Carryl MacLeod
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1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Re: Former Standard Oil Service Station 307233/ Mills Square Park
2259 First Street
Livermore, CA
ACEH Site Cleanup Case #RO02908

I have read and acknowledge the content, recommendations and/or conclusions contained in the attached *Remedial Action Plan for Petroleum Impacted Soil* submitted on my behalf to SWRCB's GeoTracker website.

This letter is submitted pursuant to the requirements of California Water Code Section 13267(b)(1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge

Sincerely,

Carryl MacLeod
Project Manager

Attachment: *Remedial Action Plan for Petroleum Impacted Soil*

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ARCADIS Design & Consultancy for natural and built assets

Chevron Environmental Management Company

REMEDIAL ACTION PLAN FOR PETROLEUM IMPACTED SOIL

Former Standard Oil Service Station 307233/MILLS SQUARE PARK

2259 First Street, Livermore, California

Case No. RO0002908

March 2, 2018

307233 REMEDIAL ACTION PLAN FOR PETROLEUM IMPACTED SOIL

Former Standard Oil Service Station
307233/Mills Square Park
2259 First Street
Livermore, California

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Our Ref.:

B0307233.2018

Date:

March 2, 2018

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ACRONYMS AND ABBREVIATIONS

ACEH	Alameda County Department of Environmental Health
Arcadis	Arcadis U.S., Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene and total xylenes
Chevron	Chevron U.S.A. Inc.
COC	constituent of concern
DPT	direct push technology
ESL	Environmental Screening Level
MNA	monitored natural attenuation
PHC	petroleum hydrocarbons
PPE	personal protective equipment
RA1	Remedial Alternative 1
RA2	Remedial Alternative 2
RA3	Remedial Alternative 3
RA4	Remedial Alternative 4
RA5	Remedial Alternative 5
RAP	Remedial Action Plan
SVE	soil vapor extraction
TEA	terminal electron acceptors
TPHd	total petroleum hydrocarbons as diesel
TPHg	total petroleum hydrocarbons as gasoline
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank

1 INTRODUCTION

On behalf of Chevron Environmental Management Company (CEMC), Arcadis U.S., Inc. (Arcadis) prepared this Remedial Action Plan (RAP) to evaluate active remedial alternatives and propose a remedial path forward for former Standard Oil service station 307233/Mills Square Park located at 2259 First Street, Livermore, California (the site; Figure 1). The remedial alternatives presented in this RAP focus on remediating the petroleum impacted soil which will, as a result, remediate groundwater. Figure 1 shows the general area of the site. Figure 2 shows a site plan for the property. Alameda County Department of Environmental Health (ACEH) issued a directive letter dated January 31, 2018 to CEMC and the City of Livermore that required submission of a RAP for remediation of petroleum hydrocarbon impacted soil (Appendix A).

1.1 Report Organization

This RAP is organized into the following sections:

- *Section 2 – Site Description and Features.* Provides a brief description of site background information, site history and previous investigations and remediation activities.
- *Section 3 – Soil Vapor.* Discusses soil vapor sampling to evaluate vapor intrusion risk to the adjacent Peet's Coffee Building
- *Section 4 – Exposure Pathway Assessment*. Discusses the potential transport and release mechanisms and receptors at the site.
- *Section 5 – Development of Remedial Options for Petroleum Impacted Soils.* Discusses the development of remedial alternative for petroleum-impacted soils.
- *Section 6 – Analysis of Remedial Alternatives.* Summarizes the analysis and evaluation of each remedial alternative.
- *Section 7 – Comparative Analysis of Remedial Alternatives.* Presents a comparative analysis of remedial alternatives.
- *Section 8 – Selected Remedy.* Presents the selected remedy.
- *Section 9 – References*. Lists the references cited throughout this RAP. References included in attached tables and figures are not repeated in this section.

2 SITE DESCRIPTION AND FEATURES

The site is located on the eastern corner of First Street and South Livermore Avenue in Livermore, California (Figure 1). The earliest available aerial photograph from 1959 shows a gasoline service station building located on the southern edge of the property and two dispenser islands located on the western portion of the property. A 1973 aerial photograph indicates that the station building and dispenser islands had been removed, leaving an unoccupied paved lot. The City of Livermore purchased the site from Standard Oil Company of California (SOCAL) in 1974. By 1978, the property had been redeveloped as Mills Square Park (Figure 2). The park remains in the same configuration as shown on a 1978 aerial photograph. The park consists of grass and trees with a paved walkway and gazebo. Land use surrounding the park is primarily commercial.

Since acquiring the property from SOCAL in 1974, the City has renovated the park on several occasions requiring digging and regrading (Appendix B of GHD 2016). Fugro West Inc., the City's consultant for the redevelopment process in 2004, concluded in a January 6, 2004 Soil and Groundwater Investigation Report (Appendix B of GHD 2016) that the source of the lead impacts at the property was "unknown to Fugro," but "likely related to fill material at the Site". Thus it is likely that during the redevelopment activities lead-impacted fill was imported to the property and/or spread across the property after the City acquired it from SOCAL.

2.1 Site Geology and Hydrogeology

The site is approximately 485 feet above mean sea level and regional topography slopes gently to the north. According to the September 2005 Groundwater Management Plan prepared by the Zone 7 Water Agency (Zone 7), the site is located in the Mocho II Sub-Basin of the Main Livermore-Amadore Valley Groundwater Basin. Zone 7 Water Agency extracts groundwater from this basin for municipal drinking water. Sediments in this basin are described as recent alluvium consisting of sandy gravel and sandy clayey gravel from the surface to approximately 150 feet below ground surface (ft bgs). This alluvium overlies the Livermore Formation. Sediments encountered beneath the site during subsurface investigation consist of silty sand, silty gravel, and sandy gravel from the surface to approximately 9 ft bgs. Silt and clay are encountered between approximately 9 and 45 ft bgs, and sand and gravel are predominately encountered from approximately 45 ft bgs to the total depth explored of 62 ft bgs.

A network of 12 onsite and offsite wells monitor groundwater in two water-bearing zones identified below the site; Zone A at approximately 28 to 40 ft bgs and Zone B at approximately 55 ft bgs. Zone A is believed to be a seasonal perched zone that is not horizontally continuous across the site, as it was only encountered in the southern and eastern portions of the site. Groundwater in shallow Zone A ranges from approximately 25 to 37 ft bgs and flows toward the southwest (Figure 3). Groundwater in deeper Zone B is confined, ranges from approximately 27 to 38 ft bgs, and flows toward the northwest (Figure 4).

2.2 Site History

Environmental assessment and remediation has been ongoing since 2003, beginning with an investigation initiated by the City of Livermore Engineering Division to assess soil and groundwater conditions prior to further development to the park. To date, 61 soil borings, 3 dual nested soil vapor probes, 2 singled soil vapor probes (discussed in Section 3), and 12 wells have been installed.

In 2005, one orphaned underground storage tank (UST) was removed. In 2007, two orphaned USTs and associated product piping were removed. A chronological summary of environmental investigation and remediation conducted to date is presented in Appendix C of GHD's Interim Remedial Action Plan (IRAP) (GHD 2016). The locations of all known monitoring wells, soil borings, and former USTs are presented on Figure 2. Figures produced by GHD detailing the vertical and lateral delineation of petroleum impacted soils can be found in Appendix B.

On July 17, 2017, ACDEH proposed to regulate the UST petroleum release case and the lead release site under two different regulatory oversight programs. ACEH is regulating the UST petroleum release case under the State Water Resources Control Board Petroleum Underground Storage Tank Cleanup Program, and it is designated as Fuel Leak Case No. RO0002908.

Site constituents of concern (COCs) include the following:

- TPH-GRO
- TPH-DRO
- Benzene, Toluene, Ethyl-benzene, and Total Xylenes

3 SOIL VAPOR

Soil vapor probe installations and sampling were conducted by GHD on January 30 and February 2, 2018 to confirm there is no vapor intrusion risk near the adjacent building (Peet's Coffee). Two vapor probes (VP-4 and VP-5) were installed at 6 feet and 8 inches and 4 feet and 2 inches, respectively. VP-4 is located near the southeast border of the site next to Peet's Coffee, and VP-5 is located on the sidewalk directly in front of the adjacent building. Soil vapor samples were collected from the two installed vapor probes and an additional sample was collected from VP-1, an existing soil vapor probe located on the south corner of the site above the removed USTs. Soil vapor analytical results indicated that COC vapor concentrations at all 3 sample locations were below detection limits with the exception of VP-5 which had a toluene concentration of 9.3 µg/m^3. As this is orders of magnitude lower than the RWQCB Environmental Screening Level for toluene (1.6E+5 µg/m^3 for residential sub-slab scenario), no vapor intrusion risk to the Peet's Coffee Building is indicated. Soil vapor sampling field forms and analytical results can be found in Appendix C.

4 EXPOSURE PATHWAY ASSESSMENT

The site is a park located in the central downtown portion of Livermore. It is Arcadis' understanding that the City of Livermore plans to renovate the existing park and landscaping, although no final design drawings or construction schedules have been provided.

There are no complete pathways for exposure to COCs under current conditions. Potential onsite receptors may be exposed to COCs in subsurface soils by direct contact during remediation activities. In general, routes of exposure during remediation by direct contact include incidental ingestion of soil, dermal contact with soil, and inhalation of constituents adhered onto dust particles that have been released by wind erosion into ambient (outdoor) air.

Remediation of petroleum-impacted soil is set to occur following the excavation of lead-impacted soil detailed in the RAP for Lead Impacted Soils submitted by Arcadis concurrently with this report (Arcadis 2018). The petroleum-impacted soil is located 20 to 40 feet below ground surface (bgs). This soil will not be exposed during the park renovations; therefore it is unlikely construction workers would come in direct contact with the petroleum-impacted soil during the excavation. Per Low-Threat Closure Policy (LTCP), there is at least a 10-foot bioattenuation zone, and while not strictly necessary, ACDEH has requested in their directive (Appendix A) that the impacted soil be addressed to remove the source of the groundwater plume.

The properties immediately surrounding the site are commercial and industrial. Currently, potential offsite receptors include commercial workers. However, as mentioned above, because the impacted soil is as deep as 15 feet below the excavated area, it is highly unlikely this exposure pathway is complete. Soil is

expected to remain below paved surfaces in the future, with no current plans for further redevelopment of the property. As a result, current and future offsite receptors, including commercial workers, are unlikely to be exposed to residual constituents in site soils.

In general, routes of exposure by direct contact with groundwater include ingestion of tap water, dermal contact with tap water, and inhalation of volatile constituents released from tap water. Onsite occupants and those of the surrounding properties currently use drinking water from the Zone 7 Water Agency (GHD 2016). This drinking water source is not expected to change in the future. Therefore, pathways associated with potential direct exposures to constituents in groundwater beneath the site are not complete for current and potential future onsite and offsite receptors.

Since the site is an existing park and is going to be excavated for future park renovations, there are no anticipated impact to an ecological habitat. As mentioned above, the park is located in the downtown portion of Livermore. Since there is no evidence of lead leaching into the groundwater, it is reasonable to conclude that impacted groundwater has not migrated to sensitive receptors in the area.

Following completion of the park renovation, treatment of the petroleum-impacted soil (Section 8), and the soil vapor sampling discussed in Section 2.2.1, it can be concluded there will be no complete exposure pathways for the site in the future.

5 DEVELOPMENT OF REMEDIAL OPTIONS FOR PETROLEUM IMPACTS

5.1 Remedial Alternative 1 – Monitored Natural Attenuation (MNA)

Remedial Alternative 1 (RA1) does not involve the implementation of active remediation to remove, treat, or contain COCs at the site. This remedial alternative relies on natural attenuation and biodegradation processes to reduce chemical concentrations through time. Semiannual groundwater monitoring will be performed to document COC concentration changes.

MNA processes achieve site-specific remediation objectives through natural attenuation with a controlled and monitored approach. The natural attenuation process includes a variety of biological, chemical, and physical processes that can reduce mass, toxicity, mobility, volume, or concentrations of COCs in groundwater. Favorable background conditions are necessary to drive the natural attenuation process and continued biodegradation of petroleum hydrocarbons. These intrinsic in-situ processes include: biodegradation, volatilization, diffusion, dilution, sorption, and chemical or biological stabilization, transformation, or destruction of COCs.

The effectiveness of natural attenuation processes is driven by the types and concentrations of constituents present and the physical, chemical, and biological characteristics of the soil and groundwater. Natural attenuation processes in the subsurface can reduce the potential risk posed by COCs in multiple ways. The biodegradation process may produce daughter compounds of constituents that are less toxic. Physical processes, dilution, or diffusion within the groundwater aquifer may also reduce risk by decreasing concentration levels. Sorption to soil or aquifer matrix within the subsurface may also decrease constituent mobility.

Components of this alternative include:

- Collecting and analyzing groundwater samples for biogeochemical parameters including dissolved oxygen (DO), pH, oxidation-reduction potential (ORP), nitrate, sulfate, methane, ferrous iron, and alkalinity (as calcium carbonate) to further evaluate the biodegradation processes (i.e., anaerobic vs. aerobic) taking place within the site groundwater. This data would be used to evaluate the effectiveness of MNA.

- Continuing the semiannual groundwater monitoring and sampling program to confirm continued reduction of site COC concentrations through natural attenuation processes. One semiannual groundwater monitoring event each year would also include collection of biogeochemical indicator parameters for continued evaluation of the biodegradation processes.

5.2 Remedial Alternative 2 – Soil Vapor Extraction (SVE)

Remedial Alternative 2 (RA2) is a physical treatment using Soil Vapor Extraction (SVE) techniques to remove COC mass. Volatilized COCs migrate upward through groundwater and into the vadose zone. The COC vapors are captured in SVE wells and directed to a treatment system through air conveyance piping.

SVE is a process that removes COCs from unsaturated soil below the ground surface and above the groundwater table. The SVE process involves inducing a vacuum within the soil matrix through a network of vapor extraction wells. The vacuum induced in the vadose zone volatilizes COCs in the soil. After collection in the SVE wells, vapors are conveyed to a treatment system. Typically, the extracted vapors are treated by vapor-phase granular activated carbon or thermal destruction (catalytic or thermal oxidation) prior to being discharged through an exhaust stack. Typical equipment used for implementation of SVE includes vertical extraction wells, a vacuum unit (blower), a liquid/vapor separator (knock-out tank), a discharge vapor treatment system, and system controls and instrumentation.

Components of this remedial alternative include:

- Conducting a baseline biogeochemical groundwater monitoring event to further evaluate the biodegradation processes taking place within the site groundwater.

- Initial testing to determine equipment sizing and need for new wells.

- Install SVE wells.

- Performing system startup, optimization, and operation and maintenance (O&M).

- Conducting air monitoring activities to evaluate the reduction of total COC concentrations in the influent and effluent air of the treatment system.

- Continuance of an established groundwater monitoring program. One groundwater monitoring event each year would also include collection of biogeochemical indicator parameters, including DO, pH, ORP, nitrate, sulfate, methane, ferrous iron, and alkalinity as calcium carbonate for continued evaluation of the biodegradation processes taking place within site groundwater

5.3 Remedial Alternative 3 – In-Situ Chemical Oxidation (ISCO)

Remedial Alternative 3 (RA3) involves remediation of groundwater COCs through ISCO by delivering oxidants and other amendments to impacted groundwater to degrade organic hydrocarbon constituents to non-toxic byproducts. Typical chemical oxidants are activated persulfate, ozone, hydrogen peroxide, and potassium permanganate. Oxidant injections can be completed either through direct-push injections or manned injection events into permanent injection wells.

The completion of bench testing and further biogeochemical evaluation would be necessary to determine the proper reagent and dosing requirements. For this RAP, we have assumed the use of sodium persulfate as the chemical oxidant with hydrogen peroxide or ferrous sulfate and citric acid as an activator. Assuming adequate dosing and delivery/contact, the VOCs will likely react rapidly (i.e., within minutes), with complete destruction upon contact (greater than 90 percent effective destruction). Therefore, the effectiveness of this alternative is primarily based on the ability to deliver/distribute the treatment reagents to the affected media, the oxidation reaction kinetics, and the ability to overcome natural oxidant demand of the soils/aquifer. Reaction kinetics will also affect the rate of carbon dioxide generation and the amount of heat generated and is often an important design consideration from a health and safety perspective.
MNA would be relied upon for areas outside the direct influence of the injection zone for final treatment.

Components of the alternative include:

- Conducting an additional baseline biogeochemical groundwater monitoring event to further evaluate the biodegradation processes taking place within the site groundwater.
- Completing an injection pilot study to further evaluate oxidant demand, potential infiltration/oxidant injection rates, and other parameters related to the design.
- Completing bench testing and further geochemical evaluation to aid in reagent selection and dose requirements.
- Installing an ISCO injection system (such as a network of vertical injection wells) at and hydraulically downgradient from the source area.
- Injecting oxidant solution into the injection wells.
- Conducting verification sampling and analysis activities to evaluate the reduction of COC concentrations in unsaturated soil.
- Continuing the semiannual groundwater monitoring program at wells that are not destroyed after the park renovation. One semiannual groundwater monitoring event each year would also include collection of biogeochemical indicator parameters, including DO, nitrate, ferrous iron, sulfate, alkalinity as calcium carbonate, methane, nonvolatile organic carbon, and ORP for continued evaluation of the biodegradation processes taking place within site groundwater.

5.4 Remedial Alternative 4 – Excavation via Bucket Augering or Slot Trenching

Remedial Alternative 4 (RA4) involves direct removal of soil containing COCs at concentrations greater than the environmental screening levels. The excavation itself would be conducted via one of two methods to reduce the risk of soil disturbance to avoid compromising the foundation of Peet's Coffee located on the southeast side of the site. The first method is known as bucket augering. A bucket auger is an open-top metal cylinder 2-3ft in diameter with one or more slots in its bottom that permit soil to enter as the bucket is rotated and downward pressure is applied. The bucket auger is driven by a rotary table and collects soil as it is rotated and pushed down. When the bucket is full, the rotation is stopped, and the bucket is lifted from the borehole and contents are emptied via tipping. For this particular site, after the soil containing COCs is removed, the borehole would immediately be backfilled with controlled density fill (CDF) and compacted prior to moving on to the next borehole to prevent subsidence of soil near Peet's Coffee.

Alternatively, slot trenching could be performed to remove the soil containing COCs. Slot trenching is the process of digging narrow trenches normally for installing in-ground utilities. Similar to the bucket augering method, the narrow slot trenches would be dug via excavator to the target depth and then backfilled with CDF and compacted prior to digging the next trench to prevent subsidence of soil near Peet's Coffee.

The soil would be disposed of at an appropriately permitted disposal facility and not reused on or offsite. To pre-profile soil to meet disposal facility requirements, one 4-point composite sample will be collected per 500 cubic yards of soil within the excavation area.

5.5 Remedial Alternative 5 – Bio Oxidation via Direct Push Injection with Gypsum Slurry

Remedial Alternative 5 (RA5) involves remediation of groundwater COCs though anaerobic biological oxidation (ABOx) process that involves supplying terminal electron acceptors (TEAs) to indigenous bacteria to facilitate the oxidation of petroleum hydrocarbons (PHCs) to carbon dioxide. ABOx relies on redox couples to facilitate cellular respiration using the PHCs as an electron donor. Most often, the preferred and most easily accessible TEA is sulfate in the form of epsom salts or gypsum. For this site, gypsum was chosen as the TEA due to its low solubility which supports an extended sulfate supply when injected in a slurry solution, as the solid materials dissolve. Though there is no single preferred method for delivery of sulfate to the groundwater; however, the site requires direct push technology (DPT) be used to ensure the TEA is delivered to the source area effectively. Additionally, surface application of gypsum will also be performed by adding a layer of gypsum to the bottom of the excavation area prior to backfilling.

The completion of pilot testing and biological evaluation is recommended but is not required to determine the proper dosing requirements.

Components of the alternative include:

- Conducting a baseline biogeochemical groundwater monitoring event to further evaluate the biodegradation processes taking place within site groundwater.

- Establishing existing onsite and offsite monitoring wells as potential dose response monitoring wells. If wells are not available, confirmation borings will need to be advanced to confirm arrival of gypsum slurry.

- Devising a map of proposed DPT points (Figure 5) where injections will be performed to cover the source area. Each DPT point will have a radius of 2.5 ft.

- Injection of the gypsum slurry into targeted zones below the excavation area.

- Conducting verification sampling and analysis activities to evaluate the reduction of COC concentrations in unsaturated soil.

- Conducting verification sampling and analysis activities to evaluate the reduction of COC concentrations in unsaturated soil.

- Continuing the semiannual groundwater monitoring program at wells that are not destroyed after the park renovation. One semiannual groundwater monitoring event each year would also include collection of biogeochemical indicator parameters, including specific conductivity, pH, oxidation reduction potential (ORP), temperature, and turbidity.

6 ANALYSIS OF REMEDIAL ALTERNATIVES

6.1 Remedy Selection Factors

This section describes and evaluates the five remedial alternatives identified in Section 5. Each remedial alternative is evaluated by assessing the following five remedy selection factors:

- Effectiveness
- Long-term reliability
- Ability to Implement
- Implementation risk
- Cost

6.1.1 Effectiveness

Each remedial action alternative is assessed for its short-term and long-term effectiveness in achieving site cleanup goals by considering the following criteria, as appropriate:

- Magnitude of risk from untreated waste or treatment residuals remaining at the site with onsite management and controls to mitigate exposure through various exposure pathways. The characteristics of the residuals will be considered to the degree that they remain hazardous, considering their volume, toxicity, mobility, propensity to bioaccumulate, and propensity to degrade.

- Required level of engineering and institutional controls necessary to manage the risk posed from treatment residuals and untreated hazardous substances remaining at the site.

- For areas requiring remedial action, the ability of the remedial action to restore or protect beneficial uses of site groundwater.

- Adequacy of treatment technologies in meeting treatment objectives. Time required to achieve the remedial action objectives.

- Any other information relevant to effectiveness.

6.1.2 Long-Term Reliability

Each remedial action alternative is assessed for its long-term reliability by considering the following criteria, as appropriate:

- Reliability of treatment technologies in meeting treatment objectives

- Reliability of engineering and institutional controls necessary to manage the risk from treatment residuals and untreated hazardous substances.

- Characteristics of the hazardous substance to be managed and the effectiveness and enforceability through time of engineering and institutional controls in preventing migration of constituents and in managing risks associated with potential exposure.

- Nature, degree, and certainties or uncertainties of any long-term management as related to ease of operation (e.g., O&M).

- Any other information relevant to long-term reliability.

6.1.3 Ability to Implement

Each remedial alternative is assessed for the ease or difficulty of implementing the remedial action, by considering the following criteria, as appropriate:

- Constructability as related to practical, technical, and legal difficulties and unknowns associated with the implementation of a technology, engineering control, or institutional control

- Ability to monitor the short- and long-term effectiveness of the remedy.

- Consistency with federal, state, and local requirements; activities needed to coordinate with other agencies; and ability and time required to obtain any necessary authorization from other governmental bodies.

- Availability of necessary services, materials, equipment, and specialists, including the availability of adequate offsite treatment, storage, and disposal capacity and services, and availability of prospective technologies.

- Any other information relevant to implementation.

6.1.4 Implementation Risk

Each remedial action alternative is assessed for the risk associated with implementation, by considering the following criteria, as appropriate:

- Potential impacts to the community during implementation of the remedial action and the effectiveness and reliability of protective or preventative measures.
- Potential impacts to workers during implementation of the remedial action and the effectiveness and reliability of protective or preventative measures.
- Potential impacts to the environment during implementation of the remedial action and the effectiveness and reliability of protective or preventative measures.
- Time until the remedial action is complete.

6.1.5 Cost

Each remedial action alternative is assessed based on its life cycle cost by considering the following costs for each phase of the implementation, as appropriate:

- Site assessment
- Design and permitting
- Implementation and/or installation.
- Operation and monitoring
- Decommissioning and site closure.

6.2 Remedial Alternative Evaluation

6.2.1 Remedial Alternative 1 – MNA

RA1 will rely solely on MNA processes (either aerobic respiration or anaerobic oxidation of petroleum hydrocarbon using naturally occurring electron acceptors) to reduce COC concentrations in groundwater through time. Semiannual groundwater monitoring will be performed to document changes in concentrations through time.

6.2.1.1 Effectiveness

Under RA1, remediation will rely on natural attenuation processes to continue to reduce total COC mass through time. Due to the lack of historical biogeochemical data, it is difficult to provide a complete assessment of the current biodegradation conditions occurring at the site. Concentrations of COCs in

groundwater are currently less than their relevant ESLs at seven of the twelve of monitoring locations, however at the remaining 5 wells, COC concentrations have not demonstrated a decreasing trend. There is no significant evidence to support the occurrence of natural attenuation of TPH-g, TPH-d, or BTEX at the site.

Furthermore, potential sources of impacts (e.g., USTs, associated piping) have been removed making future increases in COCs unlikely.

6.2.1.2 Long-Term Reliability

There are no significant concentration trends for TPHd, TPHg, or BTEX in groundwater samples collected from MW-7, where the highest concentrations are consistently detected. RA1 would rely on semiannual groundwater monitoring to document the groundwater changes through time.

6.2.1.3 Ability to Implement

MNA is an easily implementable remedial alternative. MNA relies solely on continuing the current semiannual groundwater monitoring and reporting program with the addition of baseline and annual sampling for biogeochemical and natural attenuation indicator parameters.

6.2.1.4 Implementation Risk

The MNA alternative poses minor implementation risk concerns for community members and the environment. Field personnel may come into contact with impacted groundwater during the sampling events and there is the potential for a release of impacted groundwater during sampling activities. Potential risk during sampling procedures can be readily mitigated with proper use of personal protective equipment (PPE) and sampling standard operating procedures.

6.2.1.5 Cost

The cost associated with MNA consists of continued monitoring for 7-10 years and then well abandonments. Monitoring will cost $112,000 to $160,000 over 7-10 years and well destructions will cost $30,000. The total life cycle cost for MNA is $142,000 to $190,000.

6.2.2 Remedial Alternative 2 – SVE

RA2 would consist of an SVE system. SVE system components would include appropriately constructed SVE wells, vapor conveyance piping, a vapor/liquid separator, a vapor extraction device, and a vapor treatment device. The vapor extraction device (blower) would be sized based the radius of influence and applied vacuum of the vapor extraction wells observed during pilot testing. The treatment device is determined by the anticipated influent flow rate, hydrocarbon concentration, air quality requirements, and operating duration. Extracted hydrocarbons are typically treated by granular activated carbon (GAC), catalytic or thermal oxidizers, or internal combustion engines.

6.2.2.1 Effectiveness

As stated previously for RA1, COC concentrations in groundwater show no distinct trends either increasing or decreasing. SVE would likely decrease concentrations further. The SVE system would operate until mass removal rates reached asymptotic levels, at which point the soil source mass would have been removed to the extent practicable. Post-remediation monitoring of the existing monitoring wells and vapor probes would allow continued assessment of any risks associated with remaining COCs. It is not anticipated this system would operate for more than 2 to 3 years.

6.2.2.2 Long-Term Reliability

SVE is a well-known form of remediation. System safety devices and monitoring practices common with SVE have been utilized effectively at similar sites. As stated above, the system would be designed with an adequate array of SVE wells to capture volatilized COC vapors. Monitoring vapor concentrations in existing vapor probes and monitoring wells as well as assessing the SVE system's vacuum radius of influence will allow for continued risk assessment.

6.2.2.3 Ability to Implement

A full-scale SVE system could not likely be installed at this site. The required footprint of a full-scale system will require the use a sizable portion of the renovated park. Additionally, the system would produce a continual sound disruption with the blower constantly running and the system, whether mobile or permanent, would not be very aesthetically appealing for park visitors. These obstacles would also make permitting through the local building and planning departments difficult. Additional SVE wells would have to be installed in the renovated park to effectively operate the SVE system and monitor its effectiveness.

A mobile SVE system would not be an option at this location, however due to the lack of space to park or store the mobile system as the site is located on a busy street corner in the middle of the downtown district of Livermore, a mobile system is not considered feasible.

6.2.2.4 Implementation Risk

A full-scale SVE system could cause significant impacts to business near to the site during installation and during operation. Short term mass removal events would minimize these effects and allow for greater flexibility in operation. The timeframe for conducting mass removal events is estimated to occur over 2 to 3 years. The number of events would be based on the effectiveness of the first event, however, no more than one event per month is anticipated.

6.2.2.5 Cost

Design, permitting, and coordination of monthly mobile SVE events at the site would cost up to $20,000. It is assumed after initial testing; annual operation would cost $150,000 per year and the system would run for 2 years. Groundwater monitoring is estimated to cost approximately $16,000 per year. Assuming 3 years of groundwater monitoring following SVE, the total cost for groundwater monitoring is $48,000. Well destructions are estimated at $60,000. The total estimated cost for this alternative is $428,000.

6.2.3 Remedial Alternative 3 – In-Situ Chemical Oxidation

RA3 involves ISCO injections to deliver oxidants and other amendments to impacted groundwater to degrade organic hydrocarbon constituents to non-toxic byproducts. For this RAP, Arcadis has assumed the use of sodium persulfate as the chemical oxidant, with hydrogen peroxide or ferrous sulfate and citric acid as an activator.

Based on soil types and extent of COC impacts, it is estimated substrate injections will variably target groundwater near MW-5, MW-1, MW-7 and MW-9, which historically ranges between 25 and 37 feet bgs. DPT will be used for the substrate injection. The borings will be properly abandoned upon completion of each injection event. Half of the onsite monitoring wells will be abandoned during the park renovation, therefore remaining onsite and downgradient monitoring wells MW-1, MW-2, MW-3, MW-8, MW-10, and MW-11 would be used for effectiveness monitoring and to assess the need for additional injection events.

6.2.3.1 Effectiveness

The application of ISCO injections is effective in reducing the flux of dissolved hydrocarbon constituents downgradient of the treatment area. Batch ISCO injections can also be effective in reducing the size of the grounwater plume and soil? mass of TPH-GRO, TPH-DRO and other COCs.

6.2.3.2 Long-Term Reliability

RA3 would target residual dissolved hydrocarbon mass in the soil source area for active treatment. Petroleum hydrocarbons would be degraded rapidly in the treatment zone/ source area and reduce the concentration and migration of COCs downgradient in groundwater. Long-term reliability would depend on selected oxidant and dosing requirements, which would be developed and refined during injection pilot testing and bench testing procedures. The injection events would be the most labor-intensive portion of the alternative. All injections would occur within the first 2 years of remedy implementation. Groundwater monitoring would be the only O&M activity associated with RA3 following the ISCO injections. All injected substrate materials would not pose a hazard once injected into the subsurface. Proper personal protective equipment would be used when handling the substrate.

Groundwater will need to be tested for background biogeochemical parameters to determine substrate dosage and type and slug testing will be required to determine the volume of substrate the site soils can accept. Post-injection monitoring will determine if more than one injection event is required.

6.2.3.3 Ability to Implement

Though DPT is the best way to get the reagent to the source area, ISCO injections have their own complications. Properly lined tooling must be used when injecting oxidants due to their ability to rust and corrode the inside of the metal tools that are used with DPT. Due to the anticipated number of injection locations (30 injection points), RA3 will be the most difficult remedial alternative to implement. Although the anticipated injection area will be in the excavation area of the park renovation, persulfate injection equipment and chemical handling in a moderately trafficked area can cause logistical issues and health and safety concerns. Traffic control would be required for the truck traffic coming to and from the site. Air

monitoring and possible application of a vapor suppressant would be required if COC volatilization occurs during excavation.

6.2.3.4 Implementation Risk

Potential risks to workers are high when dealing with persulfate injection and chemical handling. Risk to workers and the community posed by injection equipment and oxidants can be mitigated through proper PPE usage, chemical handling procedures, and work area exclusion zones.

Substrate injections will cause little impact to the surrounding area. Vapors released during excavation may be difficult to control and cause a nuisance to people nearby. Additional risks and control measures are discussed above, however, the temporary closure of the site business is unavoidable. Substrate injections, and post-injection monitoring will likely take two years.

6.2.3.5 Cost

The pilot test which would be used to determine the proper amount of dosing, quantity, and effectiveness would cost up to $15,000. Design and project coordination for full-scale substrate injections are estimated to cost $20,000. Annual implementation is estimated to cost $50,000 for a single injection event, which includes all labor, drilling, equipment, substrate, and consumable materials.

Groundwater monitoring would cost $80,000 assuming approximately 2 years of monitoring during implementation and 3 years of post-remedial monitoring. At the end of the project, well destructions of monitoring wells would cost an estimated $30,000. The total cost to closure for this remediation option is estimated to be approximately $195,000.

6.2.4 Remedial Alternative 4 – Deeper Excavation via Bucket Augering or Slot Trenching

RA4 involves the direct removal of soil containing COCs at concentrations greater than the environmental screening levels. The deeper excavation below the proposed lead-impacted soil removal would aim to remove the source area of the petroleum-impacted soil found 20 feet bgs and as deep as 60 feet bgs. Following the removal of the source area, concentrations of COCs would show an immediate decrease in groundwater concentration.

6.2.4.1 Effectiveness

RA4 would be effective at decreasing COC concentrations in groundwater because the source area soil is being removed from the site. Concentrations would gradually decrease over time with the residual petroleum-impacted soil gone.

6.2.4.2 Long-Term Reliability

RA4 is reliable as it removes the source area of the COCs. Monitoring practices should be continued to confirm concentrations of COCs in groundwater have decreased following the soil removal.

6.2.4.3 Ability to Implement

It is possible to perform either bucket augering or slot trenching at the site, however to protect the foundation of the building adjacent to the site (Peet's Coffee), the boreholes created by the bucket auger or the slot trenches would need to be backfilled and compacted to prevent any subsidence of soil.

6.2.4.4 Implementation Risk

The primary limitation to implementing this alternative is the risk the deep excavation poses to the building foundation on the southeast side of the site. The soil containing COCs is located 20 ft bgs over an area of approximately 355 square yards (3,200 square feet). The closest monitoring well to Peet's Coffee, MW-5, had all COC concentrations in groundwater below the laboratory detection limits collected in September of 2017, but has historically had readings above and below the environmental screening level of each respective constituent. Therefore, soil should be removed on the eastern side of the site which could compromise the integrity of the foundation of Peet's Coffee.

6.2.4.5 Cost

This type of work would be entirely subcontracted to a drilling or excavation company. Quotes were obtained for each type of excavation from Cascade Drilling, LLC. Bucket augering excavation would cost roughly $250,000. Slot trenching excavation would cost roughly $200,000. Groundwater monitoring would cost $32,000 assuming approximately 2 years of post-remedial monitoring. At the end of the project, well destructions of monitoring wells would cost an estimated $30,000. The total cost to closure for this remediation option is estimated to be approximately $322,000.

6.2.5 Remedial Alternative 5 – Bio-Oxidation via Direct Push Injection with Gypsum Slurry

Remedial Alternative 5 (RA5) involves the injection of sulfate in the form of a gypsum slurry solution to supply indigenous bacteria to facilitate the oxidation process of petroleum-impacted soils. Gypsum is preferred due to its lower solubility which would gradually release sulfate over a longer period of time. In addition to the gypsum slurry being directly injected into the source area soil, a layer of gypsum would also be applied to the bottom of the park renovation area prior to backfilling as a supplemental form of remediation.

6.2.5.1 Effectiveness

With RA5, similar to RA3, the application of bio-oxidation injections is effective in oxidizing and degrading the concentration of dissolved hydrocarbon constituents to carbon dioxide. Concentrations of COCs in groundwater can be monitored downgradient of the treatment area.

6.2.5.2 Long-Term Reliability

RA5 would target residual dissolved hydrocarbon mass in the source area for active treatment. Petroleum hydrocarbons would be degraded gradually in the treatment zone and reduce the concentration and migration of COCs downgradient. Long-term reliability would depend on the selected source of sulfate

and quantity injected. The injection event would be the most labor-intensive portion of the alternative. Groundwater monitoring would be the only O&M activity associated with RA5 following the gypsum slurry injections. All injected substrate materials would not pose a hazard once injected into the subsurface. Proper personal protective equipment would be used when handling the substrate.

Groundwater will need to be tested for background biogeochemical parameters to determine substrate dosage and type and slug testing will be required to determine the volume of substrate the site soils can accept. It is anticipated only one injection event and surface application should take place, however if COC concentrations do not show a decreasing trend over 4 consecutive quarters, then a second injection event may be considered.

6.2.5.3 Ability to Implement

In contrast to RA3, special tooling is not required for DPT injections of gypsum slurry. Gypsum slurry is nonreactive with metal and is a non-hazardous substance. The gypsum slurry can be mixed onsite in mixing tanks. There will still be 30 injection locations to target the source area of the petroleum-impacted soil. Alternatively, depending on the construction of the monitoring wells onsite and depth of the screen, some wells can be converted to injection wells as needed. The setup of injection equipment will vary depending on how many points are injected to at once but will likely be better consolidated than the ISCO injection setup.

6.2.5.4 Implementation Risk

The mixing and pouring of the dry gypsum poses the greatest risk because it is a respiratory irritant. It is recommended field staff don respirators when pouring the sacks of gypsum into mixing tanks. When adding water to create the slurry, respirators do not need to be worn unless a high-pressure hose is being used to mix the solution causing gypsum dust and misting to kick up and field staff are near the opening of the mixing tank. The mixing tank should be placed inside the park renovation excavation area since a surface application of gypsum will be applied to the bottom of the excavation after the injection event, if not secondary containment is required if it is located outside of the park renovation area. Level D PPE is the maximum amount of protection required for field staff.

6.2.5.5 Cost

Design and project coordination for full-scale substrate injections are estimated to cost $40,000. Annual implementation is estimated to cost $40,000 for a single injection event, which includes all labor, drilling, equipment, substrate, and consumable materials.

Groundwater monitoring would cost $80,000 assuming approximately 2 years of monitoring during implementation and 3 years of post-remedial monitoring. At the end of the project, well destructions of monitoring wells would cost an estimated $30,000. The total cost to closure for this remediation option is estimated to be approximately $190,000.

7 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

Remedial Alternative	MNA	SVE (Mobile Events)	In-Situ Chemical Oxidation	Deeper Excavation (Bucket Auger or Slot Trenching)	Biological Oxidation via DPT with Gypsum
Effectiveness	Poor	Moderate	Moderate (saturated zone)	Good	Moderate (saturated zone)
Long Term Reliability	Good	Moderate	Moderate (saturated zone)	Good	Moderate (saturated zone)
Ability to Implement	Good	Poor	Moderate	Poor	Good
Implementation Risk	Low Risk	Moderate Risk	Moderate Risk	High Risk	Low Risk
Aesthetics (post-redevelopment)	Good	Poor	Poor	--	Good
Pilot Test Cost	--	--	$15,000	--	--
Design/Permit/ Install	--	$20,000	$20,000	$10,000	$40,000
Operational Duration	--	2 years	1 month	--	1 month
Operation Annual Cost	--	$150,000	$50,000	$250,000	$40,000
Total Operation Cost	--	$300,000	$50,000	$250,000	$40,000
Annual Groundwater Monitoring Cost	$16,000	$16,000	$16,000	$16,000	$16,000
Post-remediation Groundwater Monitoring Duration	--	2 years	2 years	2 years	2 years
Total Groundwater Monitoring Duration	7-10 years	3 years	5 years	2 years	5 years
Total groundwater monitoring cost	$112,000 - $160,000	$48,000	$80,000	$32,000	$80,000
Closure Request/Well Destruction	$30,000	$60,000	$30,000	$30,000	$30,000
Total Cost	$142,00 - $190,000	$428,000	$195,000	$322,000	$190,000
Recommended Alternative	--	--	--	--	X

8 SELECTED REMEDY

Based on the analysis in Section 7, Arcadis recommends RA5 (Bio-Oxidation via Direct Push with Gypsum). DPT Injections of Gypsum will treat the petroleum-impacted soil and likely decrease COC concentrations in associated groundwater. DPT injections eliminate the need to install additional wells onsite and can be advanced to the target depth of 20 to 40 feet bgs. Costs can be further reduced by converting some onsite wells to injection wells depending on the depth of the selected monitoring wells and the length of the screen. The selection of gypsum will decrease the necessity of multiple injection events due to its low solubility which allows a slower release of sulfate over time to continually treat the impacted soil. Arcadis recommends confirmation borings be installed to confirm the gypsum is being adequately dispersed in the anticipated 2.5-foot radius of influence. If ACEH concurs with the conclusions and recommendations in this RAP, Arcadis will complete a Remedial Implementation Plan detailing the finalized injection location and confirmation boring figures, tasks for implementation, scheduling, and data collection.

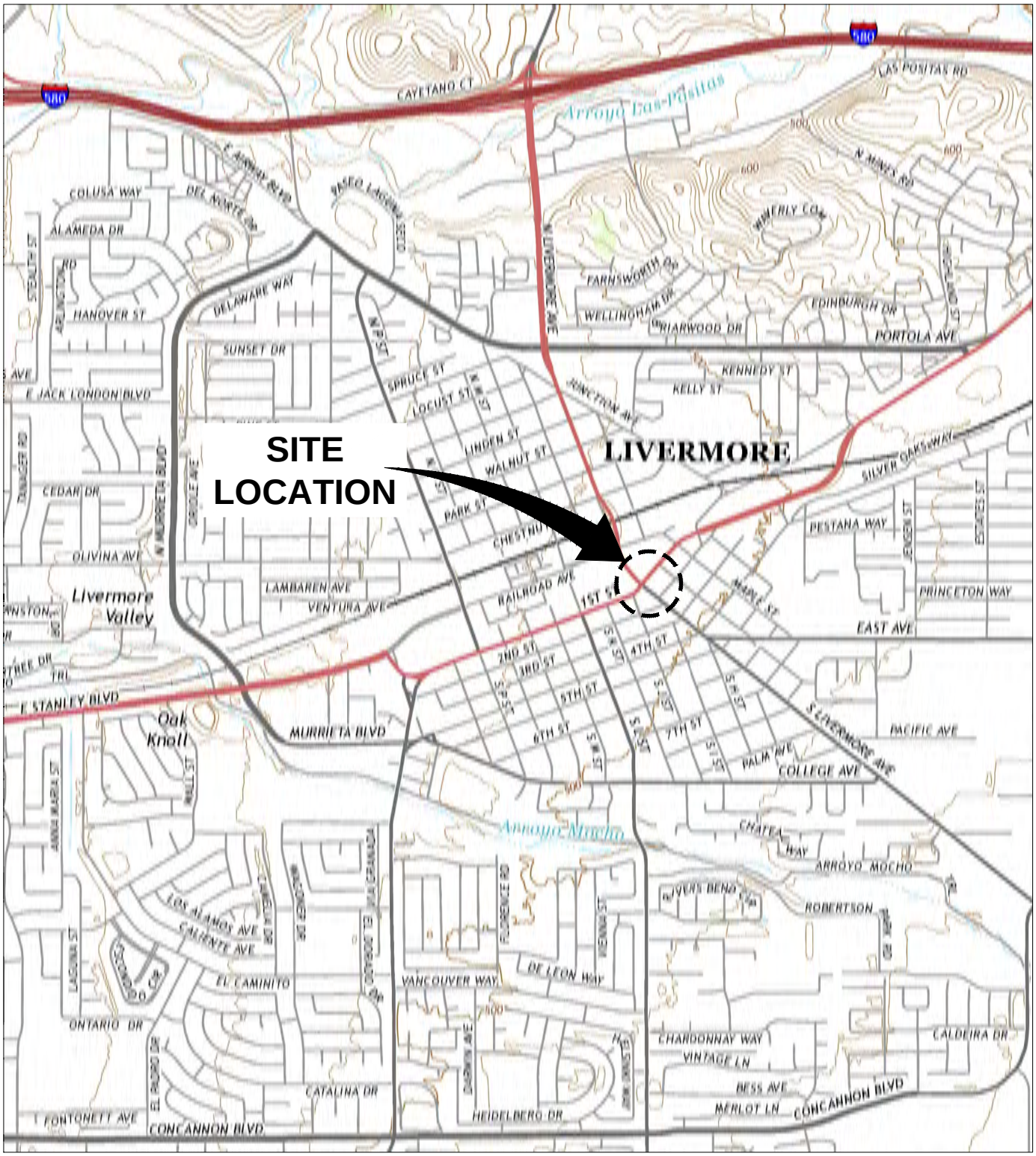
9 REFERENCES

Arcadis. 2018. Remedial Action Plan for Lead-Impacted Soils, Chevron Service Station 307233, 229 First Street, Livermore, California 94550. March 2.

GHD. 2016. Revised Interim Remedial Action Plan, Chevron Service Station 307233, 2259 First Street, Livermore, California 94550. January 14.

San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Levels, Interim-Final, February 2016. https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/esl.html

FIGURES



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD., LIVERMORE, CALIFORNIA, 2015.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.

FORMER STANDARD OIL STATION 307233
2259 FIRST STREET
LIVERMORE, CALIFORNIA

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

CITY: SAN RAFAEL, CA DV/GROUP: ENVCAD DB: J. HARRIS
C:\Users\jharris\OneDrive - ARCADIS\BIM 360 Docs\CHEVRON CORPORATION\NCA_307233\2018\B0307233.2018\01-DWG\307233 - Fig 1 - Site Location Map.dwg LAYOUT: 1 SAVED: 2/15/2018 12:36 PM ACADVER: 20.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 2/15/2018 12:37 PM BY: HARRIS, JESS
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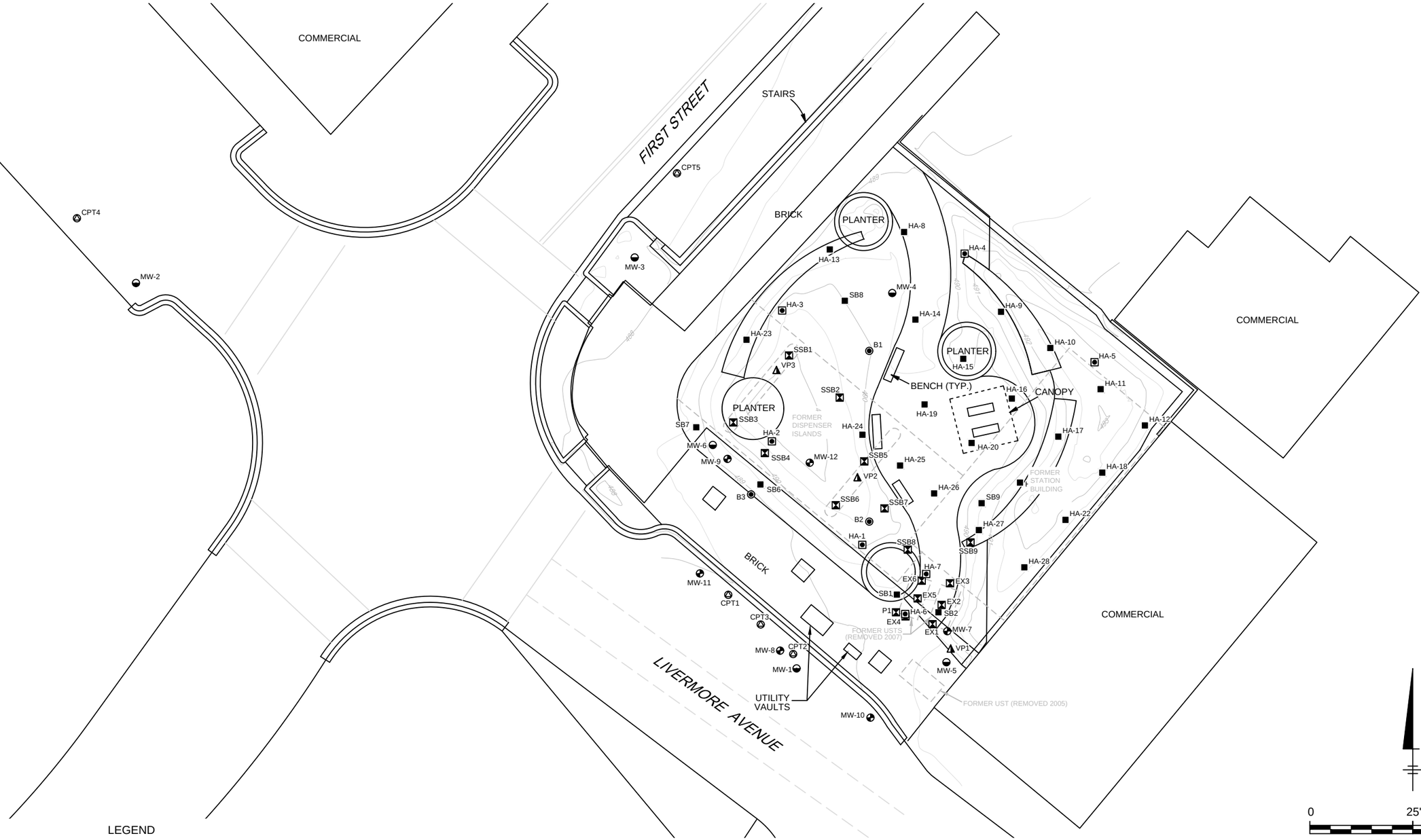
Livermore 2015.jpg



LEGEND

- SHALLOW GROUNDWATER MONITORING WELL
- DEEP GROUNDWATER MONITORING WELL
- SOIL BORING
- SOIL BORING (FUGRO 2003)
- VAPOR PROBE
- SHALLOW SOIL SAMPLE
- TOTAL LEAD SOIL SAMPLE
- CPT SAMPLE
- 490 ELEVATION CONTOUR

NOTE:

1. BASE MAP PROVIDED BY GHD, DATED 11/18/2015. CITED MAP SOURCE: CITY OF LIVERMORE, CA., COMMUNITY DEVELOPMENT - ENGINEERING DIVISION, CITY PROJECT No.2014-36-1.

0 25' 50'

GRAPHIC SCALE

FORMER STANDARD OIL STATION 307233
2259 FIRST STREET
LIVERMORE, CALIFORNIA

SITE PLAN

ARCADIS Design & Consultancy for natural and built assets

FIGURE 2

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: J. HARRIS
C:\Users\jjharris\OneDrive - ARCADIS\BIM 360 Docs\CHEVRON CORPORATION\NCA_307233\2018\B0307233.2018\01-DWG\307233 - Fig 2 - Site Plan-Comprehensive.dwg LAYOUT: 2 SAVED: 2/15/2018 11:28 AM ACADVER: 20.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS.CTB
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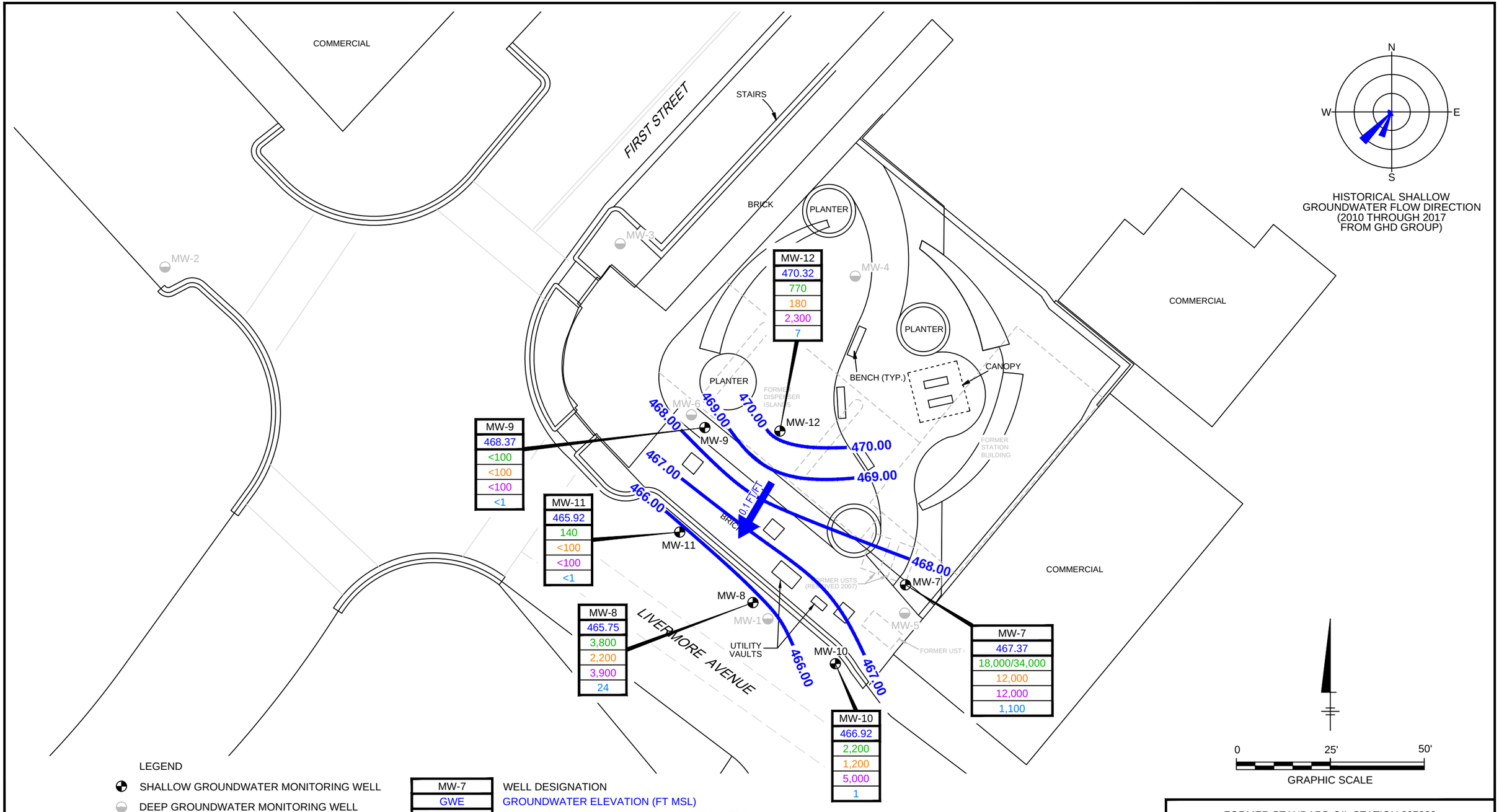


LEGEND

- SHALLOW GROUNDWATER MONITORING WELL
- DEEP GROUNDWATER MONITORING WELL
- 467.00 — GROUNDWATER ELEVATION CONTOUR (FT MSL, DASHED WHERE INFERRED)
- 0.1 FT/FT — GROUNDWATER FLOW DIRECTION AND GRADIENT (FT/FT)
- FT MSL — FEET MEAN SEA LEVEL
- FT/FT — FOOT PER FOOT

MW-7	WELL DESIGNATION
GWE	GROUNDWATER ELEVATION (FT MSL)
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL (µg/L)
TPHd (SGC)	TPHd WITH SILICA GEL CLEANUP (µg/L)
TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (µg/L)
BENZENE	BENZENE (µg/L)
<	LESS THAN LABORATORY REPORTING LIMIT
18,000/34,000	RESULT/DUPLICATE RESULT
µg/L	MICROGRAMS PER LITER

NOTE:

1. BASE MAP PROVIDED BY GHD, DATED 11/18/2015. CITED MAP SOURCE: CITY OF LIVERMORE, CA., COMMUNITY DEVELOPMENT - ENGINEERING DIVISION, CITY PROJECT No.2014-36-1.

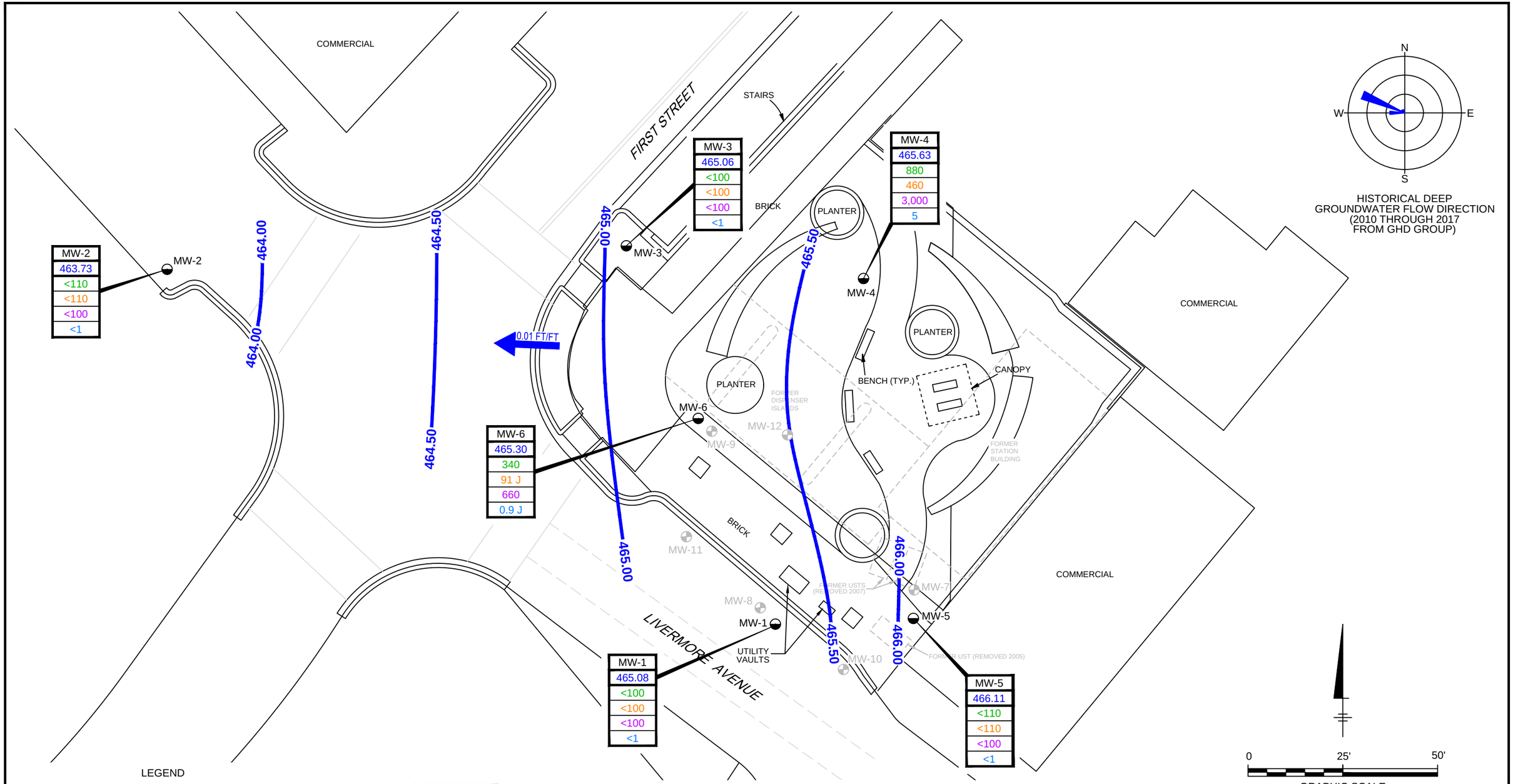
FORMER STANDARD OIL STATION 307233
2259 FIRST STREET
LIVERMORE, CALIFORNIA

SHALLOW-ZONE GROUNDWATER ELEVATION CONTOUR AND HYDROCARBON CONCENTRATION MAP SEPTEMBER 14, 2017

ARCADIS Design & Consultancy for natural and built assets

FIGURE 3

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: J. HARRIS
C:\Users\jharris\OneDrive - ARCADIS\BIM 360 Docs\CHEVRON CORPORATION\NCA_307233\2018\B0307233.2018\01-DWG\307233 - Fig 4 - GW Elev Shallow.dwg LAYOUT: 4 SAVED: 2/5/2018 10:48 AM ACADVER: 20.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 2/5/2018 7:15 PM BY: HARRIS, JESS



HISTORICAL DEEP GROUNDWATER FLOW DIRECTION (2010 THROUGH 2017 FROM GHD GROUP)

LEGEND

- SHALLOW GROUNDWATER MONITORING WELL
- DEEP GROUNDWATER MONITORING WELL
- 465.00 — GROUNDWATER ELEVATION CONTOUR (FT MSL, DASHED WHERE INFERRED)
- 0.01 FT/FT — GROUNDWATER FLOW DIRECTION AND GRADIENT (FT/FT)
- FT MSL — FEET MEAN SEA LEVEL
- FT/FT — FOOT PER FOOT

MW-1	WELL DESIGNATION
GWE	GROUNDWATER ELEVATION (FT MSL)
TPHd	TOTAL PETROLEUM HYDROCARBONS AS DIESEL (µg/L)
TPHd (SGC)	TPHd WITH SILICA GEL CLEANUP (µg/L)
TPHg	TOTAL PETROLEUM HYDROCARBONS AS GASOLINE (µg/L)
BENZENE	BENZENE (µg/L)
<	LESS THAN LABORATORY REPORTING LIMIT
J	ESTIMATED VALUE BETWEEN METHOD DETECTION LIMIT AND LABORATORY REPORTING LIMIT
µg/L	MICROGRAMS PER LITER

NOTE:

1. BASE MAP PROVIDED BY GHD, DATED 11/18/2015. CITED MAP SOURCE: CITY OF LIVERMORE, CA., COMMUNITY DEVELOPMENT - ENGINEERING DIVISION, CITY PROJECT No.2014-36-1.

FORMER STANDARD OIL STATION 307233
2259 FIRST STREET
LIVERMORE, CALIFORNIA

DEEP-ZONE GROUNDWATER ELEVATION CONTOUR AND HYDROCARBON CONCENTRATION MAP SEPTEMBER 14, 2017

ARCADIS Design & Consultancy for natural and built assets

FIGURE 4

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: J. HARRIS
C:\Users\jharris\OneDrive - ARCADIS\BIM 360 Docs\CHEVRON CORPORATION\NCA_307233\2018\B0307233.2018\01-DWG\307233 - Fig 5 - GW Elev Deep.dwg LAYOUT: 5 SAVED: 2/5/2018 11:44 AM ACADVER: 20.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: ARCADIS.CTB PLOTTED:
2/5/2018 7:15 PM BY: HARRIS, JESS

LEGEND

- SHALLOW GROUNDWATER MONITORING WELL
- DEEP GROUNDWATER MONITORING WELL
- SOIL BORING
- SOIL BORING (FUGRO 2003)
- VAPOR PROBE
- SHALLOW SOIL SAMPLE
- TOTAL LEAD SOIL SAMPLE
- CPT SAMPLE

(2.0) BENZENE CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/kg)

0.1 BENZENE CONCENTRATION CONTOUR (mg/kg, DASHED WHERE INFERRED)

PROPOSED DIRECT PUSH INJECTION LOCATION (2.5' RADIUS OF INFLUENCE)

NOTE:

1. BASE MAP PROVIDED BY GHD, DATED 11/18/2015. CITED MAP SOURCE: CITY OF LIVERMORE, CA., COMMUNITY DEVELOPMENT - ENGINEERING DIVISION, CITY PROJECT No.2014-36-1.

FORMER STANDARD OIL STATION 307233
2259 FIRST STREET
LIVERMORE, CALIFORNIA

PROPOSED DIRECT PUSH INJECTION LOCATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE 5

CITY: SAN RAFAEL, CA DIV/GROUP: ENVCAD DB: J. HARRIS
C:\Users\jharris\OneDrive - ARCADIS\BIM 360 Docs\CHEVRON CORPORATION\NCA_307233\2018\B0307233.2018\01-DWG\307233 - Fig 6 - DPI Locations.dwg LAYOUT: 6 SAVED: 2/16/2018 4:22 PM ACADVER: 20.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 2/16/2018 5:07 PM BY: HARRIS, JESS

APPENDIX A

ACDEH Directive, January 31, 2018

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
COLLEEN CHAWLA, Director

DEPARTMENT OF ENVIRONMENTAL HEALTH
OFFICE OF THE DIRECTOR
1131 HARBOR BAY PARKWAY
ALAMEDA, CA 94502
(510) 567-6777
FAX (510) 337-9135

January 31, 2018

Ms. Carryl MacLeod (*Sent via E-mail to: cmacleod@chevron.com*)
Chevron Environmental Management Company
6101 Bollinger Canyon Road
San Ramon, CA 94583

Mr. Eric Uranga (*Sent via E-mail to: ejuranga@cityoflivermore.net*)
City of Livermore Economic Development
1052 S. Livermore Ave.
Livermore, CA 94550

Subject: Fuel Leak Case No. RO0002908 and GeoTracker Global ID T0600196622, Chevron #30-7233/Mills Square Park, 2259 1st Street, Livermore, CA 94550

Dear Ms. MacLeod and Mr. Uranga:

Alameda County Department of Environmental Health (ACDEH) is providing oversight of the investigation and cleanup of the subject site under two regulatory oversight programs. Regulatory oversight for the investigation and cleanup of unauthorized releases of petroleum hydrocarbons associated with former commercial petroleum fueling facilities at the site is being provided under the State Water Resources Control Board Petroleum Underground Storage Tank (UST) Cleanup Program (Fuel Leak Case No. RO0002908). Regulatory oversight of the investigation and cleanup of lead impacted soil is being provided under Alameda County's Voluntary Remedial Action Program (Site Cleanup Program Case No. RO0003255).

Over the last several months, a series of meetings (listed below) have been held with representatives from ACDEH, the City of Livermore, and CEMC to determine a path forward for soil and groundwater remediation at the site in conjunction with the City's planned redevelopment of the site as the Livermorium Plaza.

- November 30, 2018 meeting with ACDEH, the City of Livermore, and CEMC;
- January 10, 2018 meeting with ACDEH and CEMC; and
- January 17, 2018 teleconference call with ACDEH and the City of Livermore.

Based on ACDEH's file review, and conversations held during the above listed meetings, ACDEH requests that you address the Technical Comments provided below, submit the requested reports and conduct the work by the associated compliance dates. The compliance dates have been developed based on a mutually agreed upon schedule that will facilitate coordination of remedial activities with the City's park renovation project.

TECHNICAL COMMENTS

1. **Remedial Action Plan (RAP).** Please submit a RAP for remediation of petroleum hydrocarbon impacted soil and groundwater that includes the following minimum information:

    - Proposed cleanup goals and the basis for cleanup goals;
    - Summary of site characterization data including soil vapor sampling data collected to evaluate vapor intrusion risk to the adjacent Peet's Coffee building;
    - Receptor information including likely future land use scenarios, adjacent land use and sensitive receptors, and potential groundwater receptors;
    - Evaluation of a minimum of three active remedial alternatives including discussion of feasibility, cost effectiveness, estimated time to reach cleanup goals, and limitations for each remedial alternative;
    - Detailed description of proposed remediation including confirmation sampling and monitoring during implementation;
    - Post-remediation monitoring; and
    - Schedule for implementation of cleanup.

    The RAP must include at a minimum feasible alternatives for the remediation of petroleum hydrocarbon impacted soil and groundwater beneath the site. A review of soil data indicates a significant mass of petroleum hydrocarbons in soil beneath a large portion of the site. This mass continues to be a source to the groundwater plume and thus requires remediation. Analytical data from the downgradient shallow groundwater monitoring wells MW-8 and MW-10 as well as onsite well MW-7 show total petroleum hydrocarbon as diesel (TPH-d) groundwater concentrations indicative of light non-aqueous phase liquids (LNAPLS). Groundwater TPH-d concentrations in these wells fluctuate between dissolved phase concentrations and concentrations indicative of LNAPL and thus do not exhibit a biodegradation trend. Some of the residual mass is located within soil above 15 feet below ground surface and thus could potentially excavated during lead remediation and park renovations. Alternatives for remediation of deeper soil contamination must be presented in the RAP.

    ACDEH notes that regulatory oversight for the investigation and cleanup of lead impacted soil is being provided under a separate Site Cleanup Program case (RO0003255). As discussed in the above listed meetings, the RAP will include proposed remedial actions for both petroleum hydrocarbon impacted soil and groundwater and lead impacted soil to conducted during park renovations.

    In the event the park redevelopment does not occur, a Remedial Action Plan will still be required to remediate petroleum hydrocarbon and lead impacted soil and petroleum hydrocarbon impacted groundwater to mitigate the risk to human health and the environment under the current site configuration.

    Public participation is a requirement for the RAP process, therefore, the RAP must present sufficient detail to inform the community of proposed remedial measures. ACDEH will notify potentially affected members of the public who live or own property in the surrounding area of the proposed remediation described in the RAP. Public comments on the proposed remediation will be accepted for a 30-day period.

2. **Remedial Action Implementation Plan (RAIP)** - Please submit a RAIP as a companion document to the RAP presenting a comprehensive and detailed plan for the selected remedial alternative for remediation of petroleum hydrocarbon impacted soil and groundwater.

3. **Groundwater Monitoring Well Destruction and Installation Work Plan** - Please submit a Groundwater Monitoring Well Destruction and Installation Work Plan. The work plan must identify wells proposed to be destroyed to facilitate park renovations and installation of proposed additional off-site wells to monitor and delineate the offsite groundwater contaminant plume.

4. **Construction Soil and Groundwater Management Plan (Construction SGMP)** – Please submit a Construction SGMP describing procedures to be followed by environmental consultants, construction contractors and workers, and other property owner representatives during property improvements, identifying safety and training requirements for construction workers, establishing procedures for assessing and managing contaminated. We request that you use ACDEH's Construction SGMP template which will be provided to you electronically.

5. **Soil Import Management Plan (SIMP)** - Please submit a SIMP presenting criteria required to evaluate the environmental conditions of proposed import borrow sites; the environmental sampling and analysis required to characterized the soil to be imported form proposed import borrow sites; proposed site-specific screening levels to be referenced for accepting the soil proposed to be imported; and the documentation to be submitted to ACDEH for timely review and approval of proposed soil to be imported.

6. **Baseline Project Schedule** - Please submit a Baseline Project Schedule incorporating the following stakeholder agreed upon dates:

March 2, 2018	RAP Submittal
March 9, 2018	Start of Public Participation Period
April 11, 2018	Project Status Meeting
April 9, 2018	End of Public Participation Period
April 30, 2018	ACDEH RAP Approval
April 30, 2018	Submittal of RAIP, Construction SGMP, Groundwater Monitoring Well Destruction and Installation Report and SIMP
May 18, 2018	ACDEH Approval of RAIP, Construction SGMP, Groundwater Monitoring Well Destruction and Installation Report, and SIMP
May 30, 2018	Livermorium Plaza Ceremony
June 1, 2018	Start of Remediation

The Baseline Project Schedule must be updated and submitted to ACDEH throughout the project.

TECHNICAL REPORT REQUEST

Please upload technical reports to the State Water Resources Control Board's GeoTracker website according to the following schedule and file-naming convention:

- **March 2, 2018** – Remedial Action Plan
  File to be named: RAP_R_yyyy-mm-dd RO2908_RO3255

- **April 30, 2018** – Remedial Action Implementation Plan
  File to be named: WP_R_yyyy-mm-dd RO2908_RO3255

- **April 30, 2018** – Groundwater Monitoring Well Destruction and Installation Work Plan
  File to be named: WP_R_yyyy-mm-dd RO2908_RO3255

- **April 30, 2018** – Construction Soil and Groundwater Management Plan
  File to be named: RAP_R_yyyy-mm-dd RO2908_RO3255

- **April 30, 2018** – Soil Import Management Plan
  File to be named: WP_R_yyyy-mm-dd RO2908_RO3255

If you have any questions, please call me at (510) 567-6767 or send me an electronic mail message at dilan.roe@acgov.org.

Sincerely,

Dilan Roe, PE, C73703
Chief – Land Water Division

Date: 2018.01.31 12:14:40 -08'00'

Drew J. York
Senior Hazardous Materials Specialist

Enclosure: Attachment 1 – Responsible Party (ies) Legal Requirement/Obligations Instructions
Attachment 2 – Electronic File Naming Conventions

cc: Colleen Winey, QIC 80201, Zone 7 Water Agency, 100 North Canyons Parkway
Livermore, CA 94551 (*Sent via E-mail to: cwiney@zone7water.com*)
Cheri Sheets, City of Livermore, (*Sent via E-mail to: crsheets@cityoflivermore.net*)
Rosy Ehlert, City of Livermore, (*Sent via E-mail to: rmehlert@cityoflivermore.net*)
Natasha Sihota, CEMC, (Sent via E-mail to: NSihota@chevorn.com)
Katherine Szymanowski, Arcadis, (*Sent via E-mail to:* Katherine.Szymanowski@arcadis.com)
Paresh Khatri, ACDEH (*Sent via E-mail to: paresh.khatri@acgov.org*)
Drew York, ACDEH (Sent via E-mail to: andrew.york@acgov.org)
Dilan Roe, ACDEH (*Sent via E-mail to: dilan.roe@acgov.org*)
Electronic File, GeoTracker

ATTACHMENT 1

Alameda County Environmental Cleanup Oversight Programs (LOP and SCP)	**REVISION DATE:** December 14, 2017
	ISSUE DATE: July 25, 2012
	PREVIOUS REVISIONS: September 17, 2013, May 15, 2014, December 12, 2016
SECTION: ACDEH Procedures	**SUBJECT:** Responsible Party(ies) Legal Requirements / Obligations

REPORT & DELIVERABLE REQUESTS

Alameda County Department of Environmental Health (ACDEH) Cleanup Oversight Programs, Local Oversight Program (LOP) and Site Cleanup Program (SCP) require submission of all reports in electronic form to the State Water Board's (SWB) GeoTracker website in accordance with California Code of Regulations, Chapter 30, Division3, Title 23 and Division 3, Title 27.

Leaking Underground Fuel Tank (LUFT) Cases

Reports and deliverable requests are pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party (RP) in conjunction with an unauthorized release from a petroleum underground storage tank (UST) system.

Site Cleanup Program (SCP) Cases

For non-petroleum UST cases, reports and deliverables requests are pursuant to California Health and Safety Code Section 101480.

ELECTRONIC SUBMITTAL OF REPORTS

A complete report submittal includes the PDF report and all associated electronic data files, including but not limited to GEO_MAP, GEO_XY, GEO_Z, GEO_BORE, GEO_WELL, and laboratory analytical data in Electronic Deliverable Format™ (EDF). Additional information on these requirements is available on the State Water Board's website (http://www.waterboards.ca.gov/water_issues/programs/ust/electronic_submittal/)

- Do not upload draft reports to GeoTracker
- Rotate each page in the PDF document in the direction that will make it easiest to read on a computer monitor.

GEOTRACKER UPLOAD CERTIFICATION

Each report submittal is to include a GeoTracker Upload Summary Table with GeoTracker valid values[1] as illustrated in the example below to facilitate ACDEH review and verify compliance with GeoTracker requirements.

GeoTracker Upload Table Example

Report Title	Sample Period	PDF Report	GEO_MAPS	Sample ID	Matrix	GEO_Z	GEO_XY	GEO_BORE	GEO_WELL	EDF
2016 Subsurface Investigation Report	2016 S1	✓	✓	Effluent	SO	☐	☐	☐	☐	✓
2012 Site Assessment Work Plan	2012	✓	✓			☐	☐	☐	☐	☐
2010 GW Investigation Report	2008 Q4	✓	✓	SB-10	W	✓	☐	☐	☐	✓
				SB-10-6	SO	☐	☐	☐	☐	✓
				MW-1	WG	✓	✓	✓	✓	✓
				SW-1	W	✓	✓	✓	✓	✓

[1] GeoTracker Survey XYZ, Well Data, and Site Map Guidelines & Restrictions, CA State Water Resources Control Board, April 2005

Alameda County Environmental Cleanup Oversight Programs (LOP and SCP)	**REVISION DATE:** NA
	ISSUE DATE: December 14, 2017
	PREVIOUS REVISIONS: September 17, 2013, May 15, 2014, December 12, 2016
SECTION: ACDEH Procedures	**SUBJECT:** Responsible Party(ies) Legal Requirements / Obligations

ACKNOWLEDGEMENT STATEMENT

All work plans, technical reports, or technical documents submitted to ACDEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I have read and acknowledge the content, recommendations and/or conclusions contained in the attached document or report submitted on my behalf to the State Water Board's GeoTracker website." This letter must be signed by the Responsible Party, or legally authorized representative of the Responsible Party.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6731, 6735, and 7835) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately licensed or certified professional and include the professional registration stamp, signature, and statement of professional certification. Additional information is available on the Board of Professional Engineers, Land Surveyors, and Geologists website at: http://www.bpelsg.ca.gov/laws/index.shtml.

UNDERGROUND STORAGE TANK CLEANUP FUND

For LUFT cases, RP's non-compliance with these regulations may result in ineligibility to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse the cost of cleanup. Additional information is available on the internet at: https://www.waterboards.ca.gov/water_issues/programs/ustcf/

AGENCY OVERSIGHT

Significant delays in conducting site assessment/cleanup or report submittals may result in referral of the case to the Regional Water Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

ATTACHMENT 2

Alameda County Environmental Cleanup Oversight Programs (LOP and SCP)	**REVISION DATE:** August 1, 2017 **PREVIOUS REVISIONS:** July 17, 2017, November 8, 2016, December 15, 2015, December 16, 2014, June 19, 2013, June 15, 2011, March 26, 2009, April 29, 2008 **ISSUE DATE:** June 16, 2006
SECTION: Miscellaneous Administrative Topics & Procedures	**SUBJECT:** File Names for Electronic Reports

Format: REPORT_NAME_R_YYYY-MM-DD
Ex: SWI_R_VOL1_2006-05-25

LOP and SCP (VRAP) INCOMING REPORTS AND LETTERS	
Document Name	**Abbreviation File Name= Abbreviation + Date (yyyy- mm-dd)**
Abandoned Well Information/Water Supply Well Information	ABWELLINF_R
Addendum	ADEND_R (added after report name)
Additional Information Report	ADD_R
Analytical Reports (Loose data sheets not in report)	ANALYT_R
As Built Drawings (or Plans)	AS_BUILT
Case File Scanned By OFD	CASE_FILE
Cleanup and Abatement Report	CAO_R
Case Transfer Form (from CUPA)	CASE_TRNSFR_F
Conduit Study/Well Search/Sensitive Receptor/Well Survey/Preferential Pathway Study	COND_WELL_R
Corrective Action Plan (CAP)	CAP_R
Correspondence	CORRES_L
Court Injunctions	INJ_L
Development Plans (Includes Plan Set, Cross-sections, and Related Drawings)	DEV_PLAN_date
Development Schedule (Project Schedule, Gant Chart, etc.)	DEV_SCHD_date
DWR Confidential Well Logs (Report containing)	report name_R_CONFIDENTIAL_YYYY-MM-DD (Ex: SWI_R_CONFIDENTIAL_YYYY-MM-DD)
DWR Well Completion Report-Confidential (Loose well logs)	DWR_WELL_CONFIDENTIAL_YYYY-MM-DD (Date of Well Log)
ESI/DAR (Environmental Site Investigation, Data Assessment Report	ESI_R
Excavation Report	EX_R
Extension Request Letter	EXT_RQ_L
Fact Sheet	FACT_SHT

Feasibility Study	FEASSTUD_R
Groundwater Monitoring/Quarterly Summary Report	GWM_R
Financial Assurance/Letter of Credit	FNCL_ASSRNC_LOC
Interim Remedial Action Plan	IRAP_R
Interim Remediation Results (Includes Pilot Test Reports, Vapor Mitigation Reports, Soil Reports, Free Product Removal Reports, & Dual-Phase Extraction Reports)	IR_R
Lawsuit	LAWSUIT_R
Migration Control Report	MIG_R
Miscellaneous Report/Soil Sample	MISC_R
Miscellaneous Sample Report (analytical results)	MISC_SAMP_R
Notification Letter	NOT_L
NPDES Miscellaneous Reports	NPDES_R
Operations & Maintenance Plan	OM_P
Operations & Maintenance Report	OM_R
Pay for Performance	PFP_R
Petition	PETITION_R
Phase 1 Environmental Assessment Report	PHASE1_R
Photos	PHOTO_date
Preliminary Site Assessment Report/Phase 2 (historic reports only)	PSA_R
Remedial Action Plan	RAP_R
Remedial Design & Implementation Plan	RDIP_R
Remediation Progress Report	REM_R
Request for Closure	RFC(_L or _R)
Risk Assessment Report	RISK_R
Risk Based Corrective Action	RBCA_R
List of Landowners Forms	LNDOWNR_F_DATE
SB2004 Letter of Commitment	LOC_L
Site Conceptual Model/Conceptual Site Model	SCM_R
Site Health & Safety Plan	SFTY_PLAN_R
Site Management	SITE_MANAGE_R_
Site Management Plan	SMP_R
Site Summary Report	SITE_SUM_R

Soil and Water Investigation Report (Includes soil gas/vapor reports, indoor, additional site investigation, well installation, site characterization, cross section, indoor air, additional onsite investigation, Phase II/preliminary site assessment)	SWI_R
Soil Disposal Report	SOIL_DSPL_R
Source Area Characterization	SOURCAREA_R
State Information	STATE_INFO (no date)
Status Report(monthly remediation status reports addressed to sanitary district requires no stamp/perjury	STAT_R
Tank/Tank System Removal Report	TNK_R
Tentative Order Report	TENT_R
Unauthorized Release Form	URF_R
UST Sampling Report	UST_SAMP_R
USTCF 5 Year Review	USTCF_5YR
USTCF issued Public Notice	USTCF_PP_L
Well Construction Report (limited to water supply wells)	WELL_CST_R
Well Decommissioning Report/Letter (well destruction/abandonment)	WELL_DCM_R
Work Plan	WP_R

LOP and SLIC ACEH OUTGOING LETTERS AND CASE FILE DOCUMENTATION	
Document Name	**Abbreviation** **File Name= Abbreviation + Date (yyyy-mm-dd)**
90 Day Letter	90D_L
CAP Approval	CAP_AP_L
RP Certification of Public Notice	CAP_CERT_L
CAP Public Participation Letter	CAP_PP_L
CAP Public Participation Letter to RP	CAP_PPRP_L
Certified Mail Receipt	CERT_MAIL_RECEIPT
Cleanup and Abatement Order	CAO_L
Closure Public Participation Letter	CL_PP_L
Closure Package (Letter, RACC, Summary, Deed Restriction)	CLOS_L
Correspondence	CORRES_L
Deed Restriction	DEED_L_ (Copied from CLOS_L_)
Directive Letter containing Public Notice and/or Landowner request form	DIR_PP_L
Directive Letter (Landowner form, site management requirements, well decommission scheduling prior to closure of PP, copy of PP to all RPs)	DIR_L
Enforcement	ENF_L
Enforcement Referral Letter	ENF_REF_L
Extension Approval Letter	EXT_AP_L
Extension Denial Letter	EXT_DNY_L
Fund Requests	FUND_REQ_L
Final Voluntary Remedial Action Agreement	FVRAA_date
GeoTracker info	GEOTRACK_R
Late Letter	LATE_L
List of Landowners Forms	LNDOWNR_F_DATE
Mailing List for Public Notice in Excel Format	MAIL_PP_DATE
Maps & Assessor's Parcel Information	MAPS_ASSESSOR (no date)
Meeting Agenda, Minutes, Sign in Sheet	MEETING
Miscellaneous Letter	MISC_L
New Landowner Letters	LNDOWNR_REQ_L
Notice of Responsibility	NOR_L
Notice of Violation	NOV_L
Phone Log	PHONE_LOG
Photos	PHOTO_date
Post Closure Monitoring	PCMP_L
QA/QC Checklist (confidential)	QAC_report name_date
Responsible Parties Information	RPINFO_L_DATE OF THE LETTERHEAD
Returned Mail	RTN_MAIL_date

Site Visit/Inspection Report	SITEVISIT_R
Transfer Letter	TRANS_L
UST Permit	UST_PRMT
Voluntary Remedial Action Notice to State Agencies	VRA_NOTICE
Voluntary Remedial Action Request Form from RP	VREQ_F

APPENDIX B

GHD 2010 Well Installation Report Figures

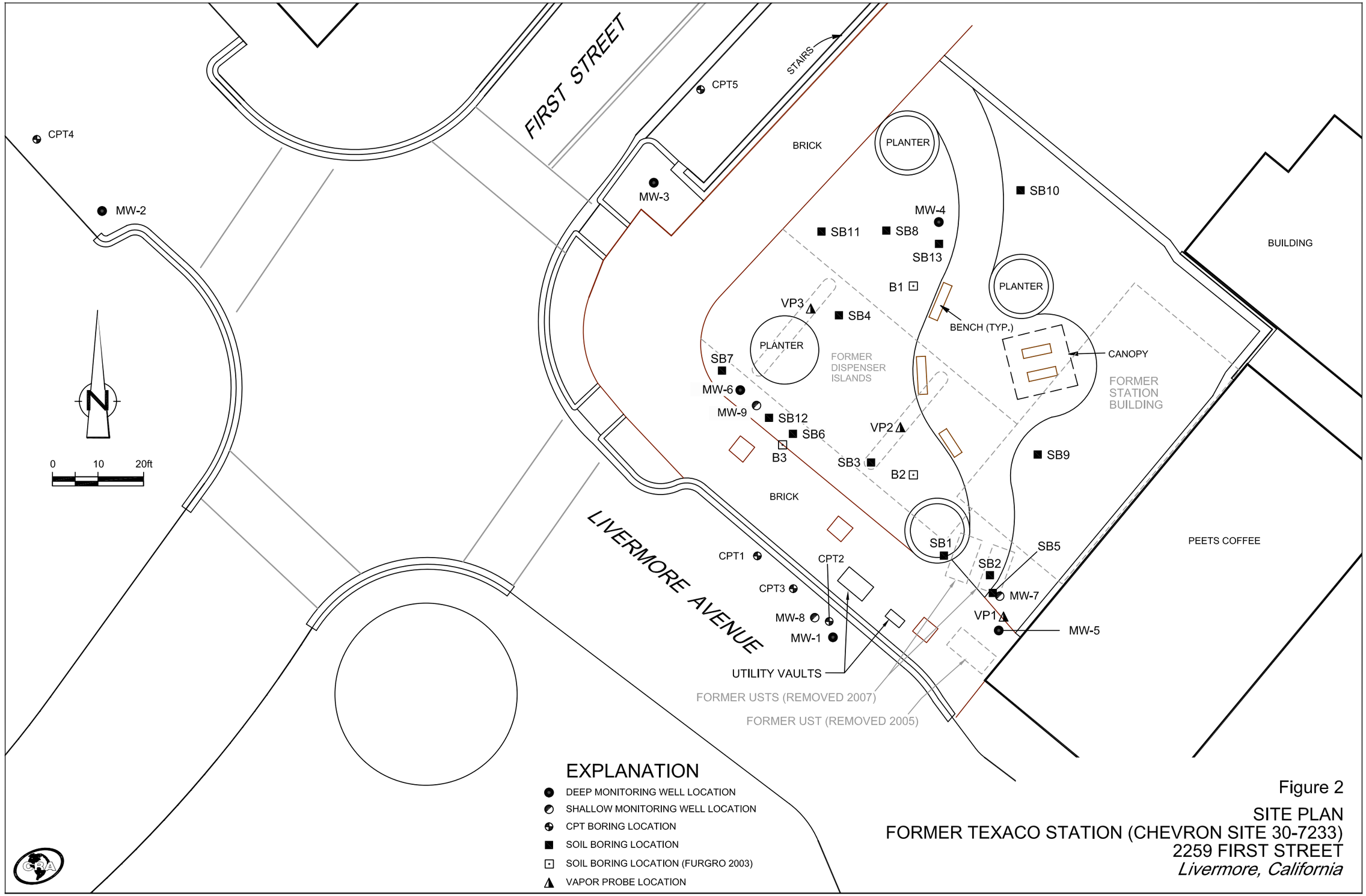


Figure 2

SITE PLAN
FORMER TEXACO STATION (CHEVRON SITE 30-7233)
2259 FIRST STREET
Livermore, California

I:\Chevron\3122-\312264 30-7233 Livermore\312264-FIGURES\312264-2010 GN-EM001-SITEPLAN.DWG

LEGEND

MW-6 — WELL DESIGNATION

GROUND SURFACE

OBSERVATION WELL INSTALLATION

STRATIGRAPHIC BOUNDARY

CL — TYPICAL SOIL CLASSIFICATION

SCREENED INTERVAL

BOTTOM OF BORING

APPROXIMATE SOIL SAMPLE LOCATION

TPHg / BENZENE / DATE — HYDROCARBON CONCENTRATIONS IN SOIL (mg/kg)

< — NOT DETECTED AT OR ABOVE STATED REPORTING LIMITS

100 — TPHg CONCENTRATION CONTOUR IN SOIL (mg/kg)

FILL

TS - TOPSOIL

CO - CONCRETE

CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS

ML - INORGANIC SILTS, VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY

SM - SILTY SANDS, SAND-SILT MIXTURES

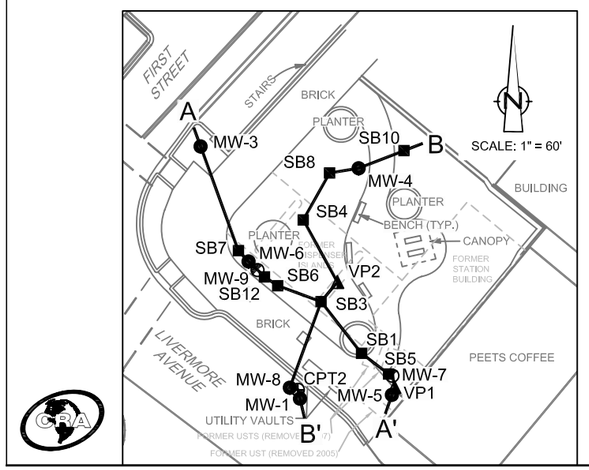
SP - POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES

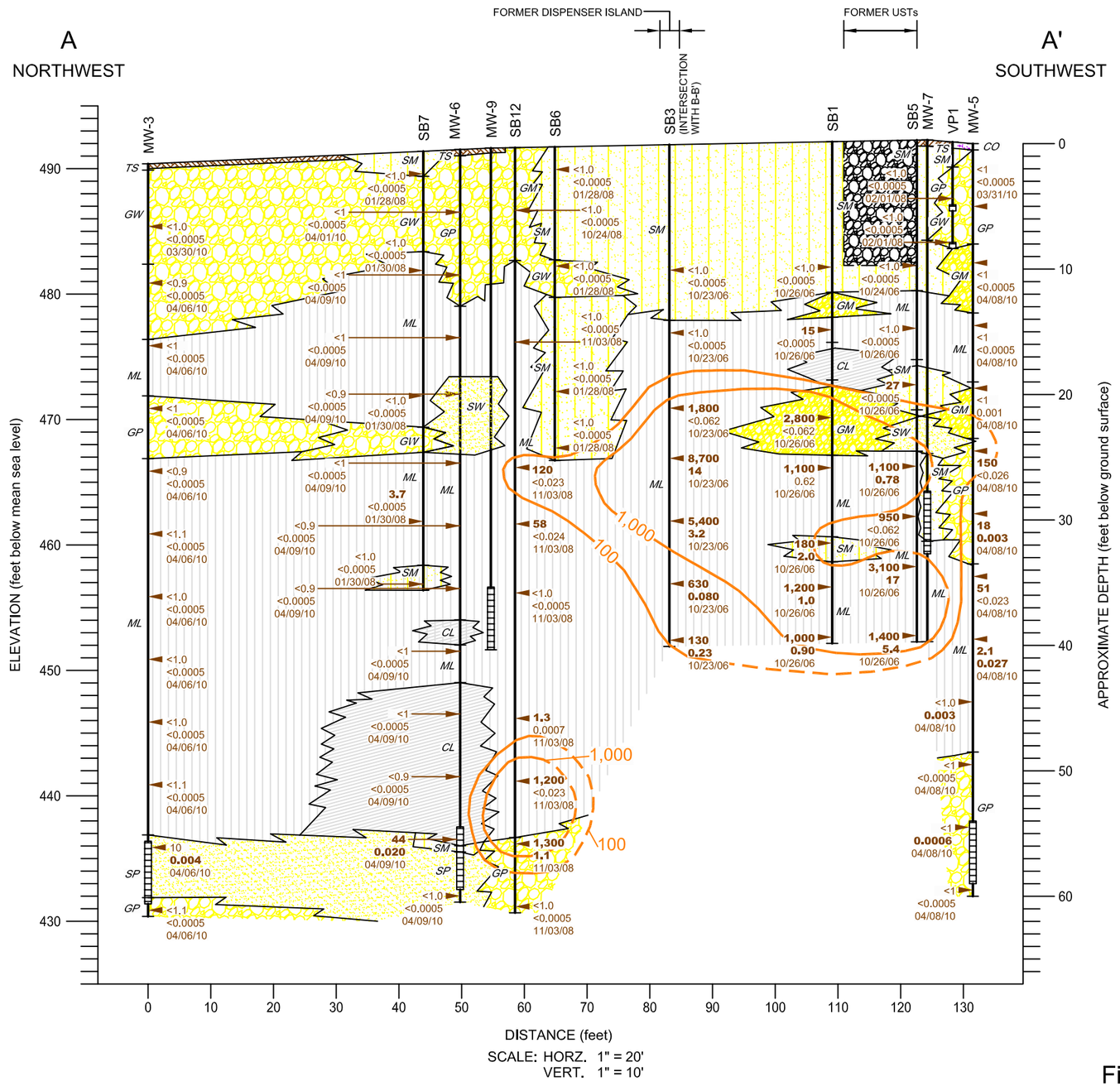
SW - WELL-GRADED SAND, GRAVELLY SANDS, LITTLE OR NO FINES

GM - SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES

GP - POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES

GW - WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES





SCALE: HORZ. 1" = 20'
VERT. 1" = 10'

Figure 3

GEOLOGIC CROSS SECTION A-A'
FORMER TEXACO STATION (CHEVRON SITE 30-7233)
2259 FIRST STREET
Livermore, California

LEGEND

MW-4 — WELL DESIGNATION

GROUND SURFACE

OBSERVATION WELL INSTALLATION

STRATIGRAPHIC BOUNDARY

CL — TYPICAL SOIL CLASSIFICATION

SCREENED INTERVAL

BOTTOM OF BORING

APPROXIMATE SOIL SAMPLE LOCATION

TPHg
BENZENE
DATE — HYDROCARBON CONCENTRATIONS IN SOIL (mg/kg)

< — NOT DETECTED AT OR ABOVE STATED REPORTING LIMITS

100 — TPHg CONCENTRATION CONTOUR IN SOIL (mg/kg)

AS - ASPHALT

TS - TOPSOIL

CL - INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS

ML - INORGANIC SILTS, VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY

SM - SILTY SANDS, SAND-SILT MIXTURES

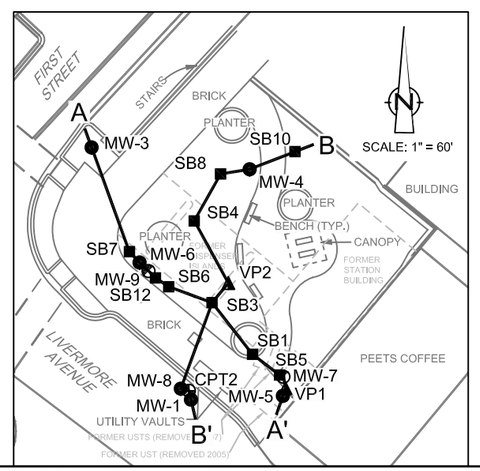
SP - POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES

SW - WELL-GRADED SAND, GRAVELLY SANDS, LITTLE OR NO FINES

GM - SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES

GP - POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES

GW - WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES



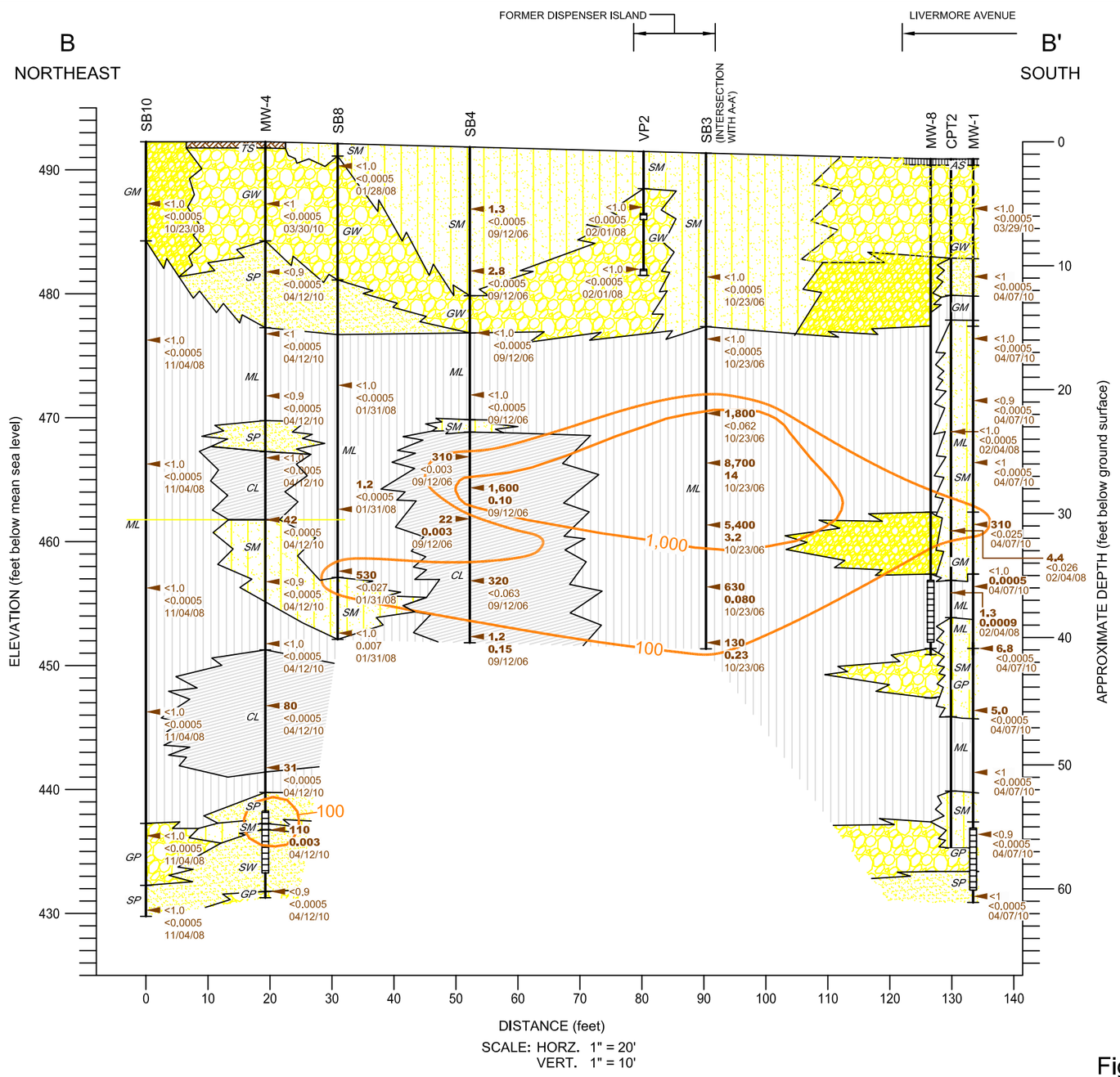
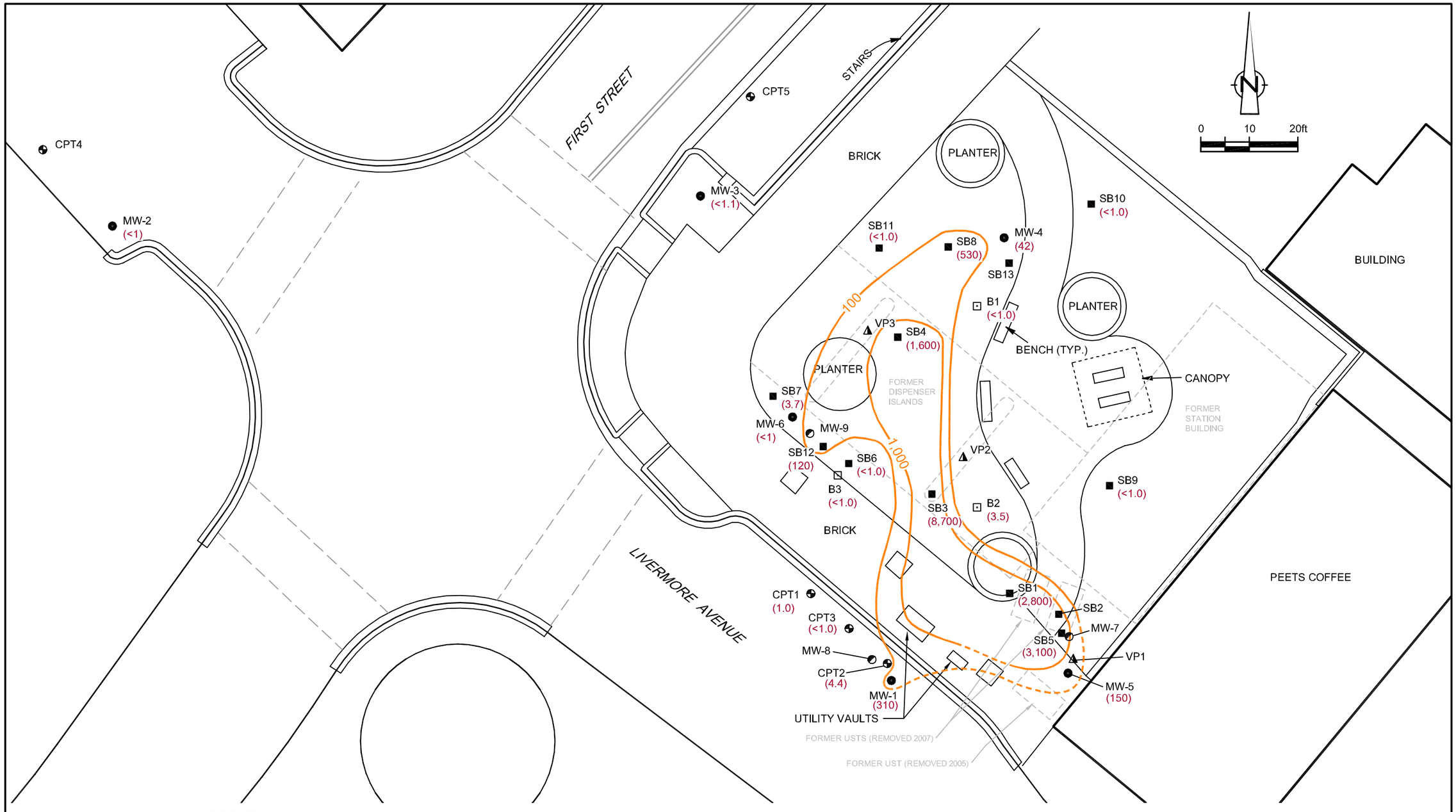


Figure 4

GEOLOGIC CROSS SECTION B-B'
FORMER TEXACO STATION (CHEVRON SITE 30-7233)
2259 FIRST STREET
Livermore, California

312264-2010(006)GN-WA001 MAY 14/2010



LEGEND

- DEEP MONITORING WELL LOCATION
- SHALLOW MONITORING WELL LOCATION
- CPT BORING LOCATION
- SOIL BORING LOCATION
- SOIL BORING LOCATION (FURGRO 2003)
- VAPOR PROBE LOCATION

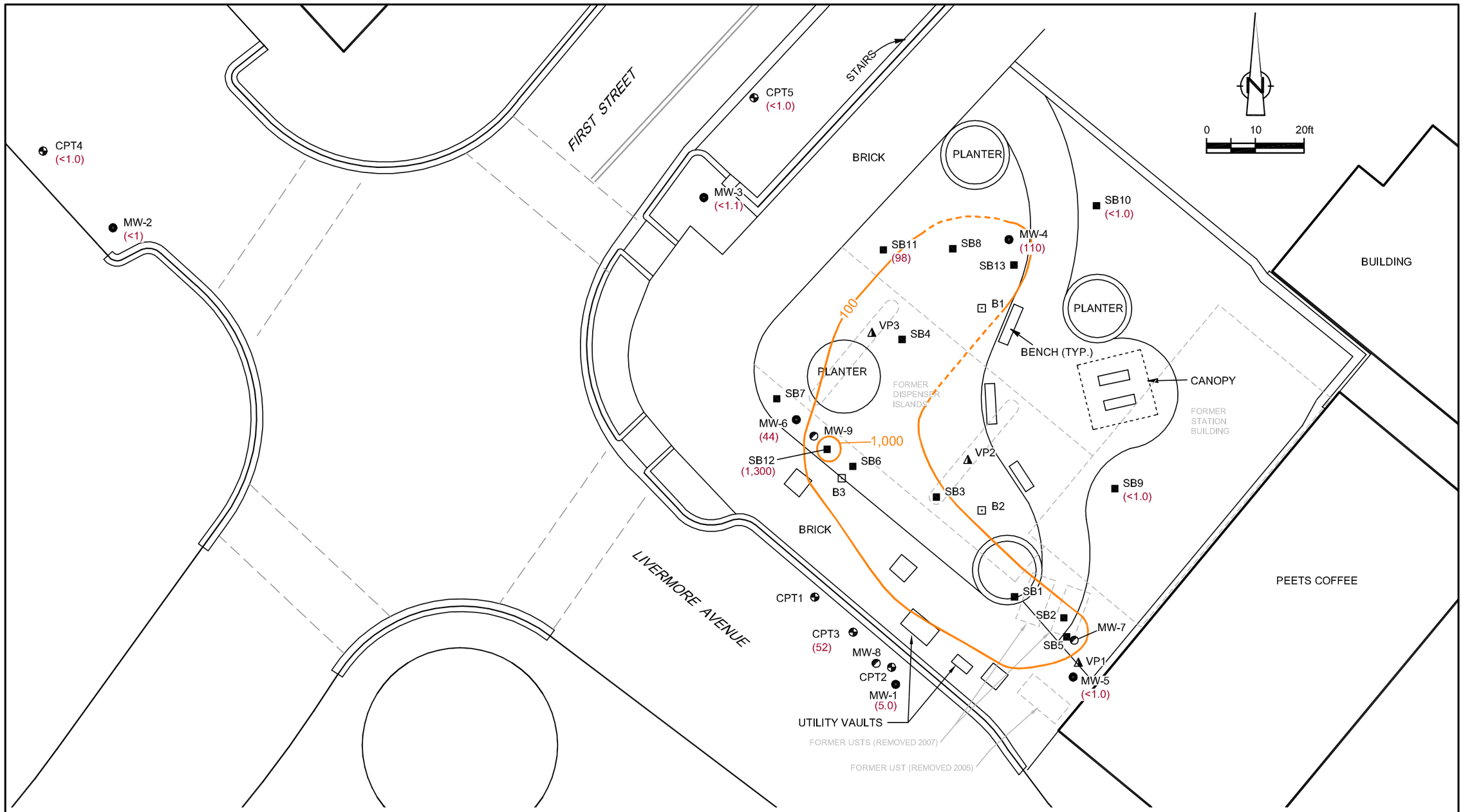
100 — TPHg CONCENTRATION CONTOUR DASHED WHERE INFERRED

(1,200) TPHg CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (mg/kg)

Figure 5

TPHg ISOCONCENTRATION IN SOIL - 20-40 FEET BELOW GROUND
FORMER TEXACO STATION (CHEVRON SITE 30-7233)
2259 FIRST STREET
Livermore, California

312264-2010(006)GN-WA003 JUN 25/2010

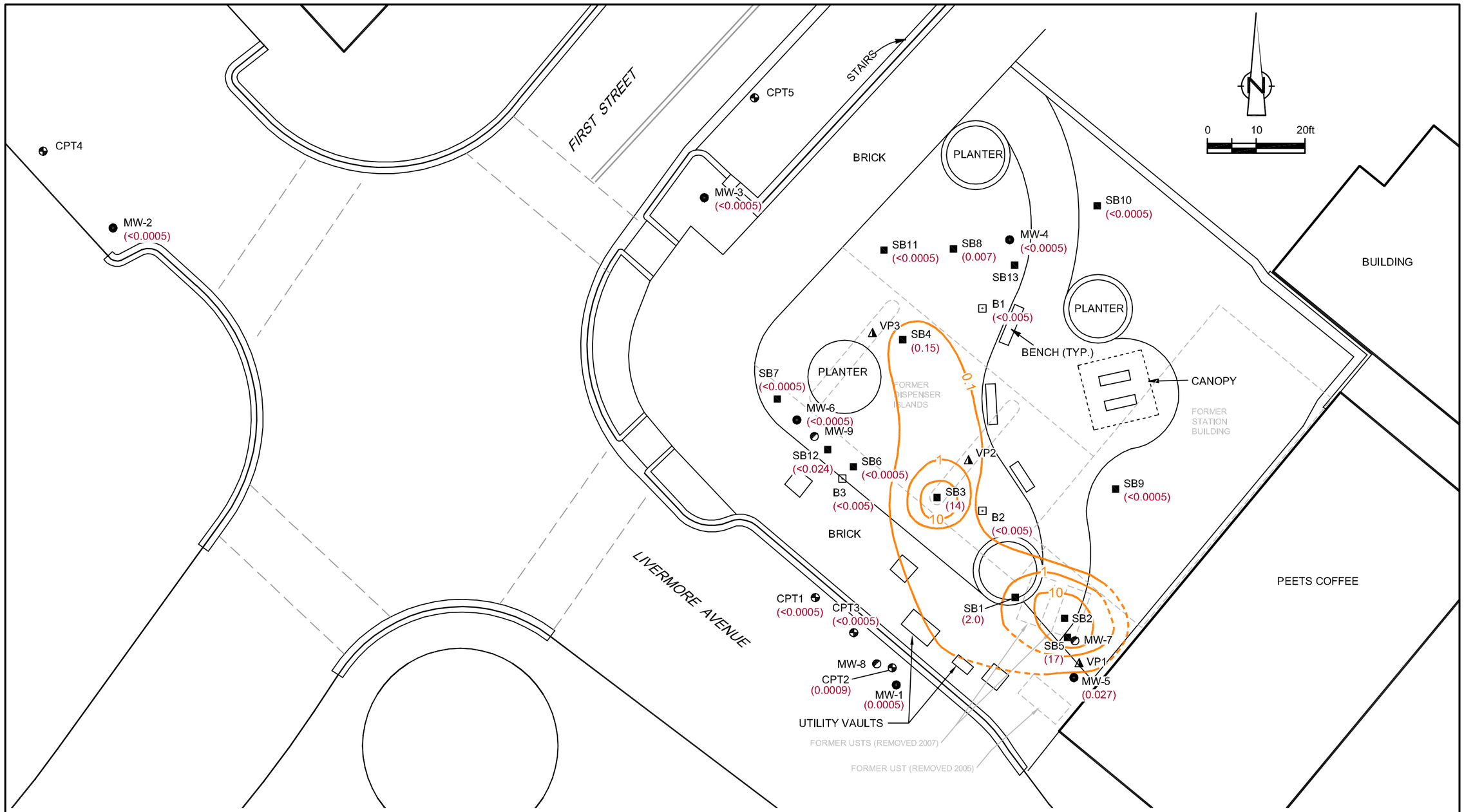


LEGEND

- DEEP MONITORING WELL LOCATION
- SHALLOW MONITORING WELL LOCATION
- CPT BORING LOCATION
- SOIL BORING LOCATION
- SOIL BORING LOCATION (FURGRO 2003)
- VAPOR PROBE LOCATION
- 100 — TPHg CONCENTRATION CONTOUR DASHED WHERE INFERRED
- (1,200) TPHg CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (mg/kg)

Figure 6

TPHg ISOCONCENTRATION IN SOIL - 40.5-56 FEET BELOW GROUND
FORMER TEXACO STATION (CHEVRON SITE 30-7233)
2259 FIRST STREET
Livermore, California



LEGEND

- DEEP MONITORING WELL LOCATION
- SHALLOW MONITORING WELL LOCATION
- CPT BORING LOCATION
- SOIL BORING LOCATION
- SOIL BORING LOCATION (FURGRO 2003)
- VAPOR PROBE LOCATION

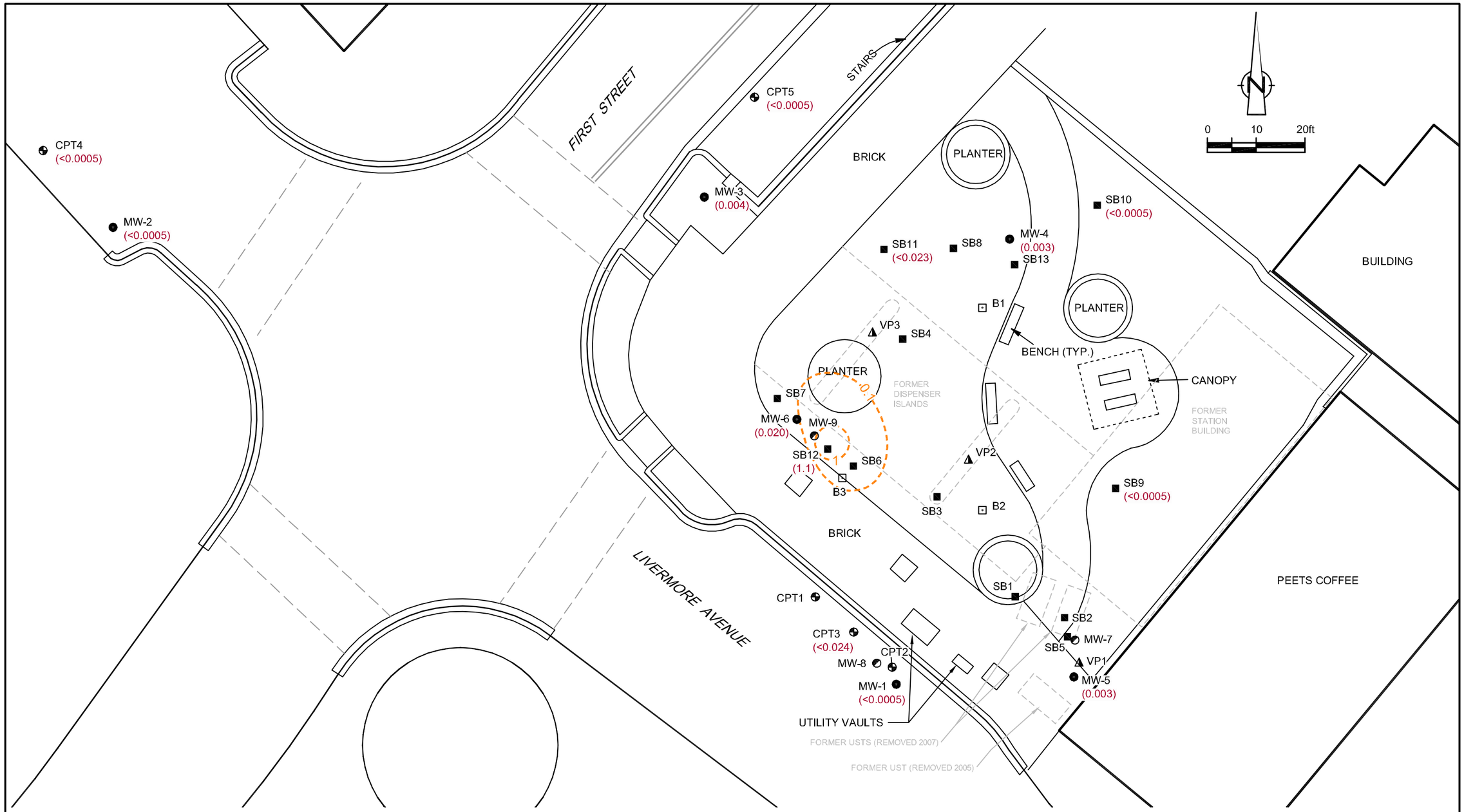
0.1 — BENZENE CONCENTRATION CONTOUR DASHED WHERE INFERRED

(1,200) BENZENE CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (mg/kg)

Figure 7

BENZENE ISOCONCENTRATION IN SOIL - 20-40 FEET BELOW GROUND
FORMER TEXACO STATION (CHEVRON SITE 30-7233)
2259 FIRST STREET
Livermore, California

312264-2010(006)GN-WA005 JUN 25/2010



LEGEND

- DEEP MONITORING WELL LOCATION
- SHALLOW MONITORING WELL LOCATION
- CPT BORING LOCATION
- SOIL BORING LOCATION
- SOIL BORING LOCATION (FURGRO 2003)
- VAPOR PROBE LOCATION

0.1 — BENZENE CONCENTRATION CONTOUR DASHED WHERE INFERRED

(1,200) BENZENE CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (mg/kg)

Figure 8

BENZENE ISOCONCENTRATION IN SOIL - 40.5-56 FEET BELOW GROUND
FORMER TEXACO STATION (CHEVRON SITE 30-7233)
2259 FIRST STREET
Livermore, California

312264-2010(006)GN-WA006 JUN 25/2010

APPENDIX B

GHD Soil Vapor Sampling Field Forms and Analytical Data

DAILY FIELD REPORT

Project Name: 307233	GHD PM: Brian Silva	Field Rep: Ben S.
Project Number: 6312264	Date: 1-30-18	Site Address: 2259 First St. Livermore
General Tasks: Install VP-4 + VP-5		
Emergency Drill Conducted: NO		
HASP Meeting Conducted (Y/N):	Equipment Checked (Y/N):	~~PID~~ Calibrated (Y/N): LEL

Time	Activity/Comments	SWA
900	GHD + Confluence on site - HASP meeting + JSA review	
915	LEL delivered	
920	EX + PTW completed and sent to Brian + Carryl	
945	Carryl + Brian approved permit Begin digging @ ~~VP-5~~ VP-4 first	
1000	Carryl on site	
1130	Finish VP-4. installed TD = 6'8"	
1145	Begin set up @ VP-5 - ~~Start~~ Review JSA for core machine - Begin core	
1225	- ~~Hit~~ pipe @ ~~first~~ location VP-5 - Call Carryl to discuss. said to move over to center of flag. Core out in middle of flag - concrete slurry to ~2 fbg. able to get through it	
1407	Call Carryl refusal @ 4.5' at VP-5 She said to keep trying for 10 more minutes large rock @ 4.5 fbg. Refusal, set well Screen at 4'2". Brian + carryl agreed. set well - concrete work clean up site. take one waste soil sample	
1545	offsite	
	Drum located in Northeast corner of site	
1730	Stop in Elk Grove for drive break + dinner	
1900	home (office) -	

SWA Key:	1: SPSA/Task Change	2: Pedestrian in Proximity	3: Unauthorized Personnel	4: Review Work Process
5: Inspection	6: Safety Orientation	7: Uncontrollable Factor	8: Minor First Aid	9: Major (explain in notes)

Hours _____ Miles _____ Other _____ Shared _____

DAILY FIELD REPORT

Project Name: Chevron 307233	GHD PM: B. Silva	Field Rep: B. Summerhalt
Project Number: 312264	Date: 2-2-18	Site Address: 2259 First St Livermore CA
General Tasks: Sample VP-4, VP-5 + VP1-5		
Emergency Drill Conducted:		
HASP Meeting Conducted (Y/N):	Equipment Checked (Y/N):	PID ~~Calibrated (Y/N):~~

Time	Activity/Comments	SWA
825	leave Roseville office	
1035	on site - Start @ VP-5 sent PTW to Brian - review H+S	
	Sample VP-5 @ 1102	
	Sample VP1-5 @ 1127	
	Sample VP-4 @ 1212	
	~~Sap~~ Duplicate taken @ VP-4	
1315	GHD off site	
1505	Drop off samples @ AT in Folsom	
1515	Drop off he meter + LEL @ UPS store in Folsom	
1600	Back at Roseville office unload Equipment	
	Took pictures of new wells VP-4 + VP-5	

A Key:	1: SPSA/Task Change	2: Pedestrian in Proximity	3: Unauthorized Personnel	4: Review Work Process
5: Inspection	6: Safety Orientation	7: Uncontrollable Factor	8: Minor First Aid	9: Major (explain in notes)

Hours _____ Miles _____ Other _____ Shared _____

Boring/Well Name VP-4 Page 1 of 1

PE/PG

Utility Cleared to

Total Depth 6' 8"

Date Started 1-30-18

Date Completed 1-30-18

Screened Interval set @ 6'2" (1" SS screen)

Depth to water (first encountered) N/A

Depth to water (static)

Located Eastern portion of park

Misc. Notes:

Client Name Chevron EMC

Job/Site Name 307233

Location 2259 First St. Livermore

Project Number 312264

Driller Confluence Env. Services

Drilling Method Hand Auger

Boring Diameter 3"

Logged by Ben Sunnarsett

Depth/Sample Interval	Time	Sample ID	PID	Well Construction	U.S.C.S. Symbol	Geologic Descriptions and Comments	Color	Penetration Resistance/ Blow Counts	Moisture	Estimated Percentages: Clay	Silt	Sand	Gravel	Estimated Plasticity
0				Hydrated Bentonite		Sandy gravel with silt gravel fine to coarse with cobbles, fine to coarse sands	brn		m		25	30	45	N
5			0.0	5'8" 6'2" 6'8"										
10														
15														
20														
25														
30														

I:\SFO-S1\SHARED\GRAPHICS\SPECIALTY FIGURES\BORING-SHEET (GHD).AI

Boring/Well Name VP-5 Page 1 of 1

PE/PG

Utility Cleared to

Total Depth 4.5'

Date Started 1-30-18

Date Completed 1-30-18

Screened Interval 4'-2" (1" SS screen)

Depth to water (first encountered) N/A

Depth to water (static)

Located sidewalk in front of Pete's

Misc. Notes:

Client Name Chevron EMC

Job/Site Name 307233

Location 2259 First St Livermore

Project Number 312264

Driller Confluence Env. Services

Drilling Method Hand Auger

Boring Diameter 3"

Logged by Ben Summerset

Depth/Sample Interval	Time	Sample ID	PID	Well Construction	U.S.C.S. Symbol	Geologic Descriptions and Comments	Color	Penetration Resistance/ Blow Counts	Moisture	Estimated Percentages: Clay	Silt	Sand	Gravel	Estimated Plasticity
0				Asphalt / Bentonite	Concrete	8" of sidewalk (concrete) concrete slurry to 2 fbg								
			0.0		3'8" 4.5'	Silty gravel + cobbles with sand Fine to Coarse gravel + sands	brn		Dry		30	20	50	N
5						refusal @ 4.5 fbg large rock at bottom of borehole								
10														
15														
20														
25														
30														

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SOIL VAPOR SAMPLING DATA SHEET

Soil Vapor Sampling Point ID: VP-1-S **Date:** 2-2-2018

Job/Site Name: CEMC 307233 **Technician:** Ben S.

Project No. 312264 **PM:** Brian Silva

Site Address: 2259 First Street, Livermore, CA

Vapor Sampling Apparatus Pressure Testing

Time	Vacuum Reading	Unit	Comments
1107	26	in/Hg	
1117	26	in/Hg	PASS

Purge Volume

Calculated Purge Volume: 0.12 liters @ 43 seconds

Time	Flow	Volume	
1119	167 ml/min	0.12	purged

Sample Collection

Flow Control Orifice Setting: 167 ml/min Summa Canister ID: IL2339

Summa Canister Size: 1 liter Analysis: See COC

Time - Begin Sampling	Canister Vacuum	Time - End Sampling	Canister Vacuum
1120	30	1127	5

Notes:

Helium % = >10%

N:\US\Rancho Cordova\Projects\Field Forms\GHD\[Soil Vapor Sampling Form.xls]SV form

SOIL VAPOR SAMPLING DATA SHEET

Soil Vapor Sampling Point ID: VP-4 **Date:** 2-2-2018

Job/Site Name: CEMC 307233 **Technician:** Ben S.

Project No. 312264 **PM:** Brian Silva

Site Address: 2259 First Street, Livermore, CA

Vapor Sampling Apparatus Pressure Testing

Time	Vacuum Reading	Unit	Comments
1147	18	in/Hg	
1147	18	in/Hg	Pass

Purge Volume

Calculated Purge Volume: 0.14 liters @ 52 seconds

Time	Flow	Volume	
1159	167 ml/min	0.14 Liter	

Sample Collection

Flow Control Orifice Setting: 167 ml/min Summa Canister ID: 1L2503

Summa Canister Size: 1 liter Analysis: See COC

Time - Begin Sampling	Canister Vacuum	Time - End Sampling	Canister Vacuum
1202	28	1212	5

Notes:

Dup # 1L2330

Helium % = 710 ppm

N:\US\Rancho Cordova\Projects\Field Forms\GHD\[Soil Vapor Sampling Form.xls]SV form

SOIL VAPOR SAMPLING DATA SHEET

Soil Vapor Sampling Point ID: VP-5 **Date:** 2-2-2018

Job/Site Name: CEMC 307233 **Technician:** Ben S.

Project No. 312264 **PM:** Brian Silva

Site Address: 2259 First Street, Livermore, CA

Vapor Sampling Apparatus Pressure Testing

Time	Vacuum Reading	Unit	Comments
1024	29	in/Hg	
1039	29	in/Hg	Pass

Purge Volume

Calculated Purge Volume: 0.11 liters @ 39 seconds

Time	Flow	Volume	
1053	167 ml/min	0.11	Purged

Sample Collection

Flow Control Orifice Setting: 167 ml/min Summa Canister ID: 12426

Summa Canister Size: 1 liter Analysis: See COC

Time - Begin Sampling	Canister Vacuum	Time - End Sampling	Canister Vacuum
1054	30	1102	5

Notes:

Helium % = 7.10%

N:\US\Rancho Cordova\Projects\Field Forms\GHD\[Soil Vapor Sampling Form.xls]SV form

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Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager Brian Silva

Collected by: (Print and Sign) Ben Summerell

Company GHD Email brian.silva@ghd.com

Address 4080 Golderado Cir. City Cameron Park State CA Zip 95682

Phone 530-387-5713 Fax

Project Info:
P.O. #
Project # 312264
Project Name CEMC 307233

Turn Around Time:
☐ Normal
☒ Rush
5 days
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
	VP1-5	1L2339	2-2-2018	1127	TPHg, BTEX by	30	5		
	VP-4	1L2503		1212	TO-15; Oxygen, CO2,	28	5		
	VP-5	1L2426		1102	N, methane, and	30	5		
	Dup	1L2330		—	helium by ASTMD-1946	28	5		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
	2-2-18/ 1505	FedEx	2/2/18 1505
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time

Notes:

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	FED		NA	Good	Yes No None	

Form 1293 rev.11

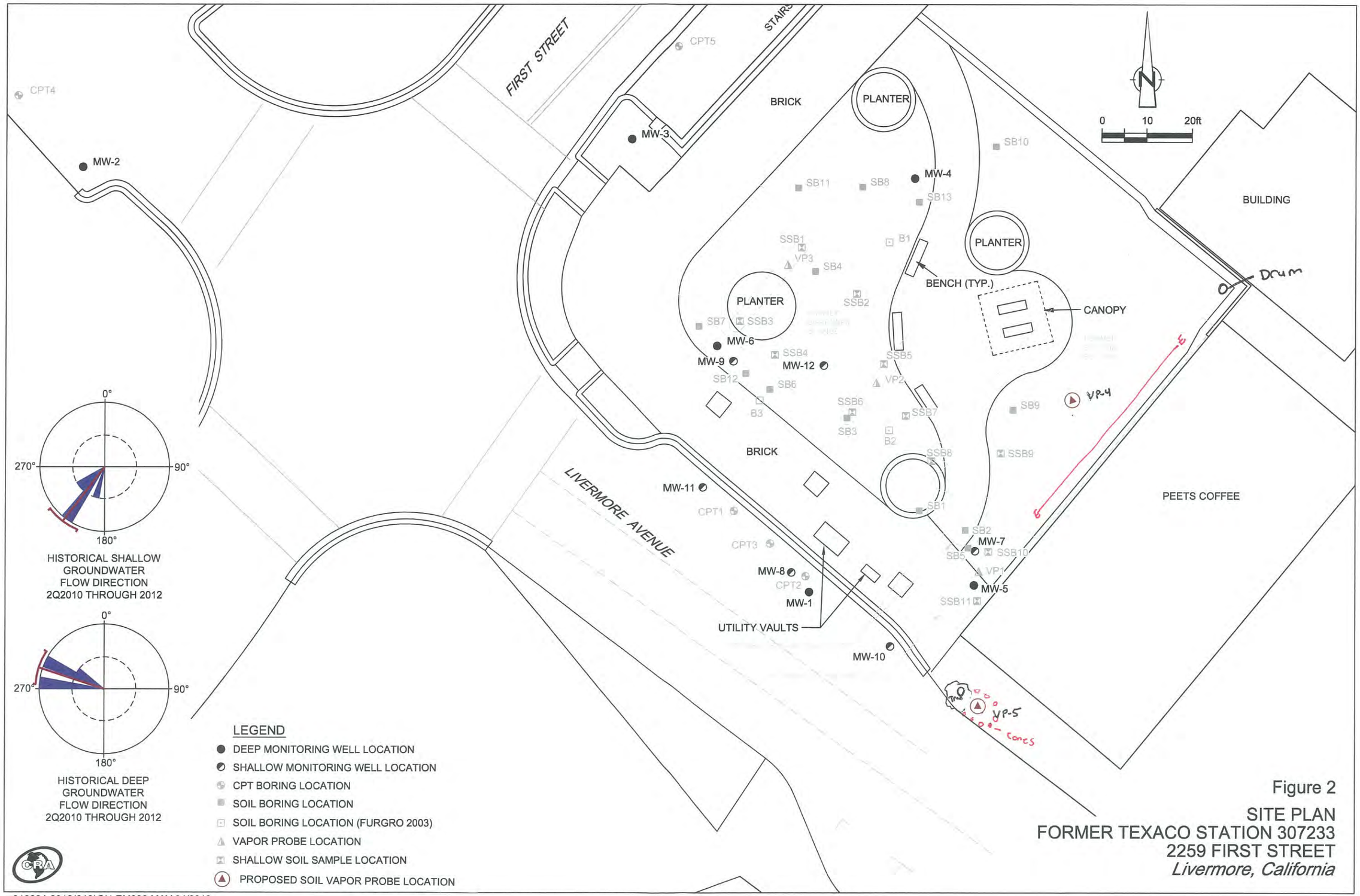

Figure 2

SITE PLAN
FORMER TEXACO STATION 307233
2259 FIRST STREET
Livermore, California

312264-2012(018)GN-EM002 MAY 24/2012

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2/9/2018
Mr. Ben Summersett
GHD
943 Reserve Drive

Roseville CA 95678

Project Name: CEMC 307233
Project #: 312264
Workorder #: 1802067A

Dear Mr. Ben Summersett

The following report includes the data for the above referenced project for sample(s) received on 2/2/2018 at Air Toxics Ltd.

The data and associated QC analyzed by TO-15 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

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WORK ORDER #: 1802067A

Work Order Summary

CLIENT:	Mr. Ben Summersett GHD 943 Reserve Drive Roseville, CA 95678	**BILL TO:**	Ms. Carryl MacLeod Chevron U.S.A. Inc. 6001 Bollinger Canyon Road L4310 San Ramon, CA 94583
PHONE:	916-889-8900	**P.O. #**	SO#0015247972
FAX:	916-677-3687	**PROJECT #**	312264 CEMC 307233
DATE RECEIVED:	02/02/2018	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	02/09/2018		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	VP1-5	TO-15	4.3 "Hg	15.4 psi
02A	VP-4	TO-15	3.7 "Hg	14.9 psi
03A	VP-5	TO-15	3.9 "Hg	15 psi
04A	Dup	TO-15	3.7 "Hg	15.4 psi
05A	Lab Blank	TO-15	NA	NA
06A	CCV	TO-15	NA	NA
07A	LCS	TO-15	NA	NA
07AA	LCSD	TO-15	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 02/06/18

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-16-11, UT NELAP CA0093332016-7, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2016, Expiration date: 10/17/2017.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

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LABORATORY NARRATIVE
EPA Method TO-15
GHD
Workorder# 1802067A

Four 1 Liter Summa Canister (100% Certified) samples were received on February 02, 2018. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

A single point calibration for TPH referenced to Gasoline was performed for each daily analytical batch. Recovery is reported as 100% in the associated results for each CCV.

Definition of Data Qualifying Flags

Ten qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit, LOD, or MDL value. See data page for project specific U-flag definition.

UJ- Non-detected compound associated with low bias in the CCV

N - The identification is based on presumptive evidence.

M - Reported value may be biased due to apparent matrix interferences.

CN - See Case Narrative.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: VP1-5

Lab ID#: 1802067A-01A

No Detections Were Found.

Client Sample ID: VP-4

Lab ID#: 1802067A-02A

No Detections Were Found.

Client Sample ID: VP-5

Lab ID#: 1802067A-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Toluene	1.2	2.4	4.4	9.3

Client Sample ID: Dup

Lab ID#: 1802067A-04A

No Detections Were Found.

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Client Sample ID: VP1-5

Lab ID#: 1802067A-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3020509**	**Date of Collection: 2/2/18 11:27:00 AM**	
Dil. Factor:	**2.39**	**Date of Analysis: 2/5/18 03:44 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.8	Not Detected
Toluene	1.2	Not Detected	4.5	Not Detected
Ethyl Benzene	1.2	Not Detected	5.2	Not Detected
m,p-Xylene	1.2	Not Detected	5.2	Not Detected
o-Xylene	1.2	Not Detected	5.2	Not Detected
TPH ref. to Gasoline (MW=100)	120	Not Detected	490	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	92	70-130
4-Bromofluorobenzene	110	70-130

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Client Sample ID: VP-4

Lab ID#: 1802067A-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3020511**	**Date of Collection: 2/2/18 12:12:00 PM**	
Dil. Factor:	**2.30**	**Date of Analysis: 2/5/18 04:48 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.7	Not Detected
Toluene	1.2	Not Detected	4.3	Not Detected
Ethyl Benzene	1.2	Not Detected	5.0	Not Detected
m,p-Xylene	1.2	Not Detected	5.0	Not Detected
o-Xylene	1.2	Not Detected	5.0	Not Detected
TPH ref. to Gasoline (MW=100)	120	Not Detected	470	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	91	70-130
4-Bromofluorobenzene	106	70-130

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Client Sample ID: VP-5

Lab ID#: 1802067A-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3020512**	**Date of Collection: 2/2/18 11:02:00 AM**	
Dil. Factor:	**2.32**	**Date of Analysis: 2/5/18 05:14 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.7	Not Detected
Toluene	1.2	2.4	4.4	9.3
Ethyl Benzene	1.2	Not Detected	5.0	Not Detected
m,p-Xylene	1.2	Not Detected	5.0	Not Detected
o-Xylene	1.2	Not Detected	5.0	Not Detected
TPH ref. to Gasoline (MW=100)	120	Not Detected	470	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	102	70-130
1,2-Dichloroethane-d4	94	70-130
4-Bromofluorobenzene	105	70-130

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Client Sample ID: Dup

Lab ID#: 1802067A-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3020513**	**Date of Collection: 2/2/18**	
Dil. Factor:	**2.34**	**Date of Analysis: 2/5/18 05:40 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	1.2	Not Detected	3.7	Not Detected
Toluene	1.2	Not Detected	4.4	Not Detected
Ethyl Benzene	1.2	Not Detected	5.1	Not Detected
m,p-Xylene	1.2	Not Detected	5.1	Not Detected
o-Xylene	1.2	Not Detected	5.1	Not Detected
TPH ref. to Gasoline (MW=100)	120	Not Detected	480	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130
1,2-Dichloroethane-d4	90	70-130
4-Bromofluorobenzene	107	70-130

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Client Sample ID: Lab Blank

Lab ID#: 1802067A-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3020507**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/5/18 12:21 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Benzene	0.50	Not Detected	1.6	Not Detected
Toluene	0.50	Not Detected	1.9	Not Detected
Ethyl Benzene	0.50	Not Detected	2.2	Not Detected
m,p-Xylene	0.50	Not Detected	2.2	Not Detected
o-Xylene	0.50	Not Detected	2.2	Not Detected
TPH ref. to Gasoline (MW=100)	50	Not Detected	200	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	101	70-130
1,2-Dichloroethane-d4	93	70-130
4-Bromofluorobenzene	103	70-130

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Client Sample ID: CCV

Lab ID#: 1802067A-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3020503**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/5/18 10:08 AM**	

Compound	**%Recovery**
Benzene	104
Toluene	110
Ethyl Benzene	108
m,p-Xylene	110
o-Xylene	112
TPH ref. to Gasoline (MW=100)	100

Container Type: NA - Not Applicable

Surrogates	**%Recovery**	**Method Limits**
Toluene-d8	103	70-130
1,2-Dichloroethane-d4	87	70-130
4-Bromofluorobenzene	106	70-130

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Client Sample ID: LCS

Lab ID#: 1802067A-07A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3020504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/5/18 10:33 AM**	

Compound	%Recovery	Method Limits
Benzene	103	70-130
Toluene	111	70-130
Ethyl Benzene	109	70-130
m,p-Xylene	111	70-130
o-Xylene	117	70-130
TPH ref. to Gasoline (MW=100)	Not Spiked	

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130
1,2-Dichloroethane-d4	88	70-130
4-Bromofluorobenzene	106	70-130

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Client Sample ID: LCSD

Lab ID#: 1802067A-07AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3020505**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/5/18 10:58 AM**	

Compound	%Recovery	Method Limits
Benzene	103	70-130
Toluene	111	70-130
Ethyl Benzene	108	70-130
m,p-Xylene	110	70-130
o-Xylene	117	70-130
TPH ref. to Gasoline (MW=100)	Not Spiked	

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
Toluene-d8	103	70-130
1,2-Dichloroethane-d4	89	70-130
4-Bromofluorobenzene	106	70-130

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2/9/2018
Mr. Ben Summersett
GHD
943 Reserve Drive

Roseville CA 95678

Project Name: CEMC 307233
Project #: 312264
Workorder #: 1802067B

Dear Mr. Ben Summersett

The following report includes the data for the above referenced project for sample(s) received on 2/2/2018 at Air Toxics Ltd.

The data and associated QC analyzed by Modified ASTM D-1946 are compliant with the project requirements or laboratory criteria with the exception of the deviations noted in the attached case narrative.

Thank you for choosing Eurofins Air Toxics Inc. for your air analysis needs. Eurofins Air Toxics Inc. is committed to providing accurate data of the highest quality. Please feel free to contact the Project Manager: Kelly Buettner at 916-985-1000 if you have any questions regarding the data in this report.

Regards,

Kelly Buettner

Project Manager

eurofins | Air Toxics

WORK ORDER #: 1802067B

Work Order Summary

CLIENT:	Mr. Ben Summersett GHD 943 Reserve Drive Roseville, CA 95678	**BILL TO:**	Ms. Carryl MacLeod Chevron U.S.A. Inc. 6001 Bollinger Canyon Road L4310 San Ramon, CA 94583
PHONE:	916-889-8900	**P.O. #**	SO#0015247972
FAX:	916-677-3687	**PROJECT #**	312264 CEMC 307233
DATE RECEIVED:	02/02/2018	**CONTACT:**	Kelly Buettner
DATE COMPLETED:	02/09/2018		

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	FINAL PRESSURE
01A	VP1-5	Modified ASTM D-1946	4.3 "Hg	15.4 psi
02A	VP-4	Modified ASTM D-1946	3.7 "Hg	14.9 psi
03A	VP-5	Modified ASTM D-1946	3.9 "Hg	15 psi
04A	Dup	Modified ASTM D-1946	3.7 "Hg	15.4 psi
05A	Lab Blank	Modified ASTM D-1946	NA	NA
05B	Lab Blank	Modified ASTM D-1946	NA	NA
06A	LCS	Modified ASTM D-1946	NA	NA
06AA	LCSD	Modified ASTM D-1946	NA	NA

CERTIFIED BY: Heidi Hayes DATE: 02/09/18

Technical Director

Certification numbers: AZ Licensure AZ0775, NJ NELAP - CA016, NY NELAP - 11291,
TX NELAP - T104704434-16-11, UT NELAP CA0093332016-7, VA NELAP - 8113, WA NELAP - C935
Name of Accreditation Body: NELAP/ORELAP (Oregon Environmental Laboratory Accreditation Program)
Accreditation number: CA300005, Effective date: 10/18/2016, Expiration date: 10/17/2017.
Eurofins Air Toxics Inc.. certifies that the test results contained in this report meet all requirements of the NELAC standards

LABORATORY NARRATIVE
Modified ASTM D-1946
GHD
Workorder# 1802067B

Four 1 Liter Summa Canister (100% Certified) samples were received on February 02, 2018. The laboratory performed analysis via Modified ASTM Method D-1946 for Methane and fixed gases in air using GC/FID or GC/TCD. The method involves direct injection of 1.0 mL of sample.

On the analytical column employed for this analysis, Oxygen coelutes with Argon. The corresponding peak is quantitated as Oxygen.

Since Nitrogen is used to pressurize samples, the reported Nitrogen values are calculated by adding all the sample components and subtracting from 100%.

Method modifications taken to run these samples are summarized in the table below. Specific project requirements may over-ride the ATL modifications.

Requirement	***ASTM D-1946***	***ATL Modifications***
Calibration	A single point calibration is performed using a reference standard closely matching the composition of the unknown.	A minimum of 5-point calibration curve is performed. Quantitation is based on average Response Factor.
Reference Standard	The composition of any reference standard must be known to within 0.01 mol % for any component.	The standards used by ATL are blended to a >/= 95% accuracy.
Sample Injection Volume	Components whose concentrations are in excess of 5 % should not be analyzed by using sample volumes greater than 0.5 mL.	The sample container is connected directly to a fixed volume sample loop of 1.0 mL on the GC. Linear range is defined by the calibration curve. Bags are loaded by vacuum.
Normalization	Normalize the mole percent values by multiplying each value by 100 and dividing by the sum of the original values. The sum of the original values should not differ from 100% by more than 1.0%.	Results are not normalized. The sum of the reported values can differ from 100% by as much as 15%, either due to analytical variability or an unusual sample matrix.
Precision	Precision requirements established at each concentration level.	Duplicates should agree within 25% RPD for detections > 5 X's the RL.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.
File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

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Summary of Detected Compounds
NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

Client Sample ID: VP1-5

Lab ID#: 1802067B-01A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.24	18
Nitrogen	0.24	80
Carbon Dioxide	0.024	2.5

Client Sample ID: VP-4

Lab ID#: 1802067B-02A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	19
Nitrogen	0.23	79
Carbon Dioxide	0.023	2.0

Client Sample ID: VP-5

Lab ID#: 1802067B-03A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	20
Nitrogen	0.23	79
Carbon Dioxide	0.023	0.96

Client Sample ID: Dup

Lab ID#: 1802067B-04A

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	19
Nitrogen	0.23	79
Carbon Dioxide	0.023	2.0

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Client Sample ID: VP1-5

Lab ID#: 1802067B-01A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10020507**	**Date of Collection: 2/2/18 11:27:00 AM**	
Dil. Factor:	**2.39**	**Date of Analysis: 2/5/18 12:05 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.24	18
Nitrogen	0.24	80
Carbon Dioxide	0.024	2.5
Methane	0.00024	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

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Client Sample ID: VP-4

Lab ID#: 1802067B-02A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10020508**	**Date of Collection: 2/2/18 12:12:00 PM**	
Dil. Factor:	**2.29**	**Date of Analysis: 2/5/18 12:40 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.23	19
Nitrogen	0.23	79
Carbon Dioxide	0.023	2.0
Methane	0.00023	Not Detected
Helium	0.11	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

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Client Sample ID: VP-5

Lab ID#: 1802067B-03A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10020509**	**Date of Collection: 2/2/18 11:02:00 AM**	
Dil. Factor:	**2.32**	**Date of Analysis: 2/5/18 01:04 PM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Oxygen	0.23	20
Nitrogen	0.23	79
Carbon Dioxide	0.023	0.96
Methane	0.00023	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

eurofins | Air Toxics

Client Sample ID: Dup

Lab ID#: 1802067B-04A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10020510**	**Date of Collection: 2/2/18**	
Dil. Factor:	**2.33**	**Date of Analysis: 2/5/18 01:26 PM**	

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.23	19
Nitrogen	0.23	79
Carbon Dioxide	0.023	2.0
Methane	0.00023	Not Detected
Helium	0.12	Not Detected

Container Type: 1 Liter Summa Canister (100% Certified)

eurofins | Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 1802067B-05A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10020504**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/5/18 10:45 AM**	

Compound	Rpt. Limit (%)	Amount (%)
Oxygen	0.10	Not Detected
Nitrogen	0.10	Not Detected
Carbon Dioxide	0.010	Not Detected
Methane	0.00010	Not Detected

Container Type: NA - Not Applicable

eurofins | Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 1802067B-05B

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10020503c**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/5/18 10:23 AM**	

Compound	**Rpt. Limit (%)**	**Amount (%)**
Helium	0.050	Not Detected

Container Type: NA - Not Applicable

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 1802067B-06A

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10020502**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/5/18 09:59 AM**	

Compound	%Recovery	Method Limits
Oxygen	104	85-115
Nitrogen	90	85-115
Carbon Dioxide	100	85-115
Methane	102	85-115
Helium	103	85-115

Container Type: NA - Not Applicable

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1802067B-06AA

NATURAL GAS ANALYSIS BY MODIFIED ASTM D-1946

File Name:	**10020511**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 2/5/18 02:07 PM**	

Compound	%Recovery	Method Limits
Oxygen	104	85-115
Nitrogen	90	85-115
Carbon Dioxide	99	85-115
Methane	102	85-115
Helium	102	85-115

Container Type: NA - Not Applicable


Peets
TIMES

APP

City of Livermore

Community Development Department
1052 S. Livermore Avenue
Livermore, CA 94550
(925) 960-4500

Encroachment
Permit No. EN180024
Type: Other

PERMIT TO DO WORK IN ACCORDANCE WITH CHAPTER 12.08 OF THE LIVERMORE MUNICIPAL CODE AND SPECIFICATIONS AS ADOPTED BY THE CITY OF LIVERMORE AND ANY SPECIAL REQUIREMENTS SHOWN OR LISTED HEREIN.

Inspection Fee - Simple EN - 2016	$402.00
Permit Fee - EN - 2022	$156.00
Total:	***$558.00***

Applicant/Permittee:
Name: Chevron / GHD
Address: 6001 Bollinger Canyon
San Ramon CA, 94583
Phone:

Contractor:
Name:
Address:
Phone:

LIVERMORE

PLEASE READ THIS PERMIT CAREFULLY. KEEP IT AT THE WORK SITE. TO ARRANGE FOR AN INSPECTION, PHONE (925) 960-4500 AT LEAST 24 HOURS BEFORE YOU START WORK.

JOB LOCATION: 2259 FIRST ST , LIVERMORE 94550

DESCRIPTION OF WORK: Install 2 soil vapor wells on city property near the intersection of N. Livermore Ave. and First St. The soil vapor wells will be installed by hand. A traffic rated well vault will be installed at the surface.
PM# .

Attention is directec
attached special req

Prosecution of Work: All v
completed to the satisfact

Liability and Damages: Th
arise out of the work perm
perform his obligations un
Livermore, its officers and
that may arise out of or be

Hold Harmless and Indem
officials, officers, directors
reasonable attorney and e
and willful misconduct of t

Chevron / GHD
Signature of Permitt

LIVERMORE CALIFORNIA

CITY OF LIVERMORE, CA

RECVD BY: LTOSTADO E100001834
PAYOR: CONESTOGA ROVERS &
TODAY'S DATE: 01/30/18
REGISTER DATE: 01/30/18 TIME: 11:51

DESCRIPTION	AMOUNT
PUB WORKS-INSPECTION F	$402.00
CUST ID: PERMIT EN180024	
2016 PUB WORKS-INSPECTION FEES	
001-35350	$156.00
STREET & CURB PERMITS	
CUST ID: 2259 FIRST ST	
2022 STREET & CURB PERMITS	
001-31300	
TOTAL DUE:	$558.00
TENDERED:	$558.00
CHANGE:	$.00
CHECK :	$558.00
REF NUM: 71019	

and must be

which may
permittee to
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luding
negligence

By: Ben Schwartzwalder

Title: Scientist

Date: 1-30-2018

Date Work Completed: _____

By. _____

Date of Issue: 1/25/18

Inspector: _____

Arcadis U.S., Inc.

2300 Clayton Road

Suite 400

Concord, California 94520

Tel 925 724 1100

www.arcadis.com