Denis L. Brown

Shell Oil Products US
HSE – Environmental Services
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Mr. Jerry Wickham
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94205-6577

Re: Former Shell Service Station
461 8th Street
Oakland, California
SAP Code: 129453
Incident No. 97093399
ACHCSA Case No. 0343

Dear Mr. Wickham:

The attached document is provided for your review and comment. Upon information and belief, I declare, under penalty of perjury, that the information contained in the attached document is true and correct.

If you have any questions or concerns, please call me at (707) 865-0251.

Sincerely,

Denis L. Brown
Project Manager

CONESTOGA-ROVERS
& ASSOCIATES

19449 Riverside Drive, Suite 230, Sonoma, California 95476
Telephone: 707-935-4850 Facsimile: 707-935-6649
www.CRAworld.com

July 15, 2008

Mr. Jerry Wickham
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502

Re: **Vertical Delineation and Monitoring Well Installation Work Plan**
Former Shell Service Station
461 8th Street
Oakland, California
SAP Code 129453
Incident No. 97093399
ACHCSA Case No. 0343

Dear Mr. Wickham:

Conestoga-Rovers & Associates (CRA) prepared this document on behalf of Equilon Enterprises LLC dba Shell Oil Products US (Shell). This work was requested in Alameda County Health Care Services Agency (ACHCSA) letters to Shell dated April 24, June 10, and July 11, 2008. The scope of work is presented below and is in accordance with the Alameda County and San Francisco Bay Regional Water Quality Control Board guidelines.

SITE DESCRIPTION AND BACKGROUND

The site is currently a paved parking lot located at the southwest corner of the intersection of 8th Street and Broadway in Oakland, California (Figures 1 and 2). The property was leased by American Oil Company from at least 1965 until 1972 when the lease was assigned to Shell Oil Products Company (Shell). A Shell service station operated on the property from 1972 to 1980. The underground storage tanks (USTs) associated with the former Shell service station were removed after Shell terminated operations at the site in May 1980. The subject site is used for paid public parking.

STATUS OF PENDING ITEMS

Monitoring Well S-5: Monitoring well S-5, located inside a storm drain drop inlet along Broadway, was previously proposed for destruction because it was determined to be located in a confined space. Replacement well, S-7, was proposed to be installed within 7th Street once S-5 was destroyed. Given the numerous subsurface utilities beneath the sidewalks and streets in this area, and the hazards associated with drilling near utilities and within roadways, CRA is evaluating whether a subcontractor with confined space entry training could perform sampling of well S-5. If S-5 can be re-incorporated into the monitoring program for this site, we will re-evaluate the need for installing S-7. We will provide an update of the status of sampling S-5 in our next submittal.

Basement Vapor Probes: Shell continues to negotiate access with the adjacent property owner for the installation of three soil vapor probes.

SITE INVESTIGATION WORK PLAN

Technical Rationale and Objectives

The ACHCSA has requested completion of the vertical delineation of soil and groundwater impact in the southern portion of the site, and that additional monitoring wells be installed prior to the performance of interim remediation by insitu chemical oxidation (ISCO). Further, Shell and CRA are proposing the installation of deeper screened wells near the excavated area to better evaluate results from any ISCO activities performed.

Proposed Scope of Work

Based on these rationale and objectives described above, this work plan proposes the installation and sampling of 10 borings (B-28, B-19, S-14R, S-19, S-10, S-21A, S-21B, S-22, S-22B, and S-23), shown on Figure 3. CRA will follow the standard operating procedures (Attachment A).

- Five borings will extend to 50 feet below grade for vertical soil and groundwater sampling; two of these borings will be closed and monitoring wells will be installed within three of the borings (B-28, B-29, S-20, S-21B, and S-22B);
- Four borings will be completed as shallow groundwater monitoring wells screened from approximately 20-35 feet below grade (S-14R, S-19, S-20, and S-23);
- Four borings will be completed as two well pairs: Shallow wells will be screened from 20-27 fbg (S-21A and S-22A), and deeper wells will be screened from 30-35 fbg (S-21B and S-22B).

Work Tasks

Permits: CRA will obtain the required drilling permits from ACHCSA.

Notification: As required by the property owners, CRA will provide 30-days advanced notification to the site tenant, Central Parking System, Inc., of any field work that will effect operations of the parking lot.

Site Safety Plan: CRA will prepare a comprehensive site-specific safety plan to protect site workers. The plan will be reviewed and signed by each site worker daily, and kept on the site during field activities.

Utility Clearance: CRA will mark proposed drilling locations and will clear the locations through Underground Service Alert prior to drilling. All locations will also be surveyed using a private utility locating service.

Soil Boring Installation: Assuming the absence of subsurface and overhead obstructions, a hollow-stem auger (HSA) drill rig will be used to drill 10 soil borings (B-28, B-29, S-14R, S-19, S-20, S-21A, S-21B, S-22A, S-22B, and S-23) in the approximate locations shown on Figure 3.

Borings B-28, B-29, S-20, S-21B, and S-22B will be advanced to approximately 50 fbg for lithologic information, soil sampling, and deeper groundwater sample collection. The remaining borings (S-14R, S-19, S-21A, S-22A, and S-23) will be advanced to 35 fbg for soil sampling. In all borings, soil samples will be collected at five foot intervals for soil lithologic description and screening for organic vapors using a photo-ionization detector (PID). Soil samples will be retained for possible chemical analyses at approximate 5-foot intervals and at significant lithological changes or areas of obvious impact. If possible, a hydropunch-type sampler will be advanced in the deeper borings from approximately 45 to 50 fbg to collect depth discreet grab groundwater samples from each of these boring.

Soil and grab groundwater samples (if collected) designated for chemical analyses will be retained in appropriate sample containers. Soil sample tubes will be covered on both ends with Teflon sheets and plastic end caps. Water samples will be transferred to laboratory supplied containers. All samples will be labeled, entered onto chain-of-custody records, and placed into an appropriate container for transport to a State of California certified laboratory for analyses. Soil and grab groundwater samples will be stored in a cooler with ice. A standard turn-around time will be requested for laboratory results.

CRA will prepare an exploratory boring log for each boring with PID measurements recorded on the logs. Following completion of the sampling activities, borings B-28 and B-29 will be backfilled to within four

inches below grade with bentonite/cement grout, and capped with concrete tinted to match the surrounding surface. The remaining borings will be converted into groundwater monitoring wells, as described below.

Monitoring Well Installation: Assuming the absence of subsurface and overhead obstructions, CRA will use a drill rig equipped with hollow-stem augers to drill eight well borings (S-14R, S-19, S-20, S-21A, S-21B, S-22A, S-22B, and S-23) at the approximate locations shown on Figure 3. The well borings will be advanced to total depths of 35 or 50 fbg, as described above. Also as presented above, soil samples from the well borings will be collected at 5-foot intervals for soil description and screening for organic vapors using a photo-ionization detector (PID). CRA will prepare an exploratory boring log for each well, which will include the PID measurements and construction details.

Unless other information suggests differently, the wells will be constructed using 4-inch diameter Schedule 40 PVC casing. The well screen intervals will be as follows: Wells S-14R, S-19, S-20, and S-23 will be screened from 20-35 fbg, wells S-21A and S-22A will be screened from 20-27 fbg, and wells S-21B and S-22B will be screened from 30-35 fbg. If field observations at borings S-21B and S-22B suggest that impacted material exists below 35 fbg, then the well screens for these two wells will extend from 30-40 fbg. A sandpack will be placed from the bottom of each well up to 2 feet above the top of the well screen followed by a 2-foot thick bentonite seal and cement grout to grade. The wells will be secured with a locking cap under a traffic-rated well box.

Following well installation, Blaine Tech Services, Inc. (Blaine) of San Jose, California will develop each well prior to sampling. After well development, Blaine will sample each well and submit the samples to a California-certified laboratory for chemical analyses.

Chemical Analyses: Soil and groundwater samples will be analyzed for total petroleum hydrocarbons as gasoline (TPHg), and benzene, toluene, ethylbenzene, xylenes (BTEX) by EPA Method 8260B.

Certification: The scope of work described in this work plan will be performed under the supervision of a California Professional Geologist or Professional Engineer.

SCHEDULE

In an effort to move this project forward, and in anticipation of agency approval, CRA will initiate the scheduling of the proposed field activities in advance of receiving agency approval, since the drillers are

scheduling 6-8 weeks out and a 30-day notice to the tenants is required by the site owners. Permitting will be initiated as soon as Shell receives written approval from ACHCSA. Once this work is completed and CRA receives and reviews the sample results, we will evaluate the information and prepare the ISCO work plan. Thus, the previously proposed submittal date of July 31, 2008 will need to be extended, as discussed in email correspondence between Shell and ACHCSA on July 10 and 11, 2008. If the field work, including well development and sampling, can be completed within the month of September, and analytical data received by October 15th, the report of findings and the ISCO work plan will be submitted 45-days after receipt of the analytical results, or approximately by November 30, 2008.

In addition to the ongoing groundwater monitoring reporting for this site, the following document submittals are still pending or proposed:

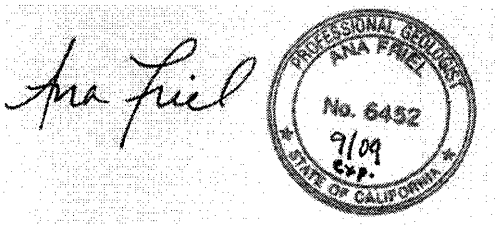
- **Pending Access** – Basement Probe Installation and Sampling Report
- **August 20, 2008** – Well Decommissioning and Well Installation Report (from May 2008 activities)
- **September 22, 2008** – Remedial Excavation and Piping Installation Activities Report
- **November 30, 2008** – Vertical Delineation/Well Installation Report, and ISCO Work Plan

CLOSING

If you have any questions regarding the contents of this document, please call Ana Friel at (707) 268-3812.

Sincerely,

Conestoga-Rovers & Associates



Ana Friel, PG

CONESTOGA-ROVERS
& ASSOCIATES

Figures: 1 - Vicinity Map
2 - Site Plan
3 – Proposed Boring and Well Location Map

Attachments: A – SOPs

cc: Denis Brown, Shell Oil Products US
A.F. Evans Company (Property Owners), c/o Anye Spivey
R. Casteel & Co.
Leroy Griffin, City of Oakland Fire Prevention Bureau

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FIGURE 1

Former Shell Service Station
461 8th Street
Oakland, California

Vicinity Map

1/2 Mile Radius

CONESTOGA-ROVERS & ASSOCIATES

LEGEND

- DESTROYED WELL
- GROUNDWATER MONITORING WELL
- OBSERVATION WELL
- INJECTION POINT
- EXCAVATION AREA
- M.H. MANHOLE
- C.B. CATCH BASIN
- FL = 16.50' FLOW LINE DEPTH BELOW GROUND SURFACE
- FLOW DIRECTION INDICATOR
- UNDERGROUND BART LINE
- STORM DRAIN LINE
- WATER LINE
- SANITARY SEWER LINE
- PACIFIC BELL LINE
- GAS LINE
- ELECTRICAL LINE

GROUNDWATER FLOW DIRECTION
(1Q00 TO 3Q05)

0 20 50ft

BUILDING

BUILDING

FORMER UST

FORMER DISPENSER ISLANDS AND FUEL LINES

FORMER SHELL STATION

S-1 S-10 S-12 S-17 S-13 S-18 S-8 S-9 S-5 S-6 S-4

OW-1 IP-1 IP-2 IP-3

M.H. FL = 19.12' DRIVEWAY

DRIVEWAY DRIVEWAY

M.H. FL = 17.00' M.H. FL = 13.27' FL = 17.50' M.H.

STORM DRAIN INLET

FREIGHT ELEVATOR

C.B.

BROADWAY

M.H. M.H. FL = 13.90' M.H. C.B. FL = 16.50' M.H.

C.B. FL = 13.23' C.B. C.B.

HYD.

FORMER CHEVRON STATION

6TH STREET

7TH STREET

8TH STREET

figure 2

SITE PLAN

FORMER SHELL SERVICE STATION

461 8th Street, Oakland, California

NOTE: MAP MODIFIED FROM FUGRO MAP DATED 7-9-92. MAP MODIFIED FROM VIRGIL SURVEY MAP DATED 6-25-08.

241501-2008(Site Plan_Jul08)GN-SO001 JUL 14/2008

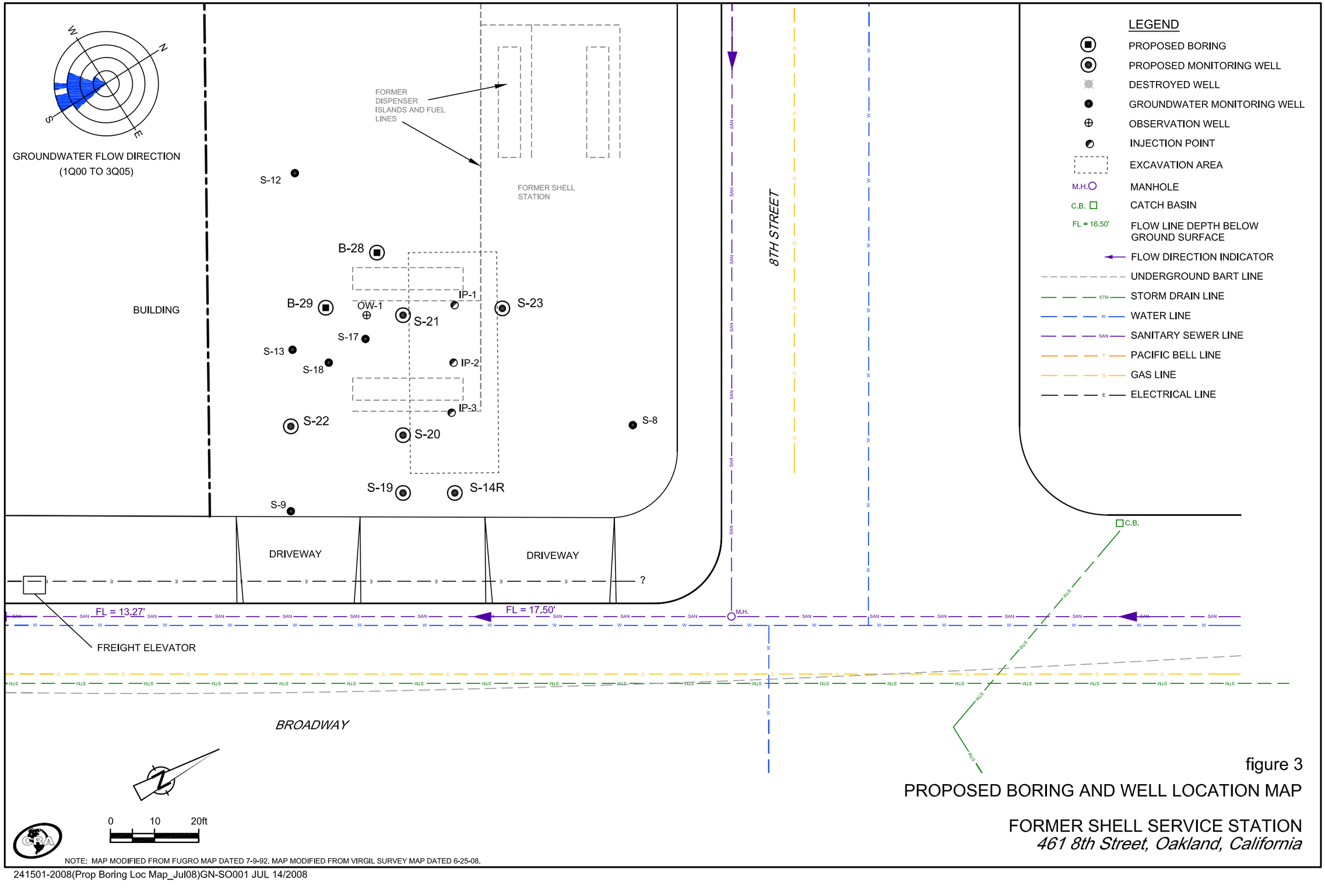

figure 3

PROPOSED BORING AND WELL LOCATION MAP

FORMER SHELL SERVICE STATION

461 8th Street, Oakland, California

NOTE: MAP MODIFIED FROM FUGRO MAP DATED 7-9-92. MAP MODIFIED FROM VIRGIL SURVEY MAP DATED 6-25-08.

241501-2008(Prop Boring Loc Map_Jul08)GN-SO001 JUL 14/2008

Attachment A

SOPs

CRA

STANDARD FIELD PROCEDURES FOR ADVANCING SOIL BORINGS AND INSTALLING MONITORING WELLS

This document describes Conestoga-Rovers & Associates (CRA) standard operating procedures for drilling and sampling soil borings, and installing groundwater monitoring wells. These procedures are designed to comply with Federal, State, and local regulatory guidelines. Specific field procedures are summarized below.

PRE-DRILLING ACTIVITIES

Permits

All necessary permits are obtained prior to beginning drilling activities.

Site Safety Plan

All field activities are conducted in accordance with a comprehensive site-specific safety plan. The plan is reviewed and signed by each site worker daily prior to beginning work and kept on site during field activities.

Utility Clearance

All proposed drilling locations are marked in advance and cleared through Underground Service Alert and a private utility locating service prior to drilling.

DRILLING AND SAMPLING

Objectives

Soil samples are collected to characterize subsurface soils, assess whether the soils exhibit obvious petroleum hydrocarbon or other compound odors or staining, and to collect samples for analysis by a State-certified laboratory. All work is conducted by trained CRA staff working under the supervision of professional geologist or engineer.

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or direct-push technologies such as Geoprobe®. If conditions warrant, an alternate drilling method (e.g., air-rotary, sonic, etc.) is used. Prior to drilling, the first 5 to 10 feet of the boring are hand cleared using an air or water knife with vacuum extraction, or by using a hand auger. The depth of hand clearing is

determined based on proximity to known subsurface features such as utilities and fuel system components. The borings are hand cleared to a minimum diameter of 4 inches greater than the diameter of the drill auger/rod. Soil samples are collected within the hand cleared interval when necessary. If the boring is located within 10 feet of a natural gas or electrical supply line the boring is cased prior to drilling. These activities minimize the potential for damaging utilities or other subsurface features.

CRA staff supervises drilling activities and describes encountered soils using the Unified Soil Classification System and Munsell Soil Color Charts. Soil samples are collected at specified intervals to the total depth for possible chemical analyses and field screening for organic vapors using a photo-ionization detector (PID) or equivalent. Soil samples are also collected at the soil/water interface (first encountered groundwater) and at lithologic changes when necessary. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed soil at the bottom of the borehole.

Drilling and sampling equipment is cleaned using an appropriate cleaning agent such as Alconox® (or equivalent) or by steam cleaning before and between borings, and prior to and following, sample collection to prevent cross-contamination.

Field Screening

Soil tubes designated for field screening are partially emptied leaving about one-third of the soil in the tube, and the tube is capped with plastic end caps. Alternately, an appropriate container is partially filled with soil and sealed. The soil is set aside to allow hydrocarbons to volatilize for approximately ten to fifteen minutes. A PID or equivalent is then used to measure hydrocarbon vapor concentrations in the headspace, extracting the vapor through an opening in the container. PID measurements are used along with the field observations, soil types, and groundwater depth to select soil samples for analysis.

Grab Groundwater Sampling and Analysis

Grab groundwater samples are collected when necessary. Grab groundwater samples are collected either from the open borehole, or from temporary screen placed in the open borehole or driven into undisturbed soil (i.e., Hydropunch® type sampler). A dedicated, disposable bailer is typically used to collected grab groundwater samples. The grab groundwater samples are decanted into appropriate clean sample containers. The samples are labeled, logged, refrigerated, and transported under chain of custody to a state-certified laboratory for analysis. Laboratory-supplied trip blanks may accompany the samples and may be analyzed to check for cross-contamination.

Soil Sampling and Analysis

Soil samples designated for chemical analyses are retained in stainless steel or brass sample tubes. The tubes are covered on both ends with Teflon sheets and plastic end caps. Soil samples

are labeled, logged, refrigerated, and transported under chain of custody to a state-certified laboratory for analysis.

Grouting

If a boring is not completed as a monitoring well, the boring is typically filled from the bottom up with cement grout using the augers or a tremie pipe. The surface is capped to match the existing grade.

MONITORING WELL INSTALLATION

Well Construction

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, encountered soil types, and State and local regulatory guidelines.

To assess groundwater in deeper water-bearing zones, deep wells can be constructed when necessary. A conductor casing may be used to protect lower water-bearing zones from potential contamination by overlying, potentially impacted groundwater. When installing a conductor casing, a boring at least 4 inches larger than the diameter of the conductor casing is drilled to the top of an appropriate aquitard. The conductor casing is then lowered into the boring, pushed up to two feet into the aquitard, and the annular space is sealed with cement grout to the surface, using stabilizers where necessary. The grout seal is allowed to cure a minimum of 24 hours before the boring is completed. The boring is then continued through the conductor casing to the selected depth and the well is constructed in a typical manner.

Well construction details are based on field conditions encountered during drilling. Groundwater monitoring wells are completed using 2 or 4-inch diameter Schedule 40 PVC casing. Screen slot size varies according to soil types encountered, but is typically composed of 0.020-inch slotted PVC. The screen interval is typically 5 feet above and 10 feet below first encountered groundwater. However, the well screen will generally not extend into or through a clay layer that is at least three feet thick. Alternate well screen intervals are used as conditions warrant or in accordance with regulatory directives (e.g., deep wells). Rinsed and graded sand appropriate for the selected well screen slot size is used for the filter pack; Lonestar #2/12 sand (or equivalent) is used for well screens with a slot size of 0.020. The filter pack is placed along the entire length of the screen interval to 2 feet above the top of the well screen followed by a 2-foot thick bentonite seal and cement grout to grade. In areas of shallow groundwater (5 feet below grade or less), the filter pack, bentonite seal, and grout seal intervals are modified as warranted. Each well is typically secured with a locking cap under a traffic-rated well box.

Surveying

Following well installation, a licensed surveyor will survey the latitude, longitude, and well head elevations of the new wells in compliance with State and local requirements.

WASTE HANDLING AND DISPOSAL

Soil cuttings from drilling activities are stockpiled onsite and covered by plastic sheeting or stored onsite in 55-gallon drums. Stockpile samples are collected and analyzed for disposal profiling in accordance with landfill requirements. Typically, a 4-point composite sample is collected for every 250 yards of soil generated. If drums are used for storage, one soil sample is collected from each drum for disposal profiling. Disposal soil samples are retained in stainless steel or brass sample tubes. The tubes are covered on both ends with Teflon sheets and plastic end caps. Soil samples are labeled, logged, refrigerated, and transported under chain of custody to a state-certified laboratory for analysis. Upon landfill approval, the soil is transported to the selected landfill by a qualified transporter.

Blaine Tech Services, Inc.
Standard Operating Procedure

WELL DEVELOPMENT

1. INITIAL MEASUREMENTS. Collect initial DTW and TD measurements.

2. CALCULATE SWAB TIME. The amount of time spent swabbing depends on the length of well screen submerged below the water column. Unless otherwise directed, spend one minute swabbing for each foot of submerged screen. If the dimensions of the screened interval are unknown, swab well for 15 minutes.

3. SWAB WELL. Using an appropriately sized swab, flush out debris from the slots of the screen by raising and lowering the swab quickly through the entire screened interval for the required time.

4. BEGIN PUMPING. Lower a Stainless Steel pneumatic pump into well so that pump intake is close to well bottom. Set purge rate at 0.5 – 1.0 GPM. While purging, raise and lower pump through the screened interval and gently tap against the well bottom to continue agitating well.

5. COLLECT PARAMETER MEASUREMENTS. Collect required water quality parameter readings at each casing volume removed. Unless otherwise directed, collect measurements for pH, Temperature, Electrical Conductivity, and Turbidity. Continue to collect DTW measurements while purging to confirm the height of the water column.

6. FINISH DEVELOPMENT. Well development is considered complete when ALL of the following conditions have been met:

   10 CASE VOLUMES. Well has been purged of 10 case volumes.

   HARD BOTTOM. All sediment that can be removed has been removed. Well bottom is hard, not silty.

   PARAMETERS STABILIZED. Measurements for pH, EC and Temp have stabilized over the last 3 case volumes. If applicable, required Turbidity level has been achieved.

   If these three conditions have been met, collect a final TD measurement and secure well.

   If the parameters remain unstable or the bottom remains soft after the removal of the 10th case volume, collect a TD measurement and contact the BLAINE Project Coordinator for instruction. Further development may be warranted.

DEWATERING WELLS. If the well begins to de-water during the pumping process, adjust the pumping rate. If a well is dewatering, cease pumping activities. Remove pump and calculate and note recharge rate. Call BLAINE Project Coordinator for direction. If well development continues, the well must be allowed sufficient time to recharge and must be re-swabbed prior to restart of pumping efforts.

LARGER DIAMETER WELLS. For 4" or greater diameter wells, pumping activities may be augmented with an Electric Submersible pump once loose sediments have been removed, a "hard bottom" has been obtained and a minimum of one casing volume removed. In these cases, the Three Inch Electric Submersible Pump purging 2 – 5 GPM may be used to complete development activities. However, if DTW measurements show that the water level is dropping and the well is dewatering, the Stainless Steel pneumatic pump must be used for the entire well development.

Blaine Tech Services, Inc.
Standard Procedure

WELL WATER EVACUATION (PURGING)

SAFETY FIRST

Decontamination

PPE	Blaine Tech Minimum PPE
PPE	Hands: Nitrile gloves.
OPERATION	Deploying pumps. The three-inch pump in particular can become extremely heavy as it is lowered into each well. Use extreme caution with deploying this pump. Keep two hands, one on the reel handle and one on the hose, at all times to control the pump's decent. If control is lost and the reel begins to spin freely, step away from the reel and keep your hands and arms away from the reel. DO NOT attempt to stop the reel.
OPERATION	Retrieving pumps. Again, the tree inch submersible may become very heavy when deployed. upon retrieval, be sure to engage the reel lock to ensure the reel will not spin if control is lost.
OPERATION	Due to the potential weight of the two hundred foot three inch electric submersible, two technicians are required to deployment and retrieval.

Traffic Control

Always be aware of traffic concerns. Both, work on site and in the street require technicians to be alert and prepared. Use the sampling vehicle as a traffic delineation device. Set up exclusion zone to divert both vehicular and pedestrian traffic.

Purpose

Evacuation of a predetermined minimum volume of water from a well (purging) while *simultaneously* measuring water quality parameters is typically required prior to sampling. Purging a minimum volume guarantees that actual formation water is drawn into the well. Measuring water quality parameters either verifies that the water is stable and suitable for sampling or shows that the water remains unstable, indicating the need for continued purging. Both the minimum volume and the stable parameter qualifications need to be met prior to sampling. This assures that the subsequent sample will be representative of the formation water surrounding the well screen and not of the water standing in the well.

Defining Casing Volumes

The predetermined minimum quantity of water to be purged is based on the wells' casing volume. A casing volume is the volume of water presently standing within the casing of the well. This is calculated as follows:

$$\text{Casing Volume} = (TD - DTW)\ VCF$$

1. Subtract the wells' depth to water (DTW) measurement from its total depth (TD) measurement. This is the height of the water column in feet.
2. Determine the well casings' volume conversion factor (VCF). The VCF is based on the diameter of the well casing and represents the volume, in gallons, that is contained in one (1) foot of a particular diameter of well casing. The common VCF's are listed on our Well Purge Data Sheets.
3. Multiply the VCF by the calculated height of the water column. This is the casing volume, the amount of water in gallons standing in the well.

Remove Three to Five Casing Volumes
Prior to sampling, an attempt will be made to purge all wells of a minimum of three casing volumes and a maximum of five casing volumes except where regulations mandate the minimum removal of four casing volumes.

Choose the Appropriate Evacuation Device Based on Efficiency
In the absence of instructions on the SOW to the contrary, selection of evacuation device will be based on efficiency.

- **Bailers**

Disposable, Teflon or stainless steel are the only approved bailers approved by Blaine Tech.

- **Pneumatic pump:** 1.75' bladderless stainless steel positive displacement pump.

The BTS 1.75" Bladderless Stainless Steel Positive Displacement Purge Pump is modeled after the EPA approved USGS/Middleburg Positive Displacement Sampling Pump. It is suitable for purging wells with diameters greater than 2" at depths up to several hundred feet.

The pump is actuated with compressed air from an electric, oil-less air compressor mounted on the Sampling Vehicle. The air travels to the pump via a single hose. Water is pushed out of the pump and up a second hose to the surface. The rate of water removal is relatively slow and loss of volatiles is almost non-existent. There is only positive pressure on the water being purged. There is no impeller cavitation or suction acting on the water. The pump can be placed at any location in the well and can draw water from the very bottom of the well. The pump is virtually immune to the erosive effects of silt or lack of water that can destroy other types of pumps.

- **3 inch electric submersible**

3" Grundfos description

Measure Water Quality Parameters at Each Casing Volume
At a minimum, water quality measurements include pH, temperature and electrical conductivity (EC). Measurements are made and recorded at least once every casing volume. They are considered stable when all parameters are within 10% of their previous measurement.

Note: The following instructions assume that well has already been properly located, accessed, inspected and gauged.

Prior to Purging a Well
1. Confirm that the well is to be purged and sampled per the SOW.
2. Confirm that the well is suitable based on the conditions set by the client relative to separate phase.
3. Calculate the wells' casing volume.
4. Put new Latex or Nitrile gloves on your hands.

Blaine Tech Services, Inc.
Standard Procedure

SAMPLE COLLECTION FROM GROUNDWATER WELLS

Overview

Collect Sample with a Stainless Steel, Teflon or Disposable Bailer
With few exceptions, all samples are collected with a stainless steel, Teflon or disposable bailer.

Collect Parameter Measurements
Always collect a set of parameter measurements at the time of sampling. If the well was purged until stabilization prior to sample collection, the last set of measurements collected will suffice. Otherwise, collect a set of measurements at the time of sampling.

Confirm Required Analysis and Corresponding Bottle Set
The S.O.W. shows the exact analyses being requested at the well. Confirm before sampling that you have the exact type and minimum quantity of the corresponding bottles.

Determine Collection Order
Every time a bailer is lowered into the well, the water is disturbed and the risk of constituents in the water volatilizing increases. Subsequently, actual collection order is based on the volatilization sensitivity of the parameter being sought. Volatile organic compounds are collected and containerized first, then semi-volatile organic compounds, then inorganic compounds. It is imperative to seal the most volatile compounds before moving on to any other tasks including filling other bottles or closing the well.

> **FIRST: Volatile Organic Compounds** may be requested and identified by EPA Method number, analysis description and/or individual compound name.
>
> Some common EPA Method numbers are 8010, 8015M, 8020 and 8260.
>
> Commonly requested analysis descriptions are Halogenated Volatile Organics (HVOC), Total Petroleum Hydrocarbons as Gasoline (TPH-G), Aromatic Volatile Organics (BTEX) and Volatile Organics By GCMS.
>
> Volatile organic compounds frequently requested by name are MTBE, ETBE, DIPE, TAME, TBA, EDB, DBCP and 1,2 DCA.

All volatile organic compound samples are collected in 40-milliliter septum vials with screw caps. Some are preserved.

SECOND: Semi-Volatile or Extractable Organic Compounds are typically requested by method number and/or analysis description.

Common EPA Methods include 418.1, 610, 5520, 8015M, 8080, 8140, 8141, 8150 and 8270.

Common analysis descriptions are Total Oil & Grease (TOG), Polynuclear Aromatic Hydrocarbons (PNAs, PAHs), Total Petroleum Hydrocarbons as Diesel (TPH-D), Total Petroleum Hydrocarbons as Motor Oil, Total Petroleum Hydrocarbons as Jet Fuel, Organochlorine Pesticides and Semi-Volatile Organic Compounds (SVOC).

Most extractable organic compounds are collected in 1 liter amber bottles. Most are not preserved.

THIRD: Inorganic Compounds are typically requested by method number and/or analysis description.

Common method numbers include 160.1, 200.7, 300.0 and 6010.

Common analysis descriptions are Total Metals, Dissolved Metals, Ferrous Iron, Nitrate, Sulfate, Total Dissolved Solids, Total & Fecal Coliform and Organic Lead.

Inorganic compounds are collected in a wide variety of special containers. Some are preserved. Some require field filtering.