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Environmental Health

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August 3, 2009

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

Subject: **Fuel Leak Case#RO0002996**
Site Address: 316 38th Street, Oakland, CA

Dear Mr. Wickham:

SOMA's "Workplan for Additional Soil and Groundwater Investigation" 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. 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. John Kortum, Esq.

Workplan for Additional Soil and Groundwater Investigation

316 38th Street
Oakland, California
Case RO0002996

August 3, 2009

Project 2720

Prepared for
Mr. Earl Thompson, Jr.
Executor for the Estate of Earl Thompson, Sr.

SOMA ENVIRONMENTAL ENGINEERING, INC.
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CERTIFICATION

SOMA Environmental Engineering, Inc. has prepared this report on behalf of Mr. Earl Thompson, Jr., Executor for the Estate of Earl Thompson, Sr., property owner of 316 38th Street, Oakland, California, to comply with Alameda County Environmental Health Services requirements for further soil and groundwater investigation, as specified in their April 30, 2009 letter.

Mansour Sepehr, PhD, PE
Principal Hydrogeologist

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1. INTRODUCTION

SOMA Environmental Engineering, Inc. (SOMA) has prepared this report on behalf of Mr. Earl Thompson, Jr., Executor for the Estate of Earl Thompson Sr., property owner of 316 38th Street in Oakland, California (Thompson Property). The site is located in an area of primarily commercial and residential property uses (Figure 1). The site map is shown in Figure 2. This report summarizes decommissioning results of three underground storage tanks (USTs) located under the sidewalk adjacent to the Thompson Property and proposes further investigation to delineate the extent of apparent contamination observed during confirmation sampling, to comply with Alameda County Environmental Health Services (ACEHS) requirements for further soil and groundwater investigation specified in April 30, 2009 correspondence.

1.1 Site Vicinity

Properties in the vicinity of the Thompson Property are primarily commercial and residential. Reportedly, six USTs were previously located at or near the nearby Glovatorium site located upgradient from the subject site at 3820 Manila Avenue (Glovatorium Property). The location of the Glovatorium Property is shown on Figures 1 and 2A. Two USTs associated with the Glovatorium Property were located under the sidewalk near 316 38th Street and four USTs were located inside the Glovatorium building. Capacities of the six Glovatorium USTs have been reported as ranging from 800 gallons to 5,000 gallons. They reportedly contained Stoddard solvent (TPH-ss), fuel oil, and possibly waste oil. In June 1997, HK2 obtained City of Oakland Fire Prevention Bureau permit No. 52-97 to decommission the USTs. USTs inside the building were interconnected through a series of pipes and valves. It was reported that in about the late 1970s a significant release of TPH-ss occurred when a new piping system was installed. In August 1997, the six Glovatorium USTs were abandoned in-place by backfilling with either cement-sand slurry or pea gravel. Groundwater monitoring wells associated with the Glovatorium Property are currently monitored semi-annually. Past groundwater monitoring events have indicated the presence of volatile organic compounds (VOCs) and petroleum hydrocarbons in groundwater beneath the Glovatorium and adjacent properties.

Following are results of the latest groundwater monitoring event at the Glovatorium Property. Detectable levels ranged as follows: Stoddard solvent (TPH-ss) from 57 µg/L in LFR-1 and SOMA-1 to 860,000 µg/L in SOMA-2; total petroleum hydrocarbon as gasoline (TPH-g) from 67 µg/L in LFR-1 to 1,300,000 µg/L in SOMA-2; perchloroethylene (PCE) from 1.5 µg/L in LFR-3 to 1,200 µg/L in B-10; trichloroethylene (TCE) from 6.2 µg/L in GW-2 to 1,200 µg/L in B-10; and cis-1,2-dichloroethylene (cis-1,2-DCE) from 0.7 µg/L in LFR-4 to 5,900 µg/L in SOMA-2. Vinyl chloride (VC) was below the laboratory-reporting limit throughout the site, except for samples from LFR-2 at 32 μg/L. Figure 2A shows locations of aforementioned sampling points.

The source of contamination is believed to be either the former Glovatorium USTs, which were used to store TPH-ss and VOCs, or releases from the Glovatorium piping on the washer system and from washing floors within the Glovatorium building with TPH-ss. At this time, multi-phase extraction (MPE) pilot testing events are being conducted at the Glovatorium Property to remediate subsurface contamination and additional soil and groundwater investigation is taking place to delineate vertical and horizontal extent of contamination at the site.

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.

1.2 Site Hydrogeology

The site 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 that are 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.

Sediments encountered in soil borings in the vicinity of the site are typical of those encountered in an alluvial fan depositional environment. The sediments 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. A relatively coarse-grained layer of silty sand, clayey sand, and clayey gravel was encountered at approximately 4.5 to 14 feet below ground surface (bgs). A discontinuous layer of silty to clayey sand was encountered at depths of 17 to 21 bgs.

According to results of historical groundwater monitoring activities in the site vicinity, groundwater occurs at 13 to 20 feet bgs. Based on current and previous groundwater monitoring reports for wells in the vicinity of the site, groundwater flows from the northeast to the southwest with an approximate groundwater flow gradient of 0.019 ft/ft to 0.035 ft/ft. Slug test results indicated that hydraulic conductivity of saturated sediments ranges between 1.2×10^{-4} and 6.9×10^{-4} cm/sec, which is equivalent to 0.34 ft/day to 1.95 ft/day. 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.

Based on confirmation soil borings advanced during USTs closure, the site is underlaid with unconfined sediments as follows around three decommissioned USTs located on the sidewalk in front of the site (see decommissioning summary below): primarily sand up to approximately 8 to 12 feet bgs (possibly fill material) and inorganic clays with sand to approximately 17 feet bgs around Tank 1; inorganic clays with sand to the total depth of the borings around Tank 2; and interbedded sand, clay, silt layers with gravel up to the total depth of the borings around Tank 3. Depth to water around Tank 1 was noted at approximately 12 feet bgs, Tank 2 at approximately 7 feet bgs, and Tank 3 at 7 feet bgs.

1.3 UST Decommissioning Summary

Three USTs located under the sidewalk in front of 316 38th Street were properly closed in November 2008, thereby effectively removing the contaminant source; results were documented in SOMA's report dated January 27, 2009. All residual amounts of the hazardous substances which were stored in the UST system prior to closure have been removed, properly disposed of, and neutralized; USTs and associated piping were filled according to Oakland Fire Department (OFD) with appropriate slurry mixture.

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, SOMA performed confirmation soil and groundwater sampling activities in accordance with OFD approval of the workplan. To verify integrity of the decommissioned USTs, on November 20-21, 2008, SOMA's field geologist oversaw advancement of confirmation soil borings around each decommissioned UST by Fisch Drilling. Locations of advanced borings are shown in Figure 2. SOMA advanced seven vertical borings to 10-27 feet bgs, depending on the depth of each UST (Tank 1 bottom at 25 feet bgs, Tank 2 bottom at 8 feet bgs, Tank 3 bottom at 15 feet bgs) utilizing direct push technology (DPT). Soil samples were collected at depths where PID readings or visual observations indicated significant soil contamination. In addition, one soil sample was collected from the vadose zone at the soil–groundwater interface. Groundwater samples were collected from each advanced boring.

TPH-g was detected in soil samples at concentrations up to 4,100 mg/kg, and TPH-g and benzene were detected in grab groundwater samples at concentrations up to 29,000 and 22 µg/L, respectively. The following sections detail laboratory analytical results derived during the confirmation soil and groundwater sampling.

1.3.1 Extent of Soil Contamination

Elevated photoionization detector (PID) levels and hydrocarbon staining were observed in confirmation borings TB1-1, TB1-3, TB2-1, TB3-1, and TB3-2 (Figure 2). As Table 1 indicates, TPH-g was detected above California Regional Water Quality Control Board (CRWQCB) Environmental Screening Level (ESL) in TB1-3 at 14 feet bgs (1,200 mg/kg), TB2-1 at 6 and 10 feet bgs (750 and 120 mg/kg), TB2-2 at 10 feet bgs (120 mg/kg), TB3-1 at 14 feet bgs (3,800 mg/kg) and TB3-2 at 14 and 17 feet bgs (3,200 and 210 mg/kg). TPH-d was detected above ESL at TB1-1 at 18 feet bgs (110 mg/kg). TPH-ss and kerosene were observed above ESL in TB1-1 at 18 feet bgs (170 and 150 mg/kg), TB1-3 at 14 feet bgs (120 and 110 mg/kg), TB2-2 at 10 feet bgs (150 and 130 mg/kg) and in TB3-1 at 14 feet bgs (130 and 120 mg/kg).

As Table 2 indicates, all BTEX (collective term for benzene, toluene, ethylbenzene and total xylenes) and other VOCs were below laboratory-detection limits and well below ESLs at all depths. Figures 3 through 8 show chemicals of concern (COC) contamination in soil at different depths. Figure 8A shows graphs depicting contaminant distribution in soil. Residual soil contamination appears to be present between 6 and 8 feet bgs between Tank 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.

1.3.2 Extent of Groundwater Contamination

Groundwater samples from each confirmation soil boring showed contaminants above CRWQCB ESLs for groundwater that is a current or potential source of drinking water, as well as a non-drinking-water source. ESLs for TPH-g, TPH as diesel (TPH-d), TPH-ss, and kerosene in drinking and non-drinking water are 100 µg/L and 210 µg/L, respectively. As Table 3 shows, TPH-g ranged from 890 µg/L to 29,000 µg/L, TPH-d from 230 µg/L to 330,000 µg/L, TPH-ss from 140 µg/L to 560,000 µg/L, and kerosene from 170 µg/L to 560,000 µg/L. All samples except those from TB3-2 showed contaminants above non-drinking-water ESLs. Benzene was detected above the drinking-water ESL in TB3-1 (22 µg/L, ESL 1 µg/L) and total xylenes were detected above drinking and non-drinking-water ESLs in TB1-3 (1,700 µg/L, drinking-water ESL 20 µg/L). BTEX was below ESLs or laboratory-detection limits in remaining samples. Table 4 shows that VOCs were detected above drinking-water ESLs in TB1-3 (TBA at 28 µg/L, ESL 12 µg/L), TB1-4 (1,2-DCA at 3.6 µg/L, ESL 0.5 µg/L), TB2-1 and TB3-1 (naphthalene at 98 and 19 µg/L, respectively, ESL 17 µg/L). All other VOCs were below ESLs or below laboratory-detection limits. Figures 9 through 12 show PHC contamination in groundwater. Groundwater samples indicate that hydrocarbon contamination in groundwater is located in the vicinity of the decommissioned USTs.

1.4 Data Gap Summary

1. Due to elevated contaminant concentrations detected in shallow soil and groundwater in close proximity to the decommissioned USTs (under the sidewalk in front of Thompson Property) and in some instances undefined extent of elevated concentrations, further investigation to delineate vertical and horizontal extent of contamination is warranted.

2. SCOPE OF WORK

Based on results of the most recent site investigation, conducted in 2008, and ACEHS approval, SOMA proposed the following action items to delineate extent of contamination around decommissioned USTs:

1. Installation of DP borings utilizing a limited access rig to delineate horizontal extent of contaminant plume upgradient (north) from decommissioned USTs.
2. Installation of DP borings to delineate horizontal extent of contaminant plume downgradient (south) from decommissioned USTs.
3. Installation of multiple monitoring wells, if DP investigation results warrant, to delineate and monitor horizontal extent of contaminant plume, and study the groundwater gradients in the tanks' vicinity.

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

Task 2: Advancement of DP borings

Task 3: Installation of groundwater monitoring wells, pending review of DP results and discussion of results with the regulatory agency

Task 4: Report preparation

Following are brief descriptions of the above-mentioned tasks.

3. FIELD ACTIVITIES

3.1 Pre-Investigation Activities

Upon approval of this workplan, and prior to initiating field activities, drilling permits will be obtained from ACEHS.

SOMA will prepare a site-specific Health and Safety Plan (HASP). The HASP will be prepared according to 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.

SOMA will contact Underground Service Alert (USA) to ensure 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.

3.2 Direct Push Borings, Collection of Soil and Groundwater Samples

3.2.1 Limited Access Direct Push Borings

Due to access limitations inside the Thompson building, proposed limited access Geoprobe borings will be advanced using Ram-Set hand portable equipment that utilizes DP technology (DPT). The Ram-Set is a portable, hydraulically powered soil probe unit designed for extremely tight space conditions. The unit requires only 5 feet of vertical clearance and has a footprint of only 2 square feet; the depth limitation of this rig in normally consolidated soil ranges between 25 and 80 feet bgs.

As many as six borings (DP-1 through DP-6) are proposed upgradient of decommissioned USTs. Final quantity of borings will be determined prior to field mobilization based on access limitations or subsurface conditions. If for any reason due to unforeseen on-site conditions Ram-Set cannot be utilized, with concurrence from ACEHS, where feasible a hand-augered borehole will be advanced instead to collect soil and groundwater samples.

Each DP boring will be advanced to at least 25 feet bgs. SOMA will utilize a PID and field observations of odor and staining to determine ultimate sampling depth and final depth of each boring. Proposed boring locations are illustrated in Figure 13. Proposed borings DP-1 through DP-6 are positioned inside the building near the Glovatorium property boundary to allow for baseline condition assessment, and in the middle of the site structure to evaluate possible plume migration pattern.

3.2.2 Direct Push Borings

Proposed Geoprobe borings around former USTs will be advanced using DPT. As many as eight borings (DP-7 through DP-14) are proposed adjacent to and downgradient from decommissioned USTs. Final quantity of borings will be determined in the field based on access limitations or subsurface conditions. The purpose of this subsurface assessment is twofold: 1) determine the lateral extent of the elevated contaminant concentrations reported in soil and groundwater samples; and 2) determine the necessity for permanent groundwater monitoring well installation in proximity to and downgradient from decommissioned USTs.

Subsurface soil and groundwater samples will be collected from each boring. Since confirmation borings were only advanced 1 to 2 feet beneath each tank (some borings were as shallow as 10 feet bgs) the vertical plume extent is not fully defined at this time. Therefore, each boring will be advanced to at least 30 feet bgs, since the deepest of the tanks was installed to the total depth of 25 feet bgs (Tank 1). SOMA will utilize a PID and field observations of odor and staining to determine the ultimate depth of each boring. Borings advanced adjacent to decommissioned USTs will aid in determining the vertical extent of contamination; borings positioned downgradient from the source will aid in determining horizontal extent of contamination.

3.2.3 Soil Sampling

DPT is an efficient method of collecting continuous soil cores while preventing cross-contamination. DPT involves hydraulically hammering a set of steel rods into the subsurface with the lead section consisting of a polyethylene-lined sampler. After pushing the drilling rods to the desired depth, the soil-filled liner will be retrieved. SOMA's field geologist will log continuous soil cores from each boring location, characterizing the content of each soil-filled tube using the Unified Soil Classification System.

Encountered subsurface lithologies from all advanced borings will be recorded on geologic borehole logs. At each interval of depth-discrete soil sampling, the DP drilling rig will obtain a 4-foot soil core sample. The contents of each sediment-filled tube will be screened using PID. Vapors from the soil core sample(s) will be screened for volatile compounds and will be documented on geologic borehole logs. SOMA proposes that soil samples be collected at depths where PID readings or visual observations indicate the presence of significant soil contamination. In addition, one soil sample will be collected from the vadose zone at the soil-groundwater interface. Absent detectable contaminants of concern in soil during field screening, a minimum of two soil samples will be collected from each soil boring. SOMA's field geologist will select and cut sections of the soil-filled tubes into 6-inch-long sections and cap ends of each sample with a Teflon liner and polyethylene end caps. Samples will be labeled and immediately placed into a chilled ice chest for transportation to a California state-certified environmental laboratory for analysis.

3.2.4 Groundwater Sampling

To collect groundwater samples at the field-identified depth intervals, a hydropunch groundwater profiler will be used. It is designed for discrete groundwater sampling without cross-contaminating water-bearing zones (WBZs) at different depth intervals. 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 drilling rods are withdrawn from within the 1.25-inch-diameter outer casing to insert the screened sampler. The field crew will use disposable bailers or a Watera sampler fitted into plastic tubing to collect grab groundwater samples.

Following soil and groundwater sampling, borings will be abandoned and sealed with a bentonite grout mixture and completed at the surface with materials to match the existing grade.

Soil and waste water 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.

3.2.5 Laboratory Analyses

Grab groundwater samples and soil samples will be submitted to a California state-certified environmental laboratory under appropriate chain-of-custody protocol for analysis of the following:

- TPH-g, TPH-d, and TPH-ss, EPA Method 8015
- Kerosene, EPA Method 8015
- BTEX, EPA Method 8260
- VOCs such as PCE, trichloroethene (TCE), VC, naphthalene, 1,2-dichloroethane (1,2-DCA), dichloroethene (DCE), and gasoline oxygenates such as methyl tertiary-butyl ether (MtBE) and tertiary-butyl alcohol (TBA), EPA Method 8260
- Total lead, EPA Method 6010

3.2.6 Data Review

Soil and groundwater data collected during the DP investigation will be utilized to determine whether all data gaps have been closed. Furthermore, investigation results will be made available to the regulatory agency to make the final determination of whether well installations proposed in Section 3.3 are necessary.

3.3 Installation of Groundwater Monitoring Wells

If warranted by DP investigation results, one groundwater monitoring well will be installed within the groundwater chemical plume and downgradient of the “hot spot”, and two wells will be installed adjacent to the decommissioned USTs in order to monitor chemical transport. Based on geology beneath the site, the proposed monitoring wells will be 2 inches in diameter casing with 0.02-inch-wide by 1.5-inch-long factory-slotted perforations, well screen will span 5 to 10 feet. The upper portion of the well will consist of blank PVC, well depths may vary and will be contingent on DP investigation results. The well will be screened from approximately 5 to 15 feet bgs. Final determination of well construction will be made in the field, based on DP investigation results, with concurrence from ACEHS.

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 a height of at least 1 foot above the top of the screens and sealed with at least a 1-foot-thick hydrated bentonite plug followed by an annular grout seal of neat cement. A PVC cap will be fitted to the bottom 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. Final determination of well construction will be made in the field, based on DP investigation results, and with approval from ACEHS.

The drilling crew will drill and continuously sample each boring for lithologic logging purposes and chemical content. In addition, the cored soil will be checked for attributes characteristic of smear zone, hydrocarbon odors, visual staining, liquid phase hydrocarbons (free product), and screened using a PID. PID readings will be noted on boring logs. Soil samples will be collected if highly varied lithologies or highly impacted areas are encountered. Upon soil sampling, both ends of each sampling tube will be secured using Teflon tape and tubes will be immediately placed in a chilled ice chest. Soil samples will be delivered to a California state-certified laboratory for analysis.

Soil and wastewater 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.

3.3.1 Development and Survey

SOMA will develop installed wells a minimum of 72 hours following installation; see Appendix A for general well development procedures. Wells will be developed by bailing out sediment-rich groundwater followed by pumping and surging. This process will continue until purged groundwater clarifies substantially and groundwater quality parameters have stabilized.

Water-bearing intervals will be developed by surging and bailing using a suitably sized surge block. Development of the well will continue until the well is producing clear water with less than 2 to 5 ppm by weight of sand and/or other suspended solids. Groundwater stabilization parameters will be maintained during development and records of this data will be included as an appendix to SOMA's final report. Forty-eight hours following well development, groundwater samples will be collected in appropriate laboratory provided pre-preserved containers, which will be completely filled and sealed properly to prevent air bubbles from forming within the headspace of the vials. Samples will then be then labeled with unique sample identifiers, date and time of sample collection, recorded on a chain-of-custody form, and placed in a cooled ice chest pending transport to a California state-certified analytical laboratory for analyses.

SOMA proposes surveying newly installed wells (NAD 83 and NAVD 88 datums) to comply with Geotracker requirements. The survey report will be included as an appendix to SOMA's final report.

3.3.2 Laboratory Analysis

Soil and groundwater samples will be submitted to a California state-certified environmental laboratory for analysis of the following:

- TPH-g, TPH-d, and TPH-ss, EPA Method 8015
- Kerosene, EPA Method 8015
- BTEX, EPA Method 8260
- VOCs such as PCE, trichloroethene (TCE), VC, naphthalene, 1,2-DCA, DCE, and gasoline oxygenates such as MtBE and TBA, EPA Method 8260
- Total lead, EPA Method 6010

4. REPORT PREPARATION

SOMA will prepare a full report of the additional site investigation, including the following:

- A description of field activities; tabulation of soil and groundwater sample analytical data; maps illustrating boring locations; and description of lateral/vertical extent of impacted soil and groundwater utilizing all available up-to-date data.

- Conclusions regarding lateral and vertical extent of impact at the assessment area of concern, based on data and information derived from field work and laboratory analysis.
- Possible remedial technologies prescreening evaluation for addressing soil and groundwater contamination at the site.

Tables

Table 1: Soil Analytical Results (TPH and BTEX)

November 20 and 21, 2008

316 38th Street, Oakland

Borehole	Depth[1] (feet bgs)	TPH-g (mg/kg)	TPH-d (mg/kg)	TPH-ss (mg/kg)	Kerosene (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)
TB1-1	10	3.1	3.3	4.5	6	<0.023	<0.023	<0.023	<0.047
TB1-1	12	850	260	340	340	<2.4	<2.4	<2.4	<4.9
TB1-1	18	0.91	110	170	150	<0.005	<0.005	<0.005	<0.0099
TB1-1	27	<0.23	<0.99	<0.99	<0.99	<0.005	<0.005	<0.005	<0.01
TB1-3	10	7.3	12	21	22	NA	NA	NA	NA
TB1-3	12	300	35	58	53	<0.97	<0.97	<0.97	<1.9
TB1-3	14	1,600	66	120	110	<0.022	<0.022	<0.022	<0.043
TB1-3	27	<0.23	1.0	<0.99	2.8	<0.005	<0.005	<0.005	<0.01
TB1-4	24	<0.24	<1.0	1.8	3.7	<0.0047	<0.0047	<0.0047	<0.0095
TB1-4	27	2.0	<1.0	2.2	4.0	<0.005	<0.005	<0.005	<0.01
TB2-1	6	750	18	39	35	<0.005	<0.005	<0.005	<0.0099
TB2-1	10	120	1.8	1.7	3.6	<0.0049	<0.0049	<0.0049	<0.0099
TB2-2	6	250	15	28	27	<0.96	<0.96	<0.96	<1.9
TB2-2	8	3,900	630	950	950	<2.5	<2.5	<2.5	<4.9
TB2-2	10	140	79	150	130	<0.012	<0.012	<0.012	<0.024
TB3-1	6	<0.25	2.5	1.1	1.4	<0.005	<0.005	<0.005	<0.01
TB3-1	8	220	4.4	4	7.4	<1.9	<1.9	<1.9	<3.9
TB3-1	14	3,800	81	130	120	<0.024	<0.024	0.036	<0.048
TB3-1	17	<0.24	<1.0	1.4	3.3	<0.005	<0.005	<0.005	<0.01
TB3-2	6	<0.25	31	2.5	5	<0.005	<0.005	<0.005	<0.0099
TB3-2	12	2,100	12	15	17	<4.9	<4.9	<4.9	<9.7
TB3-2	14	3,200	5.5	5.5	7.9	<0.0049	<0.0049	<0.0049	<0.0099
TB3-2	14	4,100	NA	NA	NA	<0.0048	<0.0048	<0.0048	<0.0096
TB3-2	17	210	3.7	5.6	7.0	<0.0049	<0.0049	0.024	0.022
ESL - Shallow Soil <3m bgs		**83**	**83**	**83**	**83**	**0.044**	**2.9**	**2.3**	**2.3**
ESL - Deep Soil >3m bgs		**83**	**83**	**83**	**83**	**0.044**	**2.9**	**3.3**	**2.3**

Notes:

TPH-g: Total Petroleum Hydrocarbons as Gasoline (C5-C12)

TPH-d: Total Petroleum Hydrocarbons as Diesel (C9-C19)

TPH-ss: Total Petroleum Hydrocarbons as Stoddard Solvents (C9-C13)

TPH by EPA Method 8015, BTEX by EPA Method 8260B/CA_LUFTMS

ESL: California Regional Water Control Board Environmental Screening levels, Interim Final November 2007, Revised May 2008, Tables A and C

Table 2: Soil Analytical Results (VOC compounds)

November 20 and 21, 2008

316 38th Street, Oakland

Borehole	Depth[1] (feet bgs)	PCE (mg/kg)	TCE (mg/kg)	Vinyl Chloride (mg/kg)	TBA (mg/kg)	MtBE (mg/kg)	1,2-DCA (mg/kg)	Cis-1,2 DCE (mg/kg)	Napthalene (mg/kg)
TB1-1	12	<0.005	<0.005	<0.005	NA	NA	NA	NA	NA
TB1-1	18	<0.005	<0.005	<0.005	<0.0095	<0.0049	<0.005	<0.005	<0.0099
TB1-1	27	<0.005	<0.005	<0.005	<0.0094	<0.0047	<0.005	<0.005	<0.01
TB1-3	12	<0.005	<0.005	<0.005	NA	NA	NA	NA	NA
TB1-3	14	<0.022	<0.022	<0.022	<1.9	<0.97	<0.97	<0.022	<0.043
TB1-3	27	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.01
TB1-4	24	<0.005	<0.005	<0.005	NA	NA	NA	NA	NA
TB1-4	27	<0.005	<0.005	<0.005	<0.0095	<0.0047	<0.0047	<0.005	<0.01
TB2-1	6	<0.005	<0.005	<0.005	<1.9	<0.96	<0.96	<0.005	<0.0099
TB2-1	10	<0.0049	<0.0049	<0.0049	<1.9	<0.94	<0.94	<0.0049	<0.0099
TB2-2	6	<0.0049	<0.0049	<0.0049	NA	NA	NA	NA	NA
TB2-2	10	<0.012	<0.012	<0.012	<2.0	<0.98	<0.98	<0.012	<0.024
TB3-1	6	<0.0049	<0.0049	<0.0049	NA	NA	NA	NA	NA
TB3-1	14	<0.024	<0.024	<0.024	<5.0	<2.5	<2.5	<0.024	0.480
TB3-1	17	<0.005	<0.005	<0.005	<0.0096	<0.0048	<0.0048	<0.005	<0.01
TB3-2	6	<0.005	<0.005	<0.005	NA	NA	NA	NA	NA
TB3-2	14	<0.0049	<0.0049	<0.0049	<1.9	<0.96	<0.96	<0.0049	<0.0099
TB3-2	14	NA	NA	NA	<9.6	<4.8	<4.8	<0.0049	<0.0099
TB3-2	17	<0.0049	<0.0049	<0.0049	<1.9	<0.93	<0.93	<0.0049	0.018
ESL - Shallow Soil <3m bgs		**0.37**	**0.46**	**0.022**	**0.075**	**0.023**	**0.0045**	**0.19**	**1.3**
ESL - Deep Soil >3m bgs		**0.70**	**0.46**	**0.085**	**0.075**	**0.023**	**0.0045**	**0.19**	**3.4**

Notes:

NA: Not Analyzed

TBA, MtBE, 1,2-DCA by Method 8260B/CA_LUFTMS

PCE, TCE, Vinyl Chloride, Cis-DCE, and Napthalene by EPA Method 8260B

Environmental Screening levels or Laboratory Detection levels

ESL: California Regional Water Control Board Environmental Screening levels, Interim Final November 2007, Revised May 2008, Tables A and C

Table 3: Groundwater Analytical Results (TPH and BTEX)

November 20 and 21, 2008

316 38th Street, Oakland

Borehole	TPH-g (ug/L)	TPH-d (ug/L)	TPH-ss (ug/L)	Kerosene (ug/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Total Xylenes (ug/L)
TB1-1	2,600	7,400	2,700	7,500	<0.5	<0.50	<0.50	<1.0
TB1-3	29,000	8,700	7,900	12,000	0.54	<0.50	<0.50	1,700
TB1-4	1,400	290	520	600	0.75	10	6.50	59
TB2-1	28,000	52,000	110,000	97,000	<5.0	<5.0	9.10	<10
TB2-2	12,000	330,000	560,000	560,000	<5.0	<5.0	<5.0	<10
TB3-1	1,100	700	490	730	22	<0.50	2.10	5.8
TB3-2	890	230	140	170	<0.50	<0.50	0.55	<1.0
ESL - Groundwater is a Current/Potential Source of Drinking Water	**100**	**100**	**100**	**100**	**1**	**40**	**30**	**20**

Notes:

TPH-g: Total Petroleum Hydrocarbons as Gasoline (C5-C12)

TPH-d: Total Petroleum Hydrocarbons as Diesel (C9-C19)

TPH-ss: Total Petroleum Hydrocarbons as Stoddard Solvents (C9-C13)

TPH by EPA Method 8015, BTEX by EPA Method 8260B/CA_LUFTMS

ESL: California Regional Water Control Board Environmental Screening levels, Interim Final November 2007, Revised May 2008, Tables F-1a

Table 4: Groundwater Analytical Results (VOC compounds)

November 20 and 21, 2008

316 38th Street, Oakland

Borehole	PCE (ug/L)	TCE (ug/L)	Vinyl Chloride (ug/L)	TBA (ug/L)	MtBE (ug/L)	1,2-DCA (ug/L)	Cis-1,2 DCE (ug/L)	Napthalene (ug/L)
TB1-1	<0.50	<0.50	<0.50	9.3	<0.50	<0.50	<0.50	<1.0
TB1-3	<0.50	<0.50	<0.50	28	<0.50	<0.50	<0.50	<1.0
TB1-4	1.8	1.1	<0.50	7.3	<0.50	3.6	0.69	<1.0
TB2-1	<0.50	<0.50	<0.50	<50	<5.0	<5.0	0.81	98
TB2-2	<0.50	<0.50	<0.50	<50	<5.0	<5.0	<0.50	1.5
TB3-1	<0.50	<0.50	<0.50	<5.0	1.30	<0.50	1.0	19
TB3-2	<0.50	<0.50	<0.50	<5.0	<0.50	<0.50	<0.50	<1.0
ESL - Groundwater is a Current/Potential Source of Drinking Water	**5**	**5**	**0.5**	**12**	**5**	**0.5**	**6**	**17**

Notes:

TBA, MtBE, 1,2-DCA by Method 8260B/CA_LUFTMS

PCE, TCE, Vinyl Chloride, Cis-DCE, and Napthalene by EPA Method 8260B

Semi-volatie organic compounds analyized by EPA Method 8270 were below Laboratory Detection levels

ESL: California Regional Water Control Board Environmental Screening levels, Interim Final November 2007, Revised May 2008, Tables F-1a

Figures

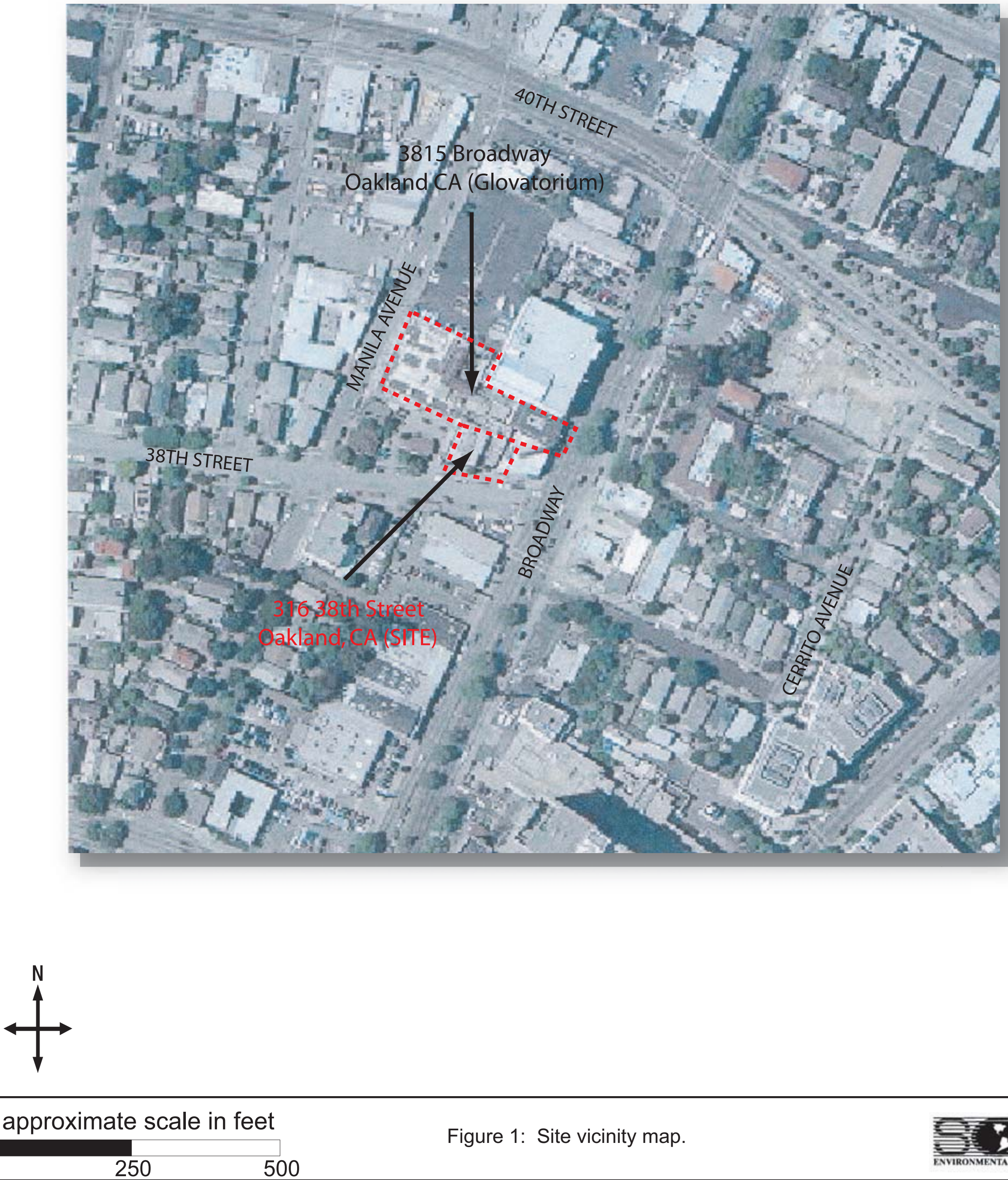


Figure 1: Site vicinity map.

SOMA ENVIRONMENTAL ENGINEERING, INC.

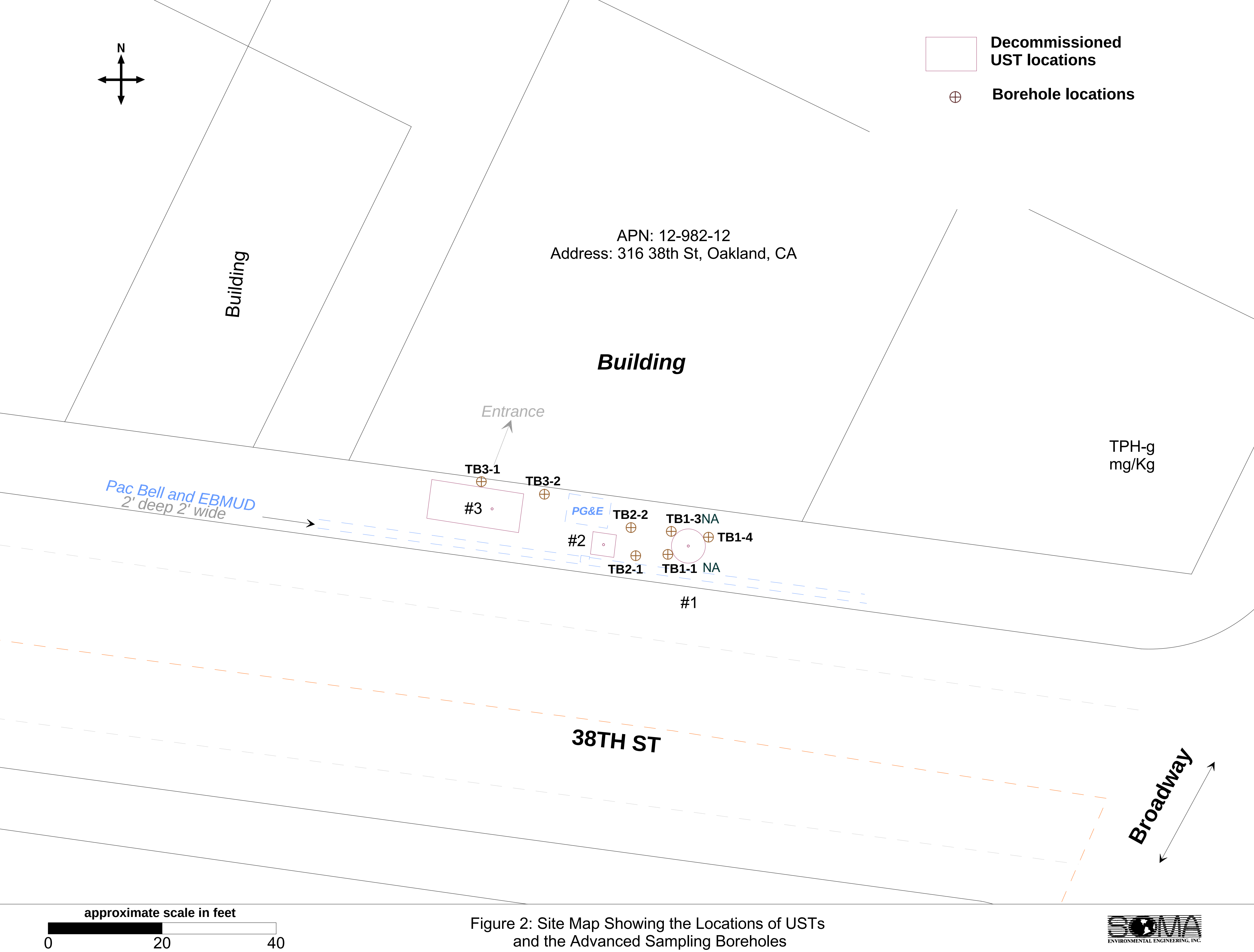


Figure 2: Site Map Showing the Locations of USTs
and the Advanced Sampling Boreholes

SOMA ENVIRONMENTAL ENGINEERING, INC.

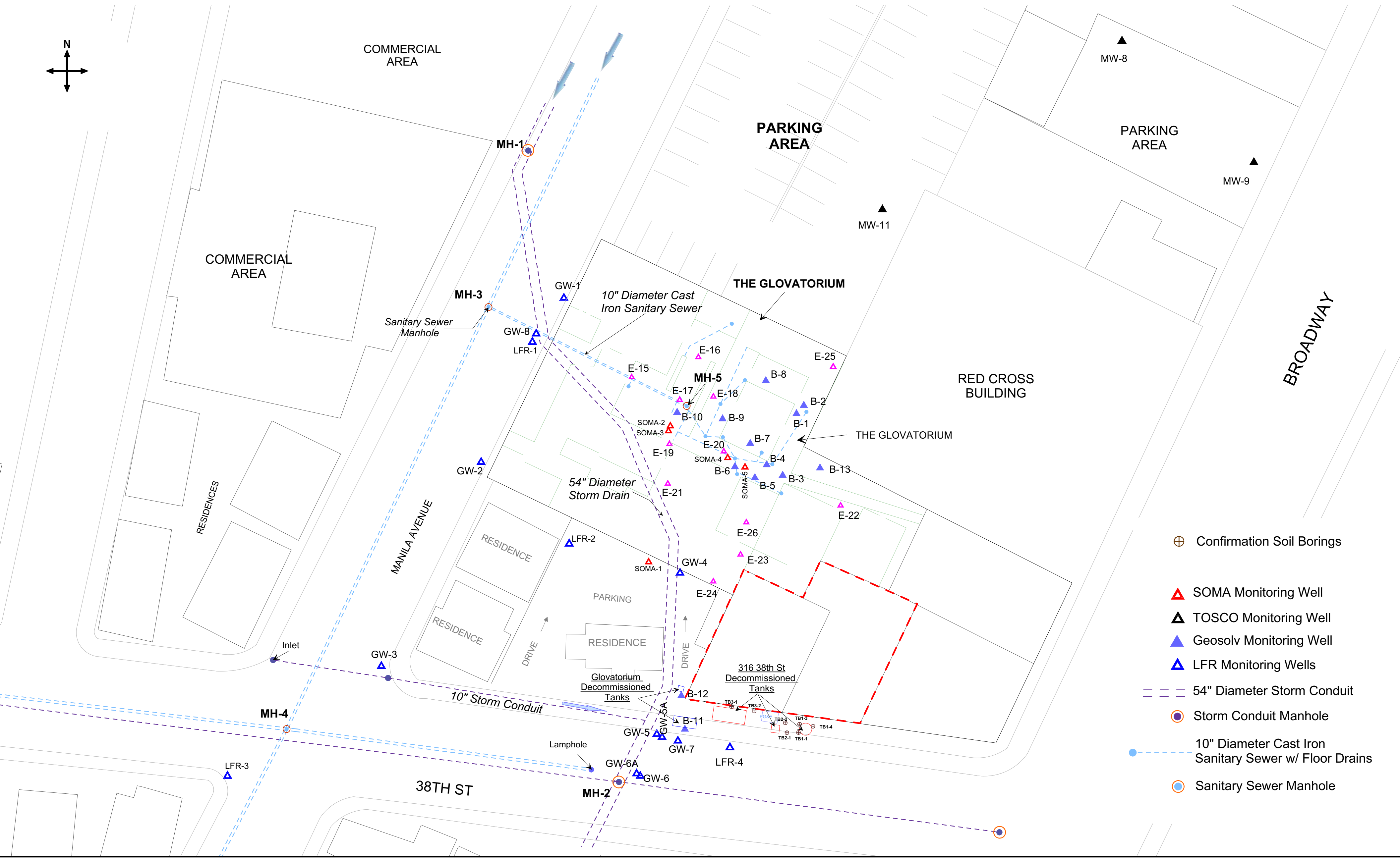


Figure 2A: Site Vicinity Map Showing the Locations of USTs, Advanced Sampling Boreholes and Wells

SOMA ENVIRONMENTAL ENGINEERING, INC.

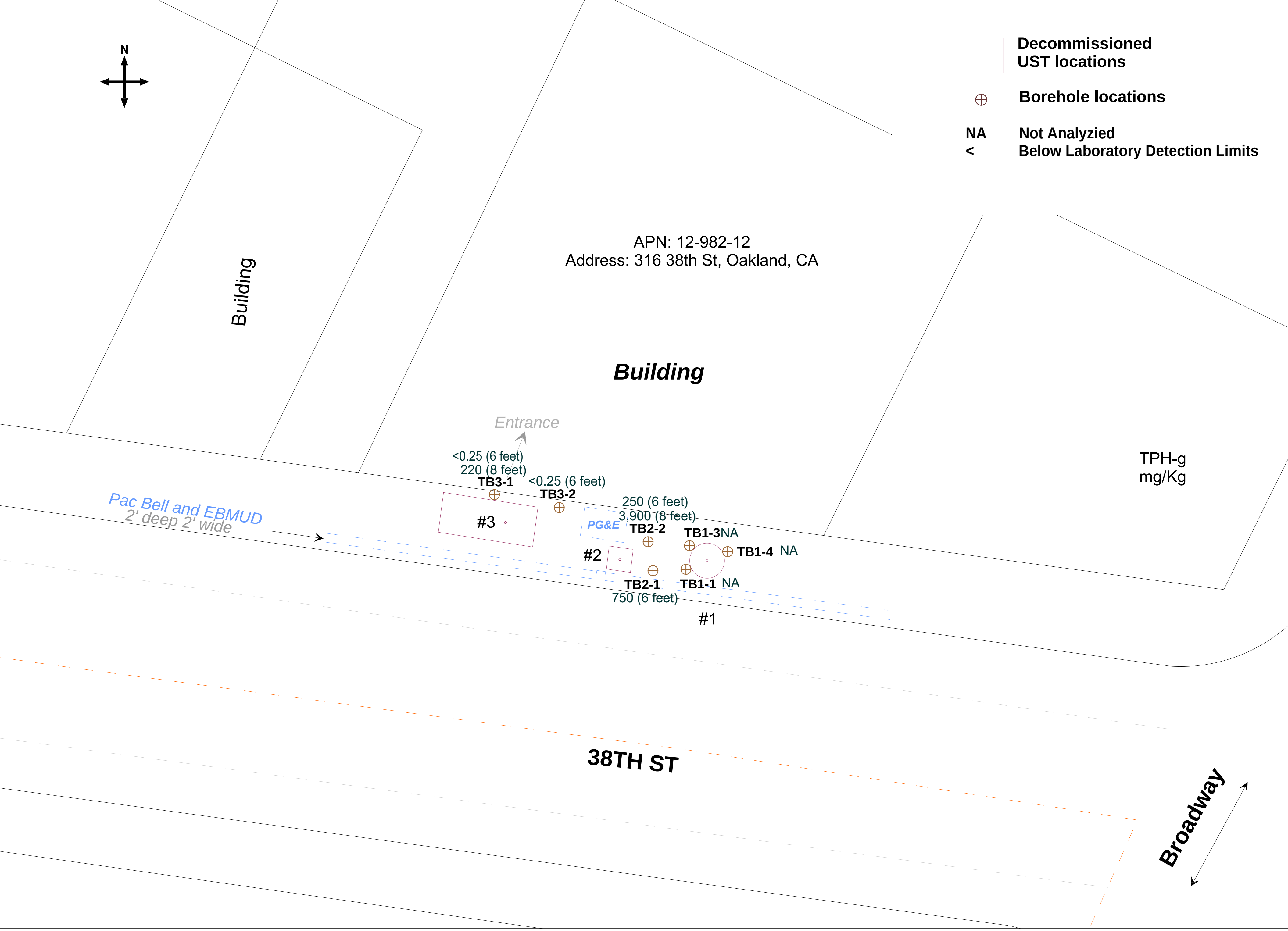


Figure 3: Map of TPH-g Concentration in Soil at 6 to 8 feet bgs

SOMA ENVIRONMENTAL ENGINEERING, INC.

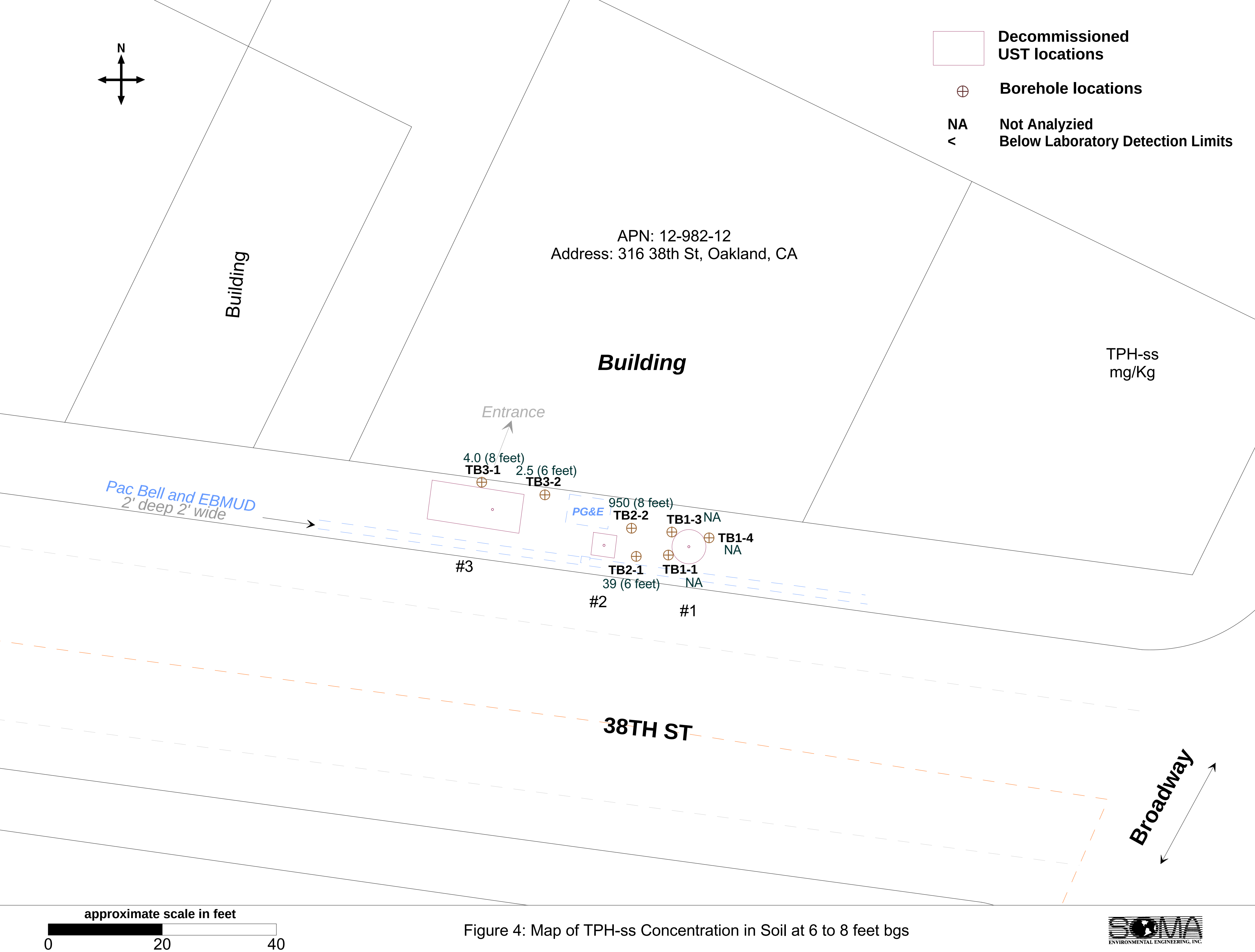


Figure 4: Map of TPH-ss Concentration in Soil at 6 to 8 feet bgs

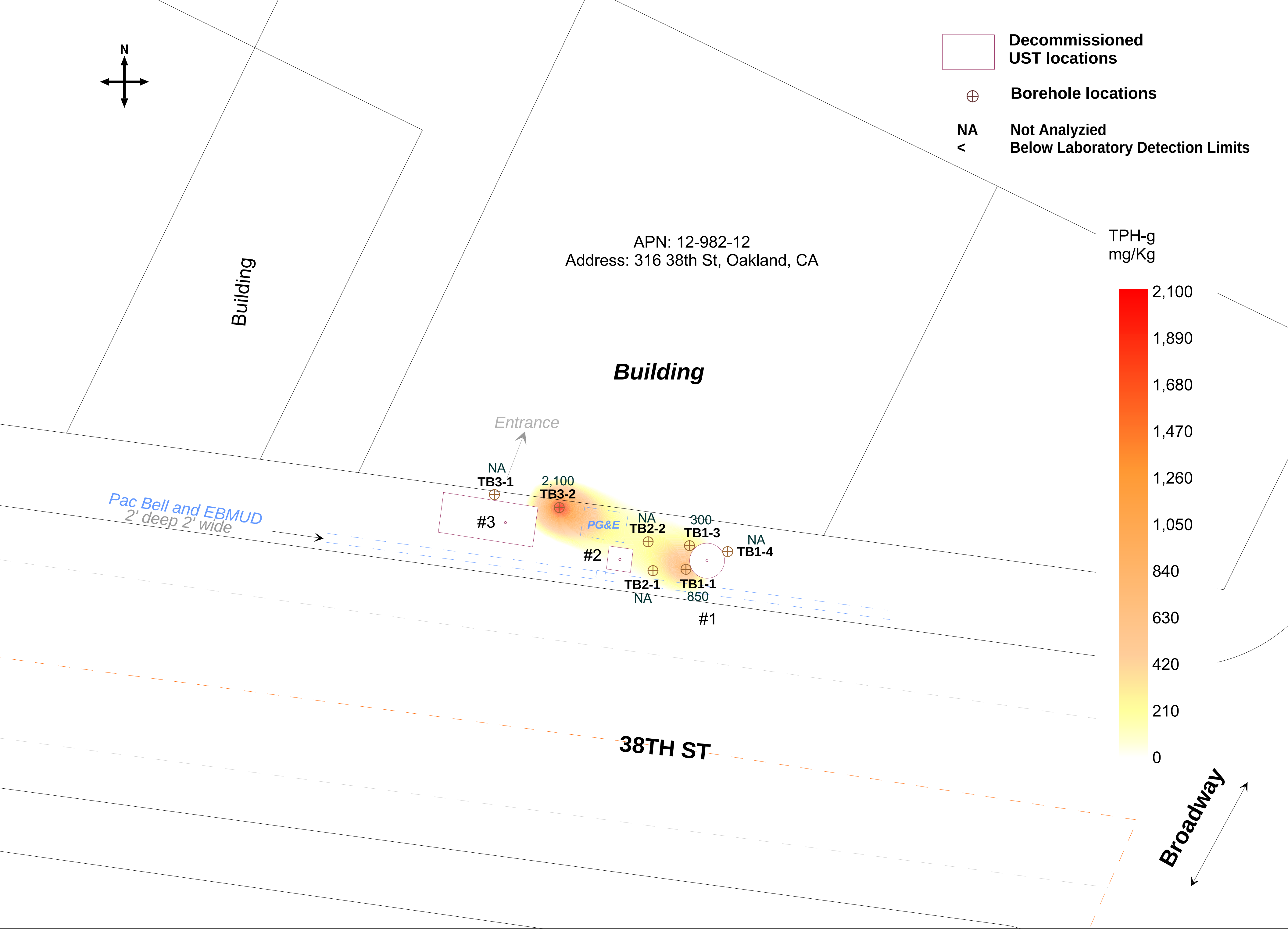


Figure 5: Contour of TPH-g Concentration in Soil at 12 feet bgs

SOMA ENVIRONMENTAL ENGINEERING, INC.

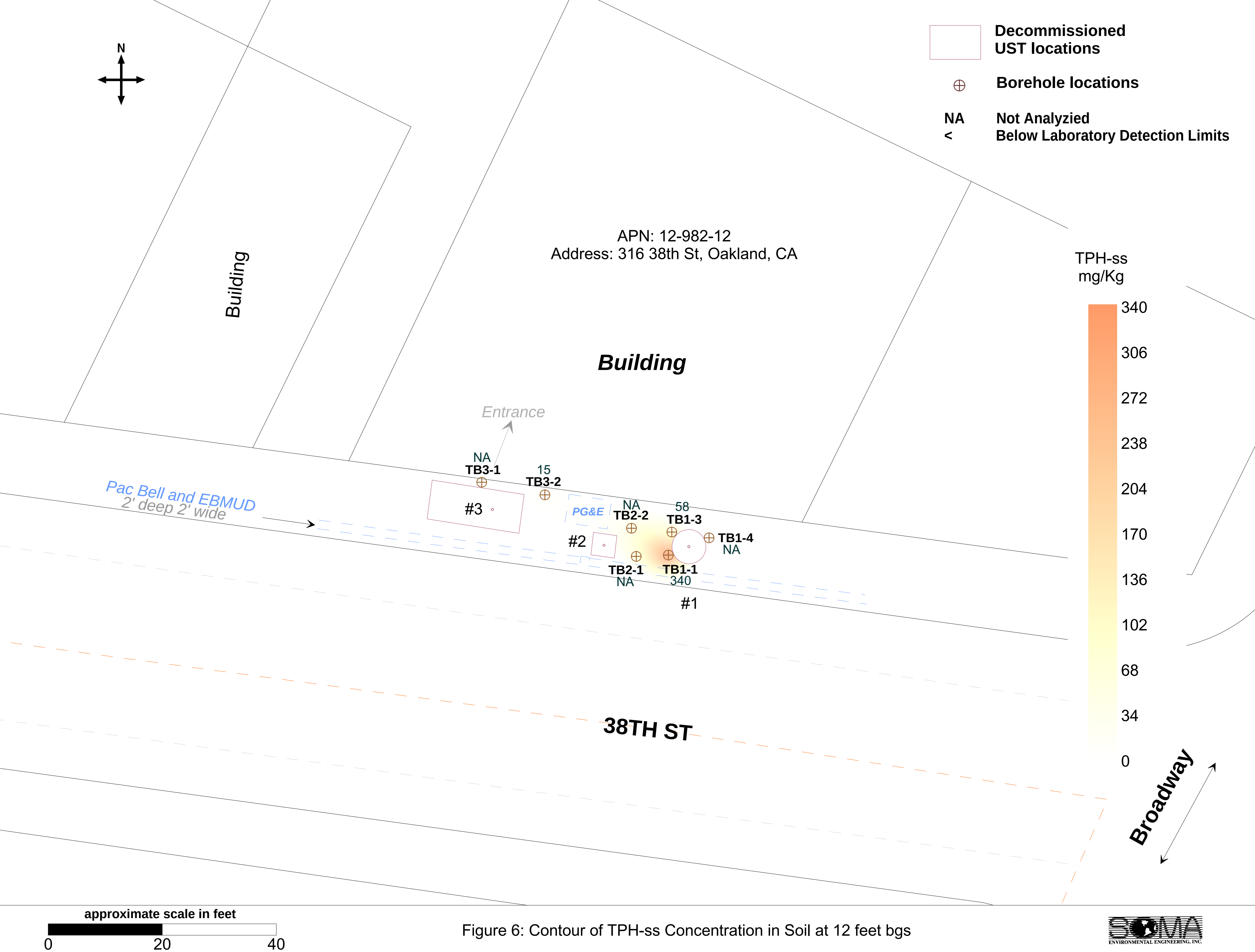
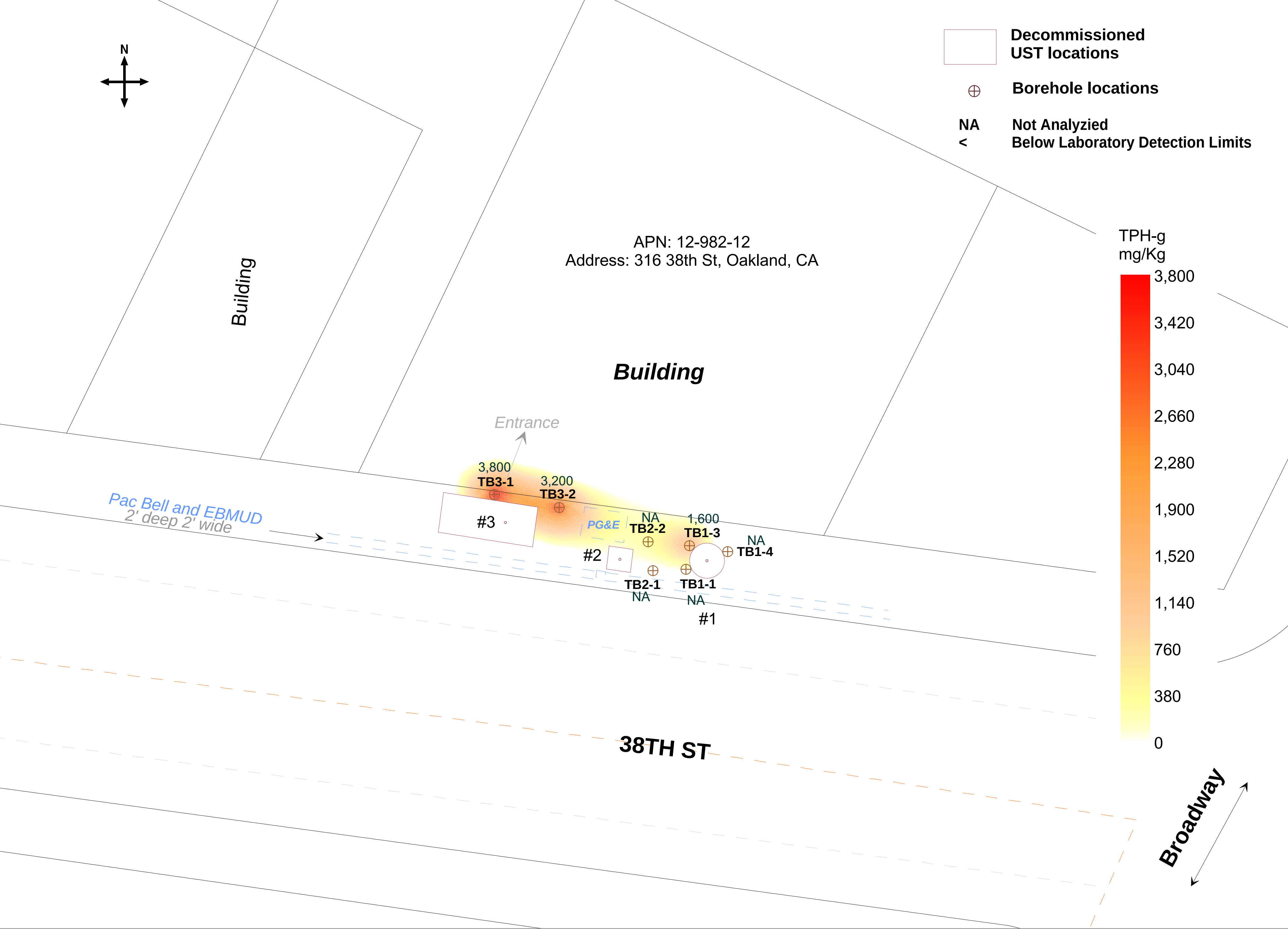


Figure 6: Contour of TPH-ss Concentration in Soil at 12 feet bgs



approximate scale in feet

0 20 40

Figure 7: Contour of TPH-g Concentration in Soil at 14 feet bgs

SOMA ENVIRONMENTAL ENGINEERING, INC.

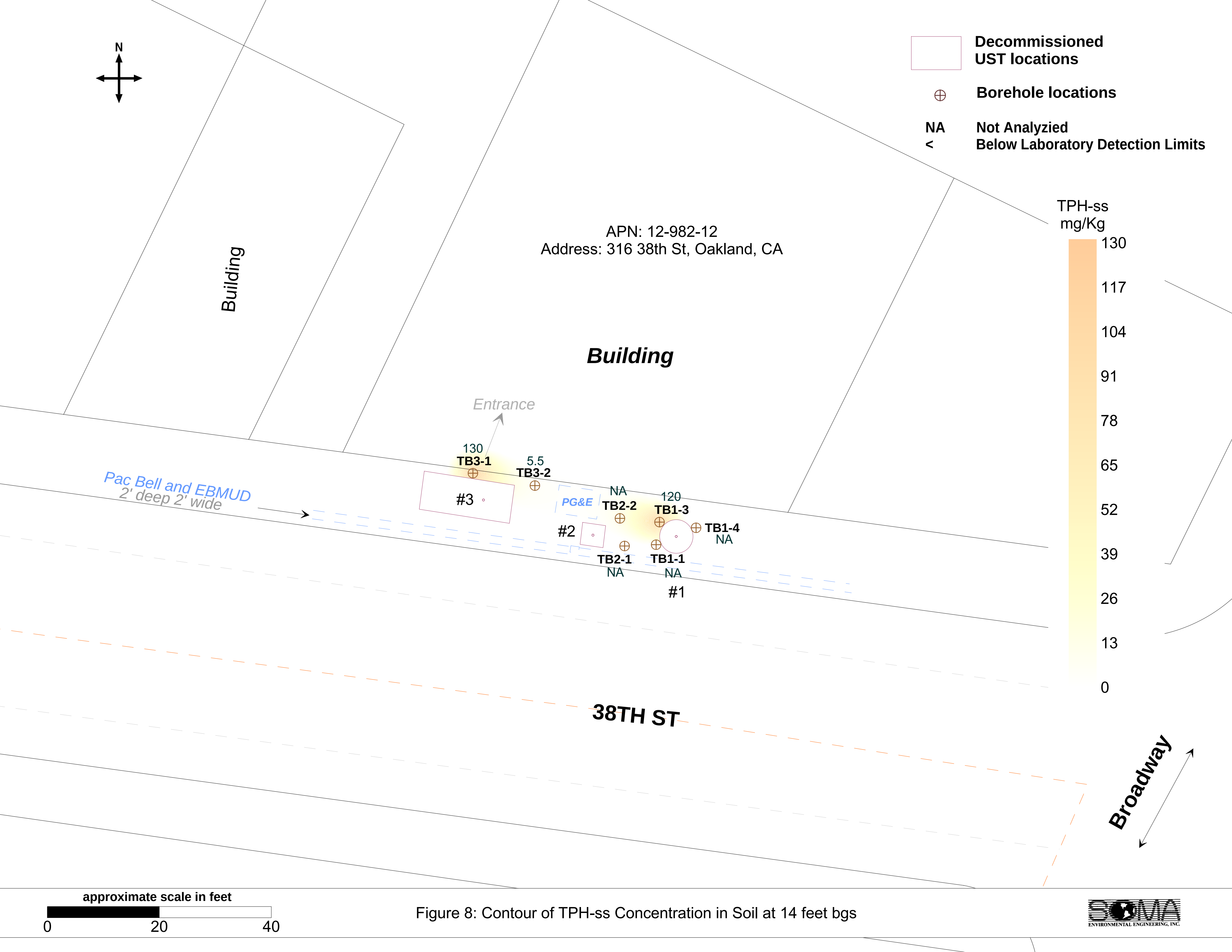
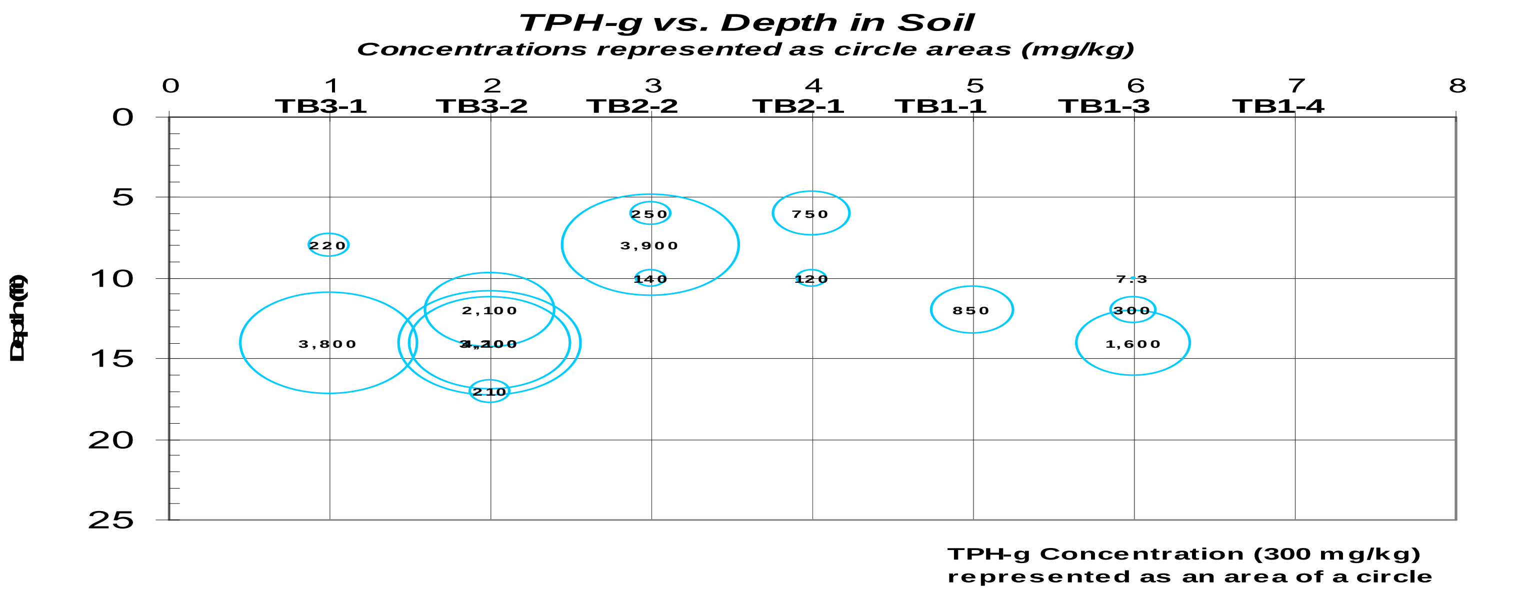
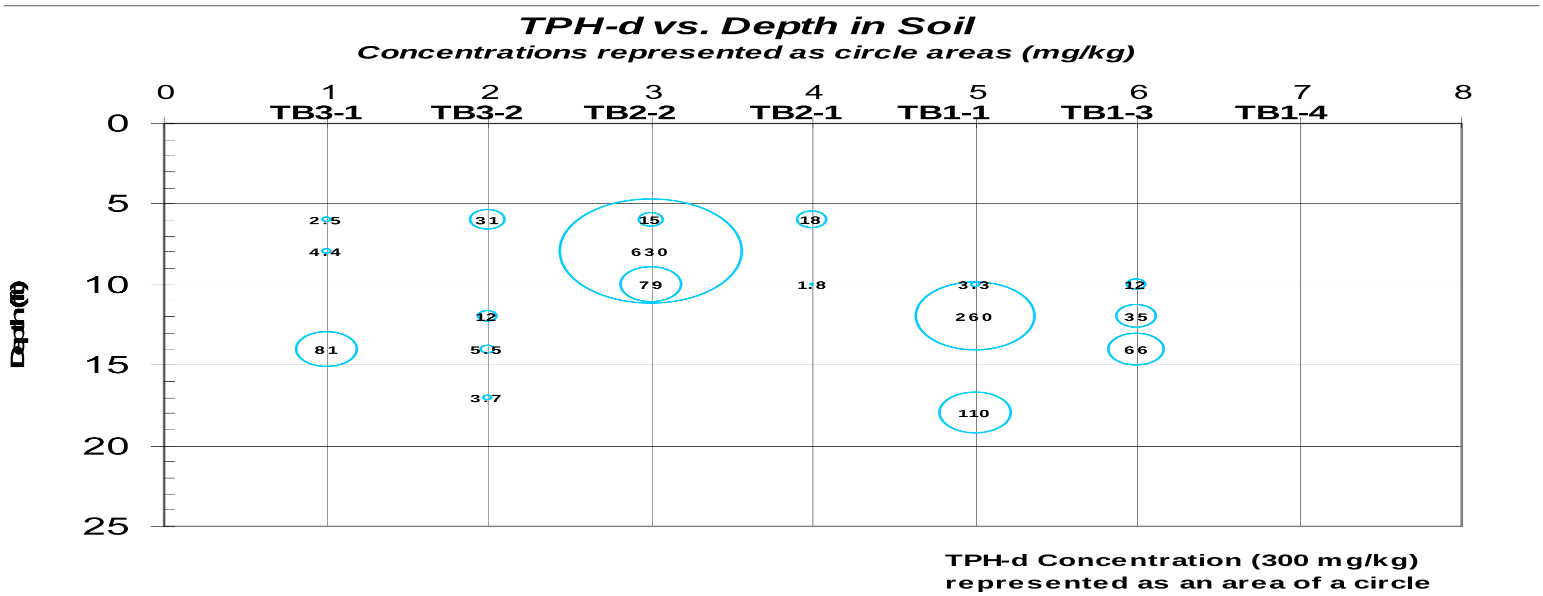


Figure 8: Contour of TPH-ss Concentration in Soil at 14 feet bgs





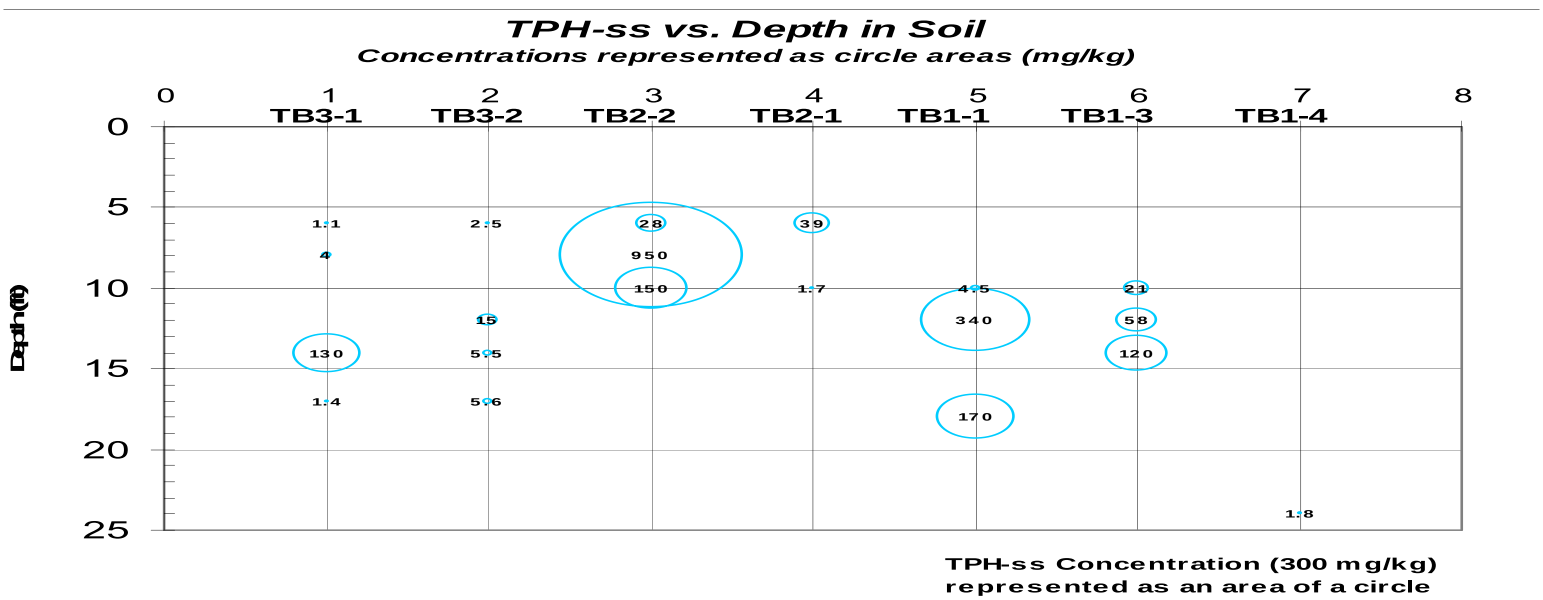
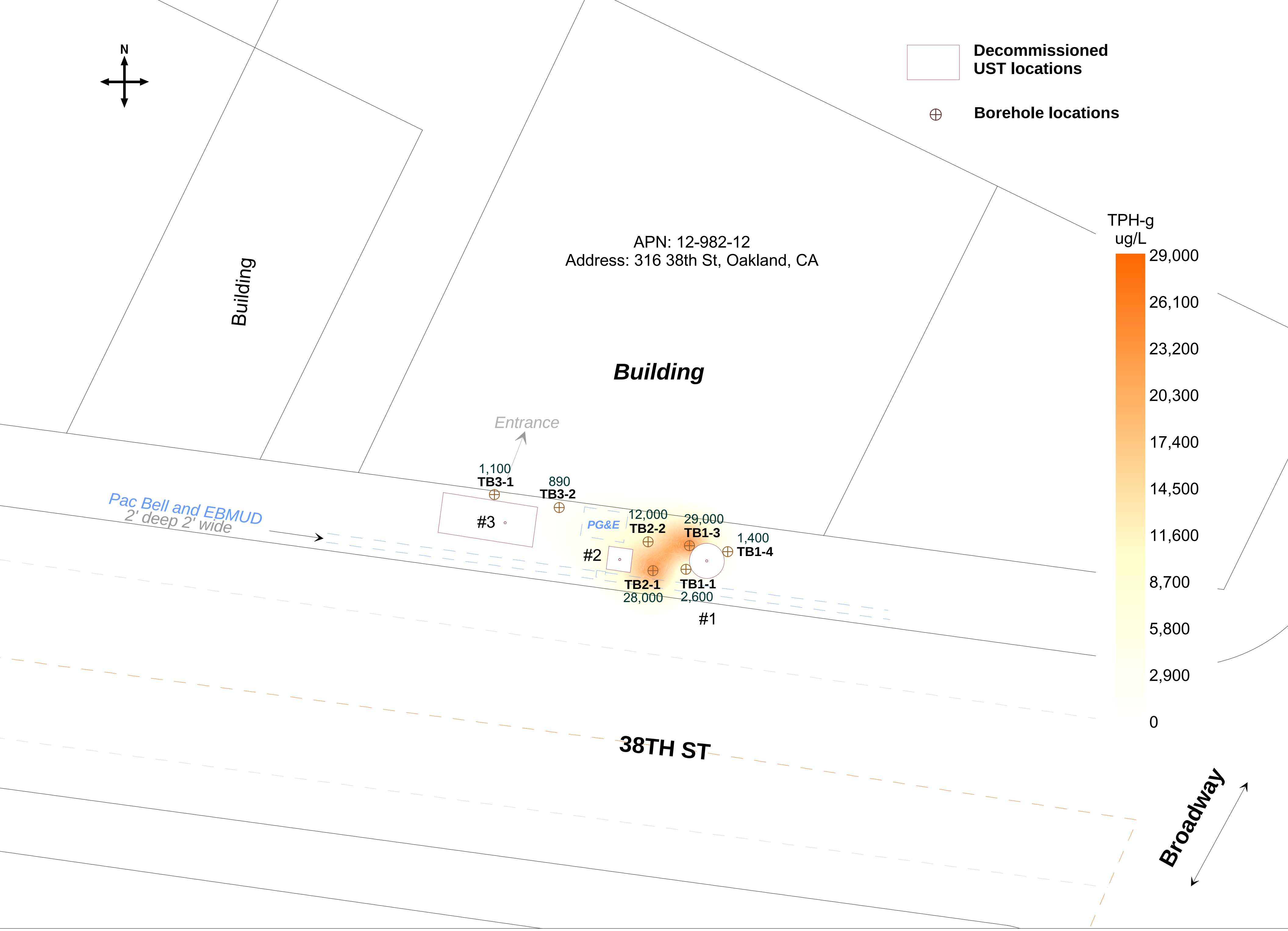


Figure 8A: Graphs Showing Contaminant Distribution in Soil

ENVIRONMENTAL ENGINEERING, INC.



approximate scale in feet

0 20 40

Figure 9: Contour of TPH-g Concentration in Groundwater

SOMA ENVIRONMENTAL ENGINEERING, INC.

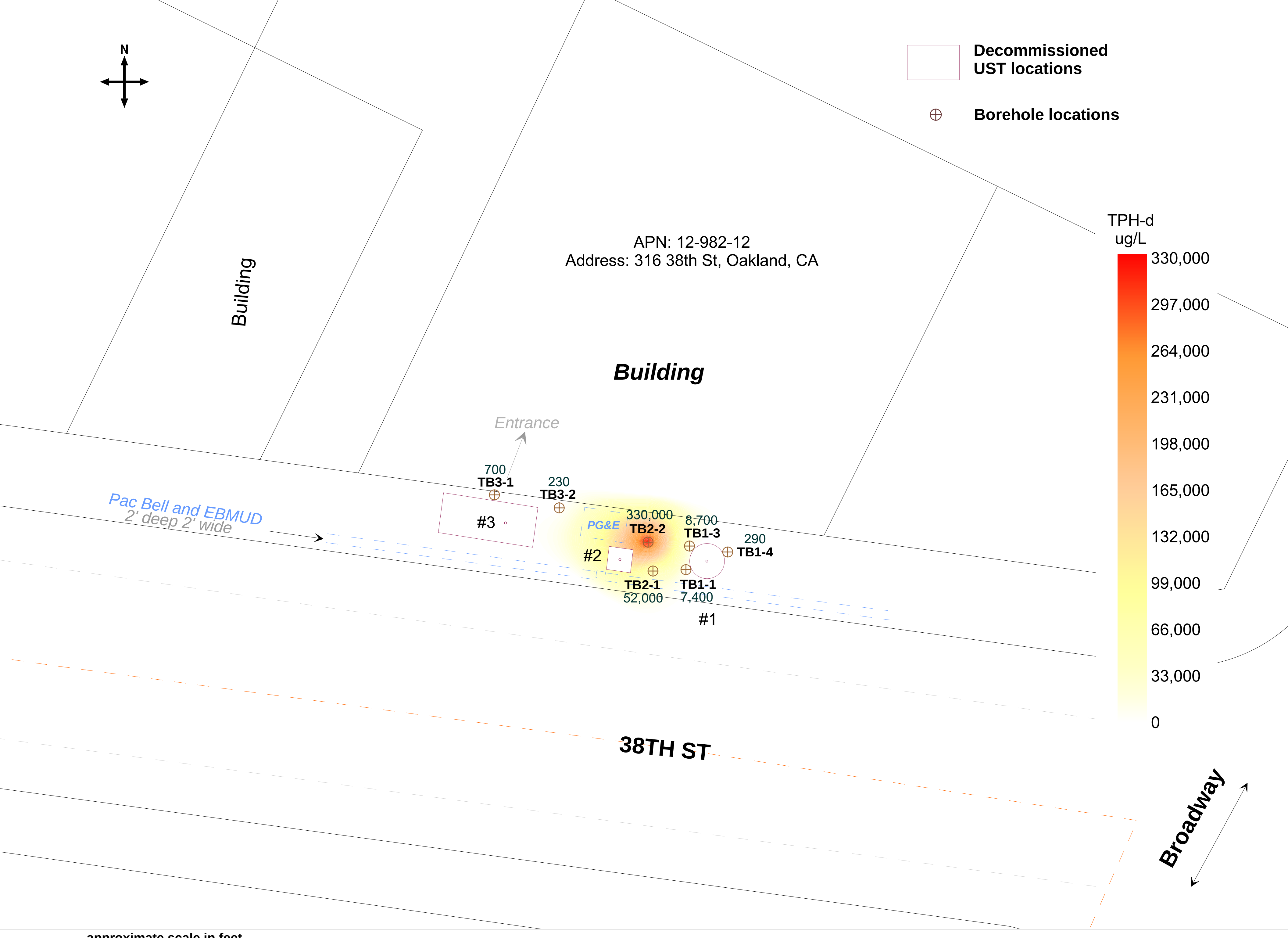
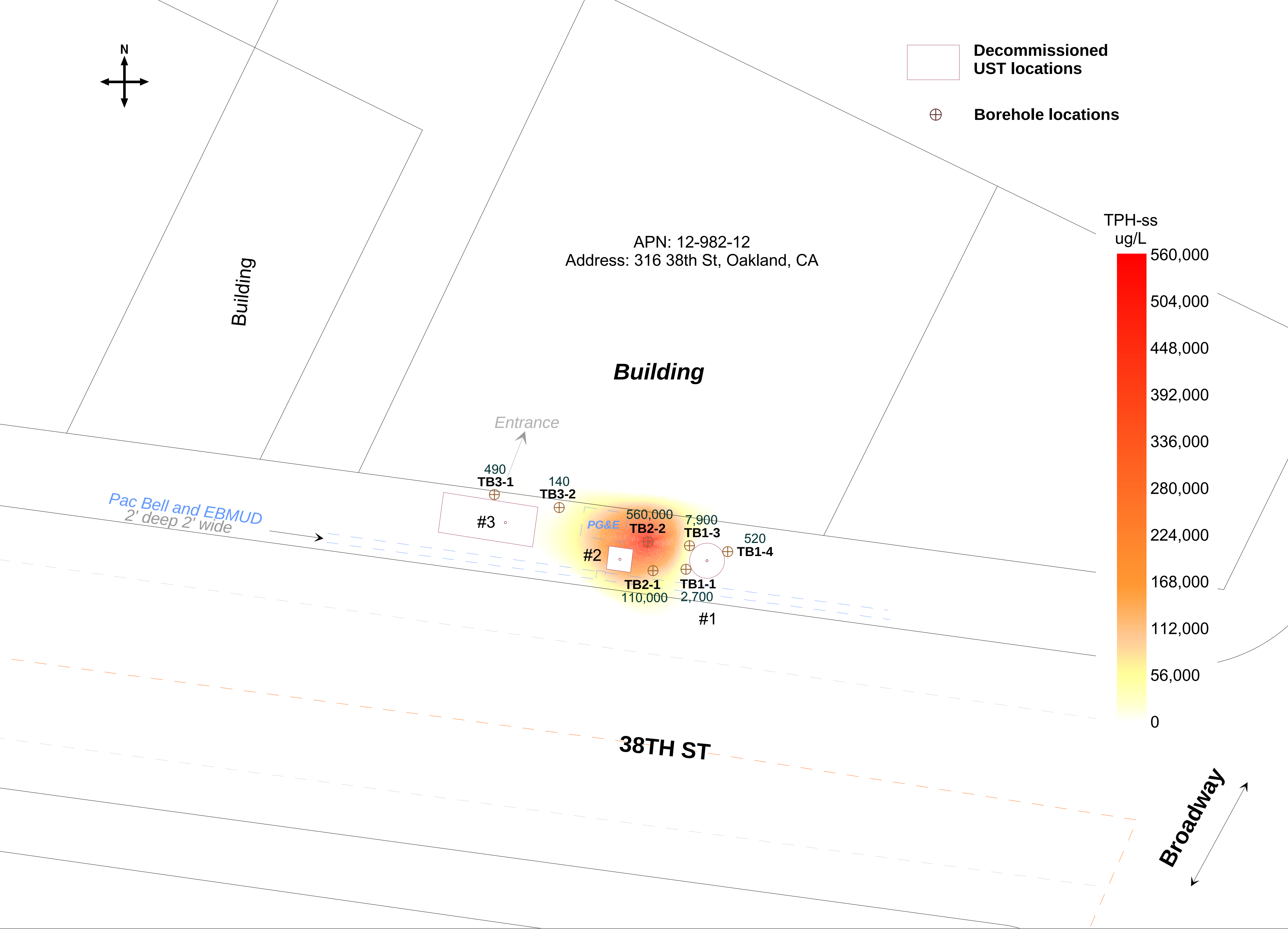


Figure 10: Contour of TPH-d Concentration in Groundwater



approximate scale in feet
0 20 40

Figure 11: Contour of TPH-ss Concentration in Groundwater

SOMA ENVIRONMENTAL ENGINEERING, INC.

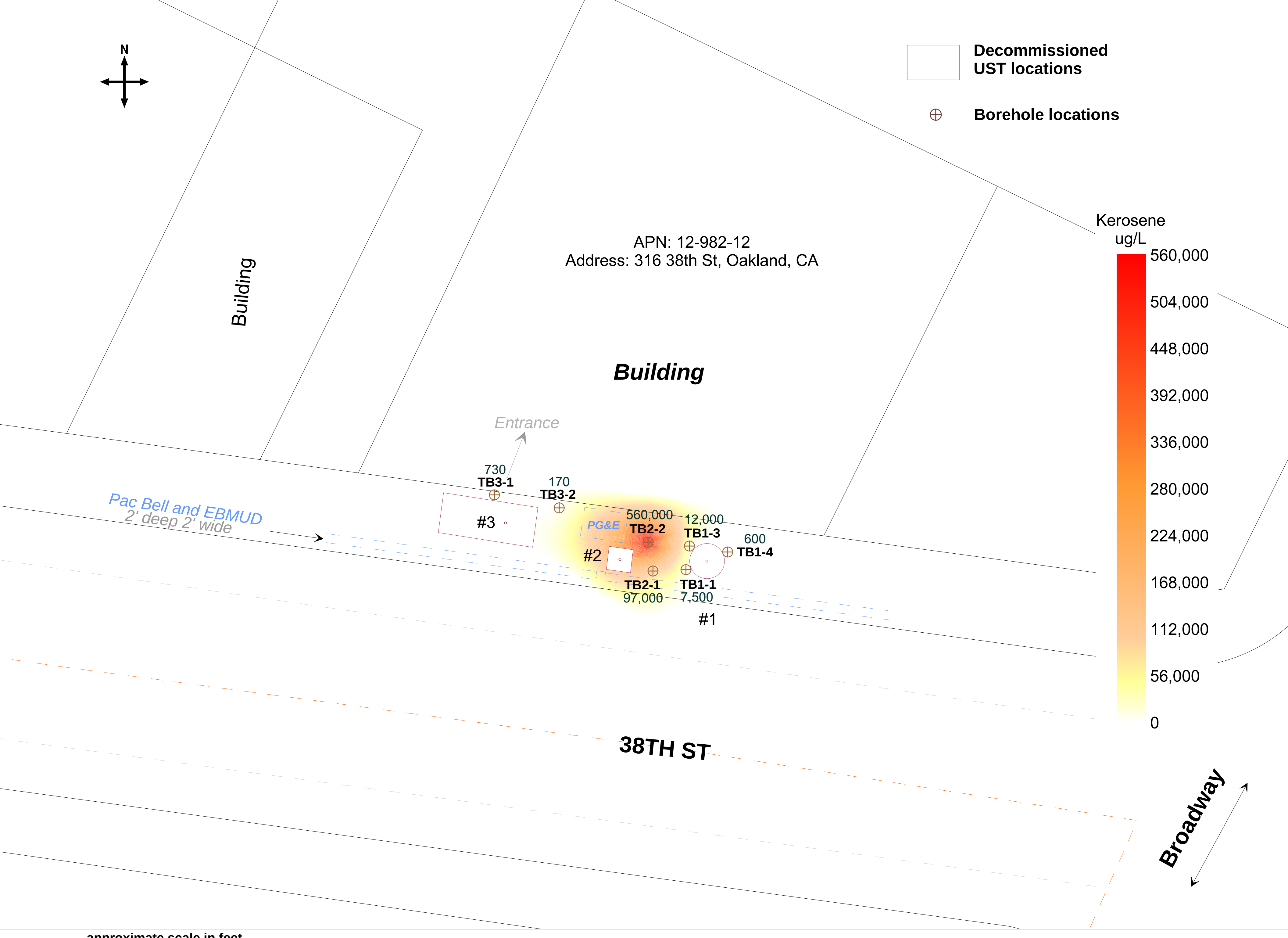


Figure 12: Contour of Kerosene Concentration in Groundwater

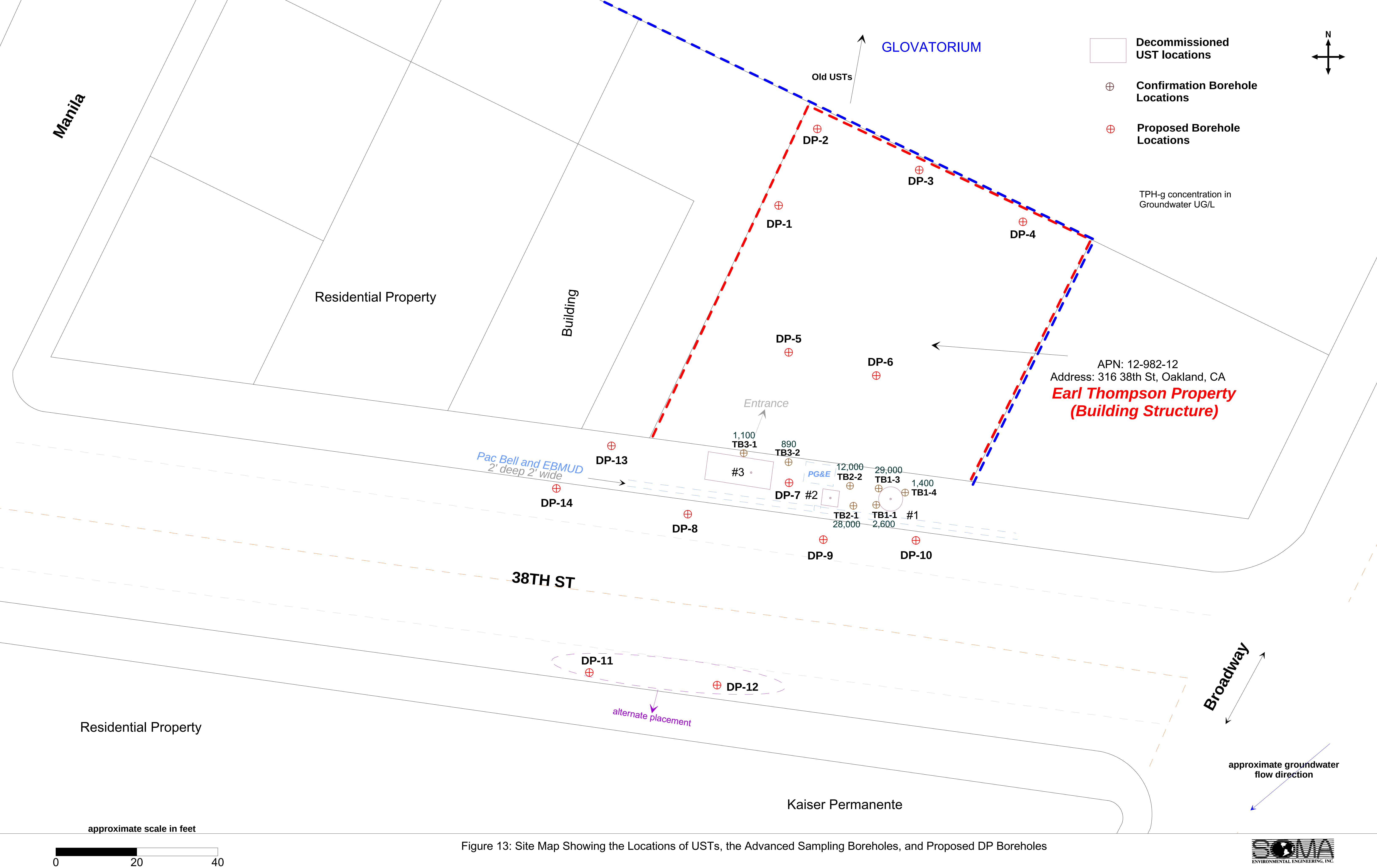


Figure 13: Site Map Showing the Locations of USTs, the Advanced Sampling Boreholes, and Proposed DP Boreholes

Appendix A
Field and Laboratory Procedures

Direct 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 (PI D), or an equivalent tool. Soil cuttings generated are stored in Department of Transportation (DOT) approved 55-gallon steel drums, or an equivalent storage container.

Grab 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 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.

Alternatively, groundwater samples are collected by lowering a disposable bailer through the sampler rod or into the borehole.

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. i.e. 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.

Hollow Stem Auger Drilling/Monitoring Well Installation

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 presence of underground structures or utilities.

Borehole Advancement

Pre-cleaned hollow stem augers (typically 8 to 10 inches in diameter) are advanced using a drill rig for the purpose of collecting samples and evaluating subsurface conditions. Upon completion of drilling and sampling, if no well is to be constructed, the augers are retracted, and the borehole is filled with neat cement grout, mixed at a ratio of 6 gallons of water per 94 pounds of Portland cement, through a tremmie pipe to displace standing water in the borehole. In areas where the borehole penetrates asphalt or concrete, the borehole is capped with an equivalent thickness of asphalt or concrete patch to match finish grade.

During the drilling process, a physical description of the encountered soil characteristics (i.e. moisture content, consistency or density, odor, color, and plasticity), drilling difficulty, and soil type as a function of depth are described on boring logs. The soil cuttings are classified in accordance with the uses.

Split-Spoon Sampling

The precleaned split spoon sampler lined with three 6-inch long brass or stainless steel tubes is driven 18 inches into the underlying soils at the desired sample depth interval. The sampler is driven by repeatedly dropping a 140-pound hammer a free fall distance of 30 inches. The number of blows (blow count) to advance the sampler for each six-inch drive length is recorded on the field logs. Once the sampler is driven the 18-inch drive length or the sampler has met refusal (typically 50 blows per six inches), the sampler is retrieved.

Of the three sample tubes, the bottom sample is generally selected for laboratory analysis. The sample is carefully packaged for chemical analysis by capping each end of the sample with a Teflon sheet followed by a tight-fitting plastic cap, and sealing the cap with nonvolatile organic compound (VOC), self-adhering silicon tape. A label is affixed to the sample indicating the sample identification number, borehole number, sampling depth, sample collection date and time, and job number. The sample is then annotated on a chain-of custody form and placed in an ice-filled cooler for transport to the laboratory.

The remaining soil samples are used for soil classification and field evaluation of headspace volatile organic vapors, where applicable, using a photo ionization or flame ionization detector calibrated to a calibration gas (typically isobutylene or hexane). VOC vapor concentrations are recorded on the boring logs.

Grab Groundwater Sample Collection

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

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 time, type of sample and type of preservative (if applicable, i.e. 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.

Groundwater Monitoring Well Installation and Development

Groundwater monitoring wells are constructed by inserting or tremmieing well materials through the annulus of the hollow stem auger. The groundwater monitoring wells are constructed with a screen interval determined from the encountered soil stratigraphy, to maintain a proper seal at the surface (minimum three feet), to allow flow from permeable zones into the well, and to avoid penetrating aquicludes. Groundwater wells are installed in accordance with the conditions of the well construction permit issued by the regulatory agency exercising jurisdiction over the project site.

The well screen generally consists of schedule 40 polyvinyl chloride (PVC) casing with 0.01 to 0.02-inch factory slots. As a general rule, 0.01-inch slots are used in fine-grained silts and clays, and 0.02-inch slots are used in coarse-grained materials. The screen is then filter packed with #2/12 or #3 sand, or equivalent, for the 0.01 and 0.02 inch slots, respectively.

Once the borehole has been drilled to the desired depth, the well screen and blank well casing are inserted through the annulus of the hollow stem augers. The well screen is sand packed by tremmieing the appropriate filter sand through the annulus between the casing and augers while slowly retracting the augers. During this operation, the depth of the sand pack in the auger is continuously sounded to make sure that the sand remains in the auger annulus during auger retraction to avoid short-circuiting the well. The sand pack is tremmied to approximately two feet above the screen, at which time pre-development surging is performed to consolidate the sand pack. Additional sand is added as necessary so that the sand pack extends approximately two feet above top of screen. Following construction of the sand pack, a one to two foot thick bentonite seal is tremmied over the sand and hydrated in place. The remainder of the borehole is backfilled with Portland neat cement grout (or the equivalent), mixed at ratio of 6 gallons of water per 94 pounds of neat cement. The well head is then capped with a locking cap and secured with a lock to protect the well from surface water intrusion and vandalism.

The well head is further protected from damage with traffic a rated well box in paved areas or locking steel riser in undeveloped areas. The protective boxes or risers are set in concrete. The details of well construction are recorded on well construction logs.

Following well construction, the wells are developed in accordance with agency protocols by intermittently surging and bailing the wells. Development is determined to be sufficient once pH, conductivity, and temperature stabilize to within s 0.1, s 3%, and s 10%, respectively.

Groundwater Monitoring Well Sampling

Depth to Groundwater/SPH Thickness Measurements

Prior to the beginning of purging and sampling the wells, the depth to groundwater and thickness of SPH, if present, within each well casing are measured to the nearest 0.01 foot using either an electronic water level indicator or an electronic oil-water interface probe. This is done in within as narrow a time frame as possible, and before the first well is purged. Measurements are taken from a point of known elevation on the top of each well casing as determined in accordance with surveys by licensed land surveyors.

Groundwater Monitoring Well Purging

SOMA proposes a standard well-purging method (volume-based and well stabilization purging and sampling) with a dedicated pump, to minimize turbulences, as being more cost effective and capable of providing a representative sample. SOMA will avoid high pumping rates during purging; at all times the water will be purged from the well at a rate that does not cause recharge water to be excessively agitated and cascade into the well. A minimum of three well volumes will be purged prior to sampling, to evacuate all standing water present in the well casing that may cause the water quality results to be biased. Physical parameters, e.g., temperature, pH, conductivity, and turbidity, will be recorded during the purging process. The purge intake is placed opposite the portion of the saturated zone expected to contain the greatest hydrocarbon impact, and the depth of the purge intake is recorded during and after purging. The water level in each well is monitored, and care is taken that the well is not dewatered. Purge operations are determined to be sufficient once three successive measurements of pH, conductivity, and temperature of the purged water at 3 to 5 minute intervals following the evacuation of on system or line volume vary by s 0.1, s 3%, and s 10%, respectively. System or line volumes, actual purge volumes, and the purging equipment used are recorded on the field data sheets.

Groundwater Sample Acquisition, Handling, and Analysis

Following purging operations, groundwater samples are collected from each of the wells, using a low-flow bladder pump. The groundwater sample is discharged from the pump tubing to the sample container before the water passes through the flow-through cell. The sampling equipment is recorded on the field data sheets.

Collected water samples are discharged directly into laboratory provided, pre-cleaned, and chemically preserved sample containers for the analyses requested. Preservatives are used in the samples if appropriate for the analyses, i.e., hydrochloric acid (HCl) for TPH, BTEX, and fuel oxygenates by EPA Method 8260B.

Labels documenting sample number, well identification, collection date and time, type of sample and type of preservative (if applicable) are affixed to each sample. The samples are then placed into an ice-filled cooler for delivery under chain of custody to a certified laboratory. The type of preservative used is documented on the chain of custody form.

To help assure the quality of the collected samples and to evaluate the potential for cross contamination during transport to the laboratory, a distilled-water trip blank accompanies the samples in the cooler. The trip blank is analyzed for the presence of volatile organic compounds of concern. For petroleum hydrocarbons, the trip blank is typically analyzed for TPPH, BTEX, and fuel oxygenates by EPA Method 8260.

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 on-site 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. A licensed waste disposal contractor removes the drums from the site to an appropriate facility for treatment/recycling.