastern corner of the intersection of Piedmont Avenue and Montell Street in Oakland, California (Figure 1), and is currently developed with a one-story commercial/office structure and associated parking areas occupied by Prudential Real Estate (Figure 2). Land use in the site vicinity is mixed commercial and residential. The site is bounded by Piedmont Avenue to the northwest, Montell Street to the southwest, an apartment building to the southeast and a restaurant to the northeast.

The site appears to have been occupied by a Chevron service station from at least 1940 until 1978. Based on a facility site plan dated 1940, station facilities at this time consisted of a lubrication building in the eastern corner of the site, two dispenser islands in the western portion of the site along Piedmont Avenue, and a small station building adjacent to the dispensers. A used-oil sump was identified adjacent to the northern corner of the lubrication building. Three underground storage tanks (USTs) were shown on the southwest side of the site along Montell Avenue: a 928-gallon UST identified as "Supreme", a 440-gallon UST identified as "Standard", and a 550-gallon UST identified as "Flight". A facility site plan dated 1955 showed two hydraulic hoists within the lubrication building, and two new dispenser islands along Piedmont Avenue replacing the original ones. The 1955 site plan also showed three different USTs along Montell Avenue replacing the original ones: a 3,000-gallon UST identified as "Custom", a 5,000-gallon UST identified as "Chevron", and a 7,500-gallon UST identified as "Supreme"; a 1,000-gallon used-oil UST was also shown to the northwest of the lubrication building. A facility site plan dated 1971 was similar to the 1955 site plan with the exception that the three USTs were identified as a 3,000-gallon UST containing unleaded gasoline, a 5,700-gallon UST containing leaded gasoline, and a 7,500-gallon UST containing supreme gasoline. The station reportedly was demolished and the four USTs removed in 1978, and the existing commercial building was subsequently constructed. Previous occupants of the building have included Homestead Federal Savings Association (prior to 1993), First Nationwide Bank (1993 through approximately 2000), PCS Smart Mart (2000 until approximately 2003), and Cingular Wireless. Former station facilities are shown on Figure 2.

Environmental work has been performed at the site since 1993. To date, four monitoring wells (MW-1 through MW-4) have been installed and nine exploratory borings (FMBO-1 through FMBO-8, and SB-2) have been drilled both on and offsite. Offsite wells MW-3 and MW-4 are currently monitored and sampled on a semi-annual basis; sampling of onsite wells MW-1 and MW-2 was recently discontinued with ACEH approval. A summary of previous environmental work performed at the site is included as Attachment A. The approximate well and boring locations are shown on Figure 2.

SITE GEOLOGY AND HYDROGEOLOGY

This site is located at the western edge of the Piedmont Hills, approximately 2 miles east of San Francisco Bay and 1 mile north of Lake Merritt. Soil in the site area is Late Pleistocene alluvium consisting of weakly consolidated, slightly weathered, poorly sorted, irregularly interbedded clay, silt, sand and gravel. Based on previous investigations, the site is underlain by interbedded layers of clay, silt, and clayey gravel to the maximum depth of exploration (24 feet below grade [fbg]). Coarser-grained materials including clayey gravel and sandy to gravelly silt were generally encountered just below the ground surface. These materials extended to depths of 4 to 15.5 fbg and were underlain by clay and sandy clay. The nearest surface water body is Glen Echo Creek located approximately 400 feet east-southeast of the site.

The depth to groundwater in the site wells has varied from approximately 4.5 to 13 feet below top of casing (TOC). The groundwater flow direction is generally to the west-northwest. A groundwater rose diagram is presented on Figure 2.

PROPOSED SCOPE OF WORK

To further evaluate downgradient groundwater quality, CRA proposes to advance two additional borings to groundwater and collect groundwater samples using a Hydropunch sampling device. To evaluate shallow soil vapor quality, CRA proposes to install and sample three soil vapor wells at the site. The proposed borings and vapor well locations are shown on Figure 2. The details of the proposed investigation are presented below.

Permits and Access Agreements: CRA will obtain all necessary permits and access agreements for the proposed wells and borings prior to beginning field operations. A minimum of 72 hours written notification will be given to ACEH before initiation of drilling activities.

Site Health and Safety Plan: CRA will prepare a site health and safety plan (HASP) to inform site workers of known hazards and to provide health and safety guidance. The plan will be reviewed and signed by all site workers and visitors, and will be kept onsite during field activities.

Underground Utility Clearance: The proposed boring locations will be marked at least 48 hours prior to the start of drilling activities and Underground Service Alert (USA) will be notified to clear the proposed boring locations with local public utility companies. A private utility locator will also be retained to additionally clear the boring locations of utility lines prior to drilling.

Drilling: The two downgradient borings will first be advanced to approximately 8 fbg using a hand auger and/or air-knife to confirm utility clearance in accordance with Chevron and CRA safety protocols. The borings will then be advanced to a total depth of approximately 20 to 25 fbg using a truck-mounted drill rig equipped with direct-push technology. The depth to groundwater is anticipated to be between 15 and 20 fbg. The three vapor well borings will be advanced to a total depth of approximately 6 fbg using a 3-inch diameter hand auger in accordance with Chevron and CRA safety protocols. The final locations and depths of the borings will be based on field conditions. CRA's standard field procedures for hand-auger and direct-push borings are included as Attachment B.

Soil Sampling: Soil samples will be continuously collected from the borings (above 6 to 8 fbg) for logging and observation purposes. *The soil encountered in the* borings will be logged in accordance with the modified Unified Soil Classification System (USCS). Soil samples from each boring will be screened in the field for volatile organic vapors using a photo-ionization detector (PID). Samples that return PID readings of 100 parts per million by volume (ppmv) or greater, or those that have evidence of impact, may be retained for laboratory analysis. We do not anticipate the collection of any soil samples for laboratory analysis from the two downgradient borings. If no evidence of impact is observed in the three vapor well borings, a soil sample collected between 5 and 6 fbg from each boring will be submitted for analysis.

Soil samples retained for laboratory analysis will be collected in brass or stainless steel liners, capped using Teflon tape and plastic end caps, labeled, placed in an ice-chilled cooler, and transported under chain of custody to Lancaster Laboratories, Inc. (Lancaster) in Lancaster, Pennsylvania, for analysis. The soil samples will be analyzed for the following constituents:

- TPHg by EPA Method 8015B
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) and MTBE by EPA Method 8260B

Groundwater Sampling and Laboratory Analysis: If encountered, groundwater samples will be collected from the downgradient borings using a Hydropunch sampling device. The Hydropunch consists of a stainless steel probe with an expendable drive point and an internal screen that will be hydraulically driven to the desired depth following utility clearance to 8 fbg. When the desired depth is reached, the probe will be retracted to expose the internal screen and allow for the infiltration of groundwater. Groundwater samples will then be collected through the inside of the drill rods using low-flow sampling techniques. Low-flow sampling will be utilized to minimize the potential for elevated false-positive analytical results. Sampling will be conducted with a peristaltic pump. After the water level has stabilized in each boring, a clean, unused sampling tube will be lowered into the drill rods so that the bottom of the tubing is at the approximate mid-point of the water column. Groundwater in each boring will be purged at a low flow rate, and monitored using a multi-meter and flow-through cell. Purged water will be monitored for temperature, pH, and conductivity, at a minimum. Purging will continue until groundwater parameters have stabilized (within 10%). At that point, the flow-through cell will be disconnected and groundwater samples will be collected. CRA's standard field procedures for groundwater sampling are included in Attachment B.

The groundwater samples will be collected in the appropriate laboratory-supplied containers and transported under chain-of-custody to Lancaster for analysis. The groundwater samples will be analyzed for the same constituents as the soil samples.

Soil Vapor Well Installation: The three onsite borings will be completed as soil vapor wells if the encountered soil in each boring appears to be sufficiently permeable to obtain reliable results. It is not appropriate to sample soil vapor from soil with high fines and clay content, because the flow of vapor in fine-grained soil is limited and evaluation of inhalation risk is not reliable. If the encountered soil appears sufficiently permeable, then vapor wells will be constructed in the borings.

The soil vapor wells will be constructed in general accordance with CRA's standard field procedures (Attachment B). One-quarter inch diameter Nylaflow® tubing will be fitted with a 6-inch-long section of 0.010-inch slotted, Schedule 40 PVC screen. The tubing and screen will be placed into each open borehole with the bottom of the screen at approximately 5.5 fbg. Washed No. 2/16 silica sand will be placed from 5 to 6 fbg to create a filter pack around the screen. A 3-inch layer of dry granular bentonite will be placed on top of the sand pack followed by hydrated bentonite powder (gel) to a few inches below the ground surface. The tubing exiting the bentonite will be capped, and well boxes with traffic-rated well vaults will be installed. A schematic diagram of the soil vapor well construction is presented on Figure A of Attachment B.

Soil Vapor Sampling and Laboratory Analysis: Soil vapor samples will be collected from the vapor wells in 1-liter SUMMA™ canisters for laboratory analysis. The samples will be collected in general accordance with the Department of Toxic Substances Control (DTSC) *Advisory-Active Soil Gas Investigations* guidance document dated January 28, 2003. A generalized schematic of the soil vapor sampling apparatus is presented on Figure B of Attachment B. CRA's standard field procedures for soil vapor well installation and sampling are included in Attachment B. The samples will be collected no sooner than 72 hours after well installation to allow adequate equilibration time.

At least one field duplicate sample per day will also be collected. In accordance with the DTSC guidance, leak testing will be performed during sampling. Helium will be used as a leak check compound to evaluate if significant ambient air is entering the SUMMA™ canisters during sampling. Field application of helium will be accomplished through using a containment structure (i.e. a clear, large volume Rubbermaid® or Tupperware® storage container) placed inverted over the entire well and sampling apparatus. Additionally, the samples will be analyzed for oxygen (O_2), carbon dioxide (CO_2), and methane (CH_4) to further evaluate the data quality.

The soil vapor samples will be kept at ambient temperature and submitted under chain-of-custody to Air Toxics Ltd. in Folsom, California for analysis. The samples will be analyzed for the following constituents:

- TPHg by EPA Method TO-3
- BTEX and MTBE by EPA Method TO-15
- Helium, O_2, CO_2, and CH_4 by ASTM D-1946

Soil and Water Disposal: Soil cuttings and decontamination rinsate generated during field activities will be temporarily stored onsite in 55-gallon steel drums and sampled for disposal purposes. Once profiled, the drums will be transported to a Chevron-approved facility for disposal.

Reporting: After receipt of the analytical results, CRA will prepare an investigation report that includes the following:

- A description of field activities
- A Figure illustrating the vapor well and boring locations
- Boring logs and soil vapor well construction diagrams
- Tabulated analytical results
- Analytical reports and chain-of-custody forms
- Our conclusions and recommendations.

SCHEDULE AND CLOSING

Upon concurrence from ACEH, or 60 days following submittal of this work plan, CRA will implement the proposed investigation. We will submit our investigation report approximately six weeks after completion of field activities.

We appreciate your assistance on this project and look forward to your reply. Please contact Mr. James Kiernan at (916) 751-4102 if you have any questions or require any additional information.

Sincerely,

CONESTOGA-ROVERS & ASSOCIATES

Christopher J. Benedict

James P. Kiernan, P.E. #C68498

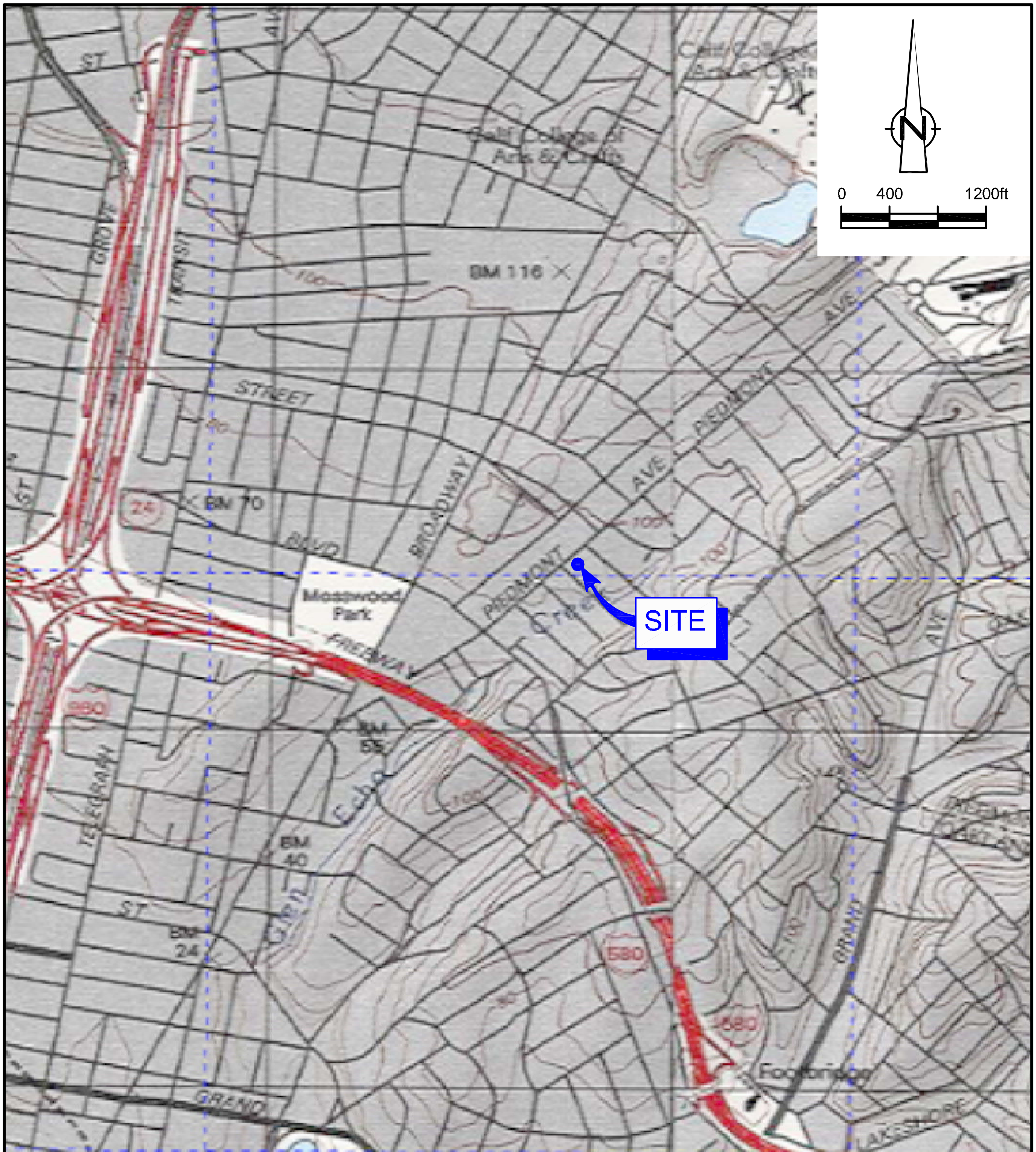
REGISTERED PROFESSIONAL ENGINEER
JAMES P. KIERNAN
No. 68498
Exp. 9/30/09
CIVIL
STATE OF CALIFORNIA

CB/kw/4
Encl.

Figure 1	Vicinity Map
Figure 2	Site Plan
Attachment A	Summary of Previous Environmental Work
Attachment B	Standard Field Procedures

cc: Ms. Stacie Frerichs, Chevron Environmental Management Company
Mr. Neil B. and Mrs. Diane C. Goodhue

FIGURES



SOURCE: TOPO! MAPS.

figure 1

VICINITY MAP
FORMER CHEVRON SERVICE 9-0517
3900 PIEDMONT AVENUE
Oakland, California

611995-203(004)GN-WA001 JUN 23/2009

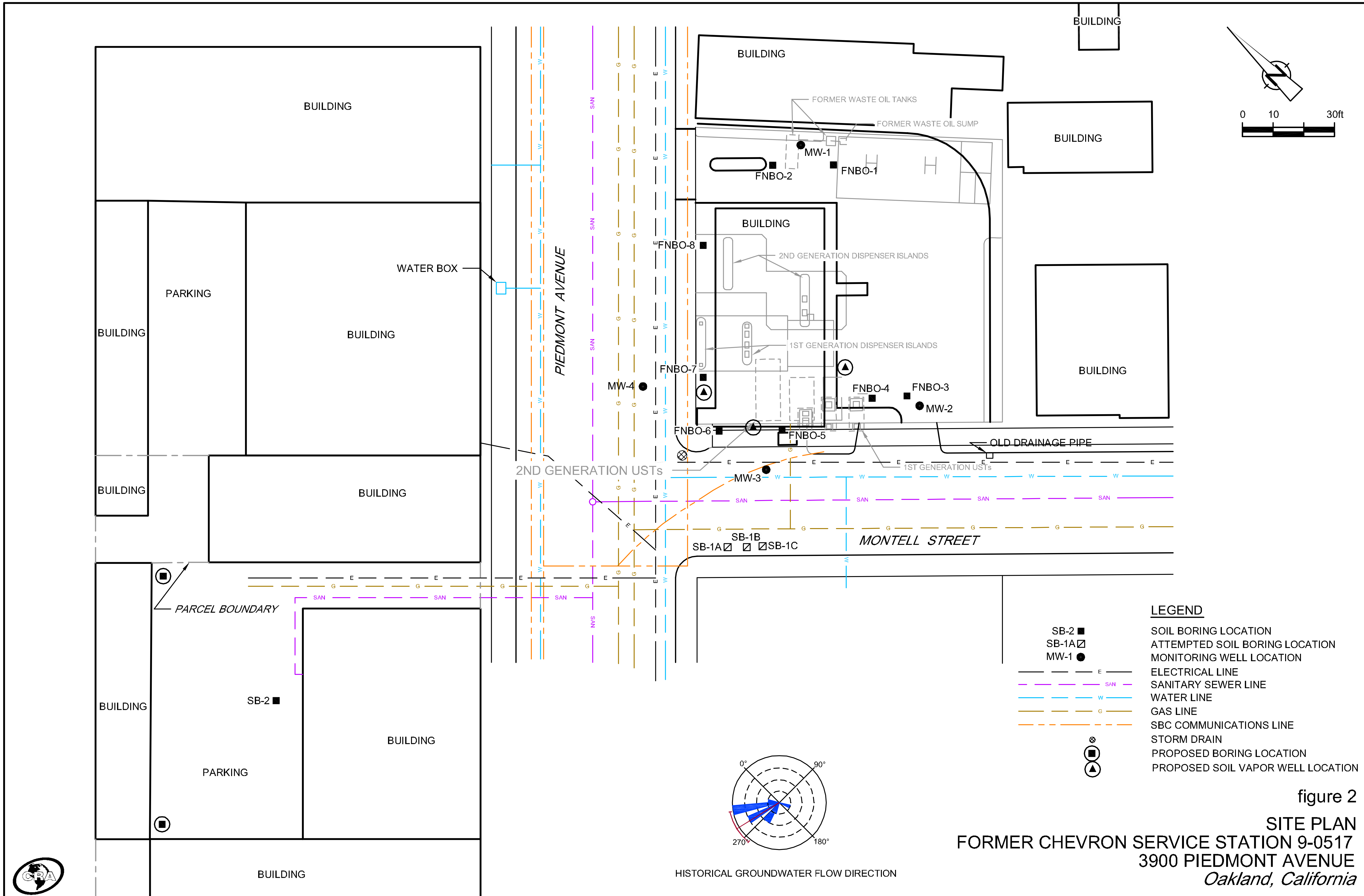


figure 2

SITE PLAN

FORMER CHEVRON SERVICE STATION 9-0517

3900 PIEDMONT AVENUE

Oakland, California

611995-203(004)GN-WA002 JUL 13/2009

ATTACHMENT A

SUMMARY OF PREVIOUS ENVIRONMENTAL WORK

SUMMARY OF PREVIOUS ENVIRONMENTAL WORK

1993 Phase I Environmental Site Assessment: In May 1993, Augeas Corporation (Augeas) conducted a Phase I environmental site assessment of the site. The results indicated that Chevron owned the property from at least 1940 through 1979. The site was utilized as a Chevron service station until approximately 1978. At least four underground storage tanks (USTs) were present at the site based on a site plan dated 1955. These USTs included two used-oil USTs along the northeastern site boundary, a 7,500-gallon fuel UST, and at least one other UST (size and contents unknown) located further to the east (along Montell Street). A copy of an Oakland Fire Prevention Bureau permit (dated October 1978) to remove four USTs (7,500-, 5,000-, and 3,000-gallon gasoline USTs, and a 1,000-gallon waste-oil UST) from the site as the station was to be demolished was found during the investigation. The permit noted that the USTs were located 25 feet east of Piedmont Avenue. No information regarding the condition of the tanks upon removal and the underlying soil quality was available. Details of the assessment were presented in Augeas' *Phase I Assessment Report* dated May 1993.

1993 Phase II Environmental Site Assessment: In October 1993, Environmental and Science Engineering, Inc. (ESE) advanced eight exploratory borings (FNBO-1 through FNBO-8) to evaluate petroleum hydrocarbon impact to soil and groundwater beneath the site. A total of 11 soil samples were collected from the borings at various depths between 6 and 11 feet below grade (fbg) and analyzed for total petroleum hydrocarbons as gasoline (TPHg) and diesel (TPHd), and benzene, toluene, ethylbenzene, and xylenes (BTEX). TPHg was detected in eight of the soil samples at concentrations ranging from 1.4 to 3,400 milligrams per kilogram (mg/kg). The maximum TPHg concentration in soil was detected in the sample collected at 6 fbg from boring FNBO-5 located immediately downgradient of the former USTs. Benzene was only detected in two of the samples at concentrations of 0.03 mg/kg and 1 mg/kg. Concentrations of toluene, ethylbenzene, and xylenes (up to 19 mg/kg) were also detected in several of the samples. Five of the soil samples were additionally analyzed for total recoverable petroleum hydrocarbons (TRPH) and volatile organic compounds (VOCs). TRPH was detected in all five of the samples at concentrations ranging from 10 to 350 mg/kg; VOCs were not detected in the five samples. A groundwater sample was also collected from boring FNBO-6 located in the southwest corner of the site and analyzed for TPHg, BTEX, TRPH, and VOCs; TPHg (7,800 micrograms per liter [μg/L]), benzene (7.7 μg/L), toluene (21 μg/L), ethylbenzene (260 μg/L), xylenes (260 μg/L), and TRPH (2,800 μg/L) were detected in the sample. VOCs generally were not detected in the groundwater sample with the exception of acetone and carbon disulfide at 30 μg/L and 33 μg/L, respectively. Details of the investigation were presented in ESE's *Phase II Environmental Site Assessment* dated November 15, 1993.

1998 Monitoring Well Installation: In July 1998, Gettler-Ryan Inc. (G-R) installed two onsite (MW-1 and MW-2) and two offsite (MW-3 and MW-4) groundwater monitoring wells to further evaluate soil and groundwater quality at the site. The wells were installed to 20 fbg and groundwater was encountered in the well borings at depths of approximately 10 to 12 fbg. Soil samples were collected at depths of 6, 10.5 or 11, and 16 fbg from the well borings and analyzed for TPHg, BTEX, and methyl tertiary butyl ether

(MTBE). TPHg and BTEX generally were not detected in the soil samples with the exception of BTEX (up to 0.01 mg/kg) in the sample collected at 6 fbg from boring MW-2, and TPHg (80 mg/kg) and BTEX (up to 5.8 mg/kg) in the sample collected at 11 fbg from boring MW-4. MTBE was not detected in any of the soil samples. The results of the investigation were presented in G-R's *Monitoring Well Installation Report* dated September 17, 1998.

2002 Well Search, Utility Survey, and Risk-Based Corrective Action (RBCA) Evaluation: In May 2002, Delta Environmental Consultants, Inc. (Delta) performed a well search, utility survey, and RBCA evaluation for the site. The well search consisted of a review of Alameda County Public Works Agency (ACPWA) files to evaluate the presence of any water-supply wells in the vicinity of the plume. No water-supply wells were identified in the vicinity of the plume; the nearest well was an irrigation well located approximately 750 feet northeast (upgradient) of the site. The utility survey determined that the sewer lines adjacent to the site were approximately 12 to 13 fbg. The specific burial depths of water, gas, and electrical lines were not available, but these lines usually were buried less than 5 fbg. Based on this information, and the historic depth to groundwater, it was concluded that the utility trenches in the site vicinity did not appear to be acting as preferential pathways. The results of the RBCA evaluation indicated that the potential risk to future residential receptors due to residual contamination at the site was within acceptable levels, and no further work was warranted. The results of the investigation were presented in Delta's *Well Search/Utility Survey/Risk-Based Corrective Action Evaluation* dated May 3, 2002.

2008 Subsurface Investigation: In July 2008, Conestoga-Rovers & Associates (CRA) advanced one offsite exploratory boring (SB-2) to further evaluate downgradient soil and groundwater quality. Three attempts were also made to advance a boring in Montell Street; however, the boring could not be completed due to subsurface impediments. The boring was advanced to 24 fbg and groundwater was encountered at approximately 18 fbg. Soil samples were collected at depths of 5, 10, 15, and 20 fbg and analyzed for TPHg, BTEX, MTBE di-isopropyl ether (DIPE), ethyl tertiary butyl ether (ETBE), tertiary amyl methyl ether (TAME), tertiary butyl alcohol (TBA), 1,2-dichloroethane (1,2-DCA), and 1,2-dibromoethane (EDB). None of the analytes were detected in any of the soil samples. A groundwater sample was also collected from the boring and analyzed for the same constituents as the soil samples. Only TPHg (540 μg/L) and MTBE (1 μg/L) were detected in the groundwater sample. The results of the investigation were presented in CRA's *Site Investigation Report* dated November 24, 2008.

ATTACHMENT B

STANDARD FIELD PROCEDURES

Conestoga-Rovers & Associates

STANDARD FIELD PROCEDURES FOR HAND-AUGER SOIL BORINGS

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

Objectives

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

Soil Classification/Logging

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

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

Soil Boring and Sampling

Hand-auger borings are typically drilled using a hand-held bucket auger to remove soil to the desired sampling depth. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments beyond the bottom of the augered hole. The vertical location of each soil sample is determined using a tape measure. All sample depths use the ground surface immediately adjacent to the boring as a datum. The horizontal location of each boring is measured in the field from an onsite permanent reference using a measuring wheel or tape measure.

Augering 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 Storage, Handling and Transport

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under 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 ground water depth to select soil samples for analysis.

Water Sampling

Water samples, if they are collected from the boring, are collected from the open borehole using bailers. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4^{o}C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

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

Grouting

The borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Waste Handling and Disposal

Soil cuttings from drilling activities are usually stockpiled onsite on top of and covered by plastic sheeting. At least four individual soil samples are collected from the stockpiles for later compositing at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Ground water removed during sampling and/or rinsate generated during decontamination procedures are 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. Disposal of the water is based on the analytic results for the well samples. 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\Hand Auger Borings.doc

Conestoga-Rovers & Associates

STANDARD FIELD PROCEDURES FOR SOIL VAPOR PROBE INSTALLATION AND SAMPLING

VAPOR POINT METHODS

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

Objectives

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

Shallow Soil Vapor Point Installation

The shallow soil vapor point method for soil vapor sampling utilizes a hand auger or drill rig to advance a boring for the installation of a soil vapor sampling point. Once the boring is hand augered to the final depth, a probe, connected with Swagelok fittings to nylon or Teflon tubing of ¼-inch outer-diameter, is placed within 12-inches of number 2/16 filter sand (Figure A). A 12-inch layer of dry granular bentonite is placed on top of the filter pack. Pre-hydrated granular bentonite is then poured to fill the borehole. The tube is coiled and placed within a wellbox finished flush to the surface. Soil vapor samples will be collected no sooner than 48 hours after installation of the soil vapor points to allow adequate time for representative soil vapors to accumulate. Soil vapor sample collection will not be scheduled until after a minimum of three consecutive precipitation-free days and irrigation onsite has ceased. Figure B shows the soil vapor sampling apparatus. A measured volume of air will be purged from the tubing using a different Summa purge canister. Immediately after purging, soil vapor samples will be collected using the appropriate size Summa canister with attached flow regulator and sediment filter. The soil vapor points will be preserved until they are no longer needed for risk evaluation purposes. At that time, they will be destroyed by extracting the tubing, hand augering to remove the sand and bentonite, and backfilling the boring with neat cement. The boring will be patched with asphalt or concrete, as appropriate.

Sampling of Soil Vapor Points

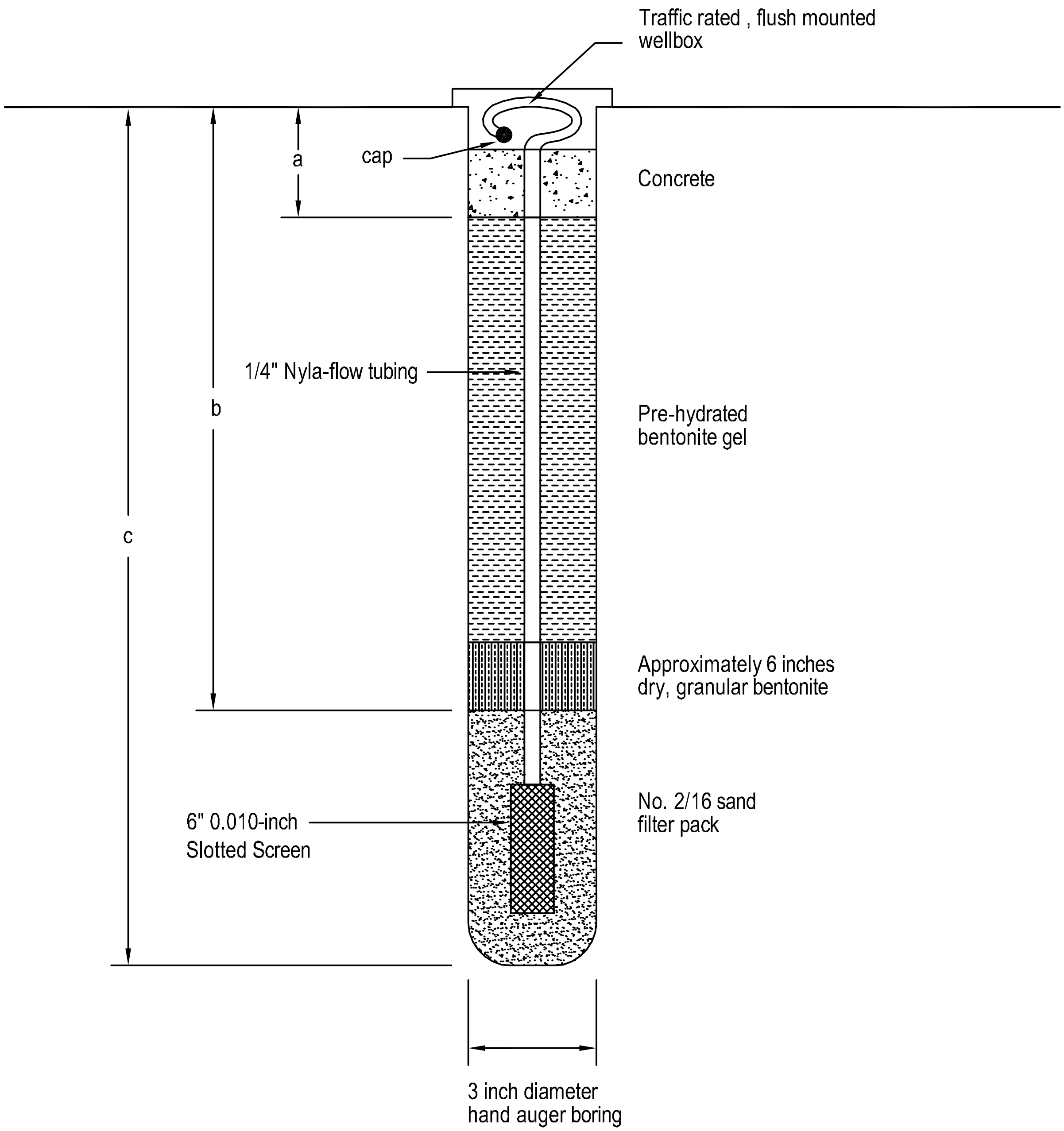
Samples will be collected using a SUMMA™ canister connected to sampling tubing at each vapor point. Prior to collecting soil vapor samples, the initial vacuum of the canisters is measured and recorded on the chain-of-custody. The vacuum of the SUMMA™ canister is used to draw the soil vapor through the flow controller until a negative pressure of approximately 5-inches of Hg is observed on the vacuum gauge and recorded on the chain-of-custody. The flow controllers should be set to 100-200 ml/minute. Field duplicates should be collected for every day of sampling and/or for every 10 samples collected.

Prior to sample collection, stagnant air in the sampling apparatus should be removed by purging approximately 3 purge volumes. The purge volume is defined as the amount of air within the probe and tubing.

In accordance with the DTSC Advisory-Active Soil Gas Investigations guidance document, dated January 28, 2003, leak testing needs to be performed during sampling. Helium is recommended, although shaving cream is acceptable.

Vapor Sample Storage, Handling, and Transport

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



Schematic Not to Scale

figure A

SOIL VAPOR POINT

CRA

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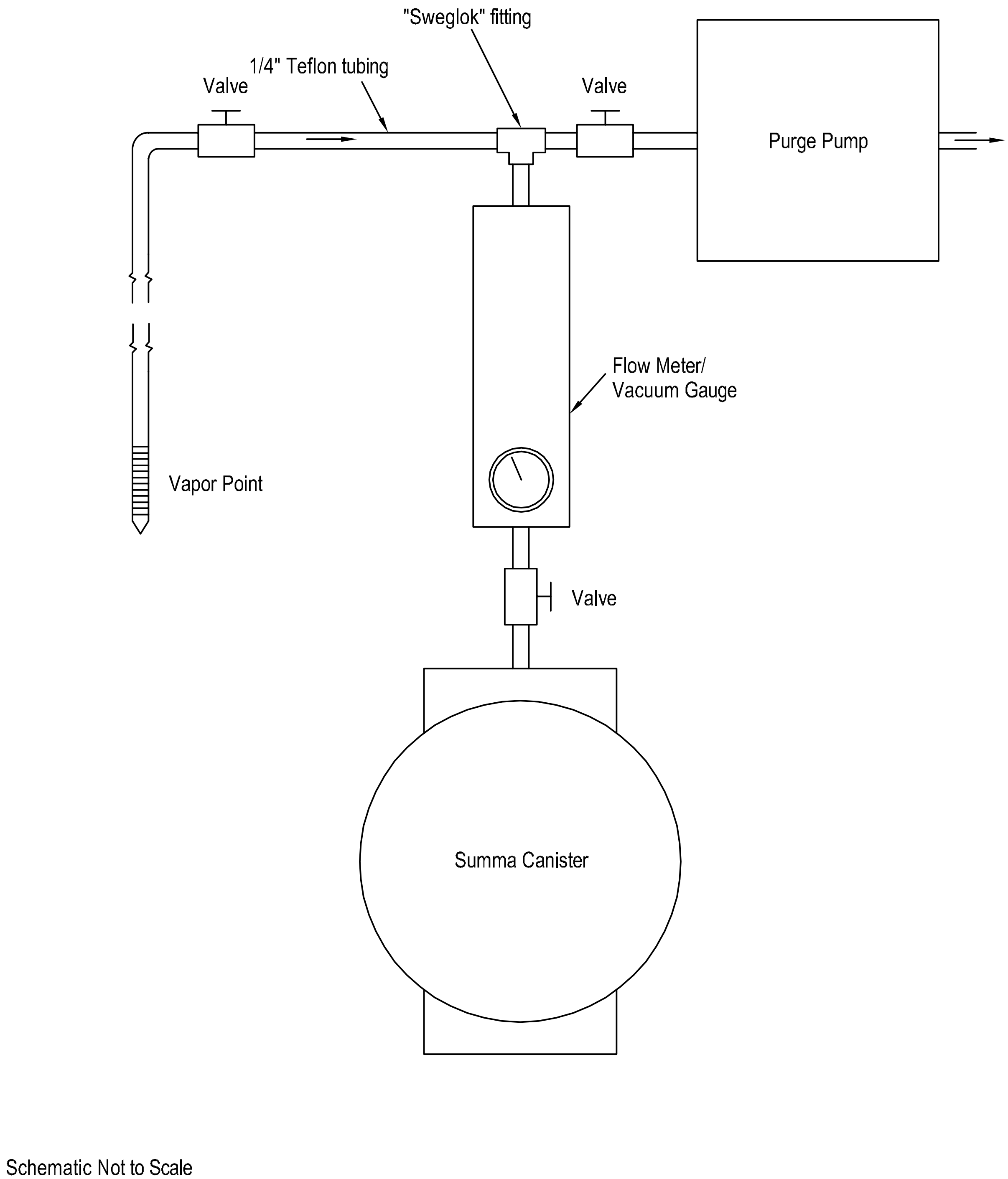

figure B

SOIL VAPOR SAMPLING APPARATUS DIAGRAM

Conestoga-Rovers & Associates

STANDARD FIELD PROCEDURES FOR SOIL BORING AND MONITORING WELL INSTALLATION

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

SOIL BORINGS

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).

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or direct-push technologies such as the Geoprobe®. Soil samples are collected at least every five ft 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° 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 volatile vapor analyzer measures volatile hydrocarbon vapor concentrations in the tube headspace, extracting the vapor through a slit in the cap. Volatile vapor analyzer measurements are used along with the field observations, odors, stratigraphy and groundwater depth to select soil samples for analysis.

Water Sampling

Water samples, if they are collected from the boring, are either collected using a driven Hydropunch® type sampler or are collected from the open borehole using bailers. The groundwater samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

Grouting

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

MONITORING WELL INSTALLATION, DEVELOPMENT AND SAMPLING

Well Construction and Surveying

Groundwater monitoring wells are installed to monitor groundwater quality and determine the groundwater elevation, flow direction and gradient. Well depths and screen lengths are based on groundwater depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines. Well screens typically extend 10 to 15 feet below and 5 feet above the static water level at the time of drilling. However, the well screen will generally not extend into or through a clay layer that is at least three feet thick.

Well casing and screen are 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 feet thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I, II cement.

Well-heads are secured by locking well-caps inside traffic-rated vaults finished flush with the ground surface. A stovepipe may be installed between the well-head and the vault cap for additional security.

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.

Well Development

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.

Groundwater Sampling

Depending on local regulatory guidelines, three to four well-casing volumes of groundwater are purged prior to sampling. Purging continues until groundwater pH, conductivity, and temperature have stabilized. Groundwater samples are collected using bailers or pumps and are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4^{o}C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

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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