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March 9, 2009

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

Subject: Site Located at 3820 Manila Avenue, Oakland, California
Former Glovatorium Facility

Dear Mr. Wickham:

SOMA's "Workplan for Soil Borings, Well Modifications, Additional Extraction Well Installations, Continued MPE Pilot Testing" for the subject property 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. Please do not hesitate to call me at (925) 734-6400, if you have any questions or comments.

Sincerely,

Mansour Sepehr, Ph.D., PE
Principal Hydrogeologist

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

cc: Mr. Albert M. Cohen, LOEB&LOEB LLP w/enclosure
Ms. Betty Graham, Regional Water Quality Control Board w/o enclosure
Dr. Bruce Page, Bruce W. Page Consulting w/enclosure
Mr. Peter W. McGaw, ARCHER NORRIS w/enclosure
Mr. Stuart Depper

Workplan for Soil Borings, Well Modifications, Additional Extraction Well Installations, Continued MPE Pilot Testing

Former Glovatorium
3820 Manila Avenue
Oakland, California

Project 2510

March 9, 2009

Prepared for:
Loeb & Loeb LLP
10100 Santa Monica Boulevard, Suite 2200
Los Angeles, California 90067-4164

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CERTIFICATION

SOMA Environmental Engineering, Inc. (SOMA) has prepared this workplan for the Law Offices of Loeb & Loeb LLP, in order to determine the nature, extent of and responsibility for soil and groundwater contamination in response to claims brought by Earl Thompson and in response a request from Alameda County Environmental Health Services in correspondence dated December 5, 2008.

Mansour Sepehr, PhD, PE
Principal Hydrogeologist

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1. INTRODUCTION

SOMA Environmental Engineering, Inc. (SOMA) has prepared this workplan for the Law Offices of Loeb & Loeb LLP on behalf of their client, the owners of the subject property. This workplan has been prepared to help determine the nature, extent of and responsibility for soil and groundwater contamination at the site and in response to a request by the Alameda County Health Care Services Agency (ACHCSA) in December 5, 2008 correspondence. The property, the former Glovatorium, is located at 3820 Manila Avenue (formerly known as 3815 Broadway), Oakland, California, as illustrated in Figure 1. The site is located in an area of primarily commercial and residential developments. Site investigation and remediation history is summarized in Appendix A.

1.1 Site Description

The site is located between Manila Avenue and Broadway, near the intersection of 38^{th} Street. Surface elevation ranges from approximately 78 to 84 feet above mean sea level.

A 54-inch, inside-diameter storm drain culvert passes under the property, from Manila Avenue on the west to 38^{th} Street in the south (Figure 2). The depth of the storm drain invert is approximately 8.5 feet under the sidewalk on the eastern side of Manila Avenue and approximately 13.2 feet below ground surface (bgs) at the far end, approximately 60 feet south of GW-4.

A 10-inch-diameter cast iron sanitary sewer conduit runs westerly from the on-site building and discharges into the sanitary sewer line, which runs north to south along Manila Avenue. Figure 2 shows locations of the storm drain and sanitary sewer system.

Six underground storage tanks (USTs) were formerly located on-site. Two were located under the sidewalk on 38^{th} Street and four inside the building. UST capacities have been variously reported as ranging from 800 gallons to 5,000 gallons. They reportedly contained Stoddard solvent (TPH-ss), fuel oil and possibly waste oil. The tanks inside the building were interconnected through a series of pipes and valves. It is reported that in about the late 1970s a significant release of TPH-ss occurred when a new piping system was installed. In June 1997, the six USTs were abandoned in place by backfilling with either cement-sand slurry or pea gravel. HK2, Inc. of San Mateo, California conducted the tank closure and reporting. In June 5 and 9, 1997, HK2 delivered a 1,500 gallon aboveground storage tank (AST) to the site, measured the amount of liquid in each UST, collected samples of the residual liquid from UST-1 through UST-4, pumped the residual liquid in the USTs into the AST, rinsed the USTs, pumped the rinsate into the AST, and inspected the inside of each UST with video camera. The report does not indicate the presence of hole in the USTs, but indicates that on June eleven HK2 pumped out the groundwater that had recharged into UST-1 through UST-4. This indirectly indicates the presence of hole(s) in UST-1 through UST-4.

In November 2008, three USTs located under the sidewalk in front of 316 38th Street were properly closed. All residual amounts of the hazardous substances which were stored in the UST system prior to closure were removed, properly disposed of, and neutralized; USTs and associated piping were filled with appropriate slurry mixture. Therefore, it was concluded that the contaminant source has been removed from the site and properly disposed of.

Based on observed recharge of 0.04 gpm into Tank 1 upon purging, it was determined that a small leak possibly existed in this UST at the time of closure. No purging or leak testing was conducted at Tanks 2 and 3 due to their apparent placement above the presumed water table. To verify integrity of the decommissioned USTs, confirmation soil and groundwater sampling was conducted in accordance with OFD approval of SOMA's workplan.

Residual soil contamination appears to be present between 6 and 8 feet bgs between Tanks 1 and 2; at approximately 12 feet bgs northeast of Tank 3, between Tank 3 and Tank 2; and at approximately 14 feet bgs north and northeast of Tank 3.

Groundwater samples indicate that the hydrocarbon contamination plume in groundwater is located in the vicinity of the decommissioned USTs and is more considerable between Tanks 1 and 2.

Surrounding properties are primarily commercial and residential. TOSCO Marketing Company is located north and upgradient of the site, at 40th Street and Broadway, and contains a number of groundwater monitoring wells. Figure 2 shows locations of the main building, fuel tank areas, and on- and off-site groundwater monitoring wells.

1.2 Site Geology and Hydrogeology

The property is located on the alluvial plain between the San Francisco Bay shoreline and the Oakland hills. Surface sediments in the site vicinity consist of Holocene alluvial deposits representative of an alluvial fan depositional environment. These deposits consist of brown, medium-dense sand that fines upward to sandy or silty clay. The pattern of stream channel deposition results in a three-dimensional network of coarse-grained sediments interspersed with finer-grained silts and clays. The individual units tend to be discontinuous lenses aligned parallel to the axis of the former stream flow direction.

The sediments encountered in soil borings are predominantly fine grained, consisting of clay, silty clay, sandy clay, gravelly clay and clayey silt. Discontinuous layers of coarse-grained sediments (clayey sand, silty sand, and clayey gravel) generally also contain relatively high percentages of silt and clay, which tend to reduce their permeability. Based on previous investigations conducted by Geosolv and LFR, a relatively coarse-grained layer of silty sand, clayey sand, and clayey gravel was encountered in soil borings E-23, E-25, E-26, GW-2, GW-3, GW-7, and GW-8 at depths of approximately 4.5 to 14 feet bgs. A discontinuous layer of silty to clayey sand was encountered in borings B-11, E-23, E-25, GW-7 and GW-8 at depths of 17 to 21 feet bgs.

Based on SOMA's October 2001 field investigation, no deeper major water-bearing zone was encountered. However, as lithologic logs of the newly installed groundwater monitoring wells indicate, the water-bearing zone is composed of fine-grained, clayey silt sediments separated by very low-permeability intervening clay layers, which are unsaturated in some locations. For instance, SOMA-5, which has been screened within a significantly thick clay layer beneath the first water-bearing zone, from 21 to 26 feet bgs using the dual tubing method, was a dry well until the First Quarter 2002 sampling event. Due to the presence of unsaturated and low-permeability intervening clay layers between shallow and deep layers, there is a significant vertical downward gradient between shallow and deep wells.

Groundwater monitoring reveals groundwater depths ranging from 4 to 14 feet bgs at gradients ranging from 0.019 ft/ft to 0.035 ft/ft. Groundwater flow has been predominantly northeast to southwest across the site. Slug test results indicate that hydraulic conductivity of the saturated sediments ranges between 1.2 x 10^{-4} and 6.9 x 10^{-4} cm/sec. Using the average groundwater flow gradient of 0.027 and aquifer porosity of 0.32, the groundwater flow velocity ranges between 10.5 and 60.1 ft/year.

1.3 Suspected Chemical Source Areas

Based on results of past site investigations and groundwater monitoring data, soil and groundwater have been impacted by petroleum hydrocarbons and chlorinated solvents.

The source of THP-ss was formed by release of these chemicals from the former USTs and their associated piping system and washing machine operation. As noted above, a significant release was reported to have occurred in the late 1970s when the new underground piping system connecting the USTs to the washing machines was found to have been incorrectly installed. Figure 2 shows the approximate location of the release area. Based on the monitoring data, TPH-ss and petroleum hydrocarbons are predominantly present in SOMA-4 and B-8, located in the area next to former USTs, and the former washing machine area.

Results from the First Semi-Annual 2008 sampling event showed significant increases in perchloroethylene (PCE) levels in B-10 and SOMA-2, wells with newly discovered free product (FP). SOMA believes that the presence of elevated levels of FP in these wells for the first time contributed to the presence of elevated levels of dissolved solvents at this location. The FP consisted primarily of TPH-ss, which has potential to dissolve PCE and trichloroethylene (TCE). Thus, it is suspected that the FP in the area of SOMA-2 and B-10 caused dissolution and mobilization of residual levels of PCE in the subsurface.

Beginning September 2, 2008, SOMA conducted a 45-day multi-phase extraction (MPE) pilot test. Pilot test results indicate that MPE technology is highly effective in removing FP, chemically impacted groundwater and soil vapor from the subsurface. Pilot tests utilized SOMA-4, SOMA-2, B-8 and B-10 as extraction wells.

2. SCOPE OF WORK

Wells used for MPE include three 2-inch-diameter wells (SOMA-4, SOMA-2, B-8) and a 1-inch-diameter well (B-10) and extend to the First water-bearing zone (WBZ). The MPE mass removal rate and zone of influence (ZOI) of these four extraction wells are not sufficient to effectively remove the chemical mass from the subsurface. Review of lithologic logs and observations made during installation of these wells indicates some contamination above the perforation intervals of these wells between 3 and 8 feet bgs. As such, these wells may not be capable of removing contaminants from shallower depths.

Due to the presence of elevated levels of PCE, free-phase PCE in the form of dense non-aqueous phase liquid (DNAPL) is most likely present in the subsurface. A rule of thumb is that if the concentration of PCE in groundwater exceeds one percent of its solubility limit (150 mg/L), there is a strong chance that DNAPL is present in subsurface. As discussed, elevated levels of PCE above its solubility limit were reported during the First Quarter 2008 groundwater monitoring event. Prior to MPE pilot testing, up to 10,000 µg/L PCE, 4,200 µg/L TCE and 15,000 µg/L cis-1,2-DCE were reported in B-10. Due to its high density, DNAPL may be located at depths below the perforation interval of the current monitoring wells being used as extraction wells. Therefore, the current extraction wells do not appear to be suitable for removing DNAPL from subsurface. As such, SOMA recommends (a) modifying B-8, B-10, SOMA-2, and SOMA-4 with longer screened intervals,(b) increasing the diameter of B-10 from 1- to 2-inch and (c) installing additional MPE extraction wells within the hotspots. These wells will then be tested to determine their effectiveness and the ability of the system to address the extent of contamination in groundwater and removal of DNAPL within the hotspots.

Historical soil sampling was conducted over 8 to 11 years ago. Due to biodegradation processes, previous soil data may not be representative of current site conditions. To better delineate the lateral and vertical extent of subsurface contamination, SOMA proposes to conduct a soil and groundwater investigation. Soil borings (SB-1 through SB-16) will be advanced next to areas of contamination and downgradient of the contaminant plume. The new soil and groundwater data will delineate the current extent of soil contamination and will be used to perform residual chemical mass calculations. The new data will also be used as a guide to design additional extraction wells with more effective depth and screen intervals.

Based on results discussed above, SOMA recommends the following:

1. Installing soil borings to evaluate the current distribution of chemicals in soil and groundwater.

2. Modifying SOMA-2, SOMA-4, B-8 and B-10 to expand B-10 from 1-inch to 2-inch-diameter and all four to longer screen intervals starting from approximately 2.5 feet bgs.

3. Installing additional MPE extraction wells. Locations and quantities will be determined once analysis results from proposed soil borings become available.

4. Once wells are modified and new extraction wells installed, continuing pilot testing using these wells for extraction to evaluate chemical removal rates.

The scope of work consists of the following tasks:

Task 1: Permit acquisition, Health and Safety Plan preparation, and subsurface utility clearance

Task 2: Soil boring advancement

Task 3: Well modifications

Task 4: Installation of additional MPE extraction wells

Task 5: Well Survey and Waste Disposal

Task 6: Conducting additional pilot test utilizing converted and newly installed wells and LFR-2

Task 7: Report Preparation

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

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

SOMA will also update the site-specific Health and Safety Plan (HASP) before beginning field installation activities. 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. The HASP 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 at the site.

SOMA will notify Underground Service Alert (USA) to ensure 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 Borings

2.2.1 Advancement

SOMA proposes advancing 16 soil borings (SB-1 through SB-16) to fully delineate the current lateral and vertical extent of subsurface contamination; Figure 3 shows locations of proposed borings. In order to advance borings within the confines of the site building, SOMA proposes utilizing a small, limited-access rig, as opposed to the standard Geoprobe. Based on historical boring logs and soil sampling, contamination is anticipated to be heaviest between 5 and 11 feet bgs, centered in the vicinity of B-10. Each boring will be advanced to 20 feet bgs to fully define the vertical extent of soil impact, or deeper if observed contamination in the boring warrants. Soil and groundwater samples will be collected from each boring.

Each advanced boring will be continuously cored, and cored soil described in accordance with the Unified Soil Classification System (USCS). In addition, cored soil will be checked for hydrocarbon odors, visual staining, and liquid phase hydrocarbons (FP), and screened using a photo-ionization detector (PID). PID readings will be noted on the boring logs. A minimum of two soil samples will be collected at depths where elevated contaminant levels were previously observed (5 to 11 feet bgs) and submitted for analysis from each boring, with additional samples collected if any hydrocarbon impact is indicated based on the above screening procedures.

SOMA will collect discrete groundwater samples from every groundwater-bearing unit encountered during drilling. To collect groundwater samples, a Dual Tube groundwater profiler will be used. The dual-walled sampler involves hydraulically driving or hammering a cased set of rods into the ground with the lead rod section consisting of a hollow acetate-lined sampler. After pushing the cased rods to the desired depth, the 1-inch-diameter drilling rods are withdrawn from within the 2.125-inch-diameter outer casing to insert the screened sampler. The field crew will use a Watera sampler fitted into plastic tubing to collect groundwater samples.

Following groundwater sampling, borings will be destroyed with a neat cement grout mixture tremmied into place as the push rods are removed, and completed at the surface with materials to match existing grade.

2.2.2 Laboratory Analyses

Samples will be submitted to a California state-certified environmental laboratory for analyses of the following:

- TPH-ss, total petroleum hydrocarbons as gasoline (TPH-g), and TPH as diesel (TPH-d) using EPA Method 8015
- VOCs including benzene, toluene, ethyl benzene, and total xylenes (collectively termed BTEX), methyl tertiary-butyl ether (MtBE), tertiary-butyl alcohol (TBA), PCE, TCE, vinyl chloride, and cis/trans-1,2-DCE (dichloroethylene) using EPA Method 8260B.

2.3 Well Modification

SOMA-2, SOMA-4, B-8, and B-10 were utilized for extraction during MPE pilot testing. SOMA-2, SOMA-4 and B-8 are 2-inch-diameter wells; B-10 is 1-inch diameter. Mass removal rates and ZOIs of these wells are not sufficient for effectively removing the chemical mass from the subsurface. Review of lithologic logs and observations made during installation of these wells indicates possible contamination above perforation intervals, at between 3 and 8 feet bgs. As such, these wells may not be sufficient for removal of contaminants from shallower depths, and may not be screened deep enough for removal of DNAPL.

Following review of results from the current soil investigation (Task 2), SOMA proposes to overdrill these wells, remove current well casings and reinstall the wells as extraction wells with 2-inch diameter PVC casing. Due to insufficient ceiling height within the Glovatorium building and resulting limitation of access for the rig, these wells cannot be constructed with optimal 4-inch diameters. Wells will be installed to a depth of 20 feet bgs within the First WBZ, unless soil investigation results suggest a greater depth is required due to the presence of DNAPL.

Wells will be installed with 2-inch-diameter PVC casings and 0.02-inch-wide by 1.5-inch-long factory-slotted perforations; the upper portion of each well will consist of blank PVC. Based on previous investigations, the length of perforated interval of each well will be 17.5 feet, starting at 2.5 feet bgs. A 2/12 sand pack filter, or other appropriate sand pack based on observed lithology, will be emplaced around the screens and, if possible, surged to consolidate the filter packs and eliminate voids. The filter packs will be emplaced to the height of the top of the screens. The filter pack will be sealed with at least a 1-foot-thick hydrated bentonite plug followed by a minimum 1-foot annular seal of neat cement to surface. A PVC cap will be fitted to the bottom of the casing, without adhesives or tape. To protect the extraction well from accidental damage or tampering, traffic rated utility box with internal steel protective covers and locking caps will be placed over the extraction wellhead, and will be set in concrete and resting flush with existing grade. Provisions may be made to equip the wellheads with appropriate compression fittings (grommets) to be used during proposed pilot testing.

A description of general field procedures is included in Appendix B.

2.4 Installation of New MPE Extraction Wells

Upon completion of the current soil investigation, SOMA will determine quantities and locations of additional MPE extraction wells to be installed on site. Figure 4 shows locations of proposed extraction wells (MPE-1 through MPE-6) based on existing contaminant levels in groundwater. These wells will be reevaluated, as new data become available. A limited-access rig will be used due to the confines of the site building. Wells will be installed to a depth of 20 feet bgs within the First WBZ, with 2-inch-diameter PVC casings and 0.02-inch-wide by 1.5-inch-long factory-slotted perforations; the upper portion of each well will consist of blank PVC. Based on previous investigations, the length of perforated interval of each well will be 17.5 feet, starting at 2.5 feet bgs. A 2/12 sand pack filter, or other appropriate sand pack based on the observed lithology, will be emplaced around the screens and, if possible, surged to consolidate the filter packs and eliminate voids. The filter packs will be emplaced to the height of the top of the screens. The filter pack will be sealed with at least a 1-foot-thick hydrated bentonite plug followed by a minimum 1-foot annular seal of neat cement to surface. A PVC cap will be fitted to the bottom casing, without adhesives or tape. To protect the extraction well from accidental damage or tampering, a traffic rated utility box with internal steel protective covers and locking caps will be placed over the extraction wellhead, and will be set in concrete and resting flush with existing grade. Provisions may be made to equip the wellheads with appropriate compression fittings (grommets) to be used during proposed pilot testing.

2.5 Well Survey and Waste Disposal

A licensed surveyor will survey all modified and newly installed wells to comply with Geotracker requirements. The survey report will be included in SOMA's final report.

Soil and wastewater generated during soil boring, well reconstruction, and well installation 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.

2.6 Conducting Additional Pilot Testing

Upon completion of additional extraction well installations and modifications of existing extraction wells, additional pilot testing will be performed using the these modified and newly installed extraction wells. Due to elevated concentrations of dissolved VOCs in LFR-2, SOMA proposes to also utilize LFR-2 as an extraction well during continued pilot testing. During Third Quarter 2008 groundwater monitoring, contaminant concentrations at this well were significantly elevated, with concentrations of TPH-ss at 15,000 µg/L, TPH-g at 23,000 µg/L, benzene at 5.9 µg/L, toluene at 1.7 µg/L, cis-1,2-DCE at 1,400 µg/L, trans-1,2-DCE at 8.3 µg/L, and vinyl chloride at 89 µg/L. Review of the lithologic log for LFR-2 indicates that sediments are predominantly silty clay/clayey silt until approximately 13 feet bgs, when the silt becomes sandy with increasing coarse-grained sediments with depth. There is 1 foot of loose, poorly graded sand around 17 feet bgs, underlaid with clayey silt. These sediments are very similar to those of SOMA-2 and SOMA-4, which have been successfully utilized as MPE extraction wells. Boring logs for LFR-2, SOMA-2, and SOMA-4 are located in Appendix C.

In August 2004, SOMA supervised a soil gas survey event conducted by Vironix. Hydroprobes were advanced to 5 feet bgs at various locations in the vicinity of LFR-2, but no soil gas was retrieved during the survey due to the low permeability of clay sediments in the shallow subsurface. Although this soil gas survey was unsuccessful, recent pilot test results have shown MPE to be effective in extracting soil vapor from the subsurface. Soil gas surveys and MPE are not comparable extraction methods. The soil gas survey was not as effective as MPE in removing soil vapor because of the following:

- Only conducted to 5 feet bgs, where soil is made up of dense clay with preferential pathways and fingering that make extraction of contaminated soil vapor difficult.
- Extraction vacuums during the soil gas survey were limited to vacuum caused by the sampling tube volume and the Suma canister, whose vacuum decreases as the sample is collected. The maximum vacuum of an evacuated Suma canister is 26 inches of mercury.

- Only a small ZOI (a couple of feet) can be created during a soil gas survey.

MPE is a much more efficient method of extracting soil vapor from the subsurface because of the following:

- Conducted in the saturated zone, where sediments are coarser and the preferential pathways (fingering and channeling) observed in the vadose zone are no longer present to offer alternative pathways for contaminants.
- Multi-phase, allowing for dewatering of the saturated zone, which can enhance volatilization of contaminants that may be sequestered in fingering channels in the vadose zone, creating greater removal of FP and soil contamination.
- Due to dewatering, MPE is able to exert a continuous vacuum in the subsurface of 21 to 26 inches of mercury.
- A greater ZOI can be created with MPE. A vacuum ZOI of up to 38 feet was observed in SOMA-4, which has a lithologic make up similar to LFR-2, during initial MPE pilot testing.

LFR-2 was constructed as a 2-inch-diameter well to a depth of 19 feet bgs, with a screen interval of 9 to 19 feet. LFR-2 will be connected to the existing stationary MPE system on-site with hoses that will run through the opening in the ceiling, over the building, and into the parking lot. Ramps will be used to protect the hoses from traffic and pedestrians. Existing monitoring wells will be utilized as observation wells while extraction is carried out at LFR-2.

Physical and chemical parameters including applied vacuum, soil vapor extraction (SVE) flow rates, oxidizer temperature, volume of groundwater extracted, VOC concentrations, and induced vacuum, will be monitored, measured and recorded. Induced vacuum in the observation wells will be measured using magnehellic vacuum gauges fitted to airtight well caps. VOC concentrations in the extracted soil vapor stream will be continuously monitored using a PID calibrated to hexane. The recorded airflow rate and PID readings will be used to evaluate the mass removal rate of contaminants from subsurface.

2.7 Report Preparation

A report will be submitted that details the following:

- Detailed description of completed boring advancement
- Detailed description of existing-well modifications and new extraction wells and their installation, based on boring advancement and related analyses
- Detailed descriptions of all field activities
- Tabulation of historical and current soil sample analytical data

- Maps of locations of modified extraction wells, new extraction wells, and soil borings
- Survey data for all modified and new wells; waste disposal manifests
- Results of LFR-2 utilization as a test well
- Results of continued MPE pilot testing
- Assessment of nature, extent and source of releases.
- The results of additional field investigation will reveal the extent of contamination at the site and degree of chemical plume intermingling between the Glovatorium and Earl Thompson's.

2.8 Schedule

The workplan will be implemented upon receipt of written authorization from ACHCSA and cost preapproval from the client. We anticipate that proposed work will be completed in five weeks following receipt of required approvals.

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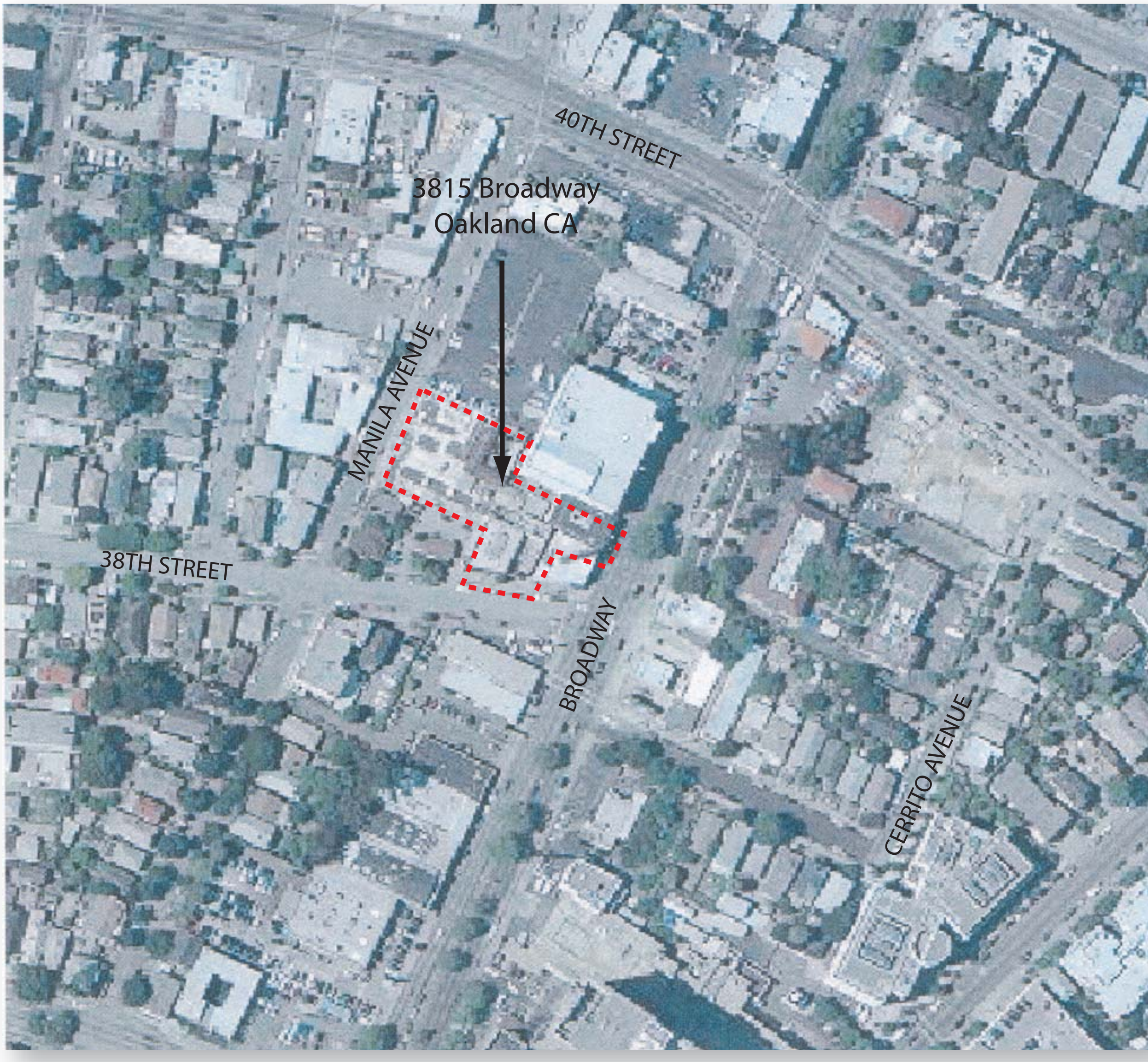
FIGURES



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approximate scale in feet

0 250 500

Figure 1: Site vicinity map.

SOMA ENVIRONMENTAL ENGINEERING, INC.

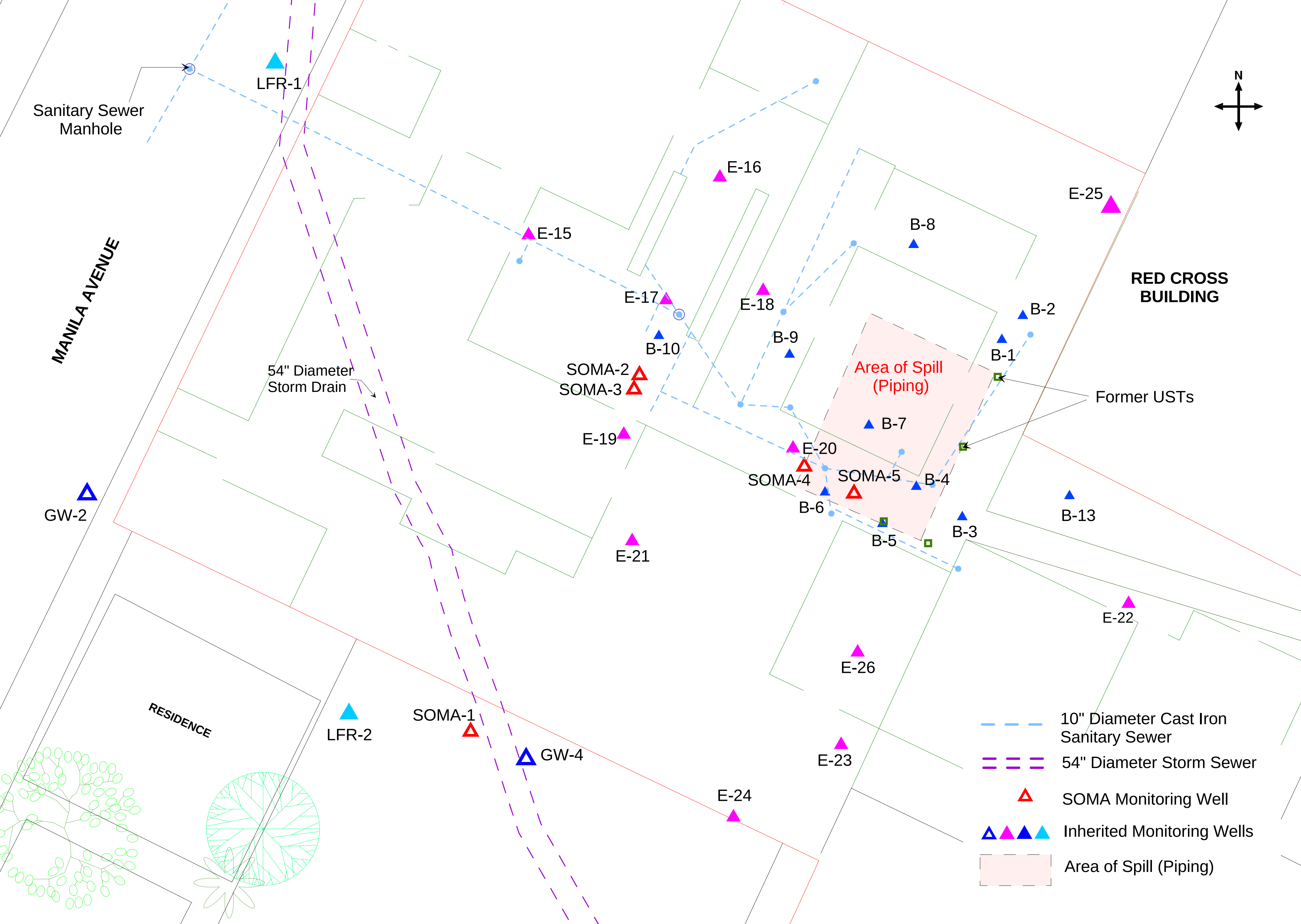
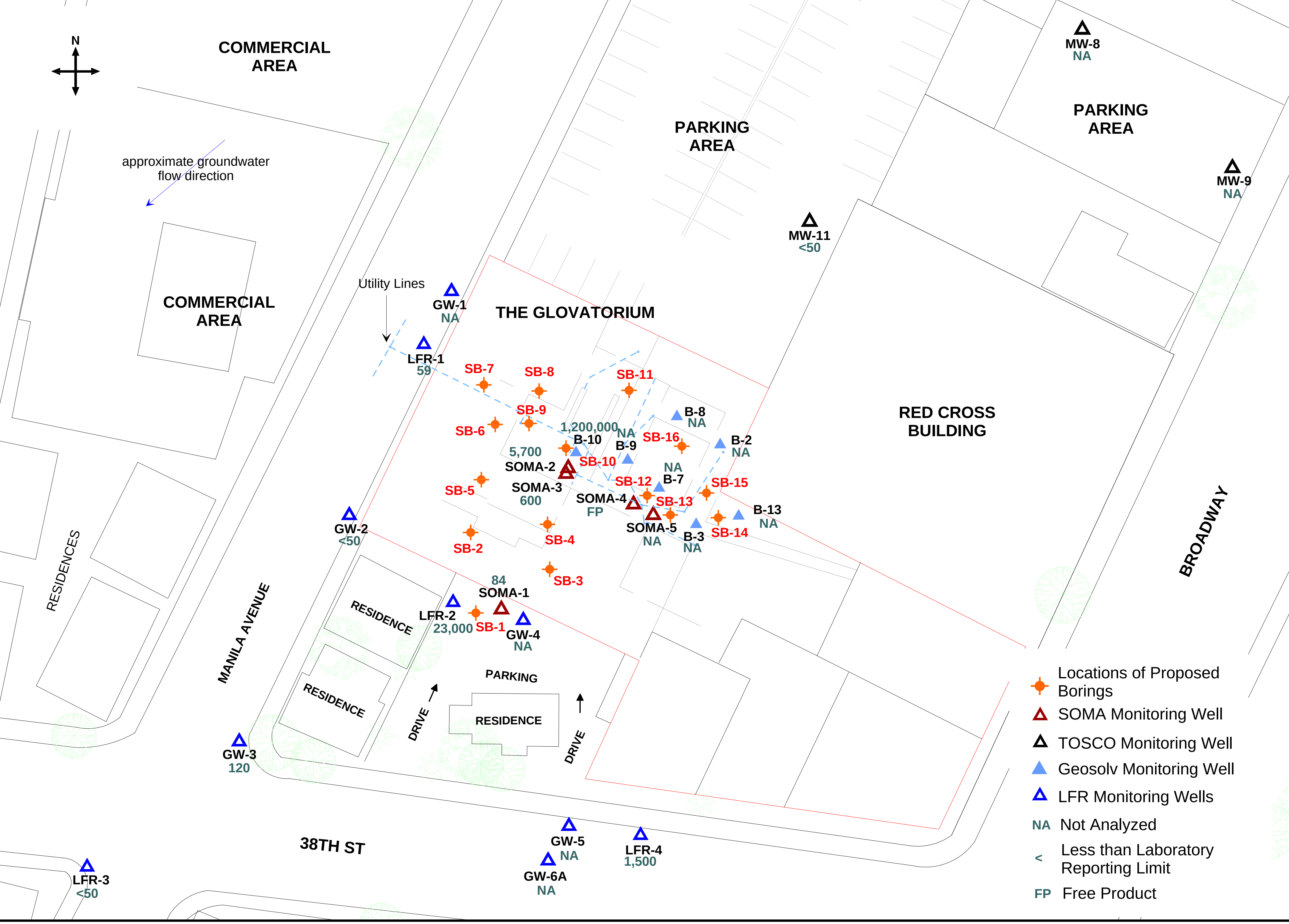


Figure 2: Site Map Showing Locations of Monitoring Wells, Soil Borings, and Preferential Flow Pathways



approximate scale in feet

0 50 100

Figure 3: Locations of Proposed Borings

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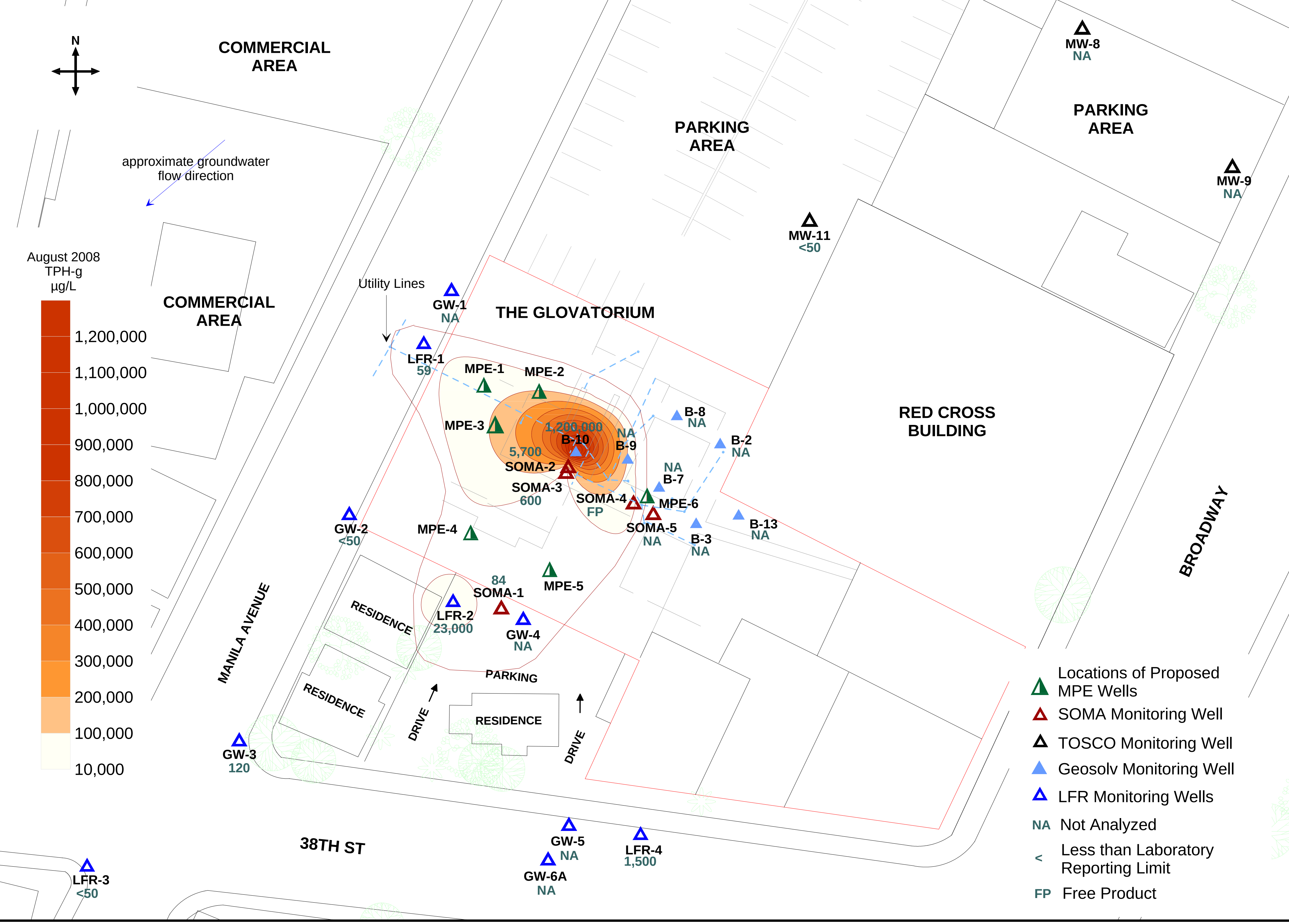

Figure 4: Locations of Proposed MPE Wells

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APPENDIX A

Site History and Previous Activities

Site History:

Geosolv, LLC (Geosolv) initiated the first soil and groundwater investigation in August 1997. Using the direct push method, Geosolv drilled 14 soil borings to the approximate depths of 10 to 24 feet bgs. Seven borings (B-2, B-3, B-7 through B-10 and B-13; Figure 2) were converted to temporary groundwater monitoring wells, where grab groundwater samples were collected. In September 1998, Geosolv conducted further soil and groundwater investigations by drilling 12 additional soil borings to approximate depths of 19 to 25 feet bgs. All 12 borings were converted to temporary groundwater sampling points, labeled E-15 through E-26. After collection of grab groundwater samples from temporary “E” sampling points, these borings were abandoned and grouted. Figure 2 shows soil boring locations.

In July 1999, an investigation of potential groundwater preferential flow paths was initiated by LFR. LFR drilled 10 soil borings (GW-1 through GW-8, GW-5A, and GW-6A) primarily along the 54-inch-diameter storm drain and sanitary sewer systems, to depths ranging from 8 to 20 feet bgs. During drilling, soil samples were collected from various depth intervals. In August 1999, LFR collected grab groundwater samples from seven of the nine “GW” wells. GW-1 to GW-6A are shown in Figure 2.

LFR conducted the first groundwater monitoring events in January, April, October, and November 2000, and installed four groundwater monitoring wells, LFR-1 through LFR-4, in July and August 2000 (Figure 2).

In January 2001, LFR conducted a second groundwater monitoring event that suggested occurrence of strong anaerobic biodegradation activities and dechlorination of tetrachloroethene (PCE) beneath the site. On April 26 to 27, 2001, SOMA began its initial groundwater monitoring events. Results of the Second Quarter 2001 monitoring event indicated strong dechlorination of PCE occurring in the subsurface.

In SOMA’s June 2001 workplan, a recommendation was made to replace the existing small-diameter monitoring wells; B-7 and B-10, with larger-diameter wells, to better evaluate bioattenuation parameters. On October 4, 11, and 12, 2001, SOMA installed monitoring wells SOMA-1 through SOMA-5 (Figure 2). During installation, boreholes were continuously logged and soil samples collected at 5-foot depth intervals to delineate vertical extent of soil and groundwater contamination.

Phase I of SOMA’s workplan included installing additional groundwater monitoring wells, soil and groundwater sampling, hydraulic testing, and a sensitive receptor survey. Phase II of the workplan included defining site regulatory status by conducting groundwater flow, chemical fate and transport modeling, and a risk-based corrective action (RBCA). SOMA's "Report on Conducting Additional Field Investigation to Evaluate the Site's Conceptual Model," dated January 3, 2002, describes results of investigations conducted in Phase I.

The modeling aspect of Phase II used results collected in Phase I and analytical data from quarterly monitoring events. The main objective of groundwater flow and chemical transport modeling was to predict groundwater chemical concentrations downgradient of the site, beneath the nearest residential neighboring property, in order to assess site regulatory status and restore groundwater quality conditions to acceptable levels specified by the RBCA.

Groundwater flow, chemical transport, and bioattenuation modeling for the site was conducted by SOMA in First Quarter 2003. Modeling results confirmed occurrence of biodegradation beneath the site and indicated that bioattenuation processes could remove PCE in the groundwater in approximately 7 to 10 years, trichloroethylene (TCE) in approximately 3 to 9 years, and cis-1,2-dichloroethene (cis-1,2-DCE) in approximately 4 to 13 years. SOMA's March 7, 2003 report entitled "Groundwater Flow, Chemical Transport and Bioattenuation Modeling" describes the study in detail.

Based on approval from ACEHS, groundwater monitoring events have been conducted semi-annually since First Quarter 2003.

Previous Activities:

In order to demonstrate the fate and transport of PCE and other volatile organic compounds (VOCs), SOMA conducted groundwater flow and chemical transport modeling and compared the results with that of routine groundwater monitoring data. The results of groundwater fate and transport modeling were used to conduct a human health risk assessment in order to evaluate the site cleanup levels. The analyses showed that conditions are conducive to biodegradation and that, in fact, biodegradation is occurring. In general, PCE trends appeared generally consistent with SOMA's model, indicating that passive remediation has been effective. However, one obstacle to closing the site was the presence of free product (FP). Alameda County environmental regulatory guidelines do not permit closure as long as FP is present. As a result, over the past several years SOMA has been removing FP from the site. As of March 2008, approximately 1,895 gallons had been removed. Levels of FP in the wells had been dropping fairly consistently over the past several years and, as noted above, PCE trends were decreasing consistent with SOMA's model.

FP or sheen have been reported sporadically in monitoring wells at the site since 1997. Past attempts to delineate the extent and sources of FP have been problematic due to variability and complexity of the subsurface soil and water table characteristics, access limited by buildings, and presence of potential preferential pathways for contaminant migration related to underground storm drain and sanitary sewer lines.

FP was located primarily in the vicinity of SOMA-4 and B-8 (Figure 2). As a result, SOMA instituted a FP removal program for those wells in 2002. As of March 2008, 1,895 gallons of FP and contaminated groundwater had been removed from SOMA-4 and B-8. As of summer 2007, FP levels had been reduced significantly and SOMA was optimistic that it would be in a position to request closure. However, during First Quarter 2008 groundwater monitoring, FP was unexpectedly observed for the first time in SOMA-2 and B-10, which are located approximately 40 feet east-southeast and northeast of SOMA-4 and B-8. Approximately 0.71 feet of FP was detected in SOMA-2 and 2.76 feet in B-10. During Second Semi-Annual 2008 groundwater monitoring, FP was observed in well B-10 at 0.17 feet and in wells SOMA-2 and SOMA-4 at 0.60 feet each.

Results from the First Semi-Annual 2008 sampling event showed significant increases in PCE levels in wells with newly discovered FP (B-10 and SOMA-2). SOMA believes that the presence of elevated levels of FP in these wells for the first time contributed to the presence of elevated levels of dissolved solvents at this location. The FP consisted primarily of TPH-ss, which has the potential to dissolve PCE and TCE. Thus, it is suspected that the FP in the area of SOMA-2 and B-10 caused dissolution and mobilization of residual levels of PCE in the subsurface.

Beginning September 2, 2008, SOMA conducted a 45-day Multi-Phase Extraction (MPE) pilot test at the site. The results of pilot test indicate that MPE technology is highly effective in removing free product, chemically impacted groundwater and soil vapor from the subsurface. The pilot tests were conducted using SOMA-4, SOMA-2, B-8 and B-10. Significantly, the pilot test showed that MPE can be effective in removing contamination from the smear zone, thereby eliminating the creation of free product. The Alameda County Health Care Agency has required that the pilot test be extended ………………….. In addition, it required that ______.

APPENDIX B

Field Procedures

GENERAL FIELD PROCEDURES

Hydraulic Push (GEOPROBE) Drilling

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.

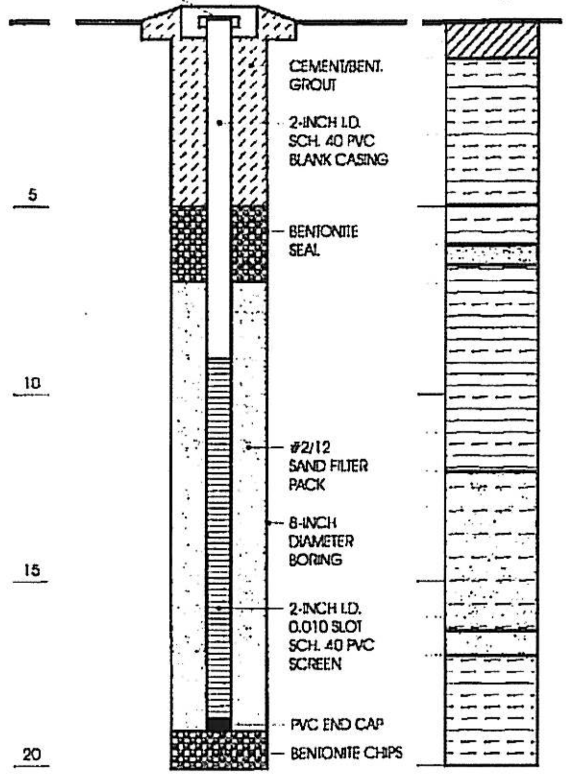
Soil Cuttings and Rinsate/Purge Water

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.

APPENDIX C

Boring Logs

WELL CONSTRUCTION	LITHOLOGY	SAMPLE DATA	HEADSPACE MEASUREMENTS



Description

ASPHALT and AGGREGATE BASE
CLAYEY SILT (ML), dark brown (10YR 3/3), moist, stiff, medium to low plasticity.

SILTY CLAY (CL), moist, very stiff, high plasticity.
SAND LENS, wet, poorly graded, fine to medium sand.

CLAYEY SILT (ML), dark grayish brown (10YR 4/2), moist, medium stiff, medium to low plasticity, trace fine sand.

SANDY SILT (ML), wet, soft, low plasticity, well graded, fine sand to fine gravel, trace clay.

Increase in coarse-grained sediments to ~25%.

SAND (SP), wet, loose, poorly graded medium sand, trace fines.
CLAYEY SILT (ML), light yellowish brown (10YR 6/4), moist to damp, soft, low plasticity, trace fine sand.
BOTTOM OF WELL 19 FEET.
BOTTOM OF BORING AT 20 FEET.

Groundwater not encountered at time of drilling.

Note: PID operation questionable - PID measurements considered qualitative.

Depth, feet	Sample	Penetration Rate (blows/ft.)	PID Measurement of Soil (ppm)
0–5		Log cuttings	
		19	
	LFR-2-6.5		
		34	
		24	
10		34	500
	LFR-2-11		
		54	1200
		50 for 6"	2400
15		50 for 6"	3800
		65	4100
		63	0.0
20		66	0.0

Well Permit No.: W00-445
Date Well Drilled: July 27, 2000
Drilling Company: Gregg Drilling
Driller: Trevor
Drill Rig: Mobile B-53 Hollow Stem Auger
Hammer Weight and Drop: 140 lbs./30-inch
LFR Geologist: Dan Foster

EXPLANATION

- Clay
- Silt
- Sand
- Gravel
- Interval sampled using 2-inch I.D. Modified California Sampler
- Soil sample collected for analysis

Approved by: [signature]

CONSTRUCTION AND LITHOLOGY FOR LFR-2

LFR LEVINE•FRICKE

FORMER GLOVATORIUM

6895L112.CDR 091100

ENVIRONMENTAL ENGINEERING, INC.	GEOLOGIC LOG OF SOMA-2	Page 1 of 1

Boring Location: See Site Map	Project #2512	Date Drilled: 10/11/2001
	Site Location: 3815 Broadway, Oakland, California	
	Drilling Method: Hollow Stem Auger	Casing Elevation:
	Driller: Gregg Drilling & Testing.	Depth to Groundwater:
	Logged By: Naser Pakrou	Approved By: Jonathan Hoffman, RG

DEPTH	GRAPHIC LOG	SOIL CLASS.	GEOLOGIC DESCRIPTION	NOTES
			6" concrete	
5		CL	Silty Clay: Dark brown to black; moist; low to med. plasticity; color gets lighter with depth; occ. gravel at depth of 6-8'; high organic content; no petroleum odor.	Well construction detail is presented in Appendix B
10		CL	Silty Clay: Same as above but, no gravel and strong petroleum odor.	
		SC	Clayey Sand: Dark olive to green; wet; fine to coarse poorly sorted sand; 25 to 30%, 7 to 10% low to medium plasticity fines; strong petroleum odor.	
15		GW	Sandy Gravel:Light brown matrix, dark brown gravel; wet; 20 to 25% fine to coarse poorly sorted sand; 5 to 10% low to med. plastic fines; strong petroleum odor.	
		CL	Silty Clay: Light olive; moist; med. plasticity; low permeabilty; no petroleum odor.	
20			Drilling terminated at 20'	

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GEOLOGIC LOG OF SOMA-4

Boring Location: See Site Map

Project #2512 | Date Drilled: 10/12/2001

Site Location: 3815 Broadway, Oakland, California

Drilling Method: Hollow Stem Auger | Casing Elevation:

Driller: Gregg Drilling & Testing. | Depth to Groundwater:

Logged By: Naser Pakrou | Approved By: Jonathan Hoffman, RG

DEPTH	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION	NOTES
			6" concrete	
		CL	Clay: Light brown; moist; med. plasticity; few orange pigments; no petroleum odor.	Well construction detail is presented in Appendix B
5		CL	Clay: Black; moist; med. plasticity; no petroleum odor.	
10		CL	Silty Clay: Dark olive; moist; med. plasticity; occ. gravel increasing with depth.	
		SC	Clayey Sand: Dark olive ; wet; fine to coarse poorly sorted sand; 15 to 25%, medium plasticity fines; strong petroleum odor.	
15		CL	Silty Clay: Light brown; moist; med. plasticity; low permeabilty; no petroleum odor.	
20			Drilling terminated at 20'	