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By Alameda County Environmental Health at 10:36 am, Jul 23, 2013

Ms. Barbara Jakub, P.G.
Alameda County Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Grimit Auto Repair and Service, 1970 Seminary Boulevard, Oakland, California (Fuel Leak Case No. RO0000413)

Dear Ms. Jakub:

Stratus Environmental, Inc. (Stratus) has recently prepared a report entitled *Work Plan for Additional Site Assessment*, on my behalf. The report was prepared in regards to Alameda County Fuel Leak Case No. RO0000413, for Grimit Auto Repair and Service, 1970 Seminary Boulevard, Oakland, California.

I have reviewed a copy of this report, sent to me by representatives of Stratus, and "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge."

If you have any questions, please contact me via electronic mail at peggy.h.garcia@sbcglobal.net, or my daughter Angel LaMarca at angelcpt@gmail.com.

Sincerely,

Peggy Garcia, Trustee

Ms. Peggy Garcia, Trustee, Grimit Family Trust

cc: Angel LaMarca

STRATUS
ENVIRONMENTAL, INC.

3330 Cameron Park Drive, Ste 550
Cameron Park, California 95682
(530) 676-6004 ~ Fax: (530) 676-6005

July 22, 2013
Project No. 2090-1970-01

Ms. Barbara Jakub, P.G.
Alameda County Environmental Health Department
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(via GeoTracker & Alameda County FTP site)

Re: Work Plan for Additional Subsurface Assessment
Former Grimit Auto Repair and Service
1970 Seminary Avenue
Oakland, California
(Fuel Leak Case No. RO0000413)

Dear Ms. Jakub:

Stratus Environmental, Inc. (Stratus) has prepared this *Feasibility Study/Corrective Action Plan* (FS/CAP), on behalf of the Grimit Family Trust, for the Former Grimit Auto Repair and Service facility (the Site), located at 1970 Seminary Avenue, Oakland, California (see Figures 1 through 3). The site previously utilized underground storage tanks (USTs) for storage of gasoline and waste oil, and Alameda County Environmental Health Department (ACEHD) currently regulates an environmental case on the subject property related to releases of these contaminants to the subsurface. In August 2012, Stratus prepared and submitted a Draft Feasibility Study/Corrective Action Plan (FS/CAP) for the site and in December 2012, a Supplement to this FS/CAP was prepared and submitted for agency review. In early May 2013, Stratus and ACEHD personnel met to discuss the documents and environmental issues associated with the property. After the meeting, Stratus prepared and submitted a technical memorandum, dated May 22, 2013, to discuss items of concern to ACEHD.

Stratus has proposed performing remediation at the site by initially utilizing dual phase extraction (DPE) technology to remove contaminant mass from the subsurface. After use of DPE, the site would then be re-evaluated for possible use of ozone injection to further reduce groundwater concentration levels, if appropriate. In a letter dated June 20, 2013, ACEHD personnel approved, with comments, the proposed cleanup plan for the site. In addition to initiating remedial efforts, the agency has requested that additional groundwater monitoring wells be installed at the site, to enable both offsite monitoring for shallow contaminants and monitoring of contaminants and assessment of groundwater flow direction within the "second water bearing interval" beneath the property.

This document proposes to install two shallow screened groundwater monitoring wells at locations discussed at the May 2013 meeting between Stratus and ACEHD. In addition, Stratus is proposing to install five deeply screened monitoring wells, with analytical data collected during a late 2011/early 2012 direct push subsurface investigation used to assist in the selection of well locations. Information regarding the proposed subsurface investigation, and a detailed description of procedures that will be utilized during this phase of work, are provided in the following subsections of this Work Plan.

SITE DESCRIPTION AND BACKGROUND

The following section of this report was prepared using information obtained from reports prepared by Stratus and a previous consultant representing the Grimit Family Trust at the subject site.

The site is located on a small land parcel within a predominately residential neighborhood in central Oakland, along Seminary Avenue. An automotive repair business (Amor's Auto Electric Repair) is currently operated on the property. The proprietor of this business leases the facility from the estate of Mr. Doyle Grimit.

Environmental-related activities began at the site in 1989, at the time of removal of three gasoline underground storage tanks (USTs) and one waste oil tank. All four tanks were reportedly installed in the 1930's and each tank had a capacity of 550 gallons. No fuel has been dispensed from the property since 1989; no USTs were replaced following the tank removals. A hydraulic lift, formerly located inside a building on the property, was removed in 2001.

Subsurface investigation of petroleum hydrocarbon impact to the subsurface was initiated in September 1990, with the advancement of borings EB-1 through EB-3 and the installation of one monitoring well MW-1 (see Figure 2 or 3 for boring/well locations). Two additional groundwater monitoring wells (MW-2 and MW-3) were completed in 1994. In 1996, a third phase of subsurface assessment was performed, involving the advancement of borings EB-4 through EB-7, and the construction of monitoring wells MW-4 through MW-6. In 1997, three additional groundwater monitoring wells (MW-7 through MW-9) were drilled and installed. A review of Figure 2 and/or Figure 3 indicates that all of these borings and wells are situated onsite.

In May 1991, a limited overexcavation was performed near the location of the former waste oil UST, resulting in the removal of approximately 20 cubic yards of petroleum impacted soil. The excavation extended to approximately 7.5 feet below ground surface (bgs), and had dimensions of 10 feet in length by 7 feet in width. Following removal of the hydraulic lift, and visual observations of impacted soil beneath the lift, a second excavation was performed which removed approximately 27 cubic yards of impacted soil. This excavation extended to approximately 10 feet in depth, and had dimensions of 7.5 feet in length by

10.5 feet in width. The configuration of the property (building location) limited the size of both excavations.

In 1997, Terra Vac Corporation performed a remediation pilot test that evaluated the feasibility of using dual phase extraction (DPE) technology to mitigate site contaminants. Terra Vac concluded, based on the findings of their pilot testing work, that DPE was a viable remedial alternative for the site. Additional information regarding the Terra Vac DPE pilot test is provided later in this document.

Groundwater monitoring and sampling has been performed at the site since 1990, following the installation of monitoring well MW-1. Petroleum sheen and/or free product have been noted at well MW-1 since the inception of the monitoring period. Sampling of other wells has indicated the presence of oil and grease (O&G), gasoline range organics (GRO), benzene, toluene, ethylbenzene, and total xylenes (BTEX compounds), methyl tertiary butyl ether (MTBE), tertiary butyl alcohol (TBA), and several volatile organic compounds (VOCs), including tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride (VC), and dichloroethene (DCE). The extent of these contaminants in the subsurface will be discussed later in this report.

In November/December 2011, Stratus directed the advancement of four onsite cone penetrometer test/laser induced fluorescence (CPT/LIF) borings onsite (CPT-1, CPT-2, CPT-3, and CPT-3A), soil and groundwater sampling borings near CPT-1, and the installation of six onsite soil vapor sampling wells (SV-1A/B through SV-3A/B). Subsequent sampling of the soil vapor wells indicated that concentrations of petroleum hydrocarbons and VOCs in soil vapor were generally low. In January 2012, Stratus oversaw the advancement of offsite direct push borings DP-1 through DP-14 for the purpose of soil sample collection, lithologic analysis, and groundwater sample collection. The locations of the borings and soil vapor sampling wells advanced/installed between November 2011 and January 2012 are included on Figure 2 and/or Figure 3.

SITE GEOLOGY AND HYDROGEOLOGY

Fine grained soils (clay/silt mixtures), with interbedded clayey sand and clayey gravel strata, are predominately encountered in the subsurface extending from surface grade to depths of approximately 40 to 52 feet bgs. Groundwater is first encountered within these soils, and for the purposes of this report, groundwater observed/sampled above 40 feet bgs is considered the "upper water bearing interval". Saturated sand, silty sand, silty gravel, and gravel strata have predominately been observed below 42 to 50 feet bgs during site investigative work. For the purpose of this report, these coarser-grained saturated strata are referred to as the "second water bearing interval", and appear to be laterally continuous across the site vicinity. At most boring locations, the thickness of the "second water bearing interval" soils has not been established; however, at borings DP-1 and DP-11, finer grained soils were observed near the base of the boring (total depth 56 feet bgs), with sandy strata noted from approximately 47 to 55 feet bgs (DP-1) and gravelly strata observed from only 52 to 54 feet bgs (DP-11). Stratus is unable to determine at this time if the fine grained soils observed at the DP-1 and DP-11 locations extend laterally to provide a basal contact for the "second water bearing interval", or represents only a local fine grained soil interbed within an aquifer that extends deeper into the subsurface. Figures 4 through 6 illustrate interpreted geological relationships in cross section; surface traces of each cross section (A to A', B to B', and C to C') are included on Figure 3.

Monitoring of groundwater levels at the site has been performed for approximately 23 years. Groundwater levels in the monitoring wells have shown significant variability across the well network, apparently due to differences in the well screen length, with the deeper wells generally measuring lower groundwater elevations than the shallower screened wells. At deeper screened well MW-1, groundwater levels have ranged from approximately 11.8 to 21.5 feet bgs between 1990 and the first quarter 2013; at shallower screened well MW-8, groundwater levels have ranged from approximately 3.4 to 5.8 feet bgs.

ACEHD has expressed concern that shallow groundwater flow beneath the property is poorly understood. Given the highly variable groundwater levels in the monitoring well network, groundwater elevation contour maps prepared by Stratus and the site's previous consultant depict groundwater flow patterns that often do not appear to match contaminant distribution patterns in shallow groundwater. In our opinion, groundwater flow beneath the property is not in a single, uniform direction. However, based on the available data, petroleum hydrocarbons appear to have migrated further from the former USTs in the west, northwest, and southwest directions; given this condition, we believe that northwest, west, and southwest are the predominant groundwater flow directions in the site vicinity. If this is the case, shallow groundwater flow would be towards San Francisco Bay.

EXTENT OF PETROLEUM HYDROCARBON IMPACT

Soil

The highest concentrations of GRO were reported in samples collected near the former waste oil UST, during the 1990 overexcavation work. Samples collected from the base of this excavation contained GRO at concentrations of 260 and 270 milligrams per kilogram (mg/Kg). O&G were detected in all of the compliance soil samples analyzed during this overexcavation, at concentrations ranging from 410 mg/Kg to 15,000 mg/Kg. Low to moderately elevated concentrations of BTEX were generally reported in the compliance soil samples; benzene was detected at a maximum level of 2.4 mg/Kg beneath one of the gasoline USTs.

During the subsurface investigative work, petroleum hydrocarbons were detected in most soil samples submitted for analysis; however, given the relatively shallow groundwater levels in the site vicinity, most of these samples appear to have been collected within the 'smear zone' which results from groundwater level fluctuations. The highest levels of GRO in soil were reported at boring MW-2, in a soil sample collected between about 10.5 and 11 feet bgs (910 mg/Kg). BTEX concentrations in soil are typically low.

Concentrations of VOCs in soil have typically been reported below laboratory instrument reporting limits in the samples submitted for chemical analysis. PCE and TCE have been detected at maximum concentrations of 1.8 mg/Kg and 0.82 mg/Kg, respectively (both from boring EB-4, from a sample collected between 14.5 and 15 feet bgs).

During the January 2012 subsurface investigation work, 48 soil samples were submitted for chemical analysis and no contaminants were detected in 47 of these samples. Given these findings, it appears that a majority of the contaminant mass to soil is situated onsite. Appendix A provides tabulated soil analytical data from historical work (note: no table was prepared to document the January 2012 soil sampling, given the general absence of contaminants from these samples).

Soil Vapor

Soil vapor samples have been collected once at the subject site, from the onsite soil vapor monitoring wells, in mid-December 2011 (5 total samples). Appendix B provides a table documenting the results of this soil vapor sampling work. Toluene, PCE, and chlorobenzene were detected in each of the December 2011 shallow soil vapor samples, at concentrations ranging from 8.6 micrograms per cubic meter ($\mu g/m^3$) to 32 $\mu g/m^3$, 78 $\mu g/m^3$ to 660 $\mu g/m^3$, and 8.9 $\mu g/m^3$ to 30 $\mu g/m^3$, respectively. GRO/TPHG (10,000 $\mu g/m^3$), benzene (6.7 $\mu g/m^3$), total xylenes (5.8 $\mu g/m^3$), acetone (17 $\mu g/m^3$), methylene chloride (3.1 $\mu g/m^3$), carbon disulfide (72 $\mu g/m^3$), and 2,2,4-trimethylpentane (480 $\mu g/m^3$) were also detected in sample SV-3B. Methane was not detected in any of the samples.

For preliminary screening purposes, Stratus compared analytical results of the soil vapor samples to both the commercial and residential values listed in SF-RWQCB's *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater*, Interim Final – November 2007 (revised May 2008); Table E-2, Shallow Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion Concerns (which are based on an excess cancer risk of 1E-06 and a hazard quotient of 0.2). Environmental Screening Level (ESL) values (if established) for contaminants detected in shallow soil vapor at the site are included on the Appendix B table for reference. Two of the five PCE sample results exceeded residential ESLs, and one GRO/TPHG sample result reached the residential ESL level. All soil vapor sample results were within commercial ESLs.

Groundwater

Upper Water Bearing Interval

Figures 7 and 8 summarize well sampling results using data collected during the first quarter 2013 for petroleum hydrocarbons and VOCs, respectively. Based on the available data, a majority of the petroleum hydrocarbon and VOC impact to the 'upper water bearing interval' remains onsite. Free product is intermittently measured in well MW-1. At the time of the most recent well sampling event, GRO was detected in 6 of the 9 wells sampled. GRO was reported at a concentration of 95,000 micrograms per liter [μg/L]) in the well MW-1 sample, with GRO levels ranging from 700 μg/L to 3,000 μg/L in the other five impacted samples. The highest concentrations of benzene impact wells MW-1, MW-4, and MW-7, with concentrations in these three wells ranging from 180 μg/L to 350 μg/L in the January 2013 samples. Benzene was also reported in well MW-5 and MW-6 samples during the first quarter 2013 (see Figure 7). MTBE and other fuel oxygenate impact to groundwater is negligible (MTBE was only detected in one well sample from January 2013, at a level of 3.1 μg/L).

In shallow groundwater, VOCs are detected in the monitoring wells located in close proximity to the former USTs (MW-4, MW-7, and MW-8). PCE is intermittently detected in samples collected from these wells (but below detection limits during the first quarter 2013). TCE, vinyl chloride (VC), 1,2-dichlorobenzene (1,2-DCB), cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE) are typically detected in samples collected from these wells; during the first quarter 2013, maximum concentrations of 6.2 μg/L (TCE), 130 μg/L (VC), 26 μg/L (1,2-DCB), 280 μg/L (cis-1,2-DCE), and 23 μg/L (trans-1,2-DCE) were detected.

During the January 2012 offsite investigation, only one detection of GRO and PCE was reported across Seminary Avenue to the west of the site (at DP-2). No GRO, BTEX, or VOCs were detected across Harmon Avenue to the north-northeast of the site; however, oil and grease was detected in shallow groundwater at the DP-8 location. Figures 9 and 10 illustrate GRO and PCE concentrations, respectively, for groundwater samples collected from borings DP-1 through DP-14 and wells MW-1 through MW-9 in January 2012 above 40 feet bgs, and also from the January 2013 monitoring well samples.

In late 2011, Stratus and a subcontractor performed laser induced fluorescence (LIF) testing at the CPT boring locations in order to evaluate the lateral extent of free product impact to the upper water bearing interval (see Figure 2 for boring locations). A review of the LIF data collected from boring CPT-1, which was advanced within a few feet of well MW-1, indicates that the highest concentrations of petroleum hydrocarbons were detected by LIF between approximately 23 and 28 feet bgs, which is below the 23-year historical water level fluctuation range near well MW-1 (11.8 and 21.5 feet bgs). Given this observation, free product present in well MW-1 may be originating within soil horizons present between approximately 23 and 28 feet bgs, and rising to float above the static water level within the well casing. The highest LIF instrument response for petroleum hydrocarbons is generally correlative with coarser grained soil (sand/gravel) logged by CPT a short distance below static water table levels.

The LIF instrument detected hydrocarbons at approximately 24 feet bgs at boring CPT-2 and approximately 23 to 26 feet bgs at CPT-3A. However, a much lower level of instrument response was reported at these locations relative to CPT-1. Given the much lower instrument response to petroleum hydrocarbons at borings CPT-2 and CPT-3A, it is our interpretation that free product does not extend laterally to these areas of the site. In our opinion, the LIF is likely detecting dissolved petroleum hydrocarbons at these depths and locations within the limits of the known contaminant plume, and not free product. If this is the case, free product only extends a very short distance laterally from the MW-1/CPT-1 area.

Second Water Bearing Interval

Assessment of the second water bearing interval was exclusively performed during the late 2011/early 2012 site assessment work. In general, within the second water bearing interval, GRO and VOC's (in particular PCE, but also TCE and cis-1,2-DCE) impact a larger area of the subsurface than in groundwater situated within the upper water bearing interval. Figures 11 and 12 depict GRO and PCE concentrations, respectively, for groundwater samples from the second water bearing interval in December 2011 or January 2012 at borings CPT-1 and DP-1 through DP-14. GRO concentrations decrease significantly between the upper water bearing interval and the second water bearing interval based on the available analytical data (and consistent with LIF data findings), and concentrations of other petroleum hydrocarbons (including BTEX) are negligible or non-detectable.

In our interpretation of the available data, it does not appear that contaminants (particularly GRO and PCE) within the second water bearing interval are migrating in a preferred direction away from the site. Instead, contaminants were detected in borings located in all directions (north/south/east/west) from the site. The distribution of contaminants is suggestive of variable groundwater flow within the second water bearing interval. Deeper screened groundwater monitoring wells installed during the scope of work proposed in this Work Plan will be used in the future, once surveyed, to allow for assessment of groundwater flow direction within the second water bearing interval.

PROJECT APPROACH

As discussed earlier in this report, despite inconsistencies in computation and depiction of shallow groundwater flow beneath the site, petroleum hydrocarbon contaminants appear to be predominantly migrating to the southwest, west, and northwest based on available analytical data. Given this condition, two groundwater monitoring wells (MW-10 and MW-11) will be installed to allow for further delineation of shallow contaminant distribution west-northwest of the site. Stratus is proposing to install the wells with screening intervals extending from approximately 10 to 30 feet bgs. In our opinion, a relatively lengthy well screening interval is necessary due to the range in water level fluctuations historically observed beneath the site. In addition, the wells need to be of sufficient depth to provide coverage across the soil intervals were the highest concentrations of contaminants have been identified (up to approximately 28 feet bgs using LIF results).

Figures 11 and 12 illustrate that GRO and PCE likely impact a larger area of the subsurface in the second water bearing interval than in the upper water bearing interval. Given this condition, Stratus is proposing to install a deeper monitoring well network that covers a relatively large area of the subsurface (see Figure 13). This should enable monitoring of contaminants in areas previously identified during the January 2012 site investigation, while also allowing for calculation of groundwater flow direction across a larger area, which we believe will be more representative of subsurface conditions than calculation of flow direction using closely spaced wells.

Well MW-16 is proposed to be installed offsite, at 5909 Holway Street, but in close proximity to the former USTs. If access to this property and location is denied by the property owner, Stratus will relocate the well approximately 15 to 20 feet to the east, within the Holway Street sidewalk and also in relative close proximity to the former USTs (see Figure 13).

SCOPE OF WORK

The objectives of the proposed scope of work are to:

- Evaluate groundwater flow direction in the second water bearing interval.
- Further assess the lateral and vertical extent of impact to the subsurface.

To accomplish these objectives, Stratus is proposing the following work activities:

- Drill and install two (2) 2-inch diameter groundwater monitoring wells offsite (MW-10 and MW-11) to a depth of approximately 33 feet bgs using hollow stem augers.

- Drill and install five (5) 2-inch diameter groundwater monitoring wells (MW-12 through MW-16) to a depth of approximately 55 to 60 feet bgs using hollow stem augers.
- Collect soil samples for lithologic comparison and chemical analysis.
- Develop, sample, and survey the newly installed wells.

The proposed scope of work has been subdivided into four tasks, as outlined below. All work will be conducted under the direct supervision of a State of California Professional Geologist or Professional Engineer, and will be conducted in accordance with standards established by the *Tri-Regional Board Staff Recommendations of Preliminary Investigation and Evaluation of Underground Tank Sites* (Regional Water Quality Control Board [RWQCB], April 2004).

Task 1: Pre-field Activities

Following approval of this *Work Plan* by ACEHD, the following activities will be completed:

- Secure an access agreement to a neighboring property (5909 Holway Street). If this access agreement cannot be obtained, an alternate well location (MW-16) will be utilized.
- Secure permits required by the City of Oakland to allow for placement of the monitoring wells in the public right-of-way.
- Obtain drilling permits from Alameda County Public Works Agency
- Retain and schedule a licensed C-57 drilling contactor.
- Update site specific Health and Safety Plan.
- Mark boring locations and contact Underground Service Alert to locate underground utilities in the vicinity of the work site.
- Notify the onsite property tenant, offsite property owner/tenant at 5909 Holway Street, ACEHD, ACPWA, and the City of Oakland of the proposed work schedule.

Task 2: Field Activities

<u>Task 2A: Soil Borings</u>

A C-57 licensed drilling contractor will advance well borings MW-10 through MW-16 using a truck mounted or limited access hollow stem auger drill rig equipped with 8-inch diameter hollow stem augers. The approximate location of each proposed soil boring and monitoring well are shown on Figure 13. The initial portion of each soil boring will be advanced with hand tools, as conditions allow, to reduce the possibility of damaging underground utilities. Once borings MW-10 through MW-16 have been advanced to total depth, groundwater monitoring wells will be completed within each borehole. A general description of field practices and procedures that will be utilized during drilling work are included in Appendix C.

Stratus proposes to collect soil samples only from borings MW-10, MW-12, and MW-16. The other four well borings (MW-11, MW-13, MW-14, and MW-15) are located in relative close proximity to borings DP-2, DP-10, DP-6, and DP-1, which have already been continuously logged to a depth sufficient to allow for evaluation of screening interval. Soil samples will be collected from borings MW-10, MW-12, and MW-16 at 5-foot intervals from each boring using a California-type, split-spoon sampler equipped with three pre-cleaned brass or stainless steel sleeves. The ends of the bottom-most, intact tube from each sample interval will be lined with Teflon™ sheets, capped, and sealed. Each sample will then be labeled, placed in a resealable plastic bag, and stored in an ice-chilled cooler. Strict chain-of-custody procedures will be followed from the time the samples are collected until the time the samples are relinquished to the laboratory. Stratus will submit a minimum of two samples from boring MW-10, and three samples from borings MW-12 and MW-16, for chemical analyses; additional samples may be submitted for analytical testing at the discretion of the registered professional overseeing the project.

Soil will be classified on-site using the Unified Soil Classification System and recorded, along with other pertinent geologic information, on a geologic log. Soil from each sampled interval will also be placed and sealed in plastic bags to allow the accumulation of volatile organic compound (VOC) vapors within the airspace in the bags. A portable photoionization detector (PID) will be used to measure VOC concentrations from each sample in parts per million (ppm), and will be recorded on the boring log.

Task 2B: Monitoring Well Construction

Monitoring wells MW-10 through MW-16 will be constructed through the 8-inch diameter hollow stem augers. The wells will be constructed using 2-inch diameter schedule 40 PVC and 0.02-inch diameter slotted well screen. Wells MW-10 and MW-11 will be screened from 13 to 33 feet bgs, wells MW-13 and MW-15 will be screened from approximately 47 to 57 feet bgs, and well MW-14 will be screened from approximately 45 to 55 feet bgs. The depth and screening interval of wells MW-12 and MW-16 will be determined at the time of the investigation, however we anticipate that the depths and screening intervals will be similar to wells MW-13 through MW-15. A filter pack of #3 sand will be placed in the annular space around the well casing from the bottom of the well screen to approximately 2 feet above the top of the well screen. Approximately 3 feet of bentonite chips (shallow wells) or coated pellets (deep wells) will be placed on top of the filter pack to provide a transition seal for the well. Neat cement will be used to backfill the remaining annular space around the well casing. A watertight locking cap will be placed over the top of the well casing, and a traffic rated vault box will be installed around the top of the well. The actual well construction may be modified in the field based on conditions encountered at the time of the investigation.

Task 2C: Monitoring Well Development and Sampling

The newly installed monitoring wells will be allowed to stand a minimum of 72 hours before being developed. Monitoring well development will consist of surging with a bailer followed by groundwater pumping. Development will continue, to the extent practical, until the discharged water runs clear and pH and conductivity measurements stabilize. Water levels, water-quality parameters (pH, temperature, conductivity), and discharged quantities will be recorded for each well.

A minimum of 24 hours after the groundwater monitoring wells are developed, the monitoring wells will be purged and groundwater samples will be collected. The samples will be collected using a disposable bailer, transferred to laboratory-supplied glass vials, and placed in an ice-chilled cooler. The groundwater samples will be transported under strict chain-of-custody protocol to a California-certified analytical laboratory for analysis.

Task 2D: Waste Management

Drill cuttings and wastewater generated during the field activities will be contained in DOT-approved 55-gallon steel drums. The drums will be appropriately labeled and stored at the site pending proper disposal. A licensed contractor will transport the soil and wastewater to an appropriate facility for disposal.

Task 2E: Site Survey

A California licensed land surveyor will be retained to survey the horizontal coordinates and elevations of each monitoring well, as required by AB 2886 (GeoTracker). Elevations of the top-of-casing of the wells will be surveyed to a 0.01-foot vertical accuracy and established relative to a known benchmark in feet MSL. The survey will be tied to the previous survey work performed at the site. These data will be uploaded to the GeoTracker database.

Task 3: Laboratory Analysis

Soil and groundwater samples will be forwarded to a state-certified laboratory for chemical analyses. The samples will be analyzed for GRO using U.S. Environmental Protection Agency (USEPA) Method 8015/8260, and for BTEX, MTBE, TBA, and TAME using USEPA Method 8260.

Task 4: Site Assessment Report Preparation

Following completion of the additional site characterization activities, a site assessment report will be prepared. The report will include, but not be limited to, a scaled site plan, soil boring logs, well details, a report from a licensed surveying contractor, tabulated analytical results, and certified analytical results. The report will be uploaded to GeoTracker upon finalization.

SCHEDULE

Following approval of this Work Plan, Stratus will forward an access agreement to the owner of property at 5909 Harmon Street to enable the installation of monitoring well MW-16 on this property. Stratus will allow approximately two months for the property owner to respond to this request for access. If the agreement cannot be obtained within a timely manner, Stratus will then relocate well MW-16 approximately 15-20 feet to the east, within the City of Oakland sidewalk.

Once the number of wells to be installed in the City of Oakland right-of-way has been determined (five wells or six wells, as discussed above), Stratus will work to obtain the necessary permits from the City of Oakland. Based on our professional experience obtaining permits from the City of Oakland for well installation, we anticipate that approximately six months will be necessary to complete this task. Once the City of Oakland permits have been obtained, Stratus will forward drilling permit applications to the ACPWA and the work will be scheduled.

LIMITATIONS

This Work Plan was prepared in general accordance with accepted standards of care that existed at the time this work was performed. No other warranty, expressed or implied, is made. Conclusions and recommendations are based on field observations and data obtained from this work and previous investigations. It should be recognized that definition and evaluation of geologic conditions is a difficult and somewhat inexact science. Judgments leading to conclusions and recommendations are generally made with an incomplete knowledge of the subsurface conditions present. More extensive studies may be performed to reduce uncertainties. This Work Plan is solely for the use and information of our client unless otherwise noted.

If you have any questions or comments concerning this report, please contact Scott Bittinger at (530) 676-2062 or Jay Johnson at (530) 676-6000.

Sincerely,

STRATUS ENVIRONMENTAL, INC.

REGISTERED GEOLOGIST
Scott G. Bittinger
No. 7477
STATE OF CALIFORNIA

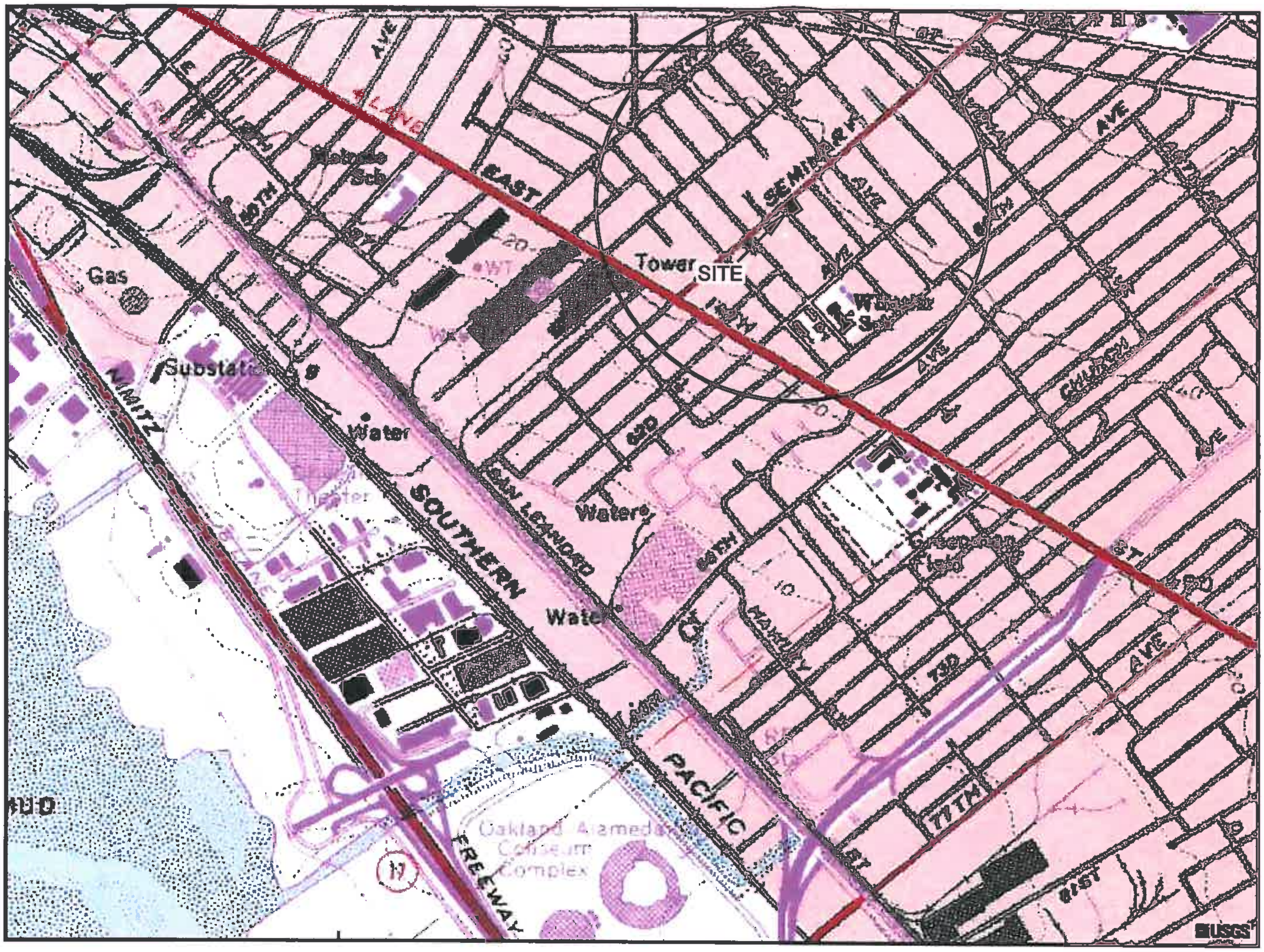
Scott G. Bittinger, P.G.
Project Manager

Jay R. Johnson, P.G.
Principal Geologist

Attachments:

Figure 1	Site Location Map
Figure 2	Site Plan
Figure 3	Site Vicinity Map
Figure 4	Geologic Cross Section A to A'
Figure 5	Geologic Cross Section B to B'
Figure 6	Geologic Cross Section C to C'
Figure 7	Petroleum Hydrocarbon Groundwater Analytical Summary, First Quarter 2013
Figure 8	Halogenated VOC Groundwater Analytical Summary, First Quarter 2013
Figure 9	GRO in Groundwater, Upper Water Bearing Interval
Figure 10	PCE in Groundwater, Upper Water Bearing Interval
Figure 11	GRO in Groundwater, Second Water Bearing Interval
Figure 12	PCE in Groundwater, Second Water Bearing Interval
Figure 13	Site Vicinity Map With Proposed Monitoring Well Locations
Appendix A	Historical Soil Analytical Data
Appendix B	December 2011 Soil Vapor Analytical Sampling Results
Appendix C	Field Practices and Procedures

cc: Ms. Angel LaMarca and Ms. Peggy Garcia, Trustee, Grimit Family Trust



GENERAL NOTES:
BASE MAP FROM U.S.G.S.
OAKLAND, CA.
7.5 MINUTE TOPOGRAPHIC
PHOTOREVISED 1996

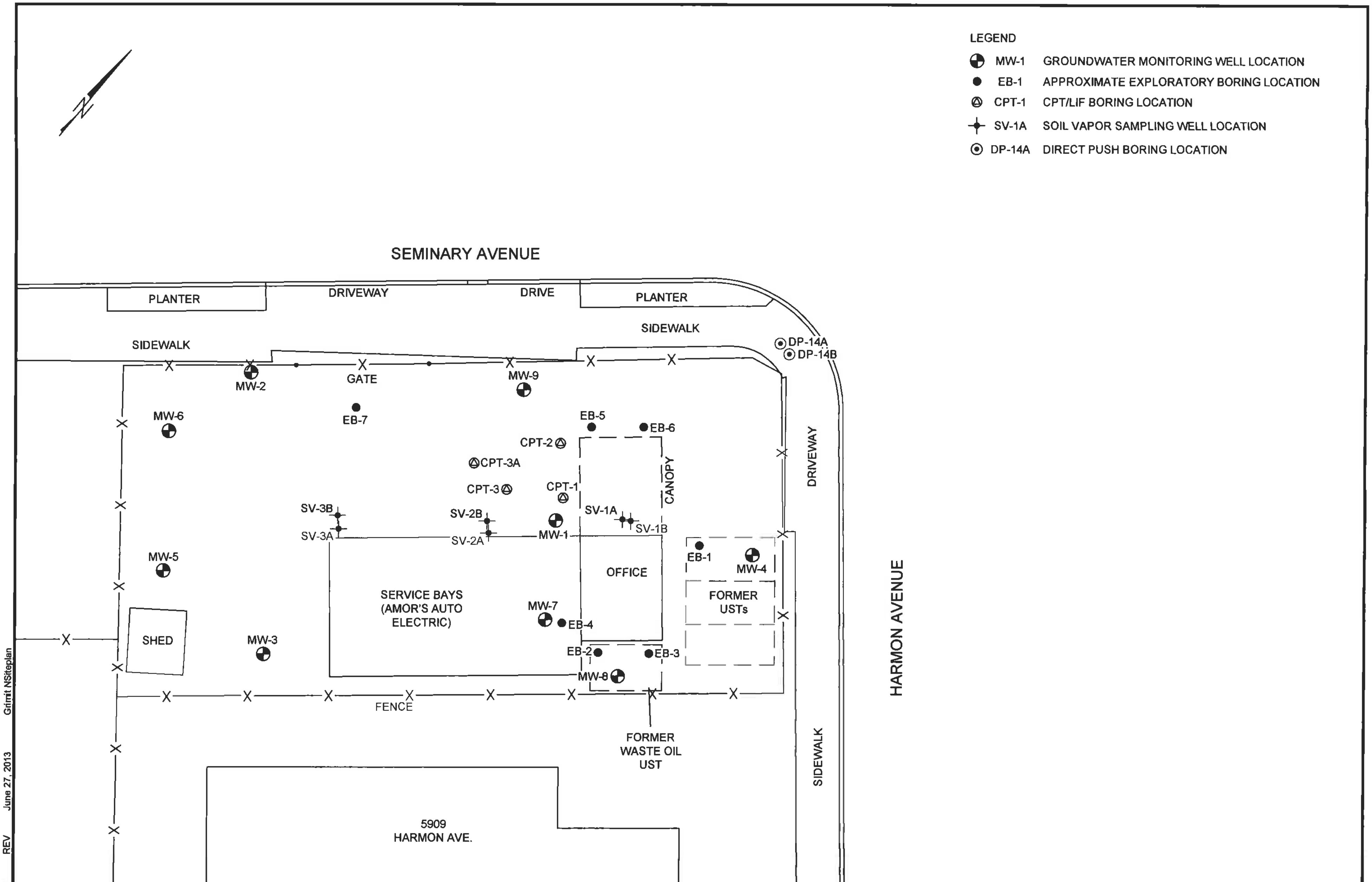
N

QUADRANGLE LOCATION

0 1800 FT

APPROXIMATE SCALE

STRATUS ENVIRONMENTAL, INC.	FORMER GRIMIT AUTO 1970 SEMINARY AVENUE OAKLAND, CALIFORNIA SITE LOCATION MAP	FIGURE 1 PROJECT NO. 2090-1970-01



Grimit NSiteplan June 27, 2013 REV JMP Grimit Auto

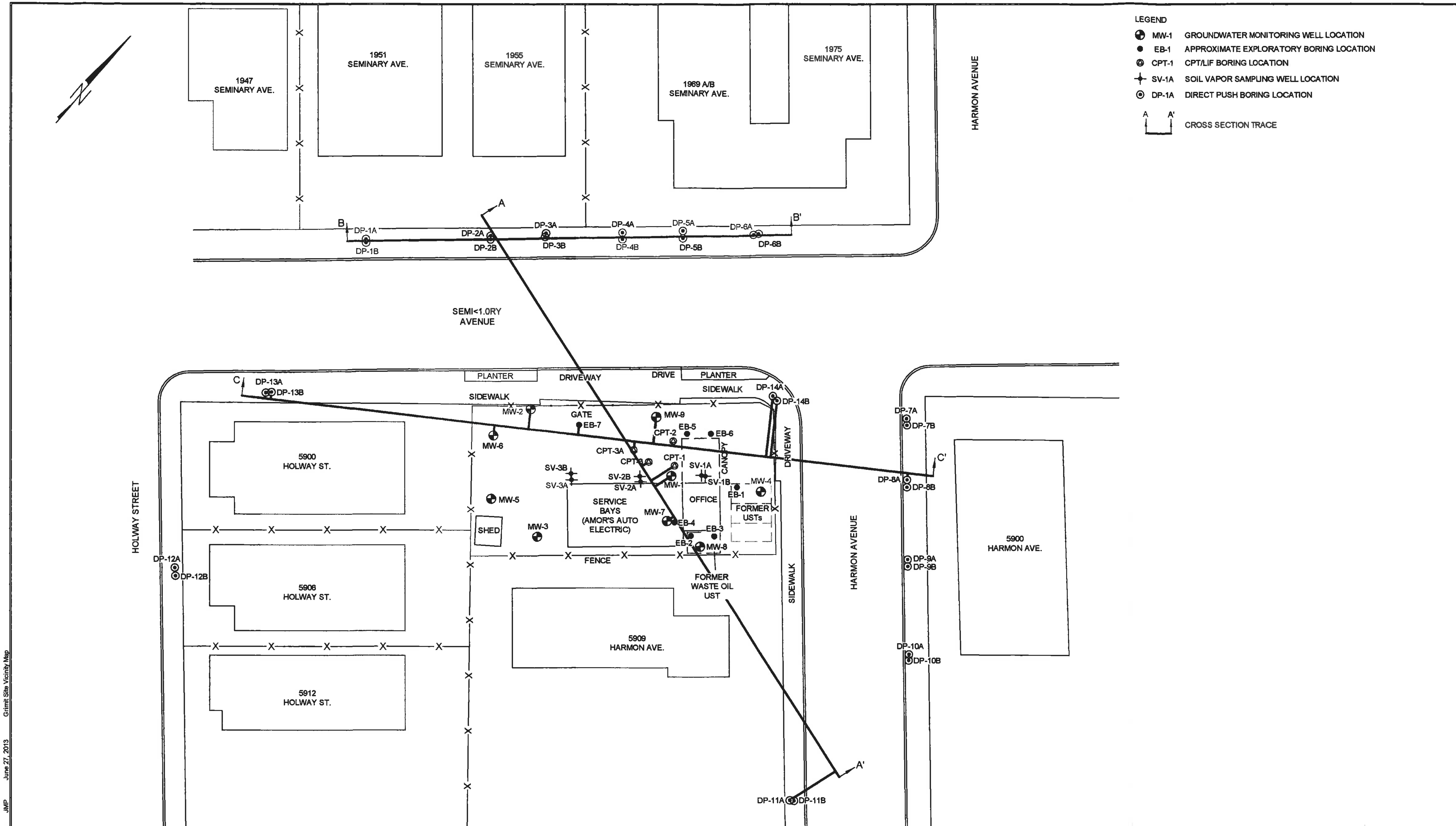
STRATUS ENVIRONMENTAL, INC.

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

SITE PLAN

FIGURE 2

PROJECT NO. 2090-1970-1



STRATUS
ENVIRONMENTAL, INC.

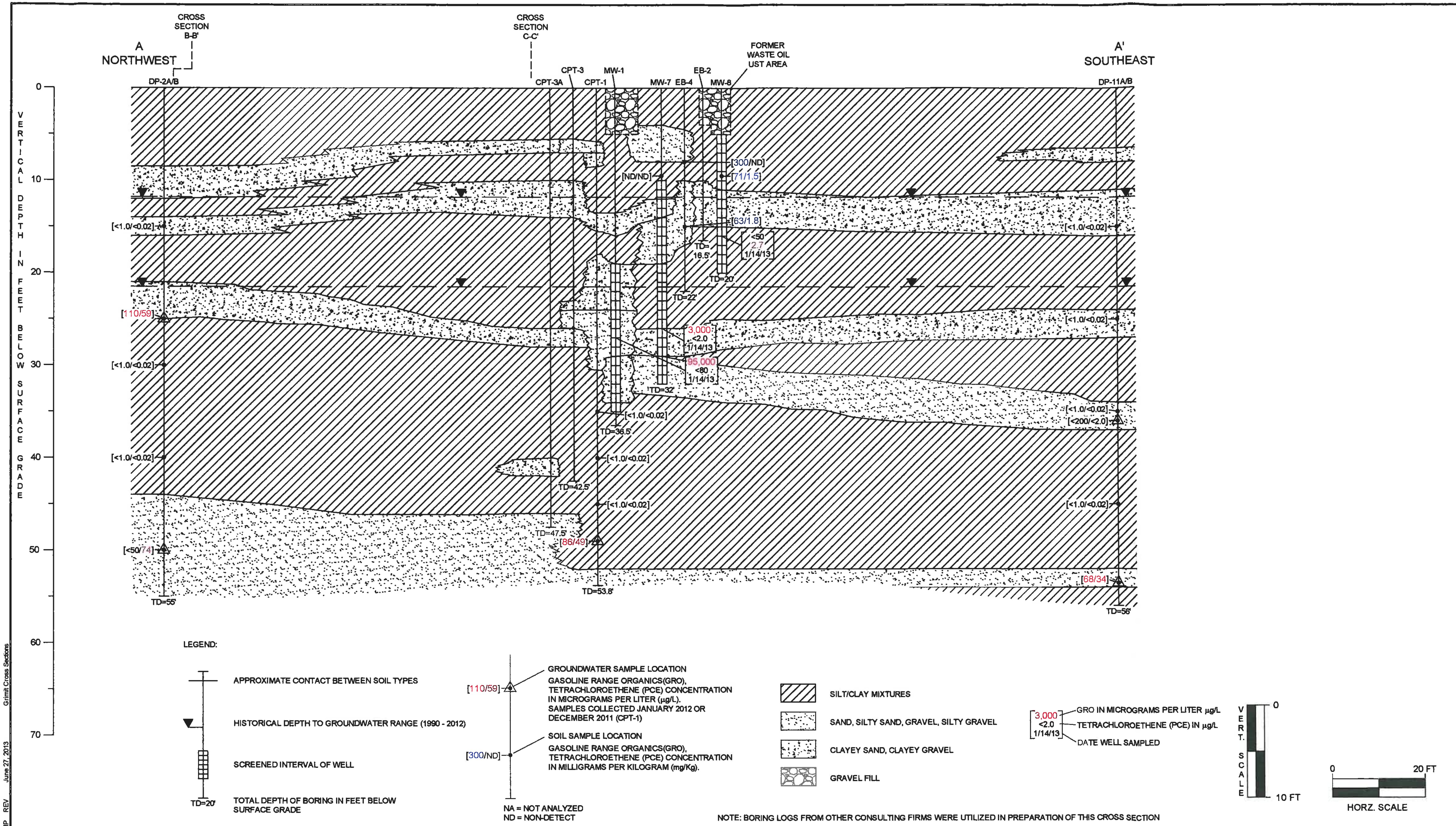
0 30 FT
SCALE

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

SITE VICINITY MAP

FIGURE
3

PROJECT NO.
2090-1970-1



STRATUS ENVIRONMENTAL, INC.

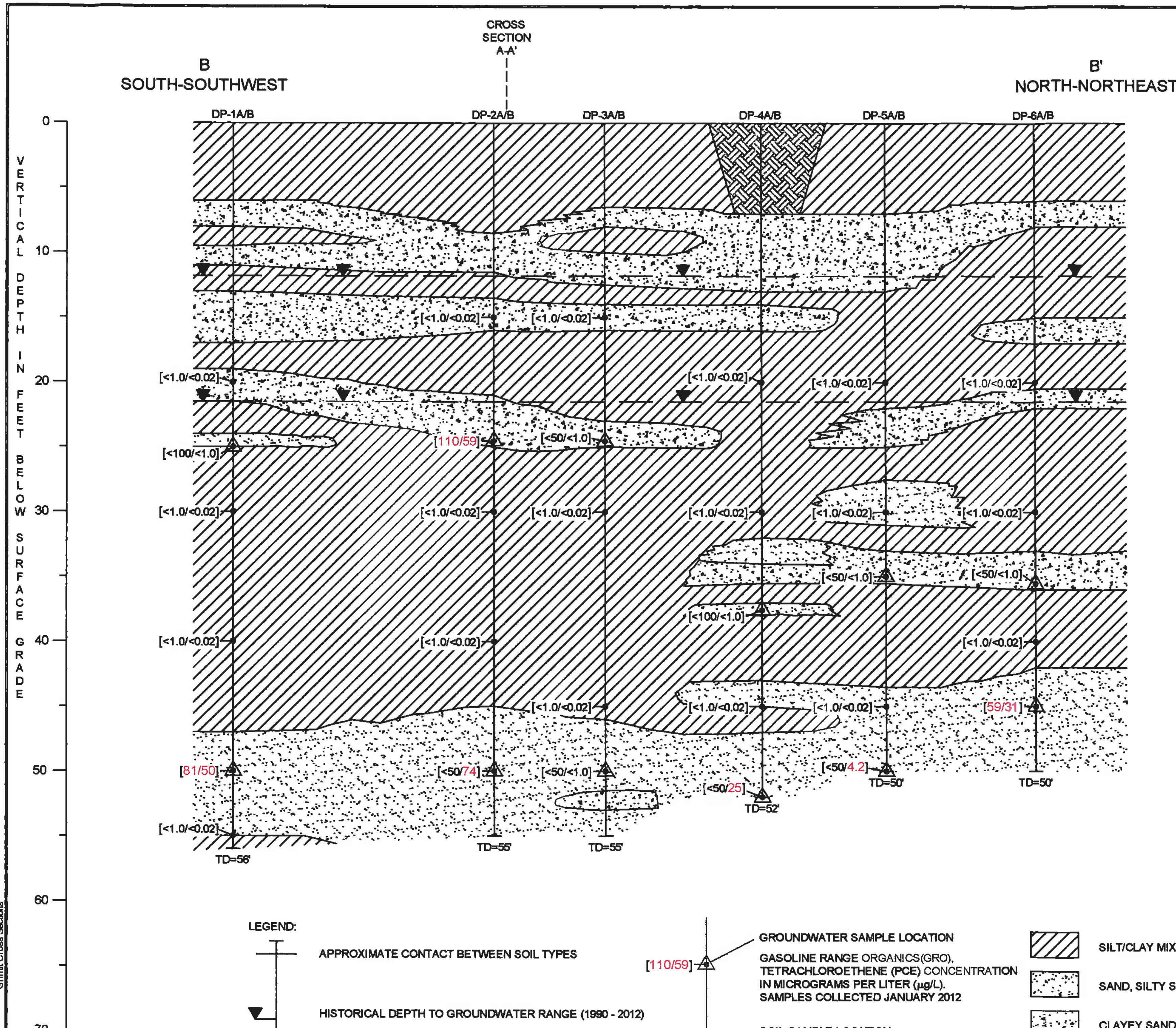
FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

GEOLOGIC CROSS SECTION A-A'

FIGURE 4

PROJECT NO. 2090-1970-1

JMP REV June 27, 2013 Grimit Cross Sections Grimit\Workplan062713



LEGEND:

- APPROXIMATE CONTACT BETWEEN SOIL TYPES
- HISTORICAL DEPTH TO GROUNDWATER RANGE (1990 - 2012)
- TD=50' TOTAL DEPTH OF BORING IN FEET BELOW SURFACE GRADE
- [110/59] GROUNDWATER SAMPLE LOCATION
  GASOLINE RANGE ORGANICS(GRO), TETRACHLOROETHENE (PCE) CONCENTRATION IN MICROGRAMS PER LITER (µg/L). SAMPLES COLLECTED JANUARY 2012
- [<1.0/<0.02] SOIL SAMPLE LOCATION
  GASOLINE RANGE ORGANICS(GRO), TETRACHLOROETHENE (PCE) CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/Kg).
- SILT/CLAY MIXTURES
- SAND, SILTY SAND, GRAVEL
- CLAYEY SAND, CLAYEY GRAVEL
- GRAVEL FILL
- SOIL/CONSTRUCTION DEBRIS FILL (W/ BRICKS, CONCRETE, SOIL, ETC.)

VERT. SCALE 0 – 10 FT

HORZ. SCALE 0 – 20 FT

Grimit Cross Sections June 27, 2013 JMP REV GrimitWorkplan062713

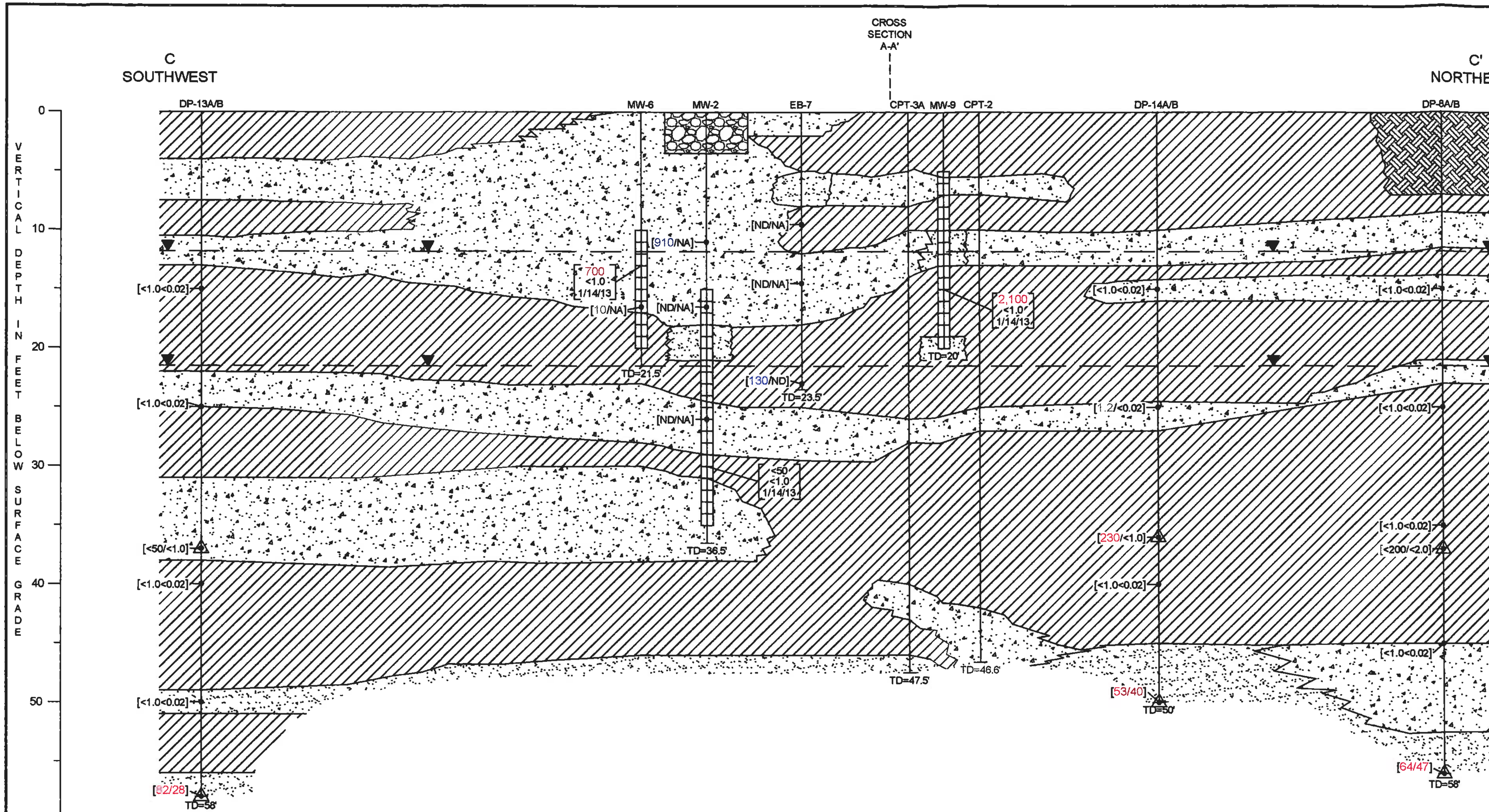
STRATUS ENVIRONMENTAL, INC.

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

GEOLOGIC CROSS SECTION B-B'

FIGURE 5

PROJECT NO. 2090-1970-1



LEGEND:

APPROXIMATE CONTACT BETWEEN SOIL TYPES

HISTORICAL DEPTH TO GROUNDWATER RANGE (1990 - 2012)

SCREENED INTERVAL OF WELL

TD=20' TOTAL DEPTH OF BORING IN FEET BELOW SURFACE GRADE

[64/47] GROUNDWATER SAMPLE LOCATION
GASOLINE RANGE ORGANICS(GRO), TETRACHLOROETHENE (PCE) CONCENTRATION IN MICROGRAMS PER LITER (µg/L). SAMPLES COLLECTED JANUARY 2012

[1.2/<0.02] SOIL SAMPLE LOCATION
GASOLINE RANGE ORGANICS(GRO), TETRACHLOROETHENE (PCE) CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/Kg).

NA = NOT ANALYZED
ND = NON-DETECT

SILT/CLAY MIXTURES

SAND, SILTY SAND, GRAVEL

CLAYEY SAND, CLAYEY GRAVEL

GRAVEL FILL

SOIL/CONSTRUCTION DEBRIS FILL (W/ BRICKS, CONCRETE,SOIL, ETC.)

<50 — GRO IN MICROGRAMS PER LITER µg/L
<1.0 — TETRACHLOROETHENE (PCE) IN µg/L
1/14/13 — DATE WELL SAMPLED

VERT. SCALE 0 – 10 FT

HORZ. SCALE 0 – 20 FT

NOTE: BORING LOGS FROM OTHER CONSULTING FIRMS WERE UTILIZED IN PREPARATION OF THIS CROSS SECTION

GrimitWorkplan062713 JMP REV June 27, 2013 Grimit Cross Sections

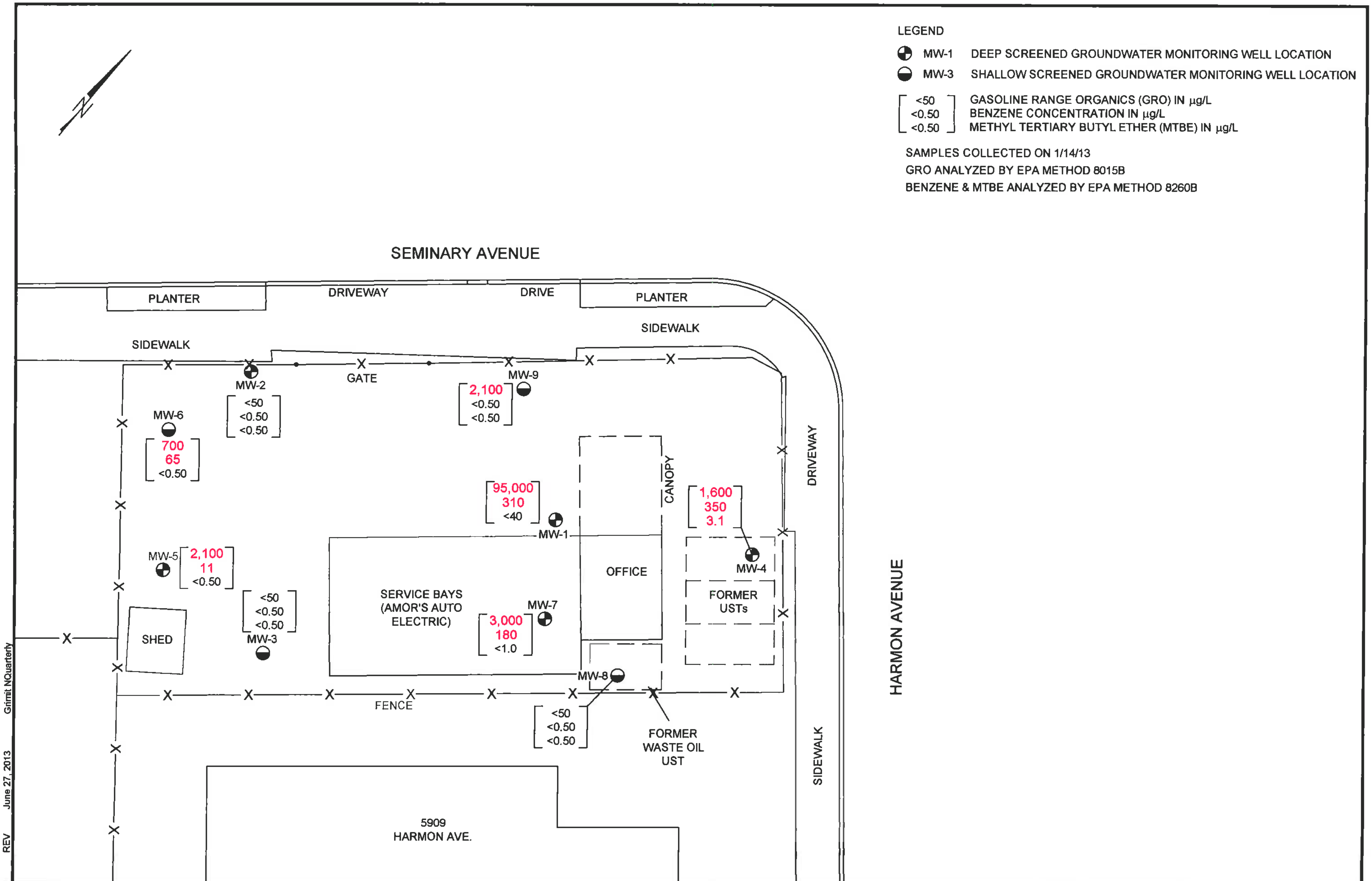
STRATUS ENVIRONMENTAL, INC.

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

GEOLOGIC CROSS SECTION C-C'

FIGURE 6

PROJECT NO. 2090-1970-1



Grimit NQuarterly June 27, 2013 REV JMP GrimitQuarterly

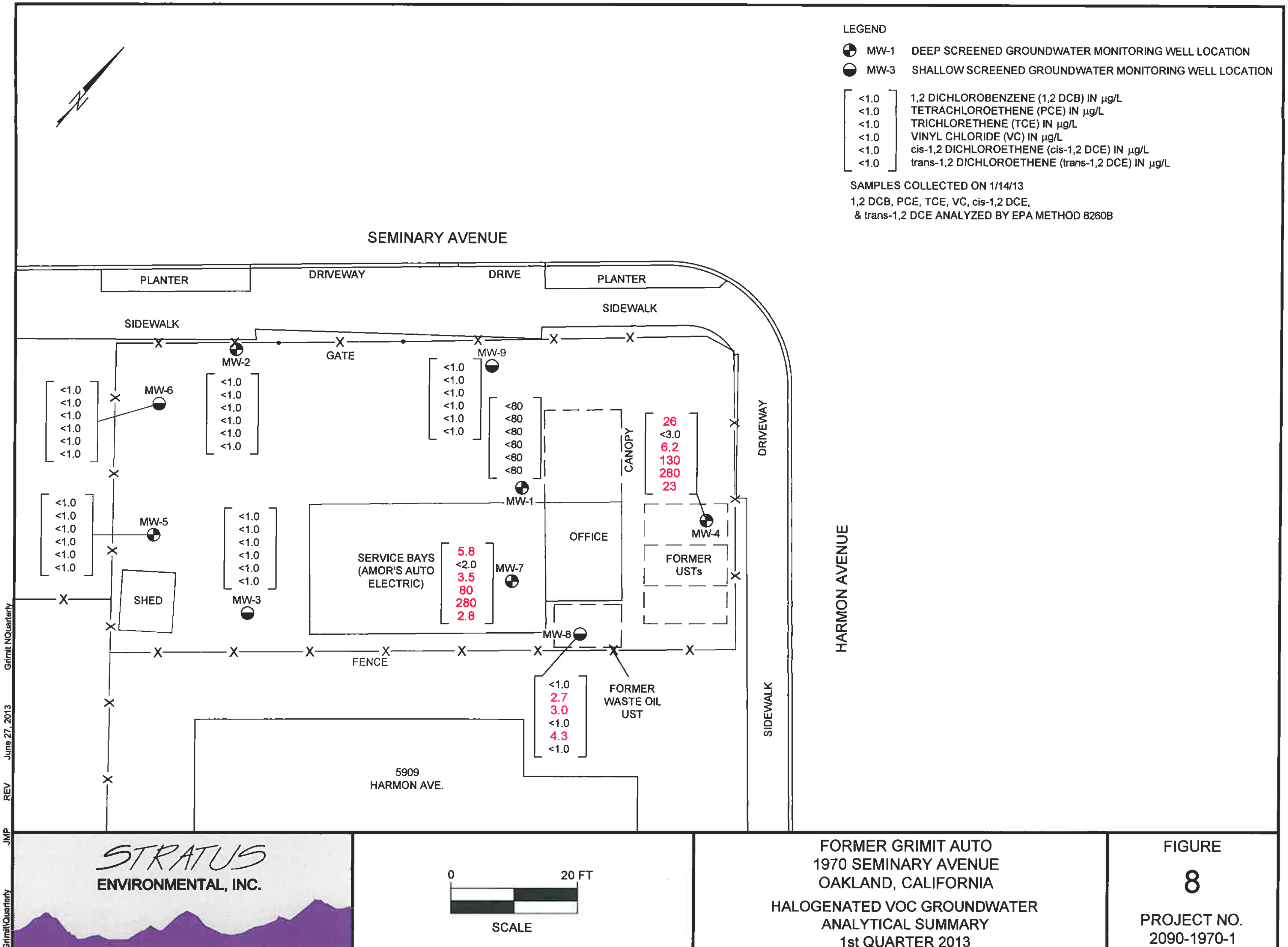
STRATUS ENVIRONMENTAL, INC.

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

PETROLEUM HYDROCARBON
GROUNDWATER ANALYTICAL SUMMARY
1st QUARTER 2013

FIGURE
7

PROJECT NO.
2090-1970-1



Grimit NQuarterly June 27, 2013 REV JMP GrimitQuarterly

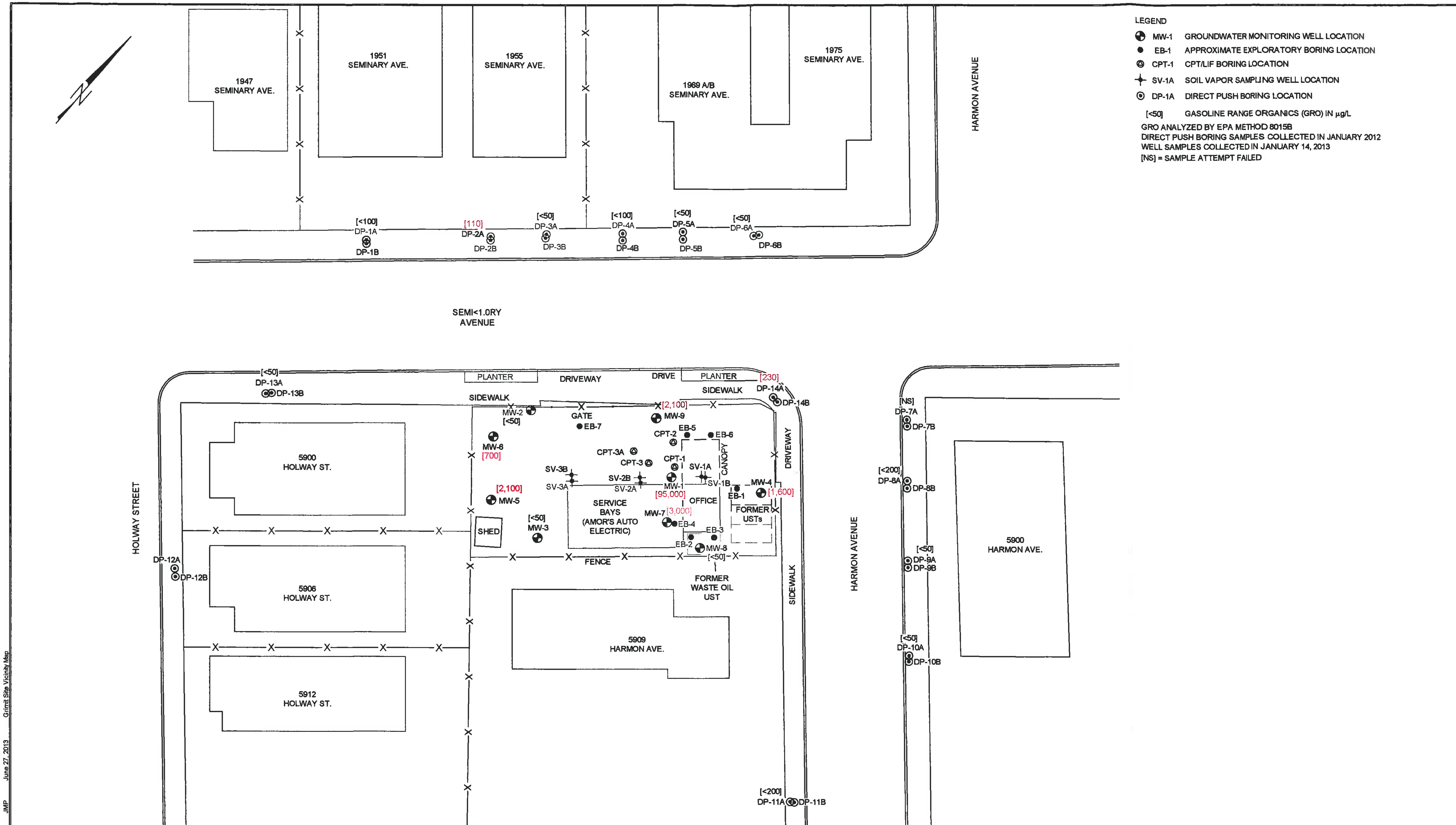
STRATUS ENVIRONMENTAL, INC.

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

HALOGENATED VOC GROUNDWATER ANALYTICAL SUMMARY
1st QUARTER 2013

FIGURE 8

PROJECT NO. 2090-1970-1



STRATUS ENVIRONMENTAL, INC.

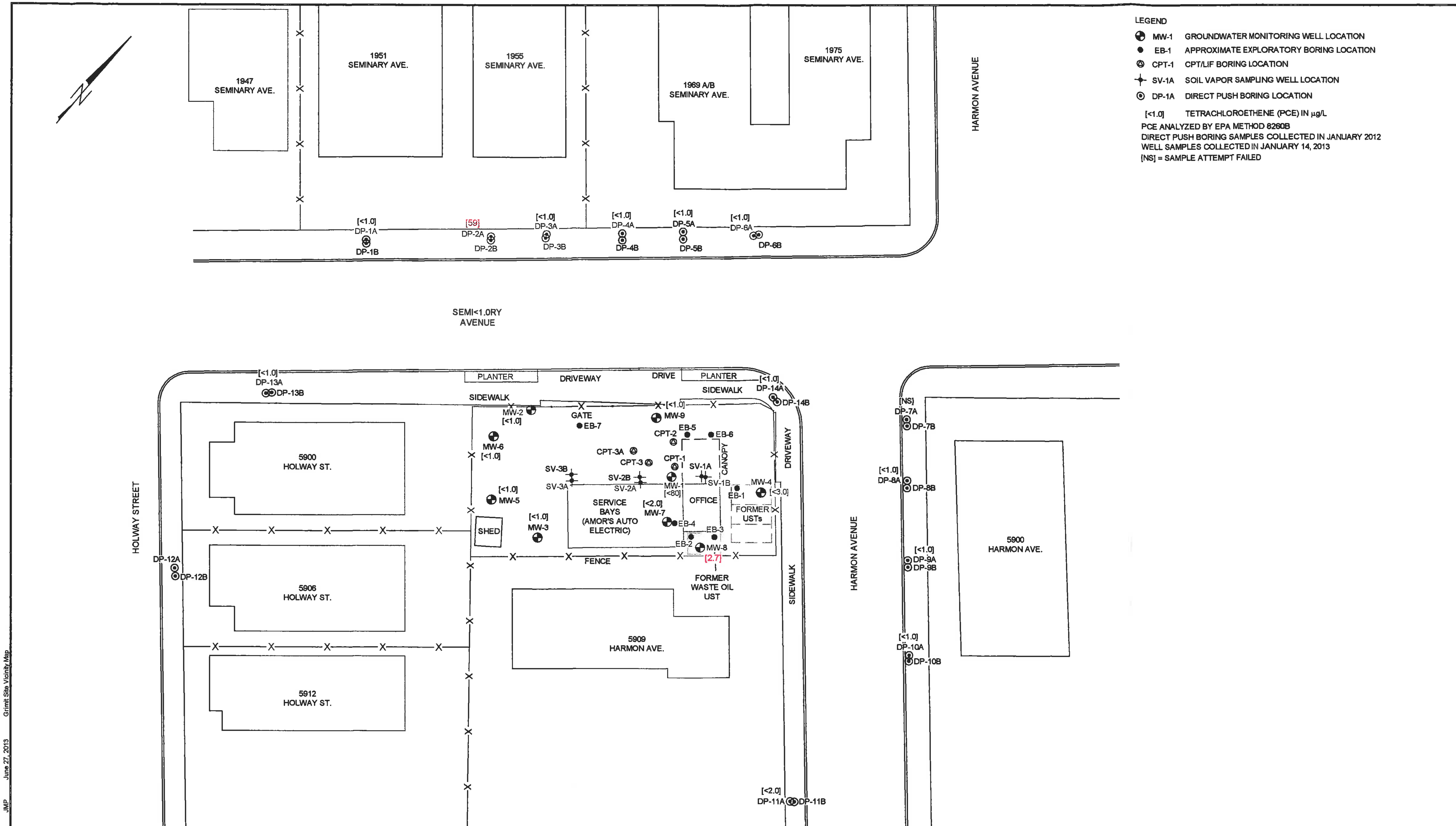
0 30 FT
SCALE

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

GRO IN GROUNDWATER ABOVE 40' bgs

FIGURE 9

PROJECT NO. 2090-1970-1



STRATUS ENVIRONMENTAL, INC.

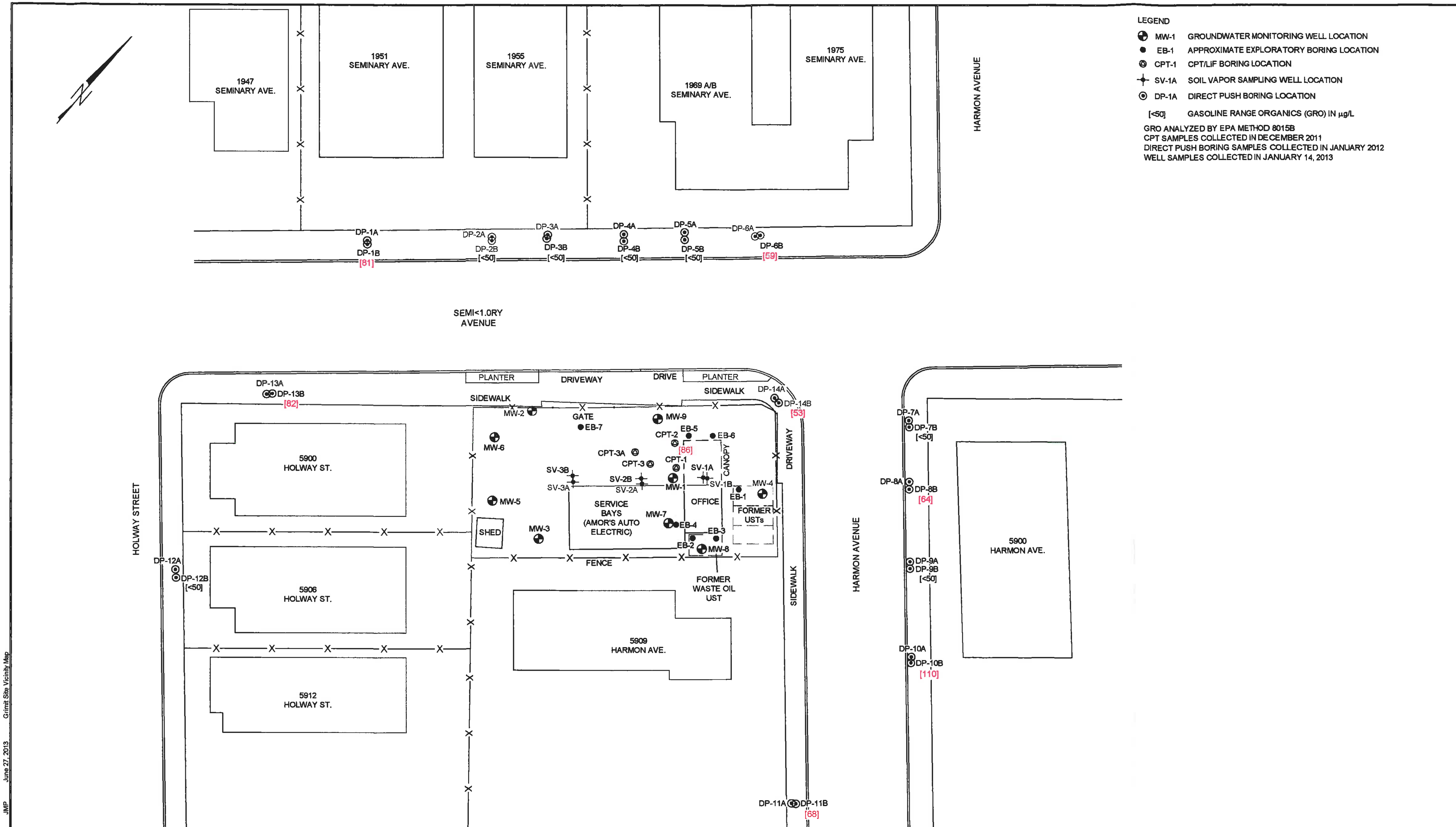
FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

PCE IN GROUNDWATER ABOVE 40' bgs

FIGURE 10

PROJECT NO. 2090-1970-1

Grimit Auto\Workplan\062713 JMP June 27, 2013 Grimit Site Vicinity Map



Grimit Auto\Workplan\062713 JMP June 27, 2013 Grimit Site Vicinity Map

STRATUS ENVIRONMENTAL, INC.

0 30 FT

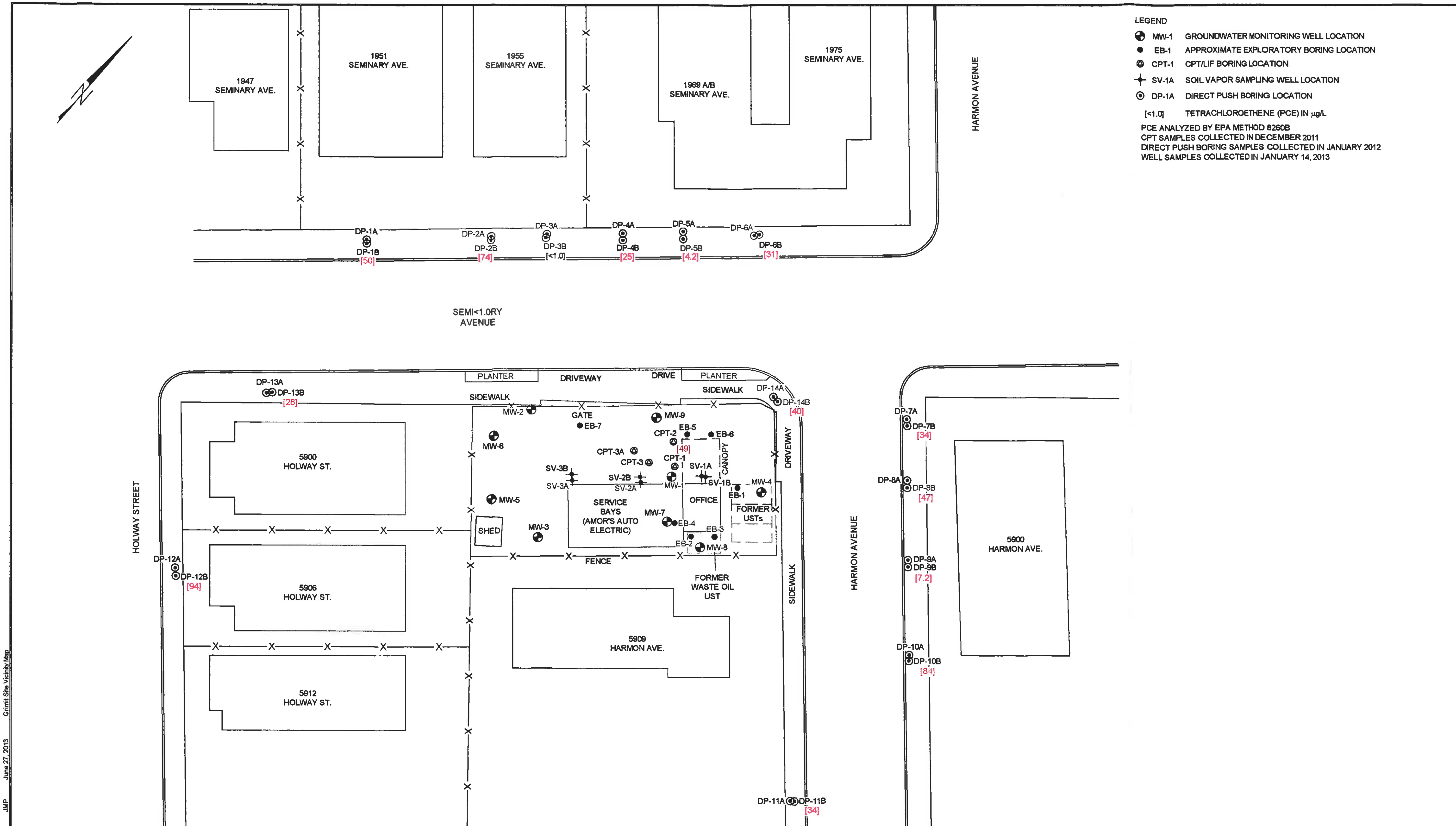
SCALE

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

GRO IN GROUNDWATER
SECOND WATER BEARING INTERVAL

FIGURE
11

PROJECT NO.
2090-1970-1



STRATUS ENVIRONMENTAL, INC.

0 30 FT
SCALE

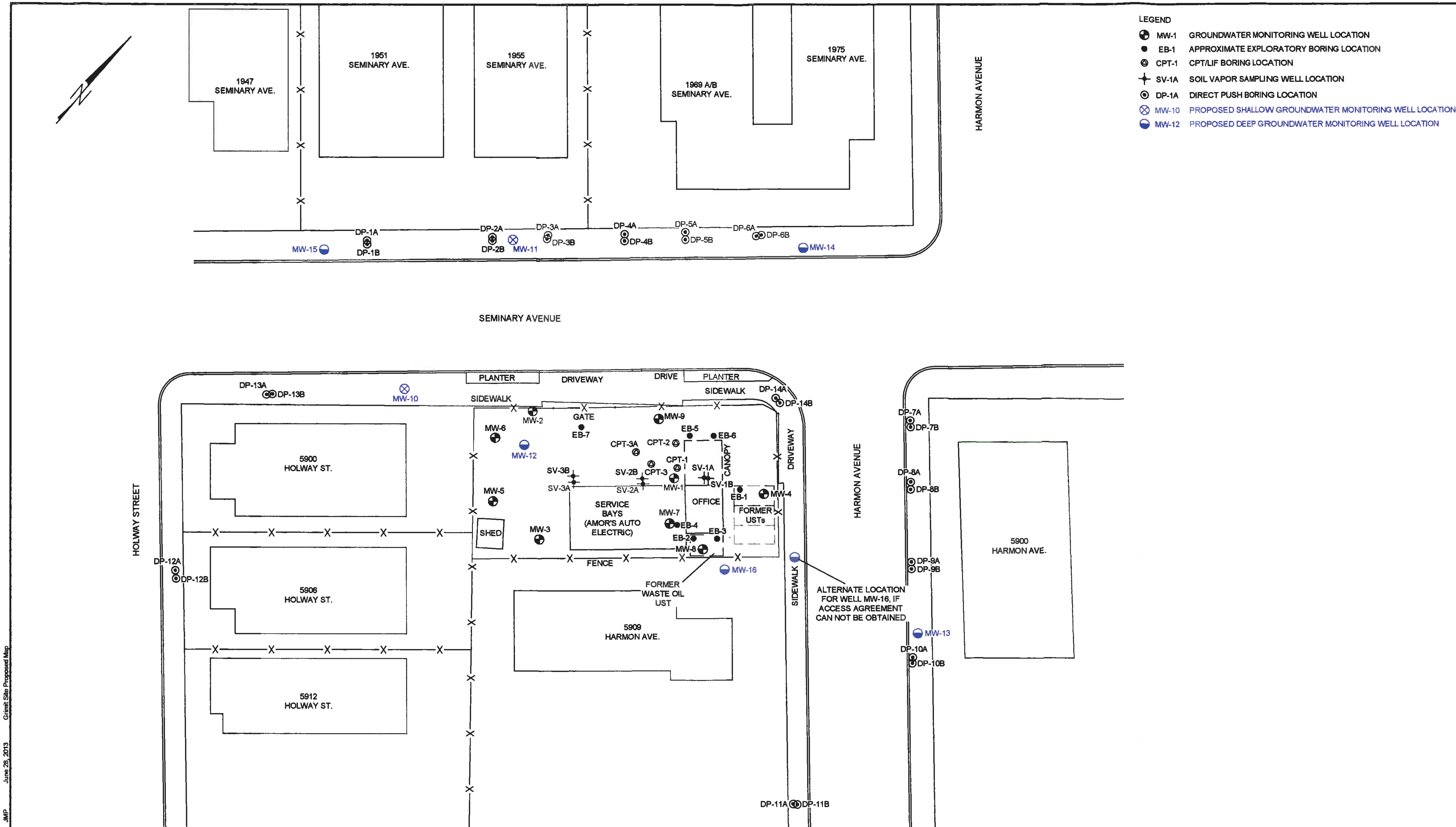
FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

PCE IN GROUNDWATER
SECOND WATER BEARING INTERVAL

FIGURE
12

PROJECT NO.
2090-1970-1

Grimit Auto\Workplan\062713 JMP June 27, 2013 Grimit Site Vicinity Map



STRATUS ENVIRONMENTAL, INC.

0 30 FT
SCALE

FORMER GRIMIT AUTO
1970 SEMINARY AVENUE
OAKLAND, CALIFORNIA

SITE VICINITY MAP WITH PROPOSED MONITORING WELL LOCATIONS

FIGURE
13

PROJECT NO.
2090-1970-1

Grimit Auto\Workplan082713 JMP June 28, 2013 Grimit Site Proposed Map

APPENDIX A

HISTORICAL SOIL ANALYTICAL DATA

TABLE 2A

SUMMARY OF ANALYTICAL TEST RESULTS - SOIL
Petroleum Hydrocarbons
(Results reported in parts per million (ppm), mg/kg) (1, 2)

Sample	TPH-Gasoline	Benzene	Toluene	Ethyl-Benzene	Xylenes	Oil and Grease (diesel)	HVOC
Initial UST Removal Confirmation Testing							
Gasoline USTs 11/17/89							
South tank W 9.5'	22	<0.025	<0.025	<0.075	<0.075	NA	NA
South tank E 7.5'	<10	<0.025	<0.025	<0.075	<0.075	NA	NA
Center tank 8'	20	<0.025	0.031	<0.075	0.200	NA	NA
North tank N 9.5'	<10	0.068	<0.025	<0.075	<0.075	NA	NA
North tank E 9.5'	21	2.4	2.9	0.320	1.7	NA	NA
Waste Oil UST 11/17/89							
1	NA	0.093	0.510	0.480	1.7	5500/760/360 (6)	**ND**
2	NA	0.160	0.400	0.810	2.4	7200/460 /190(6)	**ND**
Previous Kaldveer Investigation 8/3/90 and 8/13/90							
EB-1							
16.0	4	NA	NA	NA	NA	NA	NA
21.0	0.5	NA	NA	NA	NA	NA	NA
26.0	50	NA	NA	NA	NA	NA	NA
EB-2							
10.0	NA	NA	NA	NA	NA	4,200	NA
16.0	NA	NA	NA	NA	NA	ND	NA
EB-3							
10.0	NA	NA	NA	NA	NA	2,800	NA
16.0	NA	NA	NA	NA	NA	150	NA
Waste Oil Tank Overexcavation Confirmation Testing 5/16/91							
1 (south side)	190	ND	ND	0.58	1.3	15,000/2700/570 (6)	NA
2 (west side)	ND	ND	ND	ND	ND	1,200/61/<1 (6)	NA
3 (east side)	4.4	ND	ND	0.0083	0.021	11,000/4400/<1(6)	NA
4 (north side)	12	0.0042	ND	0.0091	0.021	410/250/<1 (6)	NA
5 (west floor)	270	ND	3.5	1.3	ND	5,500/670/140 (6)	NA
6 (east floor)	260	ND	ND	1.2	2.5	3,500/680/110 (6)	NA
Stockpile	11	0.0031	ND	0.044	0.094	1,500/710/<1 (6)	NA
Initial Hoexter Investigation January 1994							
MW-2							
10.5-11.0	910	ND	0.76	4.2	6.1	38	NA
16.0-16.5	ND	ND	0.022	ND	ND	ND	NA
20.5-21.0							
25.5-26.0 (3)	ND	ND	ND	ND	ND	ND	NA

Sample	TPH-Gasoline	MTBE	Benzene	Toluene	Ethyl-Benzene	Xylenes	Oil and Grease	HVOC
MW-3								
10.5-11.0	ND	ND	0.020	ND		ND	ND	NA
20.5-21.0	1.2	0.17	0.047	ND		0.085	NA	NA
April, 1996 Hoexter Investigation								
EB-4								
7.5-8.0	300	ND	ND	3.3		8.3	820	ND
14.5-15.0	63	ND	ND	ND		0.82	3600	Det (5)
EB-5								
3.5-4.0	ND	ND	ND	ND		ND	NA	NA
7.5-8.0	130	ND	ND	0.55		1.3	NA	NA
12.5-13.0	120	ND	ND	0.84		1.4	NA	NA
18.0-18.5								
19.5-20.0 (3)	4.5	0.025	0.015	0.028		0.078	240	Det (5)
EB-7								
9.0-9.5	ND	ND	ND	ND		ND	ND	NA
14.0-14.5	ND	ND	ND	ND		ND	NA	NA
20.0-20.5								
23.0-23.5 (3)	130	ND	0.38	1.9		2.9	620	ND
MW-4								
16.0-16.5	13	NA	0.038	0.015	ND	0.023	NA	NA
26.0-26.5								
31.0-31.5 (3)	68	NA	0.21	0.092	0.15	0.39	190	NA
36.0-36.5	5.4	NA	ND	0.008	0.015	0.011	NA	NA
MW-5								
11.0-11.5	9.7	NA	ND	0.019	ND	0.038	NA	NA
21.0-21.5	ND	NA	ND	ND	ND	ND	NA	NA
21.0-21.5								
35.5-36.0 (3)	NA	NA	NA	NA	NA	NA	ND	NA
MW-6								
11.0-11.5								
16.0-16.5 (3)	10	NA	0.037	0.033	0.18	0.46	ND	NA
June, 1997 Hoexter Investigation								
MW-7								
9.0-9.5	ND	ND	ND	ND	ND	ND	ND	Det (5)
MW-8								
9.0-9.5	71	ND	0.095	0.087	0.13	0.28	2400	Det (5)
Hydraulic Lift Overexcavation Confirmation Testing EKI July 2001								
								TPH-Diesel
NW 8.5	82 (7)	NA	<0.25	NA	0.79	0.53	490	160 (7)
NE 8.5	110 (7)	NA	2.4	NA	<0.25	3	310	74 (7)
SW 8.0	47 (7)	NA	<0.25	NA	<0.25	<5	790	200 (7)
SE 9.0	490 (7)	NA	<0.5	NA	2,4	4,4	3,300	1,100 (7)
Bottom 9.5	<1	NA	<0.005	NA	<0.005	<0.005	<50	<50

Notes

(1) ND = non-detect
(2) NA = not applicable
(3) Composite
(4) Chromatogram patterns/comments
G - gas
WG - weathered gas
NGM - non-gas mix, > C9
NDM - non-diesel mix, generally C7 - C12/13
(5) Detected: see Table 2B
(6) TOG/Motor Oil/Diesel
(7) Laboratory reported that the chromatogram patterns did not match gasoline or diesel standards

TABLE 2B

SUMMARY OF ANALYTICAL TEST RESULTS - SOIL HALOGENATED VOLATILE ORGANIC COMPOUNDS

(Results reported in parts per **million**, mg/kg) (1) (2)

Sample	CA	1,2 DCB	1,2 DCA	cis 1,2 DCE	trns 1,2 DCE	1,2 DCP	PCE	TCE	VCL
EB-4									
7.5-8.0	ND	ND	ND	ND	ND	ND	ND	ND	ND
14.5-15.0	ND	1.7	ND	ND	ND	ND	1.8	0.82	ND
EB-5									
18.0-18.5									
19.5-20.0 (3)	ND	ND	ND	ND	ND	ND	0.52	ND	ND
EB-7									
20.0-20.5									
23.0-23.5 (3)	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-7									
9.0-9.5	ND	ND	ND	ND	ND	ND	ND	0.0081	ND
MW-8									
9.0-9.5	ND	0.055	ND	0.031	ND	ND	1.5	0.22	ND

Notes

(1) ND = non-detect
(2) NA = not applicable
(3) Composite
(4) Abbreviations as follows:

CA	Chloroethane
1,2 DCB	1,2 Dichlorobenzene
1,2 DCA	1,2 Dichloroethane
cis 1,2 DCE	cis 1,2 Dichloroethene
trans 1,2 DCE	trans 1,2 Dichloroethene
1,2 DCP	1,2 Dichloropropane
PCE	Tetrachloroethene (perchloroethene)
TCE	Trichloroethene
VCL	Vinyl chloride

APPENDIX B

DECEMBER 2011 SOIL VAPOR ANALYTICAL SAMPLING RESULTS

TABLE 1
SOIL VAPOR ANALYTICAL RESULT SUMMARY
Former Grimit Auto
1970 Seminary Avenue, Oakland, California

Sample ID	Sample Depth (feet bgs)	Date	TPHg ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Total Xylenes ($\mu g/m^3$)	PCE ($\mu g/m^3$)	Freon 11 ($\mu g/m^3$)	Acetone ($\mu g/m^3$)	Chlorobenzene ($\mu g/m^3$)
Environmental Screening Level (ESL)[1] (commercial property/residential property)			**29,000/10,000**	**280/84**	**180,000/63,000**	**58,000/21,000**	**1,400/410**	**NONE**	**1,800,000 / 660,000**	**580,000 / 210,000**
SV-1A	4.5-5	12/13/11	<170	<2.6	8.6	<3.6	**660**	<4.6	14	12
SV-1B	6.25-6.75	12/13/11	<170	<2.7	13	<3.6	**490**	<4.7	12	17
SV-2A	4.5-5	12/13/11	<170	<2.7	9.9	<3.6	240	43	<8.0	9.1
SV-3A	4.5-5	12/13/11	<190	<2.9	7.6	<4.0	160	<5.1	<8.7	8.9
SV-3B	8.25-8.75	12/13/11	10,000	6.7	32	5.8	78	<4.8	17	30

Sample ID	Sample Depth (feet bgs)	Date	Methylene Chloride ($\mu g/m^3$)	Carbon Disulfide ($\mu g/m^3$)	2,2,4-TMP ($\mu g/m^3$)	Oxygen (percent)	Carbon Dioxide (percent)	Methane (percent)
Environmental Screening Level (ESL)[1] (commercial property/residential property)			**17,000/5,200**	**NONE**	**NONE**			
SV-1A	4.5-5	12/13/11	<2.8	<10	<3.8	20	0.75	<0.00016
SV-1B	6.25-6.75	12/13/11	<2.9	<10	<3.9	20	0.83	<0.00017
SV-2A	4.5-5	12/13/11	<2.9	42	<3.9	18	1.2	<0.00017
SV-3A	4.5-5	12/13/11	<3.2	<11	<4.3	19	1.7	<0.00018
SV-3B	8.25-8.75	12/13/11	3.1	72	480	18	1.8	<0.00017

TABLE 1

SOIL VAPOR ANALYTICAL RESULT SUMMARY

Former Grimit Auto

1970 Seminary Avenue, Oakland, California

Sample ID	Sample Depth (feet bgs)	Date	TPHg ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Total Xylenes ($\mu g/m^3$)	PCE ($\mu g/m^3$)	Freon 11 ($\mu g/m^3$)	Acetone ($\mu g/m^3$)	Chlorobenzene ($\mu g/m^3$)

Legend:

TPHg = Total petroleum hydrocarbons as gasoline
PCE = Tetrachloroethene
2,2,4-TMP = 2,2,4-Trimethylpentane
ug/m^3 = micrograms per cubic meter

Analytical Laboratory

Air Toxics, LTD. (NELAP 02110CA)

Analytical Methods

VOC's presented on this table were analyzed using EPA Method TO-15 Modified
Atmospheric gases presented on this table were analyzed using ASTM Method D-1946 Modified

Notes:

[1] = *RWQCB-SF Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final – November 2007 (revised May 2008)*; Table E-2, Shallow Soil Gas Screening Levels for Evaluation of Potential Vapor Intrusion Concerns (lowest commercial established risk value)

VOCs not included on this table had non-detectable concentrations reported by laboratory
BOLD font indicates analyte exceeds residential ESL for PCE

APPENDIX C

FIELD PRACTICES AND PROCEDURES

FIELD PRACTICES AND PROCEDURES

General procedures used by Stratus in site assessments for drilling exploratory borings, collecting samples, and installing monitoring wells are described herein. These general procedures are used to provide consistent and reproducible results; however, some procedure may be modified based on site conditions. A California state-registered geologist supervises the following procedures.

PRE-FIELD WORK ACTIVITIES

Health and Safety Plan

Field work performed by Stratus at the site is conducted according to guidelines established in a Site Health and Safety Plan (SHSP). The SHSP is a document which describes the hazards that may be encountered in the field and specifies protective equipment, work procedures, and emergency information. A copy of the SHSP is at the site and available for reference by appropriate parties during work at the site.

Locating Underground Utilities

Prior to commencement of any work that is to be below surface grade, the location of the excavation, boring, etc., is marked with white paint as required by law. An underground locating service such as Underground Service Alert (USA) is contacted. The locating company contacts the owners of the various utilities in the vicinity of the site to mark the locations of their underground utilities. Any invasive work is preceded by hand augering to a minimum depth of five feet below surface grade to avoid contact with underground utilities.

FIELD METHODS AND PROCEDURES

Exploratory Soil Borings

Soil borings will be drilled using a truck-mounted, hollow stem auger drill rig. Soil samples for logging will be obtained from auger-return materials and by advancing a modified California split-spoon sampler equipped with brass or stainless steel liners into undisturbed soil beyond the tip of the auger. Soils will be logged by a geologist according to the Unified Soil Classification System and standard geological techniques. Drill cuttings well be screened using a portable photoionization detector (PID) or a flame ionization detector (FID). Exploratory soil borings not used for monitoring well installation will be backfilled to the surface with a bentonite-cement slurry pumped into the boring through a tremie pipe.

Soil sampling equipment will be cleaned with a detergent water solution, rinsed with clean water, and equipped with clean liners between sampling intervals. Augers and samplers will be steam cleaned between each boring to reduce the possibility of cross contamination. Steam cleaning effluent will be contained in 55-gallon drums and temporarily stored on site. The disposal of the effluent will be the responsibility of the client.

Drill cuttings generated during the drilling procedure will be stockpiled on site. Stockpiled drill cuttings will be placed on and covered with plastic sheeting. The stockpiled soil is typically characterized by collecting and analyzing composite samples from the stockpile. Stratus Environmental will recommend an appropriate method for disposition of the cuttings based on the analytical results. The client will be responsible for disposal of the drill cuttings.

Soil Sample Collection

During drilling, soil samples will be collected in cleaned brass, two by six inch tubes. The tubes will be set in an 18-inch-long split-barrel sampler. The sampler will be conveyed to bottom of the borehole attached to a wire-line hammer device on the drill rig. When possible, the split-barrel sampler will be driven its entire length, either hydraulically or by repeated pounding a 140-pound hammer using a 30-inch drop. The number of drops (blows) used to drive the sampler will be recorded on the boring log. The sampler will be extracted from the borehole, and the tubes containing the soil samples will be removed. Upon removal, the ends of the lowermost tube will be sealed with Teflon sheets and plastic caps. Soil samples for chemical analysis will be labeled, placed on ice, and delivered to a state-certified analytical laboratory, along with the appropriate chain-of-custody documentation.

Soil Classification

As the samples are obtained in the field, they will be classified by the field geologist in accordance with the Unified Soil Classification System. Representative portions of the samples will be retained for further examination and for verification of the field classification. Logs of the borings indicating the depth and identification of the various strata and pertinent information regarding the method of maintaining and advancing the borehole will be prepared.

Soil Sample Screening

Soil samples selected for chemical analysis will be determined from a head-space analysis using a PID or an FID. The soil will be placed in a Ziploc® bag, sealed, and allowed to reach ambient temperature, at which time the PID probe will be inserted into the Ziploc® bag. The total volatile hydrocarbons present are detected by the PID and reported in parts per million by volume (ppmv). The PID will be calibrated to an isobutylene standard.

Generally two soil samples from each soil boring will be submitted for chemical analysis unless otherwise specified in the scope of work. Soil samples selected for analysis typically represent the highest PID reading recorded for each soil boring and the sample just above first-encountered groundwater.

Stockpiled Drill Cuttings and Soil Sampling

Soil generated during drilling operations will be stockpiled on-site. The stockpile will be set on and covered by plastic sheeting in a manner to prevent rain water from coming in contact with the soil. Prior to collecting soil samples, Stratus personnel will calculate the approximate volume of soil in the stockpile. The stockpile will then divided into sections, if warranted, containing the predetermined volume sampling interval. Soil samples will be collected at 0.5 to 2 feet below the surface of the stockpile. Four soil samples will be collected from the stockpile and composited into one sample by the laboratory prior to analysis. The soil samples will be collected in cleaned brass, two by six inch tubes using a hand driven sampling device. To reduce the potential for cross-contanlination between samples, the sampler will be cleaned between each sampling event. Upon recovery, the sample container will be sealed at each end with Teflon sheeting and plastic caps to minimize the potential of volatilization and cross-contanlination prior to chemical analysis. The soil sample will be labeled, placed on ice, and delivered to a state-certified analytical laboratory, along with the appropriate chain-of-custody documentation.

Direct Push Technology, Soil Sampling

GeoProbe™ is a drilling method of advancing small diameter borings without generating soil cuttings. The GeoProbe™ system consists of a 2-inch diameter, 5-feet long, stainless steel soil sampling tool that is hydraulically advanced into subsurface soils by a small, truck-mounted rig. The sampling tool is designed similar to a California-modified split-spoon sampler, and lined with a 5-foot long, clear acrylic sample tube that enables continuous core sampling.

To collect soil samples, the sampler is advanced to the desired sampling depth. The mouth of the sampling tool is plugged to prevent soil from entering the sampler. Upon reaching the desired sampling depth, the plug at the mouth of the sample tool is disengaged and retracted, the sampler is advanced, and the sampler is filled with soil. The sample tool is then retrieved from the boring, and the acrylic sample tube removed. The sample tool is then cleaned, a new acrylic tube is placed inside and the sampling equipment is advanced back down the borehole to the next sample interval.

The Stratus geologist describes the entire interval of soil visible in the acrylic tube. The bottom-most 6-inch long section is cut off and retained for possible chemical analysis. The ends of the chemical sample are lined with Teflon™ sheets, capped, labeled, and placed in an ice-chilled cooler for transport to California Department of Health Services-certified analytical laboratory under chain-of-custody.

Direct Push Technology, Water Sampling

A well known example of direct push technology for water sampling is the Hydropunch®. For the purpose of this field method the term hydropunch will be used instead of direct push technology for water sampling.

The hydropunch is typically used with a drill rig. A boring is drilled with hollow stem-augers to just above the sampling zone. In some soil conditions the drill rig can push directly from the surface to the sampling interval. The hydropunch is conveyed to the bottom of the boring using drill rods. Once on bottom the hydropunch is driven a maximum of five feet. The tool is then opened by lifting up the drill rod no more than four feet. Once the tool is opened, water enters and a sample can be collected with a bailer or tubing utilizing a peristaltic pump. Soil particles larger than silt are prevented from entering the tool by a screen within the tool. The water sample is collected, labeled, and handled according to the Quality Assurance Plan.

Monitoring Well Installation

Monitoring wells will be completed by installing 2 to 6 inch-diameter Schedule 40 polyvinyl chloride (PVC) casing. The borehole diameter for a monitoring well will be a minimum of four inches larger than the outside diameter of the casing. The 2-inch-diameter flush-threaded casing is generally used for wells dedicated for groundwater monitoring purposes.

A monitoring well is typically cased with threaded, factory-perforated and blank Schedule 40 PVC. The perforated interval consists of slotted casing, generally with 0.01 or 0.02 inch-wide by 1.5-inch-long slots, with 42 slots per foot. The screened sections of casing are factory machine slotted and will be installed approximately 5 feet above and 10 feet below first-encountered water level. The screened interval will allow for seasonal fluctuation in water level and for monitoring floating product. A threaded or slip PVC cap is secured to the bottom of the casing. The slip cap can be secured with stainless steel screws or friction; no solvents or cements are used. Centering devices may be fastened to the casing to ensure even distribution of filter material and grout within the borehole annulus. The well casing is thoroughly washed and/or steam cleaned, or may be purchased as pre-cleaned, prior to completion.

A filter pack of graded sand will be placed in the annular space between the PVC casing and the borehole wall. Sand will be added to the borehole through the hollow stem of the augers to provide a uniform filter pack around the casing and to stabilize the borehole. The sand pack will be placed to a maximum of 2 feet above the screens, followed by a minimum 1-foot seal consisting of bentonite pellets.

Cement grout containing 5 percent bentonite or concrete will be placed above the bentonite seal to the ground surface. A concrete traffic-rated vault box will be installed over the monitoring well(s). A watertight locking cap will be installed over the top of the well casing. Reference elevations for each monitoring well will be surveyed when more than two wells will be located on site. Monitoring well elevations will be surveyed by a California licensed surveyor to the nearest 0.01-foot relative to mean sea level (MSL). Horizontal coordinates of the wells will be measured at the same time.

Exploratory boring logs and well construction details will be prepared for the final written report.