SOMA
ENVIRONMENTAL ENGINEERING, INC.
6620 Owens Drive, Suite A • Pleasanton, CA 94588
TEL (925)734-6400 • FAX (925)734-6401
www.somaenv.com

March 2, 2010

Mr. Jerry Wickham
Alameda County
Department of Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Subject: **Fuel Leak Case#RO0000265**
Site Address: 3609 International Blvd., Oakland, California

Dear Mr. Wickham:

SOMA's "Workplan for Shallow Soil Vapor Sampling" at the subject site has been uploaded to the State's GeoTracker database and Alameda County's FTP site for your review.

Thank you for your time in reviewing our report. If you have any questions or comments, please call me at (925) 734-6400.

Sincerely,

Mansour Sepehr, Ph.D., PE
Principal Hydrogeologist

REGISTERED PROFESSIONAL ENGINEER
MANSOUR SEPEHR
No. C042928
Exp. 3-31-10
CIVIL
STATE OF CALIFORNIA

Enclosure

cc: Mr. Abolghassem Razi w/report enclosure
Tony's Express Auto Service

Mr. Vince Tong w/report enclosure
Traction International

Workplan for Shallow Soil Vapor Sampling

3609 International Boulevard
Oakland, California

March 2, 2010

Project 2330

Prepared for:
Mr. Abolghassem Razi
50 Stewart Drive
Tiburon, California

SOMA ENVIRONMENTAL ENGINEERING, INC.
6620 Owens Drive Suite A Pleasanton CA 94588 Ph: 925.734.6400 F: 925.734-6401 www.somaenv.com

CERTIFICATION

SOMA Environmental Engineering, Inc. has prepared this report on behalf of Mr. Abolghassem Razi, property owner of 3609 International Boulevard, Oakland, California, to comply with the request of Alameda County Environmental Health Services in correspondence dated January 26, 2010.

Mansour Sepehr, PhD, PE
Principal Hydrogeologist

REGISTERED PROFESSIONAL ENGINEER
MANSOUR SEPEHR
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1. INTRODUCTION

SOMA Environmental Engineering, Inc. (SOMA) has prepared this workplan on behalf of Mr. Abolghassem Razi, owner of the property at 3609 International Boulevard, Oakland, California situated at the intersection of International Boulevard and 36th Avenue (Figure 1). This workplan was prepared in accordance with the Alameda County Environmental Health Services (ACEHS) request contained in correspondence dated January 26, 2010.

A gasoline service station, Tony's Express Auto Services, operates on the site, which is located in an area of primarily commercial and residential use. During Third Quarter 2002, the station was remodeled and several hydraulic hoists were removed. The station no longer has an auto repair facility, but is still a smog check station. Figure 2 shows locations of the main service station, dispenser islands, underground storage tanks (USTs), on-site and off-site groundwater monitoring wells, and other site features and neighboring properties.

1.1 Site Hydrogeology

Based on data from previous investigations, groundwater has been encountered at depths ranging between 7.3 and 17.2 feet. Figure 2 shows locations of on- and off-site groundwater monitoring wells. Groundwater flows from north to south with an average gradient of 0.062 feet/feet. Based on results of pumping tests conducted by SOMA, hydraulic conductivity of the saturated sediments ranges between 1.5 and 18.3 feet per day. Assuming an effective porosity of saturated sediments of 0.35, the groundwater flow velocity ranges between 22 and 267 feet per year.

2. SCOPE OF WORK

The scope of work includes the following tasks:

1. Permit acquisition and preparation of Health and Safety Plan
2. Soil vapor borehole advancement and soil vapor sampling
3. Laboratory analysis
4. Preparation of report evaluating the potential for vapor intrusion

These tasks are described in more detail below.

2.1 Permit Acquisition, Health and Safety Plan Preparation, and Subsurface Utility Clearance

Prior to initiating field activities, SOMA will obtain all required drilling permits from Alameda County Department of Public Works.

SOMA will prepare a site-specific Health and Safety Plan (HASP). The HASP is a requirement of the Occupational Safety and Health Administration (OSHA), “Hazardous Waste Operation and Emergency Response” guidelines (29 CFR 1910.120) and the California Occupational Safety and Health Administration (Cal/OSHA) “Hazardous Waste Operation and Emergency Response” guidelines (CCR Title 8, section 5192). The HASP is designed to address safety provisions during field activities and protect the field crew from physical and chemical hazards resulting from drilling and sampling. It establishes personnel responsibilities, general safe work practices, field procedures, personal protective equipment standards, decontamination procedures, and emergency action plans. The HASP will be reviewed and signed by field staff and contractors prior to beginning field operations.

SOMA will visit the site and mark boring locations using chalk-based white paint and then contact Underground Service Alert (USA) to verify that drilling areas are clear of underground utilities. Following USA clearance, SOMA will retain a private utility locator to survey proposed drilling areas and locate any additional subsurface conduits.

2.2 Soil Vapor Study

Based on results of the Third Quarter 2009 monitoring event, SOMA recommended that ACEHS adopt No Further Action (NFA) status for the site. ACEHS responded in January 26, 2010 correspondence that they could not consider the site for NFA status until evaluation of potential for vapor intrusion into the apartment building on the adjacent site to the southwest is completed.

To evaluate progress toward case closure as requested by ACEHS, on November 14, 2008 SOMA oversaw advancement of seven soil vapor sampling boreholes by Gregg Drilling & Testing. They were advanced around the peripheral of the on-site convenient store and residential dwelling to southwest. The borings were drilled for the evaluation of potential vapor intrusion into the two buildings using soil vapor sampling.

As shown on Figure 4, SV-2 through SV-5 were advanced in close proximity of the Las Bougainvilleas Apartment Complex, a residential building, while SV-1, SV-6 and SV-7 were drilled in close proximity of the station building, to a depth of 5 feet below ground surface (bgs) using Geoprobe. The results of the soil vapor study showed that soil vapor concentration around the convenient store are generally lower than Environmental Screening Levels (ESLs) as set forth by the

Regional Water Quality Control Board (RWQCB) for commercial land use type, except at SV-5 sampling location (duplicate samples collected) where concentrations of total petroleum hydrocarbons ay gasoline exceeded the ESL value for commercial setting.

Since the soil vapor samples were collected, two multi-phase extraction (MPE) events have been conducted at the site utilizing wells MW-8 and MW-4R, located between the site and adjacent apartment building. ACEHS has requested that SOMA conduct an additional soil vapor sampling adjacent to the apartment building, below subslab to determine whether MPE events have reduced TPH-g concentrations next to the residential dwelling.

SOMA therefore proposes advancing two sub-slab soil vapor sampling boreholes adjacent to the apartment building, in vicinity of SV-5, for evaluation of vapor intrusion into the residential structure. Since TPH-g concentrations were greatly elevated in SV-5, samples collected in vicinity of the boring will reveal if concentrations have decreased sufficiently adjacent to the apartment building. Therefore, SOMA proposes installing soil vapor probes SV-8 and SV-9 to a depth of 1 to 2 feet below ground surface (bgs), dependent on sub-slab thickness for a sampling depth of 6-inches below the base of the slab, along the boundary between the subject and apartment building sites (Figure 4). Soil vapor sampling using Geoprobe will entail drawing a soil vapor sample from the subsurface and into the sampling manifold. The samples will be collected according to established guidelines, as outlined in Appendix B. General field procedures are attached in Appendix C.

Prior to beginning drilling activities at the site, SOMA will confirm that no significant precipitation has occurred near the sampling location within the previous five days.

A Geoprobe rod will be hydraulically advanced to approximately 1 to 2 feet bgs, to the target vapor sampling depth. The lead drill rod will be fitted with a sampling adaptor known as a Post-Run Tubing (PRT) adaptor. Approximately 5 to 10 feet of 1/4-inch- or 1/8-inch-diameter nylaflow sampling tube will be connected into the sampling port at the end of the rod. The sampling tube will then be capped with a vapor-tight valve. Once the target sampling depth is reached, the probe will be retracted 6 inches and allowed to equilibrate for approximately 20 to 30 minutes.

Hydrated bentonite will be placed around the drill rod to inhibit surface air migration down the outer portion of the drill rod. SOMA will utilize Torrent Laboratory manifold set-up (Appendix B), which allows automatic leak checking of the canister sample train. A pre- and post-sample vacuum reading will be recorded for each sample Summa canister. The initial vacuum of the canister should be greater than 25 inches of Hg; if the canister vacuum is less than 25 inches Hg, the canister will not be used during the field test. Once the sampling train is assembled, all connections between the Summa canisters and valve on the downhole side of the regulator will be leak tested for 10 minutes by opening and closing the purge canister valve to place a test vacuum on the assembly. The sampling train will be pretested prior to mobilizing to the field. When the sampler opens and then closes the purge can, a vacuum is created within the canister lines and fittings. When this vacuum is maintained the train can be considered leak free. In addition, because there is only one connection (probe tubing to sample train) the potential for leaks is greatly reduced.

The sampling manifold will be pressure tested and approximately three volumes of gas will be purged from the manifold and boring prior to sampling. Any further work will be terminated if gauge vacuum cannot be maintained for 10 minutes. If gauge vacuum is maintained for 10 minutes and it has been at least 20-30 minutes since the drill rod was sealed at the surface with bentonite, the purge canister valve and the valve on the downhole side of the regulator will be open to begin purging ambient air from the sampling apparatus and borehole. The time of purging will be recorded on field logs and incorporated in the investigation report. The purge canister valve will be closed when three volumes of air have been purged from the sample apparatus and borehole.

Adequacy of purging will be determined based on the inches of pressure drop on the purge canister as well as the time required for purging based on the anticipated purged volume. The volume of air sampled is a linear function of the canister vacuum pressure drop, and will be calculated accordingly based on the initial vacuum reading. The purge volume or “dead space volume” will be estimated based on a summation of the volume of the sample container (i.e., glass bulbs), internal volume of tubing used, and annular space around the probe tip.

The following describes the calculation for the appropriate purge volume and purge time:

> The effective volume of 1/8-diameter Teflon tubing is about 2.41 mL/ft; the average vapor flow rate through the sampling tube will be 167 mL/min, the total length of the Teflon tubing will be about 10 feet. Because it is recommended that purge volumes and sample volumes be collected at the same flow rate, SOMA will utilize a soil gas sampling manifold with a built-in flow restrictor (both the purge canister and sample canister are in line after the flow restrictor), a frit of stainless steel tubing between the two gauges that is calibrated by the laboratory to 167 mL/min (Appendix B). Additionally, the volume of the 6-inch-long retracting probe rod is about 80 mL. During the sampling event, three tube volumes will be purged through the sampling tubes unless otherwise specified by ACEHS. Therefore, the total purged air volume (three volume purge) is calculated as follows:

Total volume of purged air = (2.41 mL/ft x 10 ft + 80 mL) x 3 = 312.3 mL

Since volume of air sampled is a linear function of the canister vacuum pressure drop, it will be calculated accordingly based on the initial vacuum reading: for example, if the initial vacuum is 30 inches of Hg, 348.45 mL will correspond to drop of 1.56 inches of Hg. To calculate time during purging, 312.3 mL is divided by 167 mL/min, which equals 1.9 minutes.

SOMA anticipates using 6-L summa canisters, and sampling will be terminated when the sample canister gauge indicates that approximately 5 inches Hg of vacuum remain in the canister. Therefore, sample collection duration at 167 mL/min can be approximated at:

Sample collection time = 5,000 mL / 167 mL/min = 29.94 minutes

Pressure drops along with sample collection times at each location will be recorded on field logs during sample collection.

Leakage during soil gas sampling may dilute samples with ambient air and produce results that underestimate actual site concentrations or contaminate the sample with external contaminants. A leak test will be conducted to determine whether leakage is present (i.e., the leak check compound is detected and confirmed in the test sample after its application). During sampling, isopropyl alcohol (2-propanol) will be used as a tracer to test for leaks. This will be accomplished by placing gauze soaked with isopropyl alcohol along the drill rod, and around valves, joints, and pressure regulators. The gauze with isopropyl alcohol will be remoistened every 5 minutes.

At least one sample per laboratory per day will be field duplicated. Each duplicate sample will be collected from areas of concern in a separate sample container, at the same location and depth and immediately after the original sample. The sampler will change to a new pair of gloves prior to assembling the sampling train and collection of each of the vapor samples to limit potential cross-contamination. Any reusable parts will be field decontaminated. The general procedure for decontaminating sampling equipment is as follows: clean equipment with a brush using a non-phosphate detergent solution, rinse equipment with control water (i.e., water having a known chemistry), use deionized/distilled water rinse to finish decontamination.

Upon collection of proposed samples, the drilling rod will be removed along with the sampling apparatus and the boring will be backfilled with Portland cement mixed at 6 gallons of water per 94-pound bag of cement.

Borehole Abandonment and Waste Disposal

Following soil vapor sampling, the borings will be abandoned with a neat cement grout mixture tremmied into place and completed at the surface with materials to match existing grade.

Any waste generated during boring activities will be temporarily stored on-site in separate DOT-rated, 55-gallon steel drums pending characterization, profiling and transport to an approved disposal/recycling facility.

2.3 Laboratory Analyses

Soil vapor samples will be submitted to a California state-certified environmental laboratory for analysis under the appropriate sample handling protocol. The samples will be analyzed for the following:

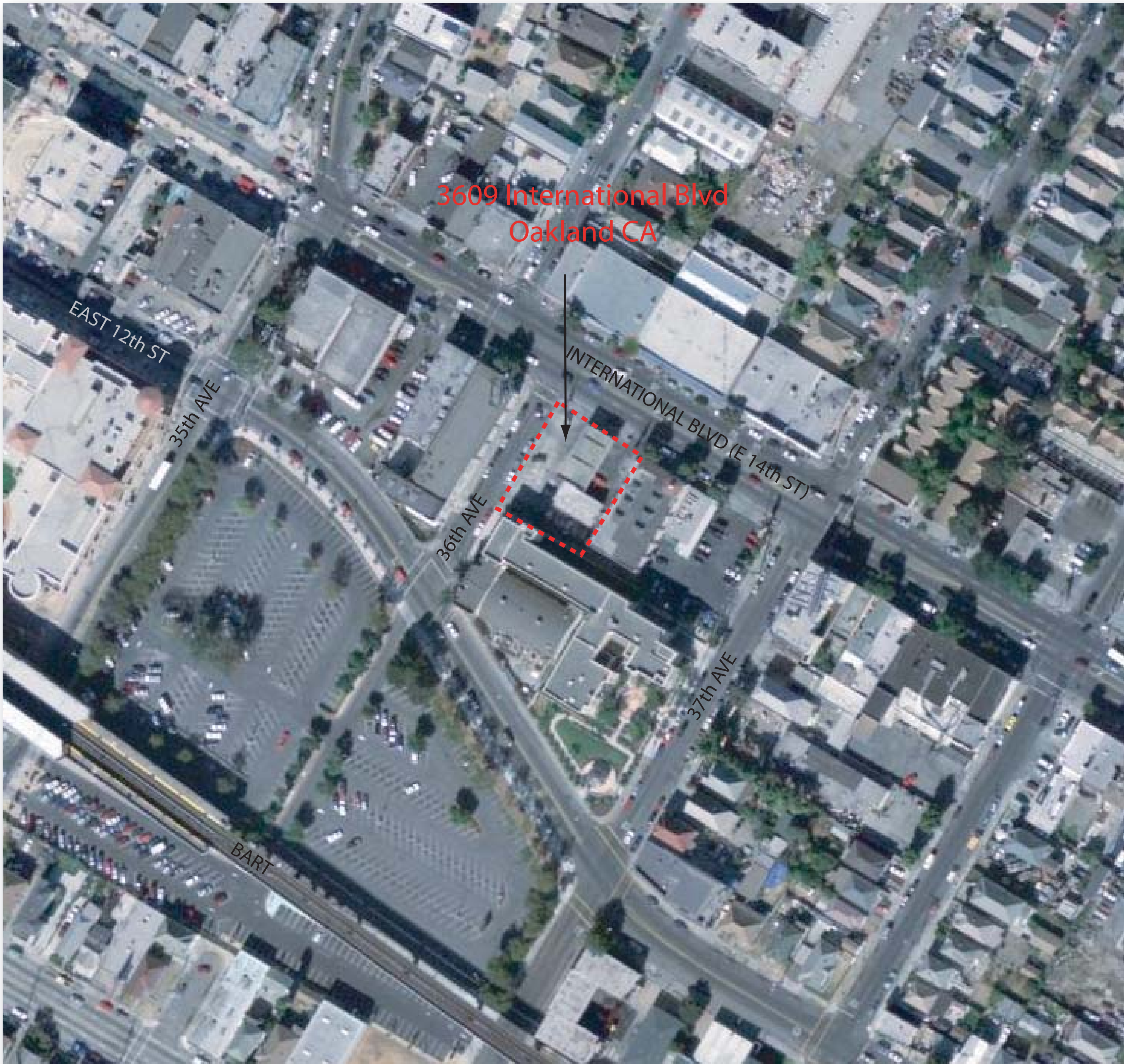
- EPA Method TO-14A (TO-15): benzene, toluene, ethylbenzene, total xylenes (collectively termed BTEX); methyl tertiary-butyl ether (MtBE); and volatile organic compounds (VOCs)
- EPA TO-3: TPH-g

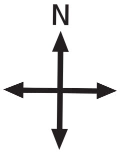
In addition to isopropyl alcohol, SOMA recommends analyzing atmospheric gases O_2, CO_2, and methane. The reporting limit for O_2, CO_2, and methane will be less than or equal to concentrations of these gases in the atmosphere. SOMA will ensure that laboratory-reporting limits for chemicals of concern are below shallow soil gas ESLs that address inhalation of contaminants in an indoor setting, set by California Regional Water Quality Control Board–San Francisco Bay.

2.4 Report Preparation

Upon receipt of sample analysis data, SOMA will prepare a report summarizing all field activities and evaluating potential for vapor intrusion into the apartment building on the adjacent site.

FIGURES





approximate scale in feet

0 150 300

Figure 1: Site vicinity map.

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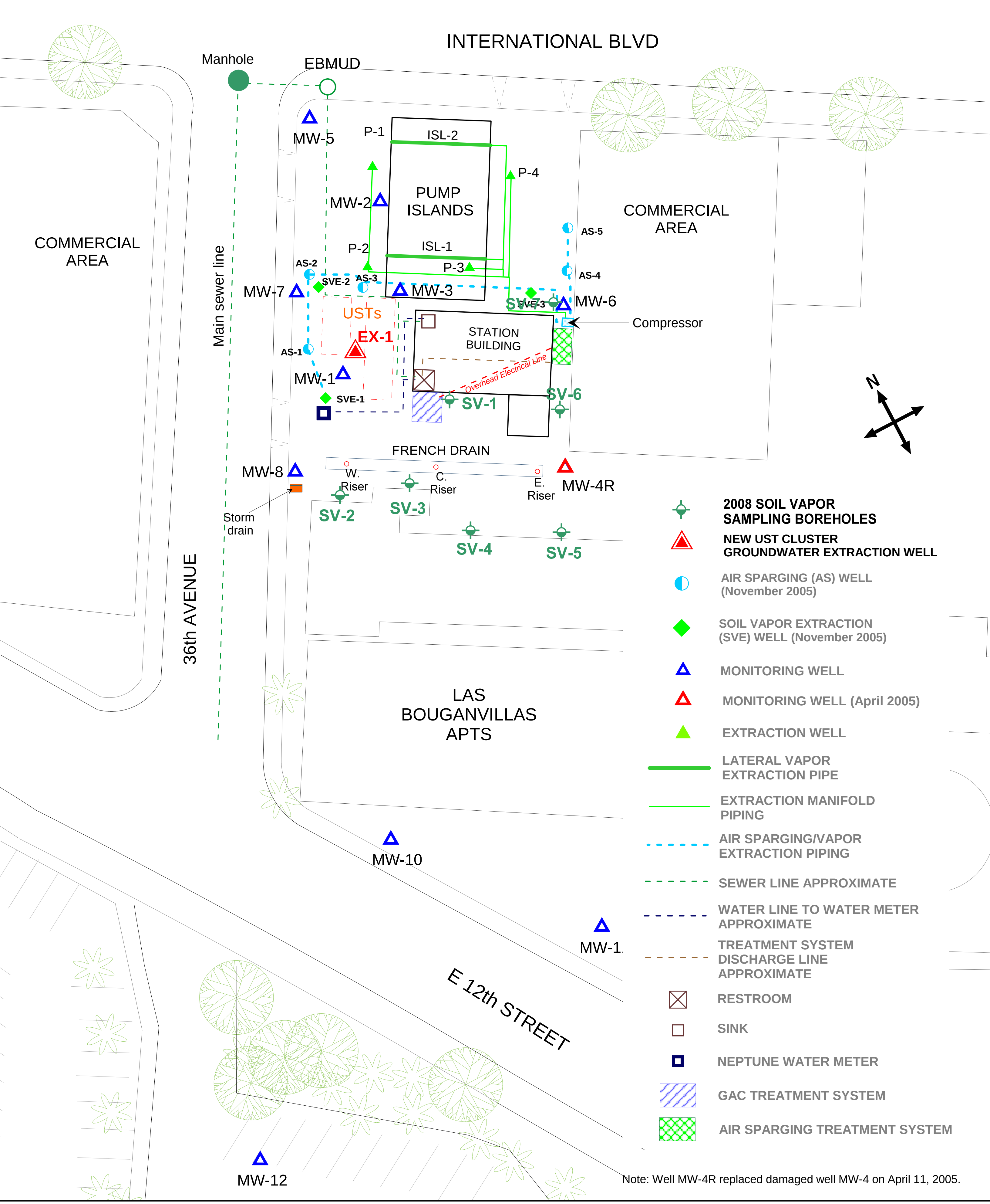
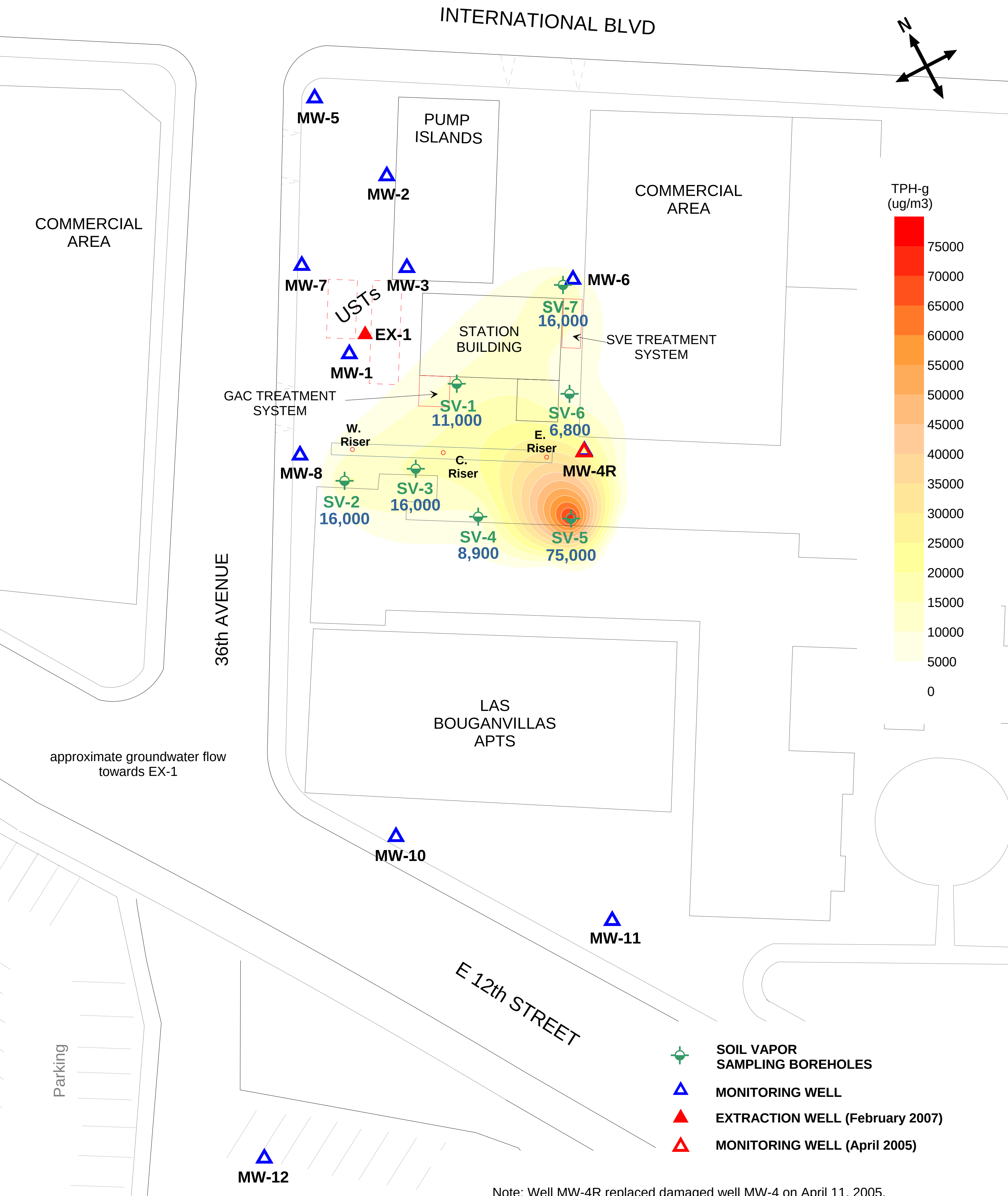


approximate scale in feet

0 20 40

Figure 2: Site Map Showing Locations of Wells, GAC and SVE Systems, and Other Site Features

SOMA ENVIRONMENTAL ENGINEERING, INC.



approximate scale in feet

0 40 80

Figure 3: Contour Map Showing TPH-g Concentration in Soil Vapor

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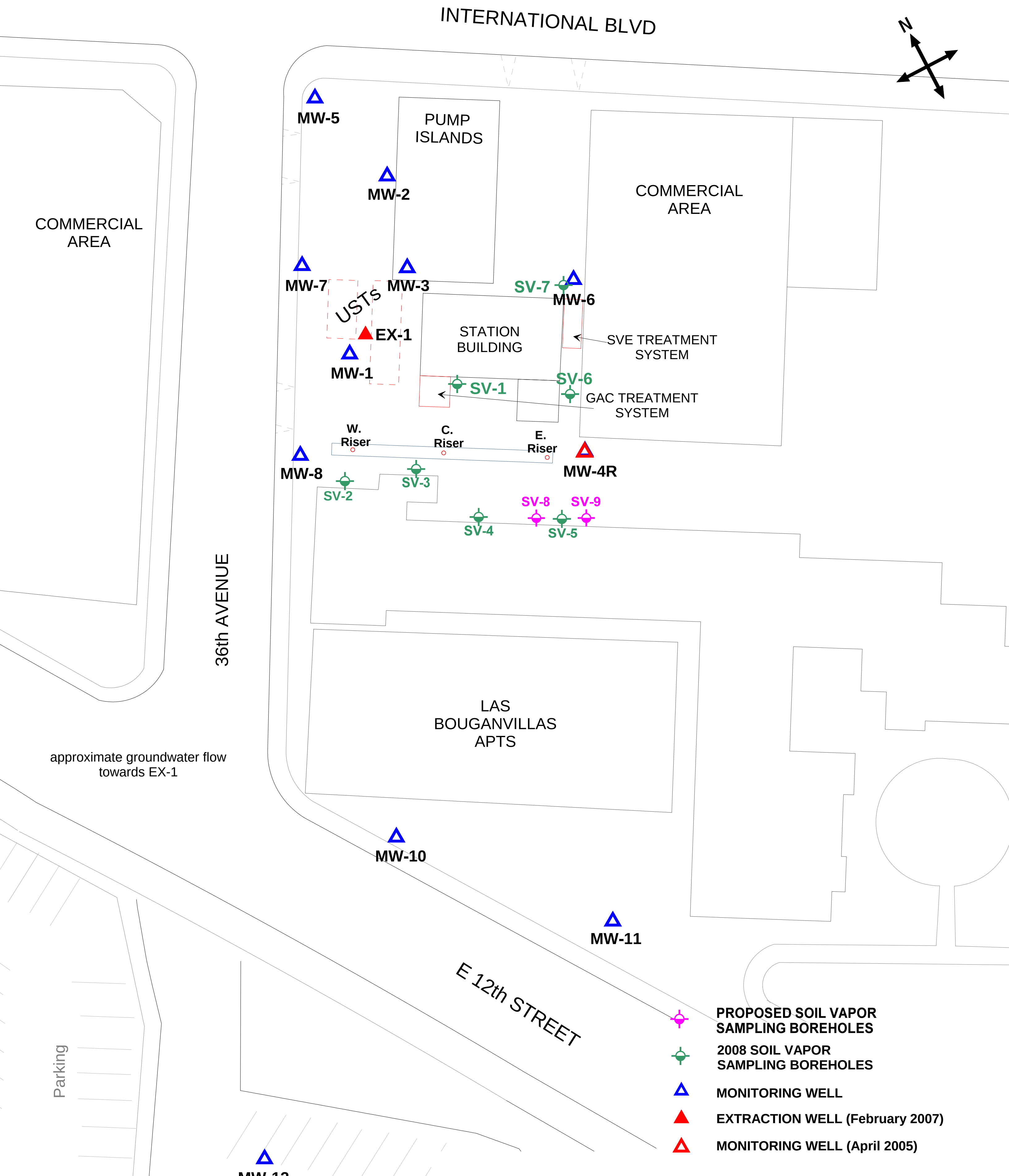

Note: Well MW-4R replaced damaged well MW-4 on April 11, 2005.

approximate scale in feet

0 40 80

Figure 4: Site Map Showing the Locations of Proposed Soil Vapor Sampling Boreholes

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TABLE

Table 1
Soil Vapor Analytical Results
3609 International Blvd.
Oakland, California
November 14, 2008

Compound	Sample ID										ESLs	
	SV-1 (uG/m3)	SV-1 Lab Duplicate (uG/m3)	SV-2 (uG/m3)	SV-3 (uG/m3)	SV-4-1 (uG/m3)	SV-4-2 (uG/m3)	SV-5 (uG/m3)	SV-5 Lab Duplicate (uG/m3)	SV-6 (uG/m3)	SV-7 (uG/m3)	Residential (uG/m3)	Commercial (uG/m3)
TPH-g	11,000	NA	16,000	16,000	8,400	8,900	75,000	66,000	6,800	16,000	10,000	29,000
Benzene	4	3.9	47	12	28	28	78	NA	<2.5	5.1	84	280
Toluene	8.6	8.2	36	15	25	26	<42	NA	6.4	23	63,000	180,000
Ethyl Benzene	4.5	4.3	8.5	4.4	5.6	5.7	<49	NA	<3.4	12	980	3,300
Total Xylene	5.8	5.8	41	8.7	8	7.4	<49	NA	3.5	33.9	21,000	58,000
MtBE	<3.0	<3.0	58	<3.4	<3.4	<3.4	<40	NA	<2.8	<3.0	9,400	31,000
Acetone	120	130	330	190	200	210	230	NA	150	95	660,000	1,800,000
Hexane	11	12	64	11	46	60	15,000	NA	4.4	120	NL	NL
Carbon Tetrachloride	<5.3	<5.3	<5.5	<6.0	<5.9	<5.9	<70	NA	<5.0	20	19	63
2-Propanol	36	37	73	27	91	79	<110	NA	17	<8.1	NL	NL
2-Butanone	64	68	84	54	63	67	86	NA	37	49	1,000,000	2,900,000
Ethanol	13	12	7.4	14	8.3	8.6	<84	NA	7.4	19	NL	NL
-	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	-	-
Oxygen	22	NA	20	22	19	20	21	20	22	21	NA	NA
Methane	0.00085	NA	0.0061	0.0012	0.0019	0.0019	0.0041	0.0040	0.0002	0.00063	NA	NA
Carbon Dioxide	0.16	NA	1.7	0.18	1.7	1.6	0.87	0.84	0.069	0.12	NA	NA

Notes:

TPH-g: Total Petroleum Hydrocarbons, gasoline range

Modified EPA Method TO-15, TO-3, ASTM D-1945

NA: Not Analyzed

NL: Not Listed

Lab Duplicates: duplicate samples run by the laboratory for QC purposes

Duplicate SUMA canisters sumbitted for SV-4 (-1 and -2)

ESL: California Regional Water Control Board Environmental Screening levels, Interim Final November 2007, Revised May 2008, Table E, Indoor Air and Shallow Soil Gas

APPENDIX A

Site History

Background

1992: Soil Tech Engineering, Inc. conducted an initial environmental investigation to determine whether soil near the product lines and USTs had been impacted by petroleum hydrocarbons.

July 1993: Soil Tech Engineering, Inc. removed one single-walled 10,000-gallon gasoline UST, one single-walled 6,000-gallon gasoline UST, and one 550-gallon waste oil UST, and replaced them with the three double-walled USTs: one 10,000-gallon gasoline UST and two 6,000-gallon gasoline USTs. UST locations are shown in Figure 2.

December 1997: Mr. Razi retained Western Geo-Engineers to conduct additional investigations and quarterly groundwater monitoring, results of which indicated elevated levels of petroleum hydrocarbons and methyl tertiary-butyl ethyl (MtBE) in groundwater.

April 1999: Mr. Razi retained SOMA to conduct groundwater monitoring, risk-based corrective action (RBCA), corrective action plan (CAP) studies, and soil and groundwater remediation. RBCA study categorized the site as a high-risk groundwater site, thereby warranting soil and groundwater remediation in on- and off-site areas. The source of petroleum hydrocarbons in groundwater was believed to be the USTs removed in 1993, which had stored gasoline. CAP study results indicated that installation of a French drain combined with a vapor extraction system would be the most cost-effective remediation alternative.

August 1999: SOMA installed a French drain and groundwater treatment system to prevent further migration of chemically impacted groundwater. This treatment system has been in operation since early December 1999.

July 2000: Following ACEHS approval, SOMA installed a vapor extraction system as recommended in the CAP document dated July 1, 1999.

January 2002: Environmental Fabric removed old product dispensers and installed new ones in the existing fuel islands.

July 25, 2003: SOMA installed an additional on-site extraction pump in the western French drain riser, to create a capture zone around the USTs and contain off-site migration along the southwestern corner of the site.

April 1, 2005: SOMA conducted a pilot test to evaluate use of ozone sparging to actively remediate groundwater at the site. The test revealed that the unsaturated zone was permeable enough to allow operation of an ozone sparging system. However, ozone injection, especially in the region of more impacted wells MW-1 and MW-3, in close vicinity to the UST cavity, posed a potential explosion hazard. Based on safety concerns, air-sparging technology was selected for site remediation.

November 17 to 23, 2005: SOMA oversaw installation of air sparge and vapor extraction wells by Woodward Drilling of Rio Vista, California.

February 22 to March 6, 2006: SOMA oversaw installation of the air sparge system by ACRC, Inc. of San Ramon, California.

December 2007 to June 2008: Following a pilot test in December 2007, SOMA conducted four monthly multi-phase extraction (MPE) events at the site from March through June 2008. As of the June 2008 MPE event, the cumulative total mass of VOCs extracted by MPE from extraction wells as 235.55 lbs; this included 64 lbs extracted during the December 2007 pilot test, 24.3 lbs during the March 2008 event, 43.06 lbs during the April 2008 event, 46.19 lbs during the May 2008 event, and 58.0 lbs during the June 2008 event.

October-November 2008: ACEHS approved SOMA's workplan for vapor intrusion evaluation in their letter dated October 7, 2008. SOMA performed the approved soil vapor sampling on November 14, 2008. TPH-g was elevated in one of the seven soil vapor samples and it was concluded that the fine-grained soils surrounding the French drain were acting as a filter retaining petroleum hydrocarbons.

Groundwater monitoring has been on going at the site since December 1997. During the Third Quarter 2008 monitoring event, the highest TPH-g concentration was detected at MW-8 at 6,500 μg/L. TPH-g concentrations have decreased in all sampled wells. MtBE concentrations in groundwater have decreased across the site and were observed at concentrations below the ESL. The highest benzene, toluene and xylene concentrations were detected at MW-8 at 120 μg/L, 22 μg/L, and 480 μg/L. The highest ethyl benzene was detected in MW-6 at 70 μg/L.

The GAC and SVE systems have been effective in reducing peak contaminant levels beneath the site. Since initial start up, approximately 250.82 lbs of hydrocarbons and 87.78 lbs of MtBE have been removed from groundwater. Approximately 967.2 pounds of petroleum hydrocarbons have been removed from the vadose zone.

MPE events at the site have effectively reduced contaminant concentrations; a cumulative total mass of VOCs extracted by MPE during pilot testing and the eight subsequent MPE events is 817.34 lbs. Benzene concentrations are dramatically reduced compared to pre-MPE event sampling in the source area.

APPENDIX B

Soil Vapor Sampling Procedures

USING A GEOPROBE TO COLLECT SUBSURFACE VAPOR SAMPLES FOR HUMAN HEALTH RISK EVALUATION

- Do not mobilize to sample subsurface vapor if measurable precipitation or site irrigation near the sampling location has occurred within the previous 5 days;

- Drill continuous cores as necessary to identify permeable strata (target vapor sampling locations) then backfill the borings with Portland cement (previous assessment may have provided this data);

- Connect a PRT adaptor to approximately 10 to 15 feet of tubing (assuming the total depth of the boring will be approximately 5 feet below grade), install a vapor tight valve on the other end of the tubing, close the vapor tight valve, and seat the PRT adaptor into the bottom of the lead drill rod;

- Hydraulically push the Geoprobe rod to the target vapor sampling depth then raise the drill rod approximately 6 inches';

- Place hydrated bentonite around the drill rod to inhibit surface air migration down the outer portion of the drill rod (do not simply add water to a pile of bentonite chips or pellets placed around the drill rod);

- Connect a tee fitting to the top of each purge and sample Summa canister and install a pressure gauge on the top of this fitting;

- Connect 1 to 2 feet of tubing to the tee fitting on each purge and sample canister (the consultant may opt to install an optional valve on the downhole side of the tee connected to the purge canister);

- Connect the free ends of each of the above tubes to a separate (third) tee fitting;

- Connect a 100 to 200 milliliter/minute flow regulator to the downhole side of the third tee fitting and connect the laboratory supplied particulate filter to the downhole side of the regulator (if required);

- Connect the vapor-tight valve in Bullet #3 to the downhole side of the filter (or regulator if the filter was built-in to the regulator);

- Vacuum test the connections between the summa canisters and valve on the downhole side of the regulator for 10 minutes by opening and closing the purge canister valve to place a test vacuum on the assembly (terminate further work if gauge vacuum can not be maintained for 10 minutes);

- If gauge vacuum was maintained for 10 minutes and it has been at least 30 minutes since the drill rod was sealed at the surface with bentonite, then open the purge canister valve and the valve on the downhole side of the regulator to begin purging ambient air from the sampling apparatus and borehole (record the time purging commenced);

- Close the purge canister valve when three volumes of air have been purged from the sample apparatus and borehole (the consultant must know how to calculate the appropriate purge volume prior to mobilization - the adequacy of purging must be based on the inches of pressure drop on the purge canister gauge and not time);

- Open the sample canister valve to begin sample collection (record the time sample collection begins);

- Drop a few pieces of isopropyl alcohol (leak test compound) moistened gauze down the inside of the drill rod and on the downhole side of the valve on the borehole side of the regulator (tinfoil is useful to hold the gauze in place - be careful not to pour isopropyl alcohol directly on the tubing and sample apparatus connections);

- Remoisten the gauze with isopropyl alcohol every 5 minutes";

- Close the sample canister valve when the sample canister gauge indicates approximately 5 inches Hg of vacuum remain in the canister (this should take approximately 25 minutes for a 6L Summa canister connected to a 200 milliliters/minute flow regulator);

- Record the time sample collection was stopped and replace the tee fitting on the sample canister with the laboratory supplied brass plug;

- Label the sample and record on the chain of custody the sample name, final vacuum, and the canister and flow controller serial numbers;

- Store the sample in a container that blocks sunlight and do not subject the sample to significant changes in pressure and temperature (avoid airline shipping of sample containers);

- Remove the drilling rod and sampling apparatus and backfill the borehole with Portland cement mixed at 6 gallons of water per 94-pound bag of cement.

FOOTNOTES:

1 - Hard drilling conditions may shear off the PRT fitting during drilling. In these conditions you must install the PRT fitting/valve assembly after reaching the target drilling depth, but before lifting the drilling rod 6 inches.

2 - Isopropyl alcohol moistened gauze must be added to all fitting connections if the reduction in sample canister gauge vacuum indicates sample collection will exceed one hour.

GENERAL NOTES:

Assemble and leak check the sampling apparatus prior to mobilizing to the field.

Use Swagelok® type fittings or equivalent for all connections. Wear a new pair of gloves when you assemble the sampling apparatus to limit potential cross-contamination.

APPENDIX C

General Field Procedures

Utility Locating

Prior to drilling, boring locations are marked with white paint or other discernible marking and cleared for underground utilities through Underground Service Alert (USA). In addition, the first five feet of each borehole are air-knifed, or carefully advanced with a hand auger if shallow soil samples are necessary, to help evaluate the borehole location for underground structures or utilities.

Borehole Advancement

Pre-cleaned push rods (typically one to two inches in diameter) are advanced using a hydraulic push type rig for the purpose of collecting samples and evaluating subsurface conditions. The drill rod serves as a soil sampler, and an acetate liner is inserted into the annulus of the drill rod prior to advancement. Once the sample is collected, the rods and sampler are retracted and the sample tubes are removed from the sampler head. The sampler head is then cleaned, filled with clean sample tubes, inserted into the borehole and advanced to the next sampling point where the sample collection process is repeated.

Soil Sample Collection

The undisturbed soil samples intended for laboratory analysis are cut away from the acetate sample liner using a hacksaw, or equivalent tool, in sections approximately 6 inches in length. The 6 inch samples are lined at each end with Teflon® sheets and capped with plastic caps. Labels documenting job number, borehole identification, collection date, and depth are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain-of-custody to a laboratory certified by the State of California to perform the specified tests. The remaining collected soil that has not been selected for laboratory analysis is logged using the United Soil Classification System (USCS) under the direction of a State Registered Professional Geologist, and is field screened for organic vapors using a photo-ionization detector (PID), or an equivalent tool. Soil cuttings generated are stored in Department of Transportation (DOT) approved 55-gallon steel drums, or an equivalent storage container.

Groundwater Sample Collection

Once the desired groundwater sampling depth has been reached, a Hydropunch tip is affixed to the head of the sampling rods. The Hydropunch tip is advanced between approximately 6 inches to one foot within the desired groundwater sampling zone (effort is made to emplace the Hydropunch screen across the center and lower portion of the water table), and retracted to expose the Hydropunch screen.

Grab groundwater samples are collected by lowering a pre-cleaned, single-sample polypropylene, disposable bailer down the annulus of the sampler rod. The groundwater sample is discharged from the bailer to the sample container through a bottom emptying flow control valve to minimize volatilization.

Because the sampling section of the non-discrete groundwater sampler is not protected or sealed, this sampler should only be used where cross contamination from overlying materials is not a concern. Discrete groundwater samplers are driven to the sample interval, then o-rings, a protective tube/sheath, and an expendable point provide a water-tight seal.

Collected water samples are discharged directly into laboratory-provided, pre-cleaned vials or containers and sealed with Teflon-lined septum, screw-on lids. Labels documenting sample number, well identification, collection date, and type of preservative (if applicable, e.g., HCl for TPPH, BTEX, and fuel oxygenates) are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain-of-custody to a laboratory certified by the State of California to perform the specified tests.

Borehole Completion

Upon completion of drilling and sampling, the rods are retracted. Neat cement grout, mixed at a ratio of 6 gallons of water per 94 pounds of Portland cement, is introduced, *via* a tremmie pipe, and pumped to displace standing water in the borehole. Displaced groundwater is collected at the surface into DOT approved 55-gallon steel drums, or an equivalent storage container. In areas where the borehole penetrates asphalt or concrete, the borehole is capped with an equivalent thickness of asphalt or concrete patch to match finished grade.

Organic Vapor Procedures

Soil samples are collected for analysis in the field for ionizable organic compounds using a PID with a 10.2 eV lamp. The test procedure *involves* measuring approximately 30 grams from an undisturbed soil sample, placing this subsample in a Ziploc--type bag or in a clean glass jar, and sealing the jar with aluminum foil secured under a ring-type threaded lid. The container is warmed for approximately 20 minutes (in the sun); then the head-space within the container is tested for total organic *vapor,* measured in parts per million as benzene (ppm; volume/volume). The instrument is calibrated prior to drilling. The results of the field-testing are noted on the boring logs. PID readings are useful for indicating relative levels of contamination, but cannot be used to evaluate petroleum hydrocarbon levels with the confidence of laboratory analyses.

Equipment Decontamination

Equipment that could potentially contact subsurface media and compromise the integrity of the samples is carefully decontaminated prior to drilling and sampling. Drill augers and other large pieces of equipment are decontaminated using high pressure hot water spray. Samplers, groundwater pumps, liners and other equipment are decontaminated in an Alconox scrub solution and double rinsed in clean tap water rinse followed by a final distilled water rinse.

The rinsate and other wastewater are contained in 55-gallon DOT-approved drums, labeled (to identify the contents, generation date and project) and stored on-site pending waste profiling and disposal.

Soil Cuttings and Rinsate/Purge Water

Soil cuttings and rinsate/purge water generated during drilling and sampling are stored onsite in DOT-approved 55-gallon steel drums pending characterization. A label is affixed to the drums indicating the contents of the drum, suspected contaminants, date of generation, and the boring number from which the waste is generated. The drums are removed from the site by a licensed waste disposal contractor under manifest to an appropriate facility for treatment/recycling.