May 17, 2021

Joel Waxdeck
Senior City Engineer
Engineering Division
City of Livermore
1052 South Livermore Ave
Livermore, CA 94550
jhwaxdeck@cityoflivermore.net

Re: **Interim Remedial Action Plan**
Old Train Depot
APN: 098-0289-02100
20, 22 & 24 S. L Street & 2009 – 2073 Railroad Avenue
Livermore, California
SFBRWQCB Case No. 01S0831, Global ID T10000016758

Dear Mr. Waxdeck:

PANGEA Environmental Services, Inc. prepared this *Interim Remedial Action Plan* for the subject site. The objective of the proposed work is to facilitate interim remedial action in advance of site development planned to commence in 2022. This report was requested by the San Francisco Bay Regional Water Quality Control Board in a letter dated February 9, 2021. This plan includes contingent scope expansion based on data from implementation of the separate *Data Gap Assessment Workplan*.

Pangea is pleased to provide this report to the City of Livermore. If you have any questions, feel free to contact me at (510) 435-8664 or briddell@Pangeaenv.com.

Sincerely,
PANGEA Environmental Services, Inc.

Bob Clark-Riddell, P.E.
Principal Engineer

Attachment: *Interim Remedial Action Plan*

cc: Bob Vinn and Rick Teczon (City of Livermore)

INTERIM REMEDIAL ACTION PLAN

Old Train Depot
20, 22 & 24 S. L Street & 2009 – 2073 Railroad Avenue
Livermore, California 94550

May 17, 2021

Prepared for:

City of Livermore
Engineering Division
1052 South Livermore Avenue
Livermore, California 94550

Prepared by:

PANGEA Environmental Services, Inc.
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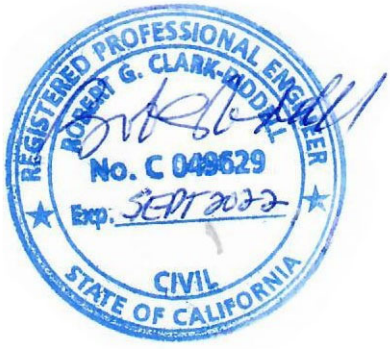
Written by:



Morgan Gillies
Project Manager

Bob Clark-Riddell, P.E.
Principal Engineer

INTERIM REMEDIAL ACTION PLAN

Old Train Depot
20, 22 & 24 S. L Street & 2009 – 2073 Railroad Avenue
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TABLE OF CONTENTS

INTERIM REMEDIAL ACTION PLAN

Old Train Depot
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TABLE OF CONTENTS (CONT.)

ATTACHMENTS

1.0 INTRODUCTION

PANGEA Environmental Services, Inc. (PANGEA) prepared this *Interim Remedial Action Plan* (IRAP) for the subject site at 20, 22 and 24 S. L Street and 2009 to 2073 Railroad Avenue (Site). The Site is in the northwest corner of Livermore Village and was historically used as a train depot and lumber yard (Figure 3B). Planned development of the Site includes construction of multifamily residences and Veteran's Park, scheduled to commence in early- to mid-2022. This IRAP was requested by the San Francisco Bay Regional Water Quality Control Board (RWQCB) in a letter dated February 9, 2021 (Appendix A). The objective of the proposed work is to facilitate interim remedial action in advance of site development planned to commence in 2022. This plan includes contingent scope expansion based on data from implementation of the separate *Data Gap Assessment Workplan*. The site background and proposed interim remediation are described below.

2.0 SITE BACKGROUND

For detailed site background information, refer to the *Data Gap Assessment Workplan*. Key background information relevant to the proposed interim remedial action is summarized below.

2.1 Site History

According to project documents (Fugro, 2007a; Fugro, 2007b; SCI, 1998), historical site use for the Site included:

- Multiple railroad lines that ran parallel and approximately 100 to 350 ft south of Railroad Avenue;
- Former railroad depot building (Southern Pacific Railroad) at 22 South L Street; and
- Former lumber storage yard located at the corner of Railroad Avenue and L Street.

According to project documents (Fugro, 2007a; Fugro 2007b; SCI, 1998), historical site use for nearby properties within the Livermore Downtown Core Development project area has included, but was not limited to, the following:

- Former dry cleaner operations (J Cleaners) at 2093 Railroad Avenue and former dry cleaner operations (Quality Cleaners) at 2048 First Street;
- Auto body operations at 2121 and 2139 Railroad Avenue; and
- Various other commercial and industrial site uses, as well as paved parking lots.

2.2 Planned Site Development

The planned Site development consists of construction of two multi-family residential building with approximately 130 units over underground parking and a communal park (Veteran's Park). The footprint of the old train depot is located within Veteran's Park and overlaps with some planned multifamily residences. The location of former Site buildings and proposed buildings are shown on Figure 3. The City's grading plan for the project will include the import of top soil for the upper 2 ft of all lawn/landscaping areas, and excavation up to 15 ft depth below grade surface (bgs) for underground parking beneath the entirety of the two planned buildings. The ventilated underground parking is considered an engineering control that mitigates potential vapor intrusion.

2.3 Adjacent Development with Agency Oversight Cases

The multifamily residences and Veteran's Park are a subset of the larger Downtown Core Development project (Figure 2). The Livermore Downtown Core Development project will involve several work phases by numerous contractors. In addition to the RWQCB cleanup program site (SCP) for the Old Train Depot (No. 01S0831), there are two other SCP cases associated with historical operations within the boundaries of the Downtown Core Development:

- **Quality Cleaners:** SFRWQCB Case No. 01S0828 and Geotracker Global ID T10000014462. The former Quality Cleaners dry-cleaning facility was located on the southern adjacent property to the Old Train Depot. Planned development of this site includes a multi-level parking structure with partial underground parking, and is planned for construction in 2022. Tentative interim remedial action of soil excavation and soil vapor extraction are under consideration for the former Quality Cleaners site. Case documents may be obtained from the State Geotracker database at https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T10000014462.

- **J Cleaners:** SFRWQCB Case No. 01S0190 and Geotracker Global ID T10000008401. The former J Cleaners dry-cleaning facility was located on the eastern adjacent property to the Old Train Depot. Planned development of this site includes a two-story arts and science building and other commercial buildings. Additional groundwater characterization is proposed west of former J Cleaners to delineation VOCs in groundwater upgradient of the subject Site. Extensive soil remediation was conducted in December 2019. Soil gas monitoring is ongoing to evaluate the effect of soil remediation on soil gas conditions. Tentative interim remedial action for the former J Cleaners site includes soil vapor extraction, if merited to reduce potential vapor intrusion concerns. Case documents may be obtained from the State Geotracker database at https://geotracker.waterboards.ca.gov/profile_report.asp?global_id=T10000008401.

2.4 Constituents of Concern from Historical Data

Analytical data for soil, groundwater, and soil gas for the site are summarized on Tables 2, 3 and 4, respectively. Well construction details are provided in Table 1. Constituents of concern from historical assessment include the following:

- Metals arsenic, lead, and nickel in shallow soil;
- Petroleum hydrocarbons in soil and groundwater, including naphthalene, total petroleum hydrocarbons as gasoline (TPHg), diesel (TPHd), and motor oil-range (TPHmo); and
- Volatile organic compounds (VOCs) in groundwater including tetrachloroethene (PCE) and breakdown product trichloroethene (TCE).

However, note that vinyl chloride has been detected immediately upgradient of the Site in shallow-zone groundwater wells MW-2 and MW-3 located near the adjacent former Quality Cleaners. Vinyl chloride is a breakdown product of PCE, the dry-cleaning chemical used at the former Quality Cleaners. PCE may have been used at the subject Site as a degreaser.

2.5 Site Geology and Hydrogeology

Based on soil logging data from Site documents and available information from nearby sites, soil at and near the Site generally consists of interbedded coarse- and fine-grained materials including silt, clay, silty sand, silty/sandy/clayey gravel. The Site is located in the Mocho Subbasin in the south-central portion of the Livermore Valley. Available documents for the Site and nearby Sites and the well MW-4 soil logging, the subsurface at the Site and nearby is currently generally characterized as shown below on Table A.

Table A – Summary of Site Hydrogeology

Hydrologic Zone	Depth Interval (ft bgs)	Lithology	Notes
Vadose Zone	*0 to 35*	*Sandy/silty gravels*	---
Perched Groundwater	30 to 38	Sandy/silty gravels to 33 ft; fine-grained soil 33-41 ft.	If/when present
	41 to 46		---
Shallow Groundwater	52 to 56.5	Sandy gravel	Confined
	62 to 66	Gravelly sand	Confined
Aquitard	*66 to 100*	*Fine-grained soil*	---
Deep Groundwater	100 to 390	Unknown/ not explored	Drinking water source

Within the Downtown Core Project area, the historical perched groundwater zone was approximately 31 to 46 ft bgs with the confined shallow groundwater zone approximately 52 to 70 ft bgs within the Downtown Core Project area. For the subject Site, the perched and shallow groundwater zones include thin lenses of fine-grained material within these zones. The site geology and hydrogeology is summarized on cross section Figure 9. Groundwater beneath the Site and vicinity reportedly flows in the approximate northwest direction.

2.6 Water Supply Wells and Nearby VOC Plumes

The Deep Zone is present approximately 100 to 390 ft bgs and is used by the City of Livermore for drinking water purposes. The closest water supply well (CalWater 8P1) is located approximately ½ mile hydraulically downgradient of the Site and apparently screened from 122 to 192 ft bgs. According to a Lawrence Livermore National Laboratory report, "PCE is nearly ubiquitous in Livermore wells…the Mocho Subbasin has a relative high degree of vulnerability to contamination from surface sources." Select nearby water supply wells have wellhead treatment for contamination.

From review of the State Board Geotracker database, there are several sites in the Site vicinity with subsurface PCE impact to groundwater. Groundwater beneath the Site and vicinity reportedly flows in the approximate northwest direction. Sites with known PCE groundwater plumes are located upgradient and cross-gradient of the Site and include Desert Petroleum/Valley Gas at 2008 First Street, Groth Brothers Chevrolet at 57-59 South L Street, and Mike's and Paul's Cleaners at the Livermore Arcade Shopping Center site.

From historical and 2018 assessment by the City, VOC and TPH groundwater impact has also been identified at adjacent properties 2048 First Street (former Quality Cleaners) and 2093 Railroad Avenue (former J Cleaners).

2.7 Conceptual Site Model Summary

Based on information in the *Data Gap Assessment Workplan*, the site conceptual model includes the following:

- **Soil:** Shallow soil impact from historic uses has not been fully characterized. Shallow metal impact (e.g., arsenic and lead) will be further evaluated during the data gap assessment. The assessment will also evaluate possible impact from the lumber yard by analyzing shallow soil for pentachlorophenol, creosote, and dioxins. No VOCs have been detected to date is site soil, and limited petroleum hydrocarbon impact has been detected.

- **Soil Gas:** A tetrachloroethylene (PCE) source could be near the historic railroad lines based on the highest PCE impact in shallow (5 ft bgs) soil gas (Figure 5). PCE concentrations in soil gas are highest in deeper soil gas (25 ft bgs). The PCE in soil gas represents a potential vapor intrusion concern for future structures.

- **Historical Perched Groundwater:** The highest PCE concentrations in deeper soil gas (25 and 30 ft bgs) are located above and near the depth of historical perched groundwater (31 to 44 ft bgs). This PCE in deeper soil gas could be affected by historical PCE migration from the upgradient former Quality Cleaners site. PCE has been detected in perched groundwater at maximum concentrations of 19 micrograms/liter (ug/L) in boring B-1 on the Old Train Depot site, and 31 ug/L in boring B-6 on the Quality Cleaners site. The separate data gap assessment work scope will evaluate if perched groundwater is currently present at the Site, and if elevated soil gas impact is present that merits remediation and/or mitigation (e.g., soil vapor extraction).

3.0 INTERIM REMEDIAL ACTION PLAN OVERVIEW

This section provides an overview of the IRAP objectives and proposed actions.

3.1 IRAP Objectives

The primary IRAP objective is to remediate and mitigate potential vapor intrusion risk into the planned multifamily residential buildings via operation of a soil vapor extraction (SVE) system. SVE operation should also help improve groundwater quality by removing the source of VOCs in vadose soil, the capillary fringe, and the historic zone of VOC impact within the former perched groundwater zone (the likely lowered water table due to drought conditions helps expose VOCs for removal via SVE). For cost control and efficiency, this proposed SVE system may also be designed to remediate soil gas at the adjacent Quality Cleaners case to the south and the J Cleaners case to the east.

The secondary IRAP objective is removal (via excavation) of secondary source material identified during forthcoming site assessment or development activities (the development plan includes excavation of subgrade garages beneath both buildings and shallow excavation in the park). Since no obvious secondary source of VOCs has been identified in shallow site soil, secondary source removal is a contingent remedial action alternative at this time. If merited, secondary source removal could be performed before or during excavation for Site grading and the subgrade parking structures.

Another objective of IRAP implementation is to help satisfy case closure criteria presented in the San Francisco Regional Water Quality Control Board (RWQCB) *Assessment Tool for Closure of Low-Threat Chlorinated Solvent Sites*, draft final dated July 31, 2009.

More extensive interim remediation is not proposed because the ventilated underground parking for the planned development is an engineering control that mitigates potential vapor intrusion.

3.2 IRAP Approach

The proposed IRAP approach includes the following:

- **SVE:** SVE will be conducted to remediate and mitigate the potential vapor intrusion risk for future residents, and will help improve groundwater quality. SVE is a soil/soil gas remediation process that uses vacuum blowers and extraction wells to create pressure gradients in the subsurface to induce vapor flow from vadose-zone soil, and within the historic zone with VOC impact. Once removed, the vapors are treated and discharged to the atmosphere. A network of SVE wells will be constructed across the site to extract soil vapor from several depth intervals of permeable material within the vadose zone. SVE cleanup goals are described in Section 5.1.

- **Contingent Excavation:** Contingent soil excavation will be performed if obvious secondary source material is identified in shallow soil. Soil excavation would be most applicable if VOC source material is found within lower permeable material (e.g., silt or clay) less amenable to SVE. Excavation can be an effective technology in removing source material bound to geologic material. Excavation can be accomplished using conventional excavators, limited access excavators and/or use of drilling augers, e.g., bucket augers. Excavation may also be limited by presence of physical structures, e.g., building foundations.

These actions will provide appropriate interim remedial action for secondary source removal in soil vapor and soil at the Site. USEPA recommends use of excavation and SVE as the presumptive remedy for sites where VOCs are present in vadose-zone soil and treatment is warranted (USEPA, 1996). Presumptive remedies are technologies that, based on historical patterns of remedy selection, are the preferred technology, i.e., screening evaluations are not needed to select this remedy.

4.0 CONTINGENT EXCAVATION

This section describes contingent excavation to remove potential source soil impact, if discovered during the forthcoming site assessment or development activities. Figure 4 shows the grading plan to 2-ft depth for Veterans Park and landscaped areas, and subgrade parking structure excavation plan to depths of 10 ft to 15 ft. Figure 4 also shows lead impact in shallow soil (10-16 inches bgs) from prior assessment for consideration for contingent excavation. Additional assessment as described in the *Data Gap Assessment Workplan* dated May 7, 2021 will help determine if contingent excavation is merited.

The excavation will be conducted by an appropriately licensed excavation contractor. The contingent excavation extents will be expanded based on field conditions or analytical data from excavation sidewall and floor samples as referenced below in Section 6.3.

4.1 Contingent Secondary Source Removal Criteria

Contingent secondary source removal may be conducted if the following criteria are met during upcoming site assessment and redevelopment activities:

- There is obvious field indication of organic contamination during grading and redevelopment excavation activities, including staining, odor, or elevated PID reading.

- Organic soil impact exceeds the direct exposure for human health environmental screening level (ESL) for residential site use (e.g., 0.59 mg/kg PCE) established by the SFRWQCB. The 2019 Tier I ESL for PCE of 0.080 mg/kg is not proposed as removal criteria because the Tier 1 ESL is protective of leaching to groundwater, and leaching to groundwater does not appear relevant given the depth to groundwater, the limited PCE detected in groundwater, and that sample collection (EPA Method 5035) that yields analytical results representative of vapor-phase PCE and PCE sorbed to soil.

- Significant VOC soil impact that could represent a source material for vapor intrusion concerns. For the adjacent J Cleaners site, a PCE soil concentration of 0.1 mg/kg was used as a general criteria for excavation.

Metal-bearing soil excavation may be conducted if metal concentrations in shallow soil (e.g, 0-3 ft bgs) exceed hazardous waste criteria or exceed construction worker ESLs. Such contingent excavation would help minimize worker exposure concerns during development grading and earthwork activities. Soil removal and management during future construction will be conducted in accordance with requirements of a soil management plan.

Excavated soil will be screened for VOC impact using a portable, RAE Systems ppbRAE 3000, photo-ionization detector (PID). Field technicians will screen soil in the stockpile, within the excavator bucket, and within newly exposed soil. Soil will also be placed in a plastic bag for screening.

4.2 Excavation Procedures

Pangea's *Excavation Standard Operating Procedures* (SOPs) are provided in Appendix B. The Excavation SOPs describe procedures for:

- Excavation preparation;
- Offsite soil disposal;
- Soil backfilling;
- Soil excavation best management practices;
- Odor, dust, and noise control;
- Grading and erosion control; and
- Criteria for import of backfill material.

Note that contingent excavation will be conducted under and in accordance with the appropriate grading and construction permits obtained by the City of Livermore for the Downtown Core Development project.

4.3 Excavation Compliance Soil Sampling

Upon completion of any contingent soil excavation, PANGEA will collect soil samples from the sidewall and floor of the excavation as follows:

- Approximately one floor sample for every 250 square feet.
- Sidewall samples approximately every 50 linear feet.

The confirmation samples will be collected from areas with field indications of contamination such as visual soil discoloration and odor. Additionally, PANGEA will screen soil for sampling in the field using a photoionization detector (PID). Soil sampling will be performed in accordance with PANGEA's *Standard Field Procedures for Excavation Sampling* presented in Appendix C.

To facilitate soil sample collection from the deeper excavation, a backhoe or excavator may be used to collect soil. Soil samples for VOC analysis will be collected by EPA Method 5035A using Terracore® samplers and laboratory supplied sampling containers. Soil samples will be analyzed for the target contaminants of concern, which may include one or more of: VOCs by EPA Method 8260, PAHs/SVOCs by EPA Method 8270C, TPH by EPA Method 8015, and Title 22 Metals by EPA Method 6010. The samples will be placed into a cooler filled with ice and delivered under chain-of-custody procedures to a State-certified laboratory.

5.0 SVE GOALS, SYSTEM INSTALLATION AND TESTING

This section describes the proposed SVE goals and the tentative design, installation, and startup testing of a soil vapor extraction (SVE) system.

5.1 SVE Goals and Cleanup Levels

The primary purposes for SVE are (1) to provide source removal of subsurface VOCs in vadose-zone soil, and (2) to mitigate the potential vapor intrusion risk into the planned multifamily residential buildings. The goal is to operate SVE using a network of wells targeting the vertical extent of VOCs in soil gas within different lithological units beneath the site. The SVE system will be designed to target the primary PCE impact identified within shallow and deeper soil gas, as shown on Figures 5 and 6. More extensive remediation of shallow and deeper soil gas is not proposed because the ventilated underground parking for the planned development is an engineering control that mitigates potential vapor intrusion, and that additional engineering controls (e.g., a VOC vapor barrier with passive ventilation) can be implemented if merited. Pangea also notes that the current environmental screening level of 15 micrograms/meter ($\mu g/m^3$) PCE for residential site use is very conservative, and pending revision by the SFRWQCB in the near future to approximately 150 $\mu g/m^3$ or higher. A tentative goal for PCE mass removal rates via SVE to approach asymptotic levels and to reduce the maximum PCE concentrations in shallow and deeper soil gas by 50% or more following rebound testing with the SVE system turned off.

A secondary goal of SVE is to improve groundwater quality by removing the source of VOCs in the historic zone of VOC impact within the former perched groundwater zone approximately 28 to 36 ft bgs (Figure 7). The lowered water table due to drought conditions has likely exposed VOCs from removal via SVE. If this zone has dewatered and is amenable to SVE, a tentative goal for PCE mass removal rates via SVE to approach asymptotic levels and to reduce the maximum PCE concentrations in soil gas within the former perched zone by 50% or more following rebound testing with the SVE system turned off.

5.2 SVE System Layout

The SVE system will be installed by a licensed remediation contractor. The proposed SVE system layout is summarized on Figure 8 (plan view) and Figure 9 (cross-sectional view). A process and instrumentation diagram for the SVE system is shown on Figure 10. For cost control and efficiency, this proposed SVE system may also be designed to remediate soil gas at the adjacent Quality Cleaners case to the south and the J Cleaners case to the east.

5.3 SVE System Components

The SVE system consists of the following components:

- Ten individual SVE wells targeting different soil depths;
- Contingent additional SVE wells if merited by data gap assessment or SVE pilot testing;
- Vapor extraction conveyance piping;
- Vapor flow control vaults (at each well vault or a manifold at the extraction system compound);
- Electrical service connection;
- SVE equipment fenced compound; and
- Equipment anchorage.

5.4 SVE Extraction Network and Well Design

The SVE extraction network designed to remediate and mitigate PCE soil gas is shown on Figures 5 through 9. A total of ten SVE wells (VEMF-1/1A, VEMF-2A/2B, VEMF-3A/3B, VEMF-4A/4B, VEMF-5B, and VEMF-6B) will be screened across three permeable intervals within the vadose zone, as shown in cross section on Figure 9. The SVE system layout is based on an assumed 50-ft design radius of influence (ROI); this design radius is deemed appropriate for remedial goal and the anticipated pneumatic permeability of the targeted clayey/silty gravel with overlying/underlying fine-grained material. Reported values for the ROI typically range from 15 to 100 ft (Hutzler, 1989), with lower ROI for fine-grained soil and higher ROI for coarse-grained soil. The well locations were also selected to avoid the footprint of the buildings, facilitating possible ongoing SVE during or after site development.

The proposed screened intervals for the ten SVE wells are as follows:

- 5-10 ft bgs: VEMF-1,
- 15-20 ft bgs: VEMF-1A, VEMF-2A. VEMF-3A, and VEMF-4A, and
- 28-36 ft bgs: VEMF-2B, VEMF-3B, VEMF-4B, VEMF-5B, and VEMF-6B.

As shown on Figure 5, SVE well VEMF-1 will be screened from 5-10 ft bgs to target the primary PCE impact in *shallow* soil gas that exceeds approximately 300 µg/m^3. As shown on Figure 6, SVE wells VEMF-1A, VEMF-2A. VEMF-3A, and VEMF-4A will be screened from 15-20 ft bgs within permeable material (a sand with clay layer was identified starting at 19 ft bgs at location SG-4, and clayey soil has been identified near this depth at nearby sites); these wells target the primary PCE impact in *deeper* soil gas that exceeds approximately 1,000 µg/m^3. Deeper wells VEMF-2B, VEMF-3B, VEMF-4B, VEMF-5B, and VEMF-6B will be screened from approximately 28 to 36 ft bgs within the upper part of the historical perched groundwater zone (PCE soil gas concentrations in this zone to be determined during proposed site assessment). These deeper well locations will either function as SVE wells if dry, or as groundwater monitoring wells if water is present in the wells after installation.

The extraction piping network will consist of the following:

- Underground (or aboveground) 2-inch diameter schedule 40 PVC piping routed to the proposed SVE wells;
- Traffic-rated well vaults; and
- A piping manifold with valves and ports to facilitate vapor flow control and measurement to each extraction location.

Underground piping may be installed deep (e.g. 5 ft or more) to avoid disturbance during future construction of Veterans Park and the multifamily residences.

5.5 SVE Well Installation

SVE well installation will be conducted during implementation of the *Data Gap Assessment Workplan*. As described in the workplan, the wells will be constructed with 2-inch diameter, Schedule 40 poly vinyl chloride (PVC) casing with 0.010 or 0.020-inch factory-slotted PVC screen. A filter pack annulus of clean graded sand #3 or Monterey #2/12 sand will be placed from bottom of the well up to one foot above the top of the well screen. A two-foot well seal of bentonite will be set above the filter pack. The remaining annular space will be backfilled with Portland cement and finished with a flush-mounted well box with the oversight of a Zone 7 Water Agency inspector.

5.6 Vapor Extraction and Treatment System

The SVE system process flow and instrumentation diagram are provided in Figure 10. The final SVE blower selection will be conducted after pilot testing of SVE wells described in Section 5.7, and as merited to accommodate SVE expansion for remediation at adjacent Quality Cleaners and J Cleaners sites. A tentative proposed SVE blower proposed vapor extraction blower is the AirTech Model 3BA1900 (Appendix D). The blower is a dual-stage regenerative blower to provide higher vacuums than single-stage regenerative blowers. With a 12-horsepower motor, this blower can achieve a maximum applied vacuum of 70 inches of water with a vapor flow rate of 590 cubic feet per minute (cfm). With a 20-horsepower motor, this blower can achieve a maximum applied vacuum of 110 inches of water with a vapor flow of 450 cfm. The blower can provide 750 cubic feet per minute with free air (no applied vacuum). A variable-frequency-drive (VFD) may be provided to allow adjustment of the blower speed to control the applied vacuum and extraction flow rate to save energy and prolong the blower life.

PANGEA proposes a minimum two 1,000-lb carbon vessels connected in series to better accommodate larger system flow rates and to minimize time required between carbon change out. Alternatively, two or three 200-lb carbon vessels could be used in series if the final maximum design flow rate is determined to be 300 cfm (vessels would be special ordered to handle this flow rate). A 55-gallon water knockout vessel will allow separation of entrained water from the extraction piping. The SVE blower, carbon treatment

abatement system, and emission stack will be permitted with the Bay Area Air Quality Management District (BAAQMD).

5.7 SVE Pilot Testing

SVE pilot testing will be performed to facilitate final selection of the extraction blower, treatment system, and extraction well network. The pilot testing will evaluate the following:

- Vapor extraction flow rates and applied vacuum during testing of individual wells and/or combination of wells.
- The extent of vacuum radius of influence within nearby monitoring locations.
- VOC concentrations in SVE wells.
- VOC mass removal rates.

The testing will evaluate if the SVE well network provides vacuum influence up to 0.01 inches of water up to 50 ft away consistent with the design assumption, and help determine if additional SVE wells are merited (e.g., one additional SVE well from 15-20 ft bgs in center of the four proposed wells). The applied vacuum and measured flow rate will facilitate selection of an appropriate blower to extract from all SVE wells simultaneously, or to anticipate reduced or cyclical operation from select wells over the project lifecycle as VOC concentrations reduce. The blower selection may account for remediation of soil gas at the adjacent Quality Cleaners case to the south and the J Cleaners case to the east.

The proposed SVE test equipment includes the following:

- A 5-horsepower regenerative blower capable of applying vacuum of approximately 6 inches of mercury and a flow rate of approximately 150 cubic feet per minute (cfm);
- Two 200-lb carbon canisters plumbed in series consistent with BAAQMD requirements; and
- Aboveground conveyance piping from test wells to the equipment.

PANGEA will notify the Bay Area Air Quality Management District (BAAQMD) prior to pilot testing.

The SVE testing will include a minimum of 30 minutes of extraction on each well. The testing may extend to five days in accordance with BAAQMD testing requirements. For wells providing evaluation of the extent of VOCs in soil gas, an initial soil vapor sample will be collected after purging approximately 3 volumes of air/vapor from the extraction piping and well casing.

Air flow rates will be measured using a hot-wire anemometer inserted in a port on the pressure side of the blower. A RAE Systems MiniRAE 3000 PID calibrated to 100 part per million per volume (ppmv) isobutylene will be used to field measure VOC concentrations from the test well and the from influent, midpoint and effluent of the carbon canisters. Magnehelic pressure gauges will be used to measure the

applied vacuum and induced vacuum in the observation wells. Influent vapor samples will be collected in 1-liter Tedlar™ bags or Summa cansiters from the extraction well for the initial sampling and near the end end of individual well testing. Influent vapor samples will be submitted to a state-certified laboratory for analysis of VOCs by EPA Method 8260B or EPA Method TO-15.

Analytical and performance data will be used to calculate VOC mass removal rates.

6.0 SVE OPERATION, MAINTENANCE, MONITORING AND REPORTING PLAN

This Section describes an Operations, Maintenance, Monitoring, and Reporting Plan (OMM&R Plan) for the SVE system proposed in Section 5.0. The OMM&R Plan provides the following:

- System performance objectives/metrics;
- A schedule for maintenance and replacement of system components;
- A schedule and scope of work for routine inspections;
- Reporting requirements.

6.1 System Performance Objectives, Metrics, and Triggers

The following system performance objectives, metrics, and triggers are proposed for the SVE system:

- The SVE system will continue operating until VOC concentrations in the system influent have reached asymptotic levels, and do not significantly rebound after periods of non-operation for rebound testing purposes. At that time, active operation of the system may be discontinued. Reaching asymptotic levels is the primary performance metric for SVE. As described in Section 5.1, a tentative goal for PCE mass removal rates via SVE to approach asymptotic levels and to reduce the maximum PCE concentrations in shallow and deeper soil gas by 50% or more following rebound testing with the SVE system turned off,

- If influent VOC concentrations have sufficiently reduced when development starts, SVE operation will be discontinued. The decision to continue SVE when development starts will be based on SVE performance, residual VOC concentrations in soil gas, and engineering controls incorporated into the development project.

- If SVE operation interferes with development activities and significant source material remains, the SVE will be relocated for continued operation during or after building construction. SVE would not be resumed if the development engineering controls are deemed sufficient by the SFRWQCB.

The RWQCB will be consulted for concurrence with SVE operation status. Very extensive source removal via SVE is less important since the ventilated underground parking is an engineering control that mitigates potential vapor intrusion, and other engineering controls can be implemented.

6.2 Maintenance Schedule

The SVE equipment will be maintained in accordance with equipment manufacturer recommendations.

6.3 Routine Monitoring, Inspection, and Reporting

The SVE system monitoring, inspection, and reporting will be in accordance with information in Table B.

Table B – SVE System Monitoring, Inspection and Reporting

Purpose	Monthly	Quarterly	Annually	Notes
System Inspection	X	X	X	
System Influent/Midpoint/Effluent Sampling	PID	TO-15*, PID	TO-15*, PID	Daily monitoring with PID at startup per BAAQMD
Individual Well Monitoring	PID, Flow	PID, Flow	PID, Flow, TO-15*	TO-15 analysis after rebound testing also.
System Reporting	Startup Report	Quarterly Reporting (Year 1)	Semi-annual (after Year 1)	
Vapor Intrusion Evaluation	At Completion of Garage Foundation		TBD	Sub-slab gas sampling is anticipated after construction of the garage foundation to evaluate vapor intrusion risk.

* Optional analysis by EPA Method 8260 with 1-liter Tedlar bags where VOC concentrations exceed the reporting limits for this method.

The routine system inspection and monitoring will include the following:

- Visual inspection of system components for damage, leakage, and excess noise/vibration.
- Blower maintenance and lubrication per manufacturer specifications.
- Measurement of water accumulation in the air/water knock out vessel, and emptying of knock out vessel into 55-gallons drums for offsite disposal.
- Measurement of applied vacuum, PID readings, and vapor flow for the system to evaluate system performance can compliance with permit requirements.
- Measurement of applied vacuum, PID readings, and vapor flow for individual SVE wells to assist with system optimization.
- PID measurement of system influent, midpoints, and effluent to evaluate carbon treatment capacity and schedule carbon vessel change-out and to maintain permit compliance.
- Collection of vapor samples for analysis by EPA Method TO-15 (per schedule).

Non-routine inspections may be required to monitor the following:

- Excessive water accumulation in the knockout vessel, especially during rain periods.
- Carbon treatment performance during system startup.
- Blower operational status during periods of blower operational issues.

6.4 Trigger for Discontinuance of SVE

The proposed triggers for discontinuation of active SVE are described in Sections 5.1 and 6.1.

7.0 REPORTING

Pangea proposes preparation of the following reports following IRAP implementation:

- A *SVE System Startup Report* following system installation and startup.
- Periodic *SVE Operation Reports* will be prepared in accordance with the proposed operation, maintenance, monitoring and reporting plan described above.
- A *Source Removal* report following completion of any contingent source soil excavation.
- *Site Management Plan* to provide guidelines for the protection of human health and the environment during potential future handling of and exposure to site soil and soil vapor.

8.0 REFERENCES

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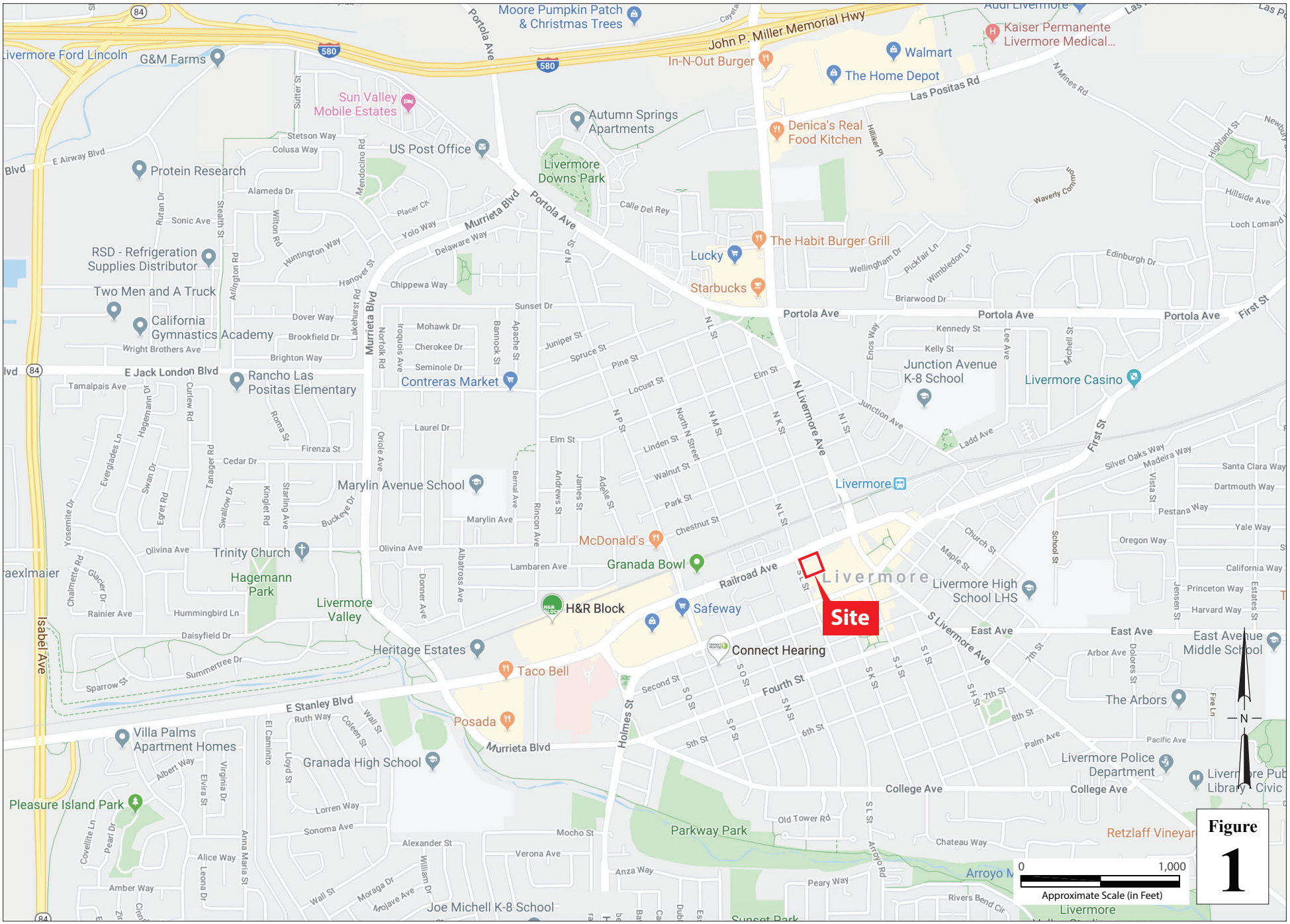
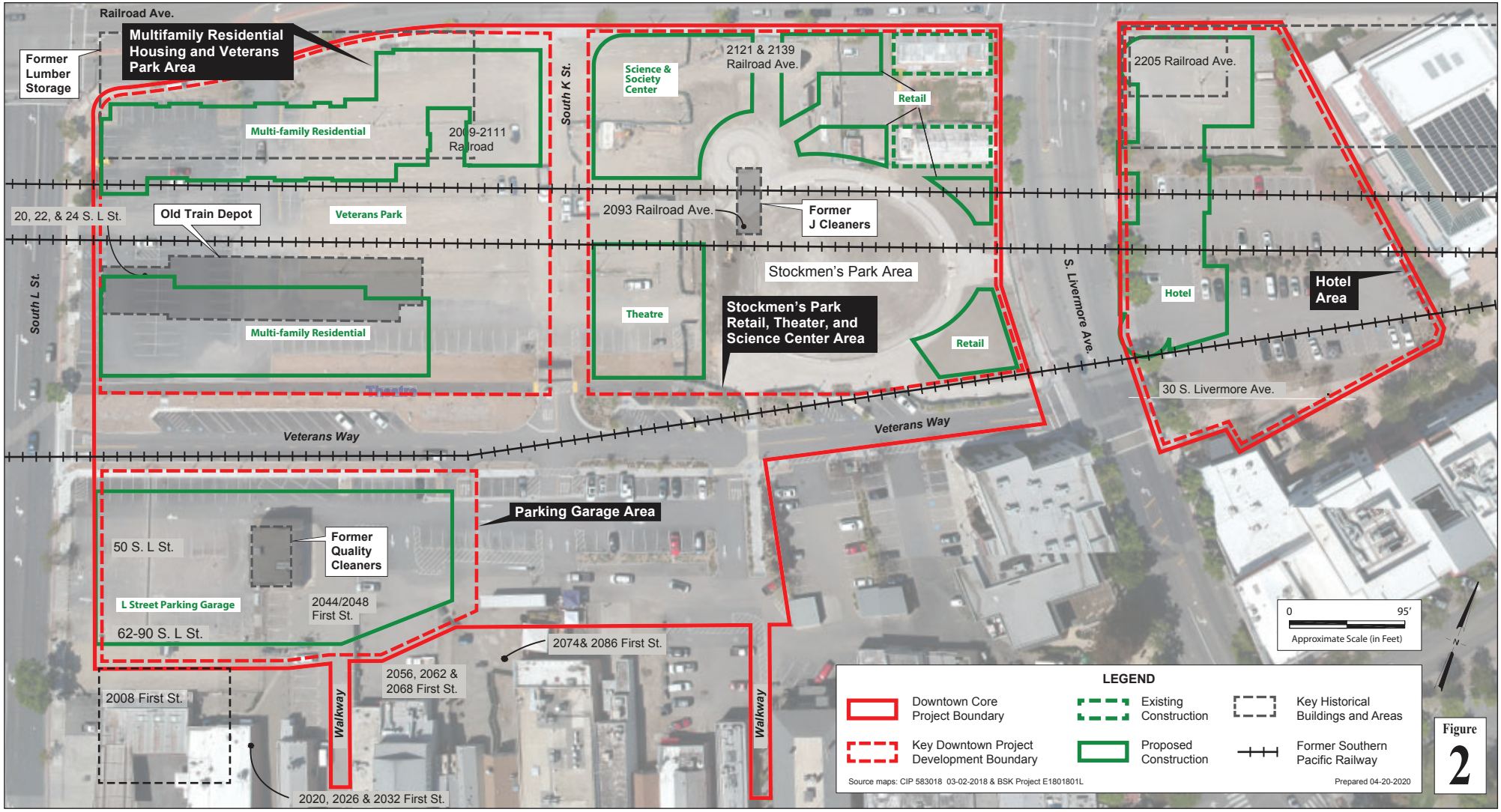


Figure 1

Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

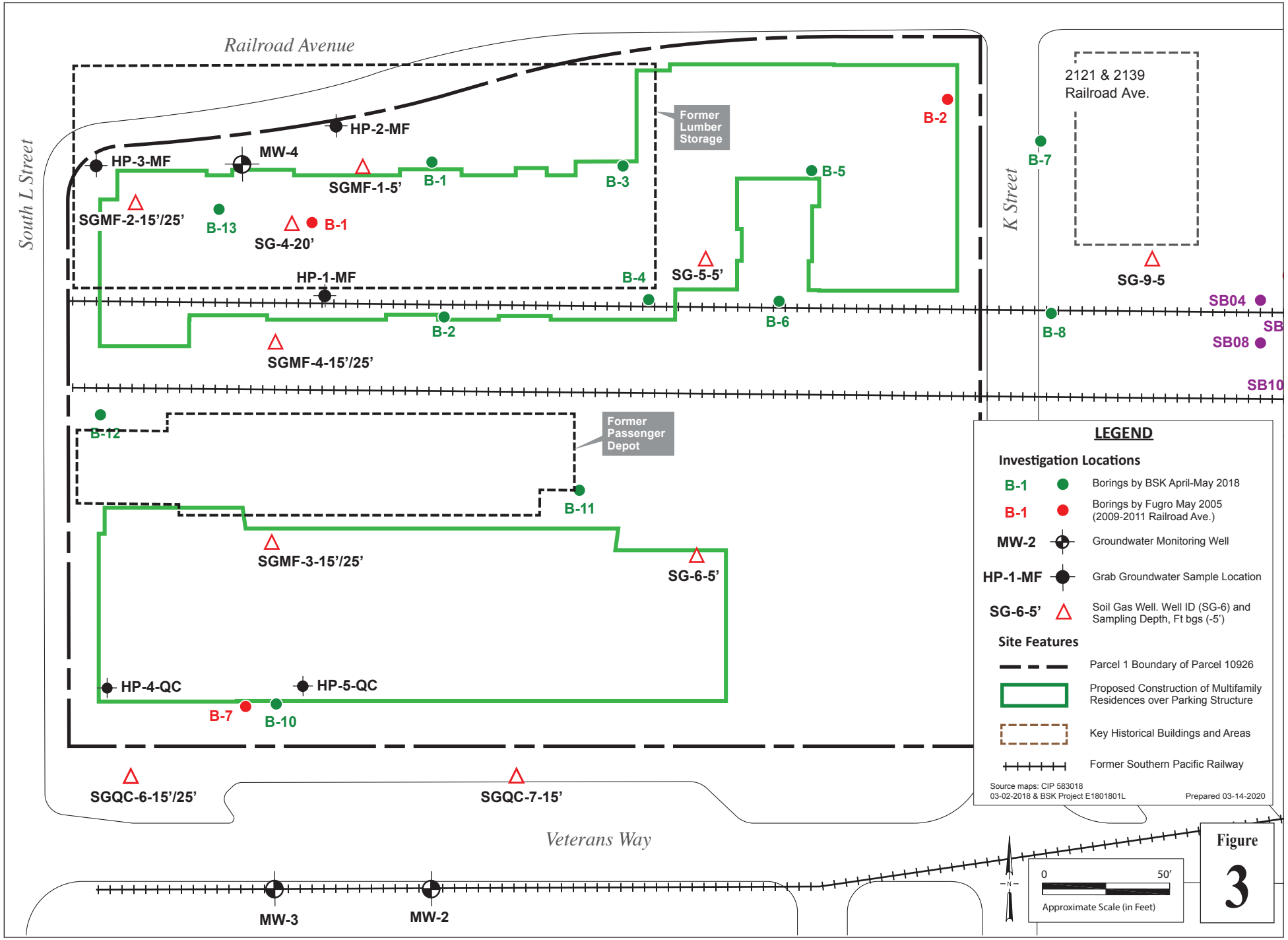
Vicinity Map



Downtown Core Project Area
Livermore, California

PANGEA

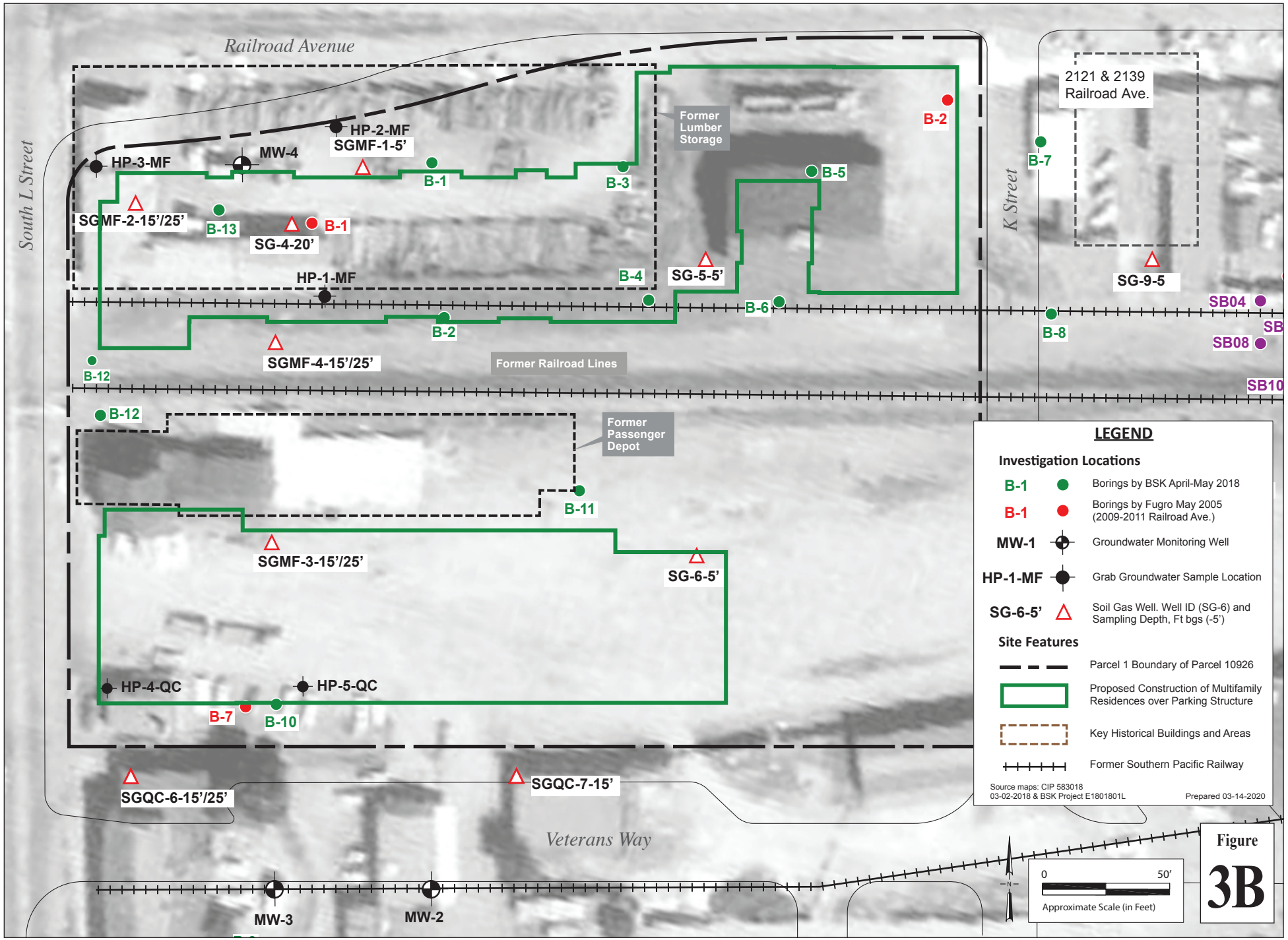
Downtown Core Project Area



Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

Site Map



Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

Site Historical Use

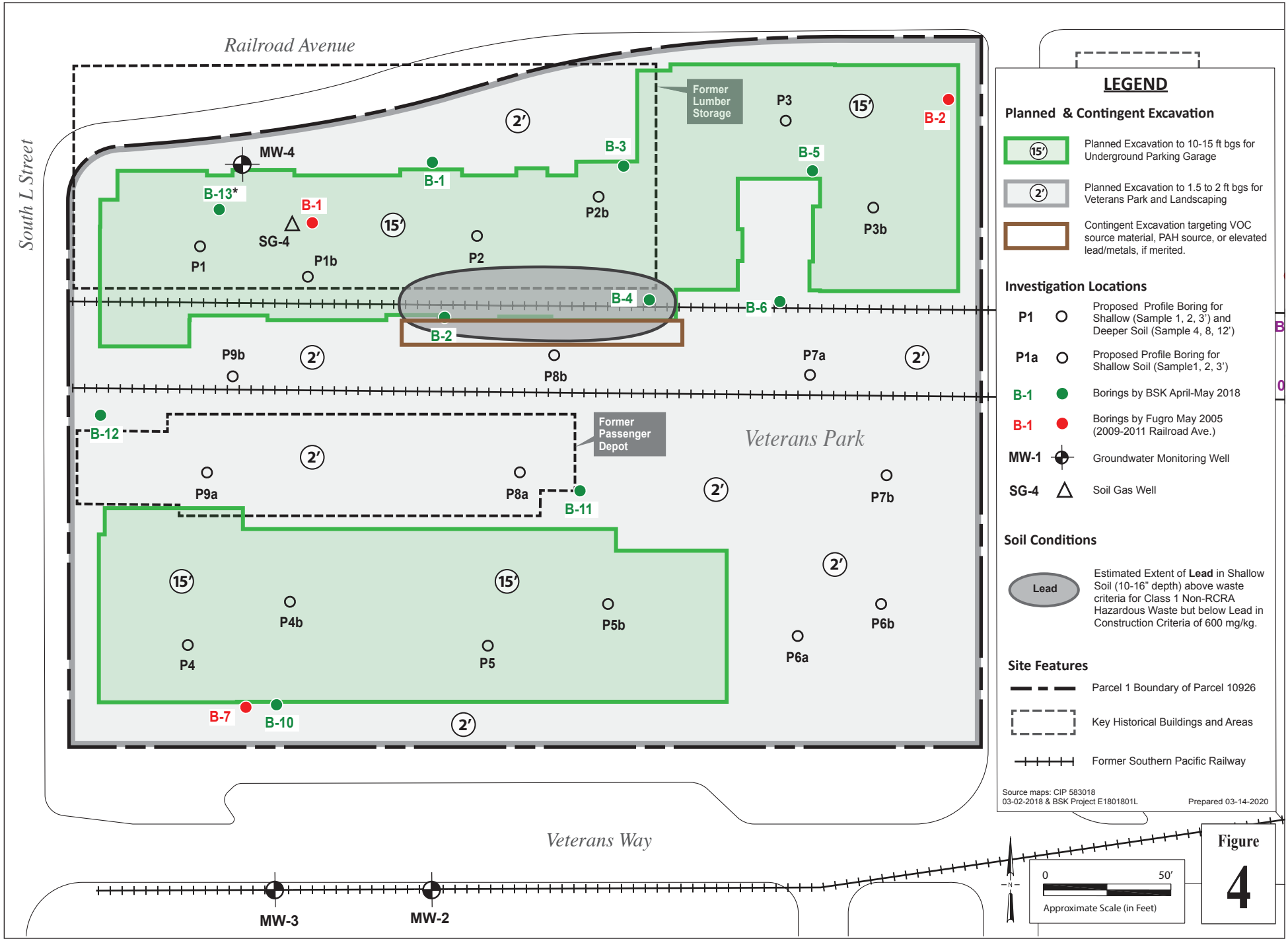
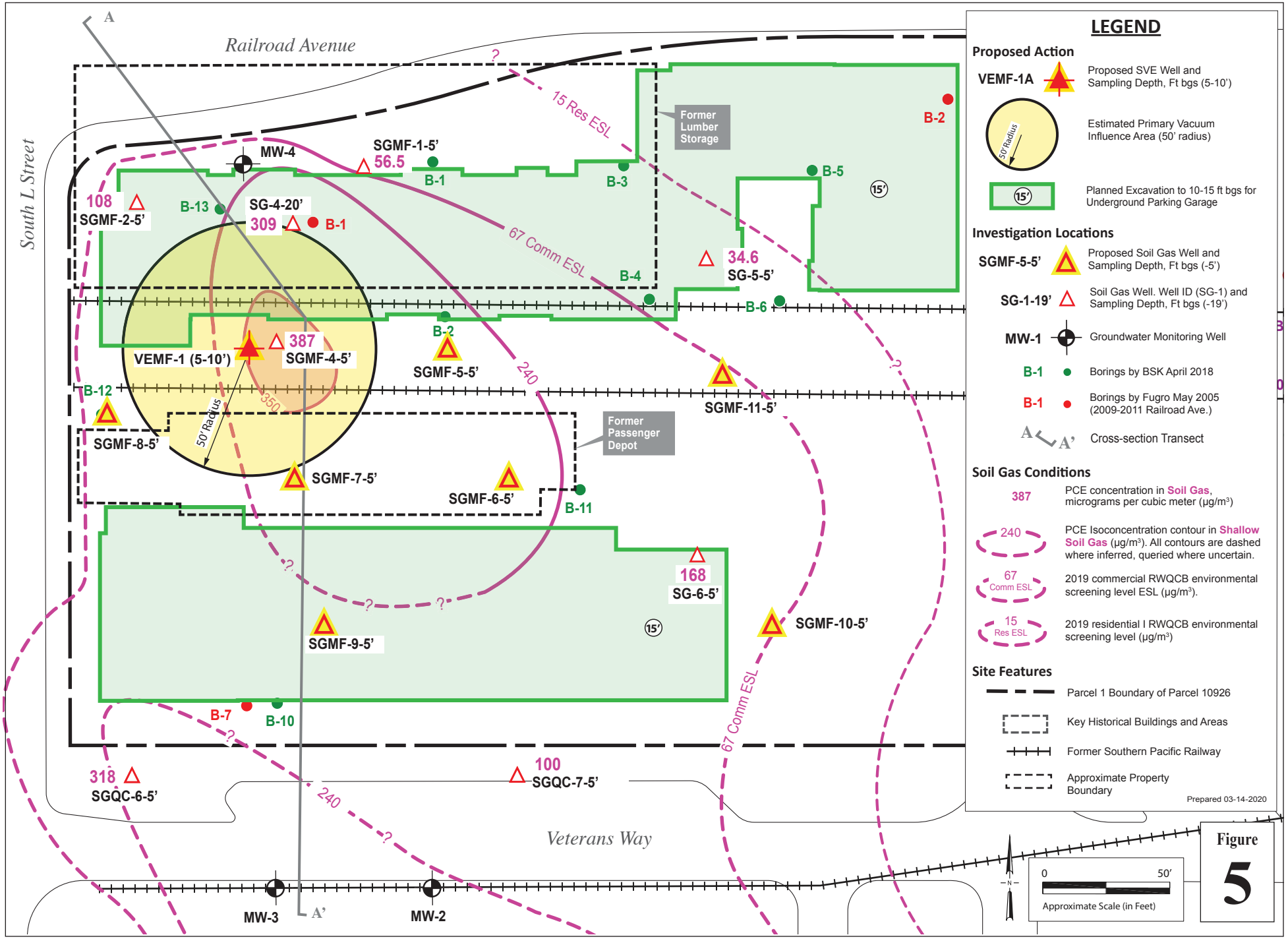


Figure 4

Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

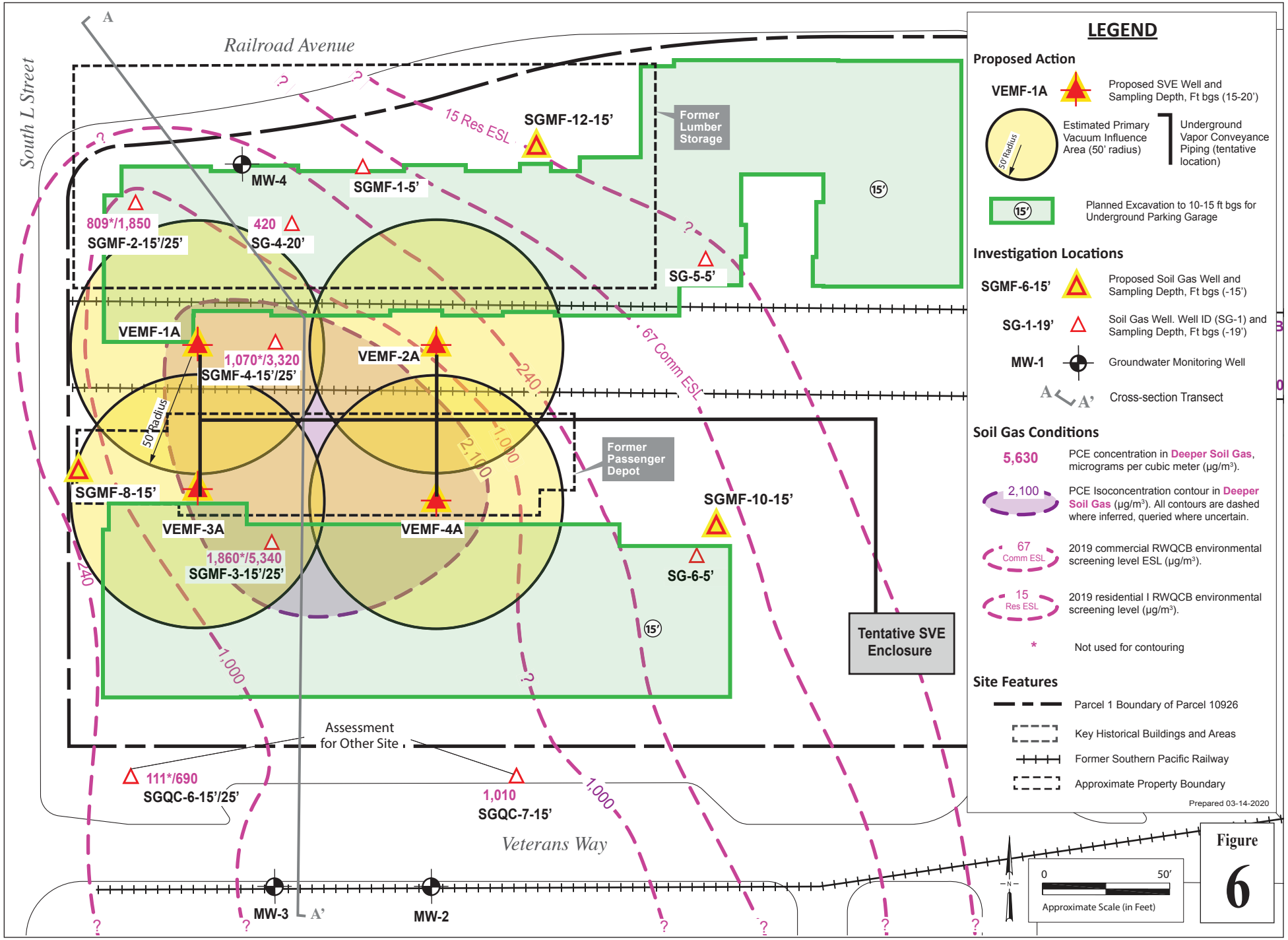
Planned and Contingent Excavation



Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

Proposed SVE in Shallow Soil (5-10 ft bgs)



Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

Proposed SVE in Deeper Soil (15-20 ft bgs)

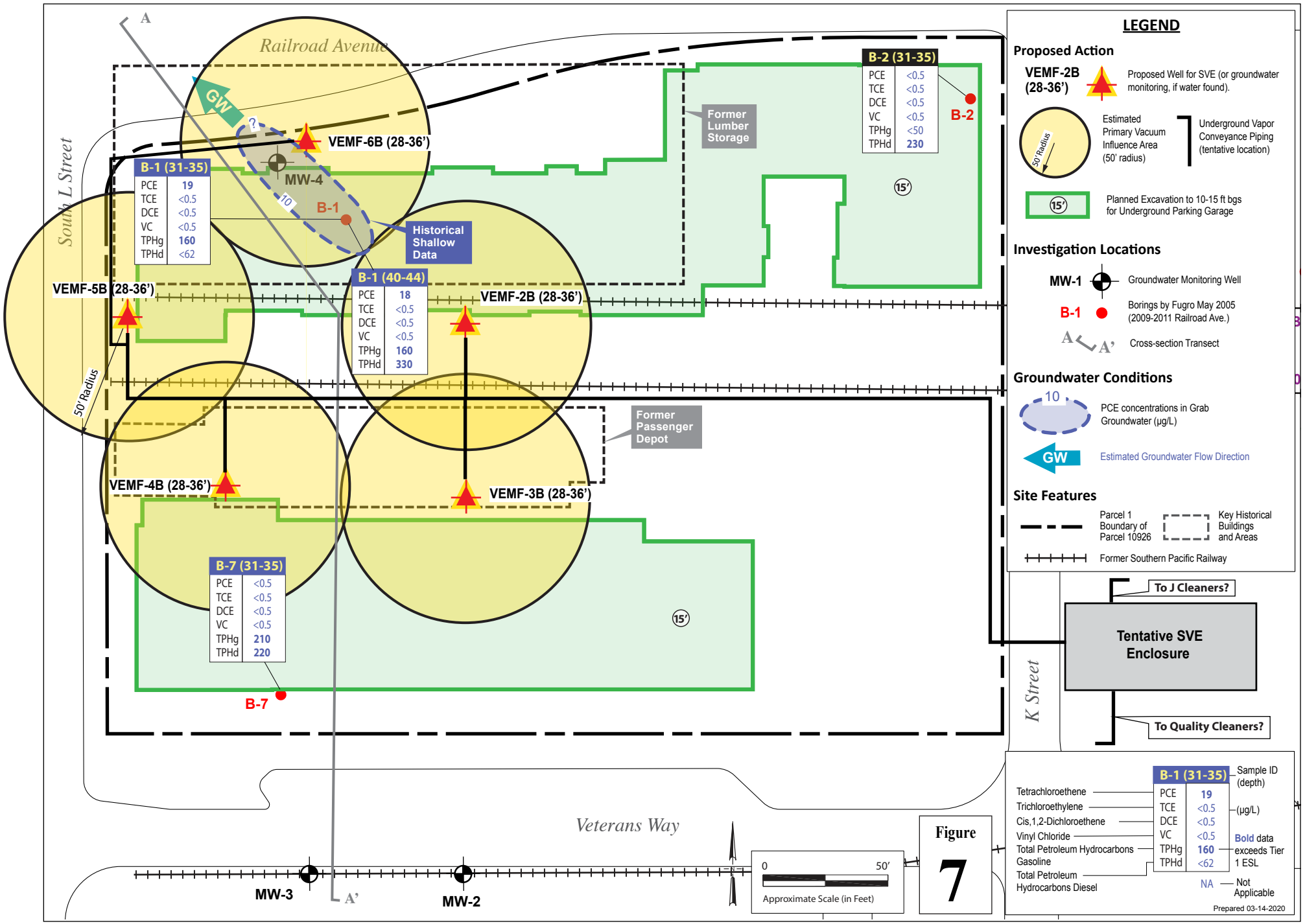


Figure 7

Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

Proposed SVE in Historical Perched Groundwater Zone (28-36')

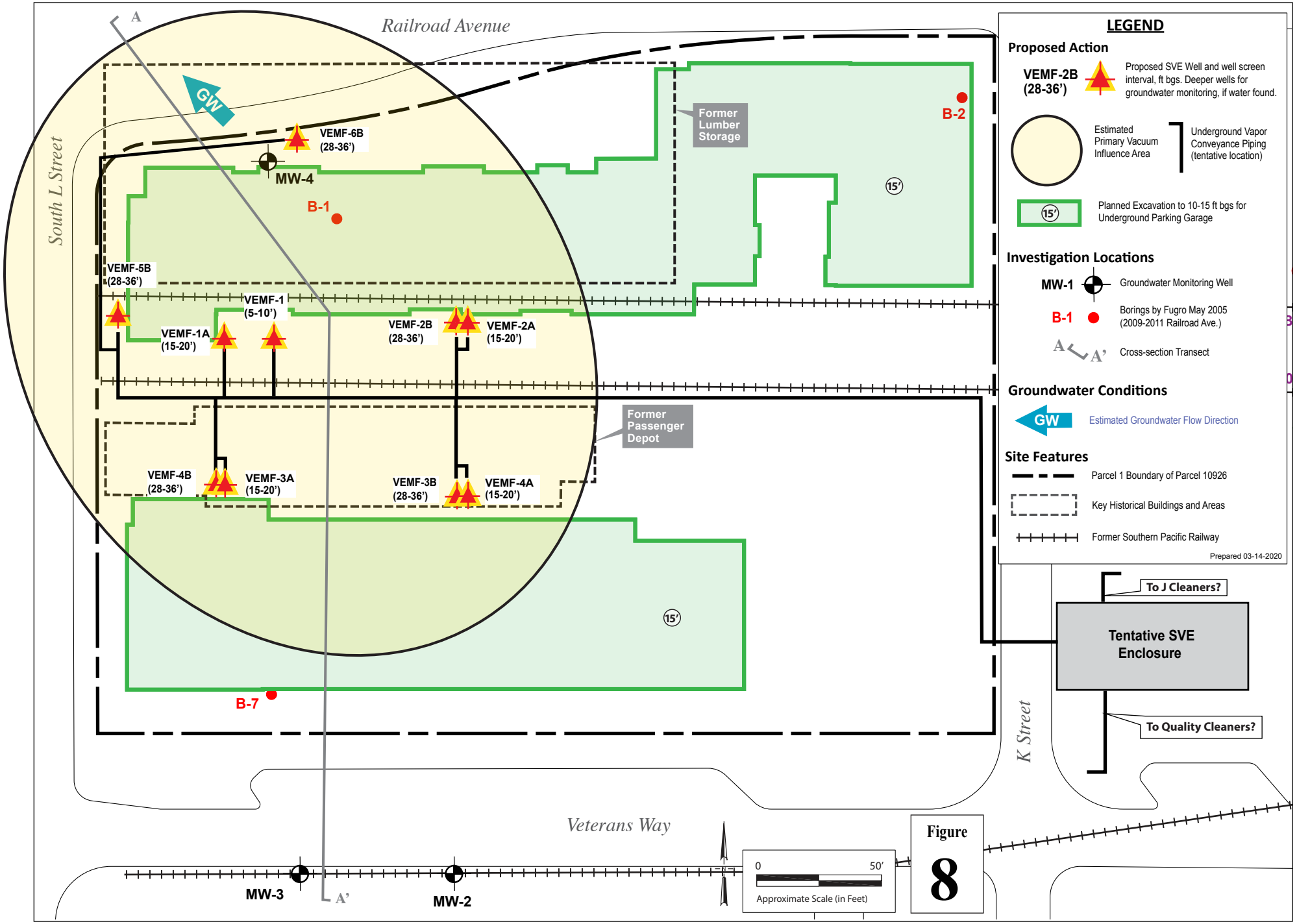


Figure
8

Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

Proposed SVE System Layout

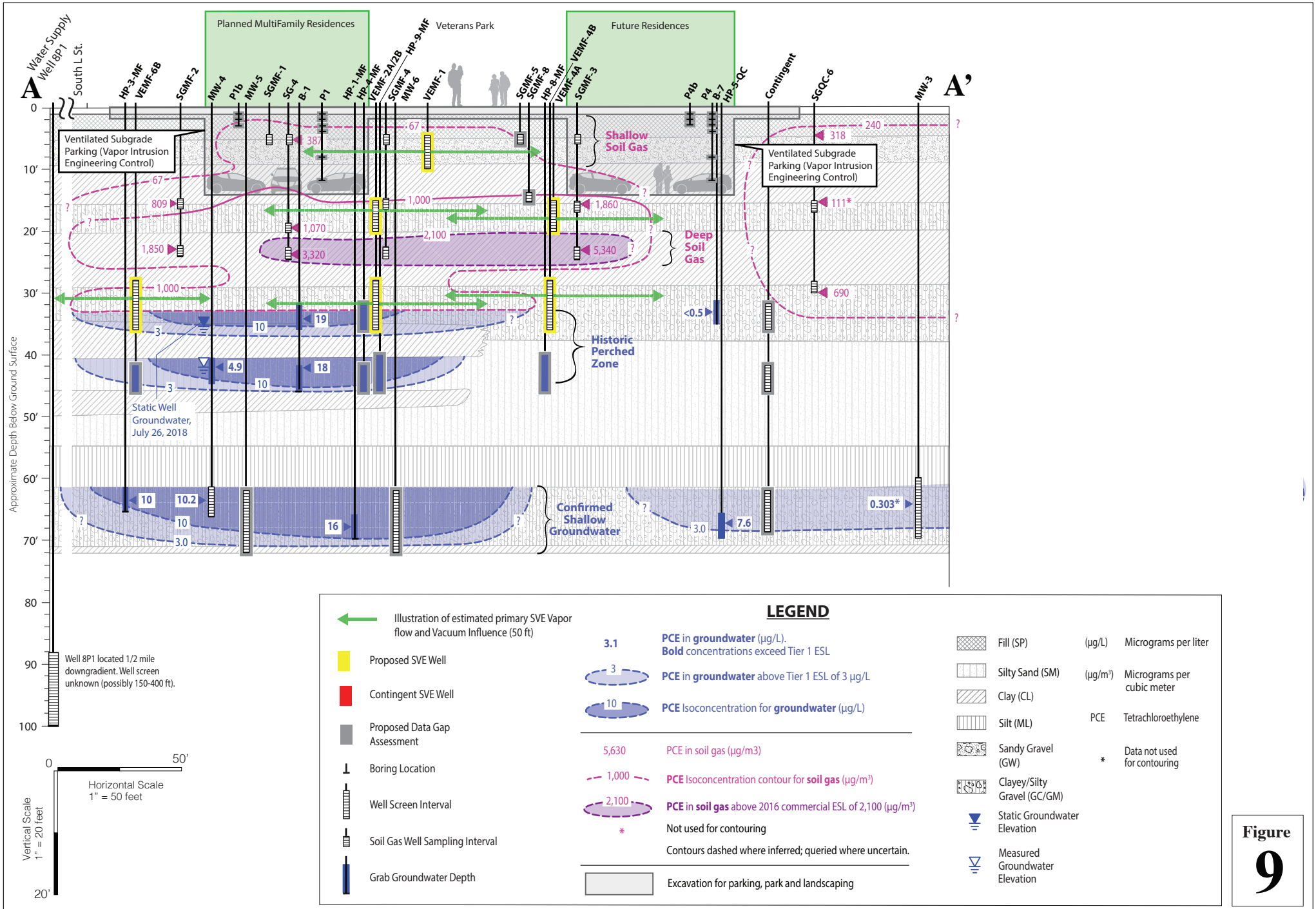


Figure 9

Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

Proposed SVE in Cross Section

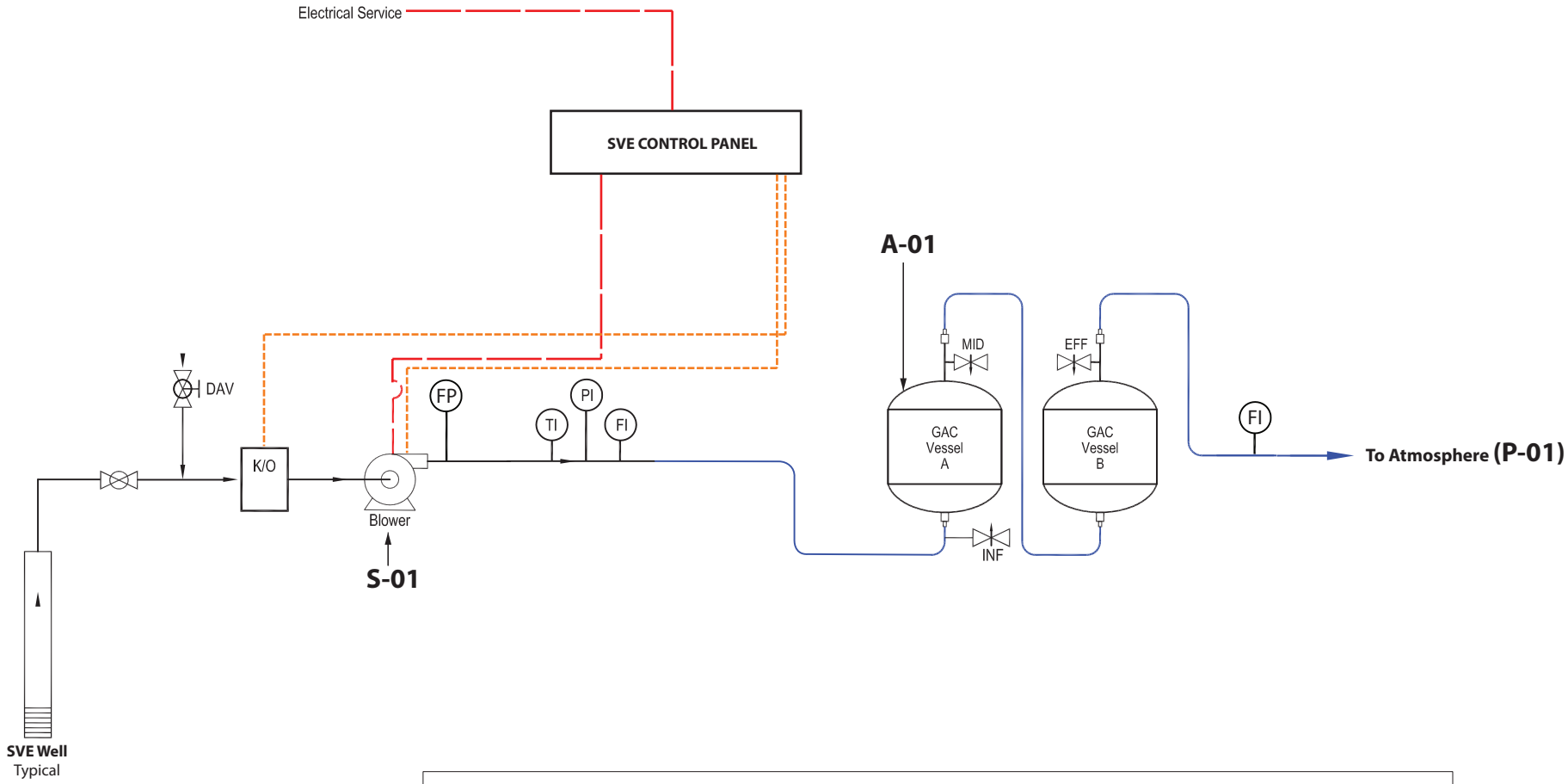


Figure
10

Old Train Depot
20, 24 & 24 L Street & 2009-2073 Railroad Avenue
Livermore, California

PANGEA

SVE System Process and Instrumentation Diagram

Table 1. Well Construction Details - Old Train Depot, Livermore Downtown Core Development, Livermore, California

Well ID	Well Type	Total Depth (ft bgs)	Screened Interval (ft bgs)	Slot Size (in)	Boring Diamater (in)	Casing Diam. (in)	Well Location for Monitoring	Well Status
GROUNDWATER MONITORING WELLS								
Quality Cleaners								
MW-1	Mon	60	55-60	0.010	7	1	Quality Cleaners, Central	Unknown
MW-2	Mon	72	60-72	0.020	8	2	Quality Cleaners, North	Unknown
MW-3	Mon	72	60-72	0.020	8	2	Quality Cleaners, North	Unknown
Old Train Depot								
MW-4	Mon	67	62-67	0.010	8 (0-41 ft bgs) 2.5 (41-67 ft bgs)	2	Old Train Depot, Northwest	Unknown
SOIL GAS WELLS								
Old Train Depot								
SG-4-5	Soil Gas	5	4.5-5	--	3.25	0.25	Old Train Depot, Northwest	Unknown
SG-4-20	Soil Gas	20	19.5-20	--	3.25	0.25	Old Train Depot, Northwest	Unknown
SG-5-5	Soil Gas	5	4.5-5	--	3.25	0.25	Old Train Depot, Central	Unknown
SG-6-5	Soil Gas	5	4.5-5	--	3.25	0.25	Old Train Depot, Central	Unknown
SGMF-1-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	Old Train Depot, Northwest	Unknown
SGMF-2-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	Old Train Depot, Northwest	Unknown
SGMF-2-15	Soil Gas	15.5	14.5-15.5	--	3.25	0.25	Old Train Depot, Northwest	Unknown
SGMF-2-25	Soil Gas	25.5	24.5-25.5	--	3.25	0.25	Old Train Depot, Northwest	Unknown
SGMF-3-15	Soil Gas	15.5	14.5-15.5	--	3.25	0.25	Old Train Depot, Central	Unknown
SGMF-3-25	Soil Gas	25.5	24.5-25.5	--	3.25	0.25	Old Train Depot, Central	Unknown
SGMF-4-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	Old Train Depot, Central	Unknown
SGMF-4-15	Soil Gas	15.5	14.5-15.5	--	3.25	0.25	Old Train Depot, Central	Unknown
SGMF-4-25	Soil Gas	25.5	24.5-25.5	--	3.25	0.25	Old Train Depot, Central	Unknown
Quality Cleaners								
SGQC-6-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	Quality Cleaners, North	Unknown
SGQC-6-15	Soil Gas	15.5	14.5-15.5	--	3.25	0.25	Quality Cleaners, North	Unknown
SGQC-6-30	Soil Gas	30.5	29.5-30.5	--	3.25	0.25	Quality Cleaners, North	Unknown
SGQC-7-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	Quality Cleaners, North	Unknown
SGQC-7-15	Soil Gas	15.5	14.5-15.5	--	3.25	0.25	Quality Cleaners, North	Unknown
J Cleaners								
SGJC-1R-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, Central	Active
SG-7R-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, Southwest	Active
SG-9R-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, West	Active
SG-9-15	Soil Gas	15.5	14.5-15.5	--	2.5	0.25	J Cleaners, West	Active
SG-10R-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, Northeast	Active
SG-11R-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, East Central	Active
SG-11-15	Soil Gas	15.5	14.5-15.5	--	2.5	0.25	J Cleaners, East Central	Active
SG-12R-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, East	Active
SG-20-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, Southwest	Active
SG-20-15	Soil Gas	15.5	14.5-15.5	--	2.5	0.25	J Cleaners, Southwest	Active
SG-21-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, East	Active
SG-22-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, Northeast	Active
SG-23-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, Northeast	Active
SG-26-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, Northwest	Active
SG-27-15	Soil Gas	15.5	14.5-15.5	--	2.5	0.25	J Cleaners, Central	Active
SG-28-5	Soil Gas	5.5	4.5-5.5	--	3.25	0.25	J Cleaners, Central	Active
SG-28-15	Soil Gas	15.5	14.5-15.5	--	2.5	0.25	J Cleaners, Central	Active

Notes:
ft bgs = measured in feet below ground surface
-- = not applicable, not available

Pangea

Table 2. Soil Analytical Data - Old Train Depot, Livermore Downtown Core Development, Livermore, California

Boring / Sample ID	Date Sampled	Sample Depth (ft bgs)	TPHg	TPHd	TPHmo	Benzene	Toluene	Ethylbenzene	Total Xylenes	PCE	TCE	Cis-1,2-DCE	Trans-1,2-DCE	Vinyl Chloride	Other VOCs	Arsenic	Total Chromium	Chromium STLC (mg/L)	Lead	Lead STLC (mg/L)	Nickel	Nickel STLC (mg/L)	Other Metals	Chlorinated Herbicides	Notes
			mg/kg																						
Tier 1 ESL:			**100**	**260**	**1,600**	**0.025**	**3.2**	**0.4**	**2.1**	**0.08**	**0.085**	**0.19**	**0.65**	**0.0015**	**varies**	**0.067**	**160**	--	**32**	--	**86**	--	varies	varies	
Direct Exposure, Construction Worker ESL			1,800	1,100	54,000	33	4,700	540	2,400	33	130	78	570	3.4	varies	2.00	--	--	160	--	86	--	**varies**	**varies**	
Direct Exposure, Residential, Shallow Soil ESL			430	260	12,000	0.33	1,100	5.9	580	0.59	0.95	19	130	0.0083	varies	0.067	--	--	80	--	820	--	varies	varies	
Background Levels[1]:			--	--	--	--	--	--	--	--	--	--	--	--	--	**19.1**	**99.6**	--	**16.1**	--	**119.8**	--	**varies**	--	
2009-2111 Railroad Ave, Fugro, 2005																									
B-1	5/2/2005	0.5	<1	35	110	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<1	30	--	12	--	58	--	+	--	
		3.0	<1	11	40	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<1	--	--	11	--	--	--	--	--	
B-7	5/3/2005	0.5	<1	43	99	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<1	32	--	**44**	--	60	--	+	+	
		3.0	<1	2.8	6.8	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<1	--	--	5.2	--	--	--	--	--	
Various Addresses, BSK, April 2018																									
B-1	4/13/2018	0"-6"	--	5.4	70	--	--	--	--	--	--	--	--	--	--	**7.5**	38	--	**56**	1.8	**81**	--	+	ND	
		10"-16"	--	4.6	24	--	--	--	--	--	--	--	--	--	--	**6.2**	39	--	**65**	2.7	**77**	--	+	ND	
		18"-24"	--	13	60	--	--	--	--	--	--	--	--	--	--	**8.1**	40	--	**100**	3.9	**74.0**	--	+	ND	
B-2	4/13/2018	0"-6"	--	6.2	22	--	--	--	--	--	--	--	--	--	--	**2.8**	30	--	19	--	**68**	--	+	ND	
		10"-16"	--	33	200	--	--	--	--	--	--	--	--	--	--	**55 a**	13	--	**170 b**	9.5	**23**	--	+	ND	
		18"-24"	--	16	78	--	--	--	--	--	--	--	--	--	--	**11**	21	--	**93**	2.1	**46**	--	+	ND	
B-3	4/13/2018	0"-6"	--	6.4	40	--	--	--	--	--	--	--	--	--	--	**20 a**	41	--	**89**	3.0	**96**	--	+	ND	
		10"-16"	--	4.7	32	--	--	--	--	--	--	--	--	--	--	**5.9**	47	--	**120**	1.6	**120 c**	--	+	ND	
		18"-24"	--	8.1	22	--	--	--	--	--	--	--	--	--	--	**8.4**	37	--	**140**	4.3	**90**	--	+	ND	
B-4	4/13/2018	0"-6"	--	4.6	23	--	--	--	--	--	--	--	--	--	--	**5.0**	56	<0.50	**58**	2.1	**110**	--	+	ND	
		10"-16"	--	29	120	--	--	--	--	--	--	--	--	--	--	**28 a**	30	--	**200 b**	7.3	**66**	--	+	ND	
		18"-24"	--	2.3	<2.0	--	--	--	--	--	--	--	--	--	--	**6.4**	36	--	**130**	2.8	**86**	--	+	ND	
B-5	4/13/2018	0"-6"	--	60	280	--	--	--	--	--	--	--	--	--	--	**7.1**	43	--	**41**	--	**98**	--	+	ND	
		10"-16"	--	3.9	24	--	--	--	--	--	--	--	--	--	--	**5.0**	52	<0.50	22	--	**130 c**	--	+	ND	
		18"-24"	--	4.6	16	--	--	--	--	--	--	--	--	--	--	**7.7**	45	--	27	--	**130 c**	--	+	ND	
B-6	4/16/2018	0"-6"	--	3.0	18	--	--	--	--	--	--	--	--	--	--	**4.6**	62	<0.50	11	--	**140 c**	--	+	ND	
		10"-16"	--	9.0	24	--	--	--	--	--	--	--	--	--	--	**8.4**	44	--	**43**	--	**100**	--	+	ND	
		18"-24"	--	11	34	--	--	--	--	--	--	--	--	--	--	**7.5**	38	--	**41**	--	**94**	--	+	ND	
B-10	4/16/2018	0"-6"	--	3.0	19	--	--	--	--	--	--	--	--	--	--	**2.6**	32	--	<6.3	--	**43**	--	+	--	
		10"-16"	--	<1.0	<2.0	--	--	--	--	--	--	--	--	--	--	**3.2**	76	<0.20	8.8	--	**160 c**	--	+	--	
		18"-24"	--	2.6	6.0	--	--	--	--	--	--	--	--	--	--	**3.0**	57	<0.50	9.0	--	**370 c**	1.9	+	--	
B-11	4/17/2018	0"-6"	--	17	120	--	--	--	--	--	--	--	--	--	--	**7.3**	36	--	**63**	1.6	**74**	--	+	--	
		10"-16"	--	14	72	--	--	--	--	--	--	--	--	--	--	**5.1**	30	--	**120**	3.8	**46**	--	+	--	
		18"-24"	--	5.3	15	--	--	--	--	--	--	--	--	--	--	**3.6**	18	--	**55**	1.4	**32**	--	+	--	
B-12	4/17/2018	0"-6"	--	6.1	53	--	--	--	--	--	--	--	--	--	--	**3.2**	25	--	<6.3	--	**53**	--	+	--	
		10"-16"	--	37	130	--	--	--	--	--	--	--	--	--	--	**48 a**	67	<0.50	7.3	--	**120 c**	--	+	--	
		18"-24"	--	37	100	--	--	--	--	--	--	--	--	--	--	**18**	52	<0.50	7.0	--	**140 c**	--	+	--	
B-13	4/17/2018	0"-6"	--	12	18	--	--	--	--	--	--	--	--	--	--	**2.6**	30	--	<6.3	--	**55**	--	+	--	
		10"-16"	--	<1.0	<2.0	--	--	--	--	--	--	--	--	--	--	**2.9**	55	<0.50	9.0	--	**160 c**	--	+	--	
		18"-24"	--	3.1	42	--	--	--	--	--	--	--	--	--	--	**3.4**	52	<0.50	<6.3	--	**140 c**	--	+	--	
Multifamily Residences Area, Pangea, 2018																									
SG-4-3	6/20/2018	3.0	<1.0	<1.0	<5.0	--	--	--	--	--	--	--	--	--	--	**4.0**	54	0.18	7.1	--	**140**	--	+	--	
SG-4-6	6/20/2018	6.0	<1.0	<1.0	<5.0	--	--	--	--	--	--	--	--	--	--	**3.3**	50	<0.10	4.7	--	**110**	--	+	--	
SG-4-12	6/20/2018	12.0	<1.0	<1.0	<5.0	--	--	--	--	--	--	--	--	--	--	**4.3**	48	--	5.3	--	**120**	--	+	--	
SGMF-2-23	11/14/2018	23.0	--	--	--	<3.8	<3.8	<3.8	<7.6	<3.8	<3.8	<3.8	<3.8	<3.8	<3.8	--	--	--	--	--	--	--	--	--	

Notes and Abbreviations:

TPH = total petroleum hydrocarbons as gasoline (TPHg), diesel (TPHd), and/or motor oil (TPHmo) range

PCE = tetrachloroethene

TCE = trichloroethene

DCE = dichloroethene

Other VOCs = volatile organic compounds not otherwise listed

ft bgs = feet below ground surface

mg/kg = milligrams per kilogram

< n = Chemical not present at a concentration in excess of detection limit shown.

+ = chemicals detected at relatively low concentrations. See laboratory reports for details.

-- = not applicable

ND = Not Detected at levels above laboratory reporting limits. Limits vary by constituent.

ESL = Environmental Screening Level, from California Regional Water Quality Control Board - San Francisco Bay Region, Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, January 2019 (Revision 2).

1 = background levels taken from *Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory* - revised April 2009.

BOLD = Analyte detected above Tier 1 ESL.

GREY HIGHLIGHT = Analyte concentration exceeds construction worker ESL and background level if applicable (see notes a, b, c).

RED HIGHLIGHT = Analyte concentration exceeds criteria for waste soil classification as Class I Non-RCRA (California) hazardous waste.

a = 95UCL concentration of arsenic (14 mg/kg) for the April 2018 BSK data set is below local background concentration of 19.1 mg/kg.

b = 95UCL concentration of lead (75 mg/kg) for the April 2018 BSK data set is below construction worker ESL of 160 mg/kg.

c = 95 UCL concentration of nickel (110 mg/kg) for the April 2018 BSK data set is below local background concentration of 119.8 mg/kg.

Pangea

Table 3. Groundwater Analytical Data - Old Train Depot, Livermore Downtown Core Development, Livermore, California

Sample / Boring ID *(TOC Elevation)*	Date Sampled	Sample Depth / Screened Interval (ft bgs)	Depth to Water (feet bTOC)	Groundwater Elevation (feet amsl)	TPHg	TPHd	TPHmo	Benzene	Naphthalene	PCE	TCE	Cis-1,2-DCE	Trans-1,2-DCE	Vinyl Chloride	Chloroform	Other VOCs	Notes
					µg/L												
				Tier 1 ESL:	**100**	**100**	**--**	**0.42**	**0.17**	**0.64**	**1.2**	**6.0**	**10**	**0.0086**	**0.81**	**--**	
2009-2111 Railroad Ave, Fugro, May 2005																	
B-1	5/2/2005	31-35	--	--	**160**	<62	<62	<0.5	--	**19**	<0.5	<0.5	<0.5	<0.5	<0.5	ND	Grab data
	5/2/2005	40-44	--	--	**160**	**330**	480	<0.5	--	**18**	<0.5	<0.5	<0.5	<0.5	<0.5	ND	Grab data
B-2	5/2/2005	31-35	--	--	<50	**230**	72	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	Grab data
B-3	5/2/2005	31-35	--	--	**160**	<56	<56	<0.5	--	**6.8**	<0.5	<0.5	<0.5	<0.5	<0.5	ND	Grab data
B-4	5/2/2005	31-35	--	--	**170**	<57	<57	<0.5	--	**34**	1.0	<0.5	<0.5	<0.5	<0.5	ND	Grab data
B-6	5/2/2005	31-35	--	--	**170**	<56	<56	<0.5	--	**31**	0.91	<0.5	<0.5	<0.5	0.54	<0.5	Grab data
B-7	5/2/2005	31-35	--	--	**210**	**220**	130	<0.5	--	<0.5	<0.5	<0.5	<0.5	<0.5		+	Grab data
Quality Control Samples																	
Duplicate-1(B-1)	5/2/2005	31-35	--	--	**160**	--	--	<0.5	--	**21**	<0.5	--	--	--	--	ND	Grab data. Control sample.
Duplicate-2(B-3)	5/2/2005	31-35	--	--	**150**	<54	56	<0.5	--	**4.8**	<0.5	--	--	--	--	ND	Grab data. Control sample.
Duplicate-3(B-4)	5/2/2005	31-35	--	--	**160**	<59	<59	<0.5	--	**32**	0.88	--	--	--	--	ND	Grab data. Control sample.
Monitoring Well, Pangea, 2018																	
MW-4 *484.31*	7/26/2018	62-67	36.71	447.60	**--**	--	--	<0.102	0.117	**10.2**	0.138	<0.114	<0.104	<0.129	0.708	<3.45	Well sample after development.
Grab Groundwater Samples, Pangea, 2018																	
MW-4	7/11/2018	41-45	41.00	--	**--**	--	--	<0.50	<0.50	**4.9**	<0.50	<0.50	<0.50	<0.50	**1.3**	a	Perched zone grab data.
HP-1-MF	11/12/2018	66-70	50.10	--	**--**	--	--	<0.5	<2.0	**16**	<0.5	<0.5	<0.5	<0.5	0.60	<1.0	Grab data
HP-2-MF	11/13/2018	66-70	46.80	--	**--**	--	--	<0.5	<0.5	**4.6**	<0.5	<0.5	<0.5	<0.5	0.77	<0.5	Grab data
HP-3-MF	11/13/2018	62-70	52.00	--	**--**	--	--	<0.5	<0.5	**10**	<0.5	<0.5	<0.5	<0.5	0.72	<0.5	Grab data
HP-4-QC	11/8/2018	66-70	52.00	--	**--**	--	--	<0.331	<1.0	**3.21**	1.20	<0.260	<0.396	<0.259		--	Upgradient of Old Train Depot
HP-5-QC	11/12/2018	66-70	45.30	--	**--**	--	--	<0.5	<2.0	**7.6**	<0.5	<0.5	<0.5	<0.5		+	Upgradient of Old Train Depot

Notes & Abbreviations:

TOC Elevation - Top of casing elevation surveyed on October 5, 2018 by Virigl Chvez Land Surveying using NAVD 88 benchmark elevation. Reported in feet above mean sea level.

TPH = Total petroleum hydrocarbons as gasoline (TPHg), diesel (TPHd), and/or motor oil (TPHmo) range

PCE = Tetrachloroethene

TCE = Trichloroethene

DCE = Dichloroethene

Other VOCs = Volatile organic compounds not otherwise listed

ft bgs = Feet below ground surface

µg/L = Micrograms per liter

< n = Chemical not present at a concentration in excess of detection limit shown.

-- = Nt applicable or not available

ND = Not Detected at levels above laboratory reporting limits. Limits vary by constituent.

ESL = Environmental Screening Level, from California Regional Water Quality Control Board - San Francisco Bay Region, Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, January 2019 (Revision 2).

a= Bromodichloromethane detected at 0.57 ug/L, below its Tier 1 ESL of 0.87 ug/L.

BOLD = Analyte detected above Tier 1 ESL.

Pangea

Table 4. Soil Gas Analytical Data - Old Train Depot, Livermore Downtown Core, Livermore, CA

Boring / Sample ID	Date Sampled	Sample Depth (ft bgs)	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	Benzene	Ethylbenzene	TPH (Low Fraction)	2-Propanol (Leak Check)	Other VOCs	Notes	
			µg/m³											
		Tier 1 ESL:	**15**	16	280	2,800	0.32	3.2	37	--	--	--		
		Residential ESL for Vapor Intrusion Human Health Risk:	**15**	16	280	2,800	0.32	3.2	37	--	--	--		
		Commercial ESL for Vapor Intrusion Human Health Risk:	**67**	100	1,200	12,000	5.2	14	160	--	--	--		
Multifamily, Pangea, June 2018														
SG-4-5	6/22/2018	5.0	**309**	<1.07	<0.793	<0.793	<0.511	0.997	2.35	551	5.04	a		
SG-4-20	6/22/2018	20.0	**420**	<1.07	<0.793	<0.793	<0.511	2.70	0.954	1,900	<3.07	a		
SG-5-5	6/21/2018	5.0	**34.6**	<1.07	<0.793	<0.793	<0.511	0.676	<0.867	512	4.70	a		
SG-6-5	6/21/2018	5.0	**168**	<1.07	<0.793	<0.793	<0.511	<0.639	1.27	329	242	a		
Shroud	6/22/2018	--	--	--	--	--	--	--	--	--	219,000	---		
MultiFamily, Pangea, November 2018														
SGMF-1-5	11/27/2018	4.5-5.5	**56.5**	<1.07	<0.908	<0.908	<0.511	<0.639	2.18	<207	7.11	a		
SGMF-2-5	11/27/2018	4.5-5.5	**108**	<1.07	<0.793	<0.793	<0.511	<0.639	<0.867	<207	38.9	a		
SGMF-2-15	11/27/2018	14.5-15.5	**809**	<1.07	<0.793	<0.793	<0.511	1.92	<0.867	960	<3.07	a		
SGMF-2-25	11/27/2018	24.5-25.5	**1,850**	3.9	<0.793	<0.793	<0.511	**58**	1.1	3,870	8.23	a		
SGMF-3-15	11/28/2015	14.5-15.5	**1,860**	1.4	<0.793	<0.793	<0.511	2.1	<0.867	2,130	28.7	a		
SGMF-3-25	11/28/2015	24.5-25.5	**5,340**	7.2	<0.793	<0.793	<0.511	**5.0**	<0.867	3,680	4.86	a		
SGMF-4-5	11/28/2015	4.5-5.5	**387**	<1.07	<0.793	<0.793	<0.511	0.863	4.19	611	14.5	a		
SGMF-4-15	11/28/2015	14.5-15.5	**1,070**	<1.07	<0.793	<0.793	<0.511	**3.55**	10.6	1,540	96.1	a		
SGMF-4-25	11/28/2015	24.5-25.5	**3,320**	12	<0.793	0.826	<0.511	**14.1**	22.1	4,080	7.87	a		
SGQC-6-5	11/9/2018	4.5-5.5	**318**	<1.07	<0.793	<0.793	<0.511	**27.1**	43.6		8.90	a	TPH = 4,060	Short equilibration time ~ 4 hr
SGQC-6-15	11/9/2018	14.5-15.5	**111**	<1.07	<0.793	<0.793	<0.511	**115**	115		160	a	TPH = 10,200	Short equilibration time ~ 2 hr
SGQC-6-30	11/9/2018	29.5-30.5	**690**	27.8	<0.793	4.39	0.802	**86.5**	110		<3.07	a	TPH = 8,890	Short equilibration time ~ 2 hr
SGQC-7-5	11/9/2018	4.5-5.5	**100**	<1.07	<0.793	<0.793	<0.511	**2.65**	3.01		9.12	a	TPH = 360	
SGQC-7-15	11/9/2018	14.5-15.5	**1,010**	<1.07	<0.793	<0.793	<0.511	**11.6**	3.11		59.8	a	TPH = 1,400	
SHROUD	11/12/2018	--	--	--	--	--	--	--	--		2,150,000	--		
	11/28/2018	--	--	--	--	--	--	--	--	--	150,000	---		

Notes and Abbreviations:

PCE = Tetrachloroethene

TCE = Trichloroethene

DCE = Dichloroethene

Other VOCs = Volatile organic compounds by EPA Method TO-15 or EPA Method 8260.

µg/m3 = Micrograms per cubic meter of air results calculated by laboratory from parts per billion results using normal pressure and temperature (NPT).

ft bgs = feet below ground surface.

< n = Chemical not present above laboratory detection limit.

--- = Not analyzed

Bold = Concentrations above ESLs for Residential Land Use for shallow soil gas (SG samples).

ESL = Environmental Screening Level, from California Regional Water Quality Control Board - San Francisco Bay Region, *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater,* January 2019 (Revision 2).
a= Other analytes detected below Tier 1 ESLs, if established, including acetone, bromodichloromethane, carbon disulfide, ethanol, MEK, trichloroflouromethane, dichloroflouromethane, propene, toluene, xylenes, 1,1,1-trichloroethane, 1,2,4-trimethylbenzene, n-hexane, and methylene chloride.

Appendix A

Agency Correspondence

February 9, 2021
File No. 01S0831 (ekw)
Cost Recovery ID 2020842

City of Livermore
Attn: Rick Teczon
1052 South Livermore Avenue
Livermore, CA 94550
rteczon@cityoflivermore.net

Subject: Approval of Site Assessment and Summary Report and Site History Technical Report and Request for Data Gap Workplan and Interim Remedial Action Plan – Old Train Depot, 20, 22 & 24 S. L Street & 2009 to 2073 Railroad Ave, Livermore, Alameda County

Dear Mr. Lanphier:

This letter approves the April 18, 2020, Site Assessment and Summary Report (Site Assessment) and May 22, 2020, Site History Technical Report (Report) submitted by the City of Livermore (City) in response to the Regional Water Board's April 24,2020, directive letter. As explained below, we request the City submit a Data Gap Assessment Workplan and an Interim Remedial Action Plan for the Old Train Depot (Site).

Background

The Site is located within the Livermore Downtown Core Development project area and historically was used as a lumber yard and a train depot with multiple railroad lines. Prospective development of the Site consists of multiple residential and commercial buildings and a Veteran's park.

Soil, groundwater, and soil vapor sampling were conducted at the Site to assess the presence of chemicals from operations at and nearby the Site. Nearby properties historically included a dry cleaner, auto body operations, and other commercial and industrial uses. Results of investigations conducted since 2009 identified select metals in soil, petroleum hydrocarbons in soil and groundwater, and volatile organic compounds, including tetrachloroethene (PCE) and its breakdown products, in groundwater and soil vapor. The Deep Zone groundwater (approximately 100 to 390 feet below ground surface [bgs]) is used by the California Water Service for drinking water. The closest water supply well is located approximately ½ mile downgradient of the Site and is reportedly screened from 22 to 192 feet bgs. The Report concludes the following:

- Soil containing metals at concentrations greater than environmental screening levels will require management during site grading and use.

- Additional action, focused on soil vapor and groundwater, is warranted to assess, remediate, and/or mitigate PCE and its breakdown products at the Site.

Comments

- Water Board staff concur with the Report's conclusions that soil management will be necessary during Site development and that additional assessment is needed to further characterize the extent of PCE and its breakdown products in soil vapor and groundwater.
- Water Board staff request additional evaluation be conducted to assess whether operations as a lumber yard could have impacted the Site. Chemicals historically used to treat lumber (e.g., pentachlorophenol, dioxin) could potentially have been released if treated lumber was stored at the Site or if lumber was treated onsite.
- Prior to construction and Site redevelopment, a Site Management Plan that has been reviewed and approved by the Water Board will be necessary to address handling, management, and disposal of contaminated media during construction activities.

Request for Data Gap Assessment Workplan and Interim Remedial Action Plan

The Water Board requests the City submit the following two reports:

1. Data Gap Assessment Workplan (Workplan)
2. Interim Remedial Action Plan (IRAP).

No deadline is set for submittal of these documents; however, we request the City work with the Water Board case manager to submit the reports in a reasonable timeframe.

The Workplan should propose soil, groundwater, and/or soil vapor sampling to collect data that will fill identified data gaps and develop a robust conceptual site model (CSM) considering the proposed future use of the Site. The Workplan should include the rationale for the proposed investigative activities, sampling locations, sampling methods, and analytical testing methods.

The IRAP should present the results of the investigation conducted under the Workplan, including, but not limited to maps showing sampling locations and chemical concentration data, tabulated data, lithologic logs, and analytical laboratory reports. In addition, the IRAP should include the updated CSM and describe the remedial alternatives evaluated, remedial alternative selected, and proposed implementation method and timeframe.

The City is required to submit all documents in electronic format to the State Water Resources Control Board's GeoTracker database, pursuant to the California Code of Regulations (Title 23, Section 3890, et seq.). See Electronic Submittal of Information for guidance on submitting documents to GeoTracker. Please note that this requirement includes all analytical data, monitoring well information (latitudes, longitudes, elevations, and water depth), site maps, and boring logs.

Basis for Request
The information required in these reports is needed to further understand the extent of site contamination and identify remedial options that can reduce or eliminate future impacts to human health or water quality from site contamination. The City is named in its capacity as the current landowner.

If you have any questions, please contact me at elizabeth.wells@waterboards.ca.gov.

Sincerely,

Elizabeth Wells
Senior Water Resource Control Engineer

Copy by email:
Joel Waxdeck, City of Livermore, jhwaxdeck@cityoflivermore.net
Paul Spence, City of Livermore, prspence@cityoflivermore.net
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Bob Clark-Riddell, Pangea Environmental Services, Inc., briddell@pangeaenv.com
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Appendix B

Excavation Standard Operating Procedures

EXCAVATION PROCEDURES

Excavation Preparation

Soil excavation and related soil handling, import, and backfilling will be performed by an appropriately licensed contractor. Prior to initiating field activities, the following tasks will be conducted:

- Obtain the necessary grading/construction permits from the City of Livermore and/or Alameda County Public Works Agency (to be obtained by the property owner and developer, the City of Livermore);
- Pre-mark the excavation area with white paint and notify Underground Service Alert (USA) of the excavation activities at least 48 hours before work begins;
- Prepare a site-specific health and safety plan to educate personnel and minimize their exposure to potential hazards related to site activities; and
- Coordinate with excavation and laboratory contractors and with involved parties.

Soil excavation will be conducted consistent with grading/construction permits obtained by the City of Livermore for the Downtown Core Redevelopment project. Perimeter barriers will be installed and maintained throughout excavation and backfilling activities. Soil handing and dust monitoring procedures are described below.

Soil Excavation

Excavated soil will be disposed offsite. Soil analytical data collected during upcoming site assessment will be used to profile soil for offsite disposal. Excavated soil may be stockpiled prior to loading. Additional soil sampling may be conducted to further characterize excavated waste for disposal.

Offsite Soil Disposal

Soil for offsite disposal will be profiled according to requirements of the soil accepting facility. Additional soil sample collection and analysis will be conducted as required by the disposal facilities.

A State-licensed waste hauler will transport any offsite disposal soil to the appropriate facility. Trucks transporting soil off the Site will follow a pre-determined transport route.

Soil Backfilling

The excavation area will be backfilled with imported material, including controlled density fill (CDF) and Class II aggregate base, and/or select clean overburden soil. Importing of material and determination of overburden reuse suitability will be consistent with the Alameda County Department of Environmental Health (ACDEH) clean fill certification criteria in accordance with ACDEH's *Fill Material Characterization Guidance* (2018). While the excavation pit is open, the excavation will be secured with fencing and sloping as necessary to comply with OSHA safety requirements.

Soil Excavation Practices

Throughout field activities, all applicable municipal codes and best management practices (BMPs) and standards will be followed. Mechanical and manual (hand digging) excavation techniques will be utilized during remedial activities. Procedures before and during excavation activity include:

- A competent person trained to identify hazardous conditions, with authority to take corrective action, will be in charge of excavation. This person will inspect excavations daily and after every rain event, and ensure that all equipment and materials are in good, working condition.

- Excavated or other materials as required will be stored 2 feet or more from the edge of the excavation. Workers will stay away from any equipment loading or unloading material. Perimeter protection will be provided at all times.

- Workers will have all appropriate training and wear the required personal protective equipment including hardhats, safety footwear, gloves, eye protection, hearing protection, and fall protection devices, as needed.

- Excavated material and the excavation pit will be monitored by hand-held screening instrumentation, (e.g., PID), as well as visual and olfactory indications of soil impact from petroleum hydrocarbons or chlorinated solvents (e.g., visible green or gray staining, odor).

- Stockpiles of materials will not be placed within the public right of way, will not obstruct drainage ways, will not be subject to erosion, will not endanger other properties and will not create a public nuisance or safety hazard. Stockpiles of any contaminated soil will be placed away from the north and east property boundaries to minimize any potential impact to offsite residences.

- Debris (brick, rubble, etc.) encountered during excavation as well as concrete and/or asphalt cuttings will be separated from the excavated soil and handled separately for recycling.

The contractor will comply with Cal/OSHA requirement to ensure a safe working environment and to keep the sides of the excavation stable. Excavation activities will be documented by photographs.

Odor, Dust and Noise Control

Dust monitoring will be conducted adjacent to the earthwork activities and along the downwind perimeter of these activities. The dust standard will be based on the PM10 ambient air quality standards adopted by BAAQMD, which specifies a ceiling level of no more than 50 micrograms per cubic meter ($\mu g/m^3$) difference between upwind and downwind sampling locations. The ceiling level of 50 $\mu g/m^3$ represents the Bay Area 24-hour time-weighted average standard for 10-micron diameter particulate matter (the PM10 24-hour standard). An air exceedance is defined as a PM10 concentration of 50 $\mu g/m^3$ above the upwind baseline level for more than for 5 minutes along the perimeter, or for more than 15 minutes directly adjacent to the earthwork location. Should any visible clouds of dust be observed or at any time a PM10 reading

exceed 50 μg/m^3, soil will immediately be wetted with water, or otherwise suitably contained to prevent nuisance from dust. If perimeter readings exceed action levels, work will be stopped, engineering controls will be implemented, and the work will be adjusted until background levels are reached. Dust monitoring will be performed with hand-held equipment described below.

All graded surfaces of any nature shall be wetted, or otherwise suitably contained to prevent nuisance from dust or spillage on city streets or adjacent properties. Equipment, materials and roadways on the site shall be used in a manner or treated as to prevent excessive dust conditions. Dust and dirt control activities shall not result in any material entering the storm drain system.

Dust control measures during excavation, backfilling, and handling of contaminated soil will consist of spraying the minimum amount of water needed to suppress the dust onto the soil and work area. Noise generated during excavation will be monitored and modified accordingly, to ensure compliance with any applicable noise ordinances. Vapor suppressant spray will also be utilized, as deemed necessary.

VOC Monitoring: A portable RAE Systems MiniRAE 3000 Photo-Ionization Detector (PID) or equivalent will be used to collect VOC measurements near soil work activity as necessary for worker health and safety during onsite excavation activities. If VOC concentrations are measured above 5 ppm parts per million per volume (ppmv) during the handling of any contaminated soil, PID readings will be collected every hour along the downwind perimeter of the Site (or more frequently if PID readings above 5 are measured in the work area). If the Site is windless, PID readings will be taken from the perimeter location(s) closest to the Site activities. The dominant downwind direction at the Site is towards the east based on previous Site observations. A handheld digital anemometer will be used to measure the wind speed. A high wind condition is defined as 18 mph sustained for at least 5 minutes in any 1-hour period.

Air Mitigation Measures: Initially, VOC emissions from the Site will be maintained below 5 parts per million per volume (ppmv) for any 15-minute period. This concentration corresponds to the lowest short-term exposure limit (15 minutes) established by Cal OSHA of site VOCs of concern, which is benzene for this site. The 8-hour time-weighted-average permissible exposure limit (PEL) for benzene established by Cal OSHA is 1 ppmv. The 8-hour time-weighted-average PEL established by Cal OSHA for gasoline is 300 ppmv, for ethylbenzene is 100 ppmv, for toluene is 50 ppmv, and for xylenes is 100 ppmv.

Initially, if VOC concentrations exceed the 5 ppmv (above background) for 15 minutes, operations will cease until the source of the vapor emissions is identified and mitigated. Potential mitigation steps would include covering the area/stockpile with heavy duty plastic and/or applying a vapor/odor suppressant such as Simple Green™ onto the soil. The maximum threshold for VOC emission mitigation will be 50 ppmv, 50% of the PEL for ethylbenzene.

Dust Monitoring: Dust monitoring will be conducted daily during any excavation activities at the Site using a portable dust meter. Perimeter dust monitoring for real-time PM_{10} concentrations will be conducted using a handheld respirable air monitor (TSI Sidepak™, Model AM520 or equivalent). Perimeter dust monitoring results will be recorded near the building rollup door and along the east property boundary at two locations. Wind direction and wind speed will also be monitored periodically throughout the day using a handheld digital anemometer.

Onsite dust monitoring for real-time PM_{10} concentrations will be conducted adjacent to any grading or earthwork activities using a portable TSI AIM 510 meter or equivalent. The dust monitoring results will be written manually on preformatted data field sheets. All manual entries are to be made in a legible and orderly manner using permanent ink. Erasures will be avoided. If an error is made, it is to be crossed out with a single line and the correction immediately made. Cancellations or insertions should be initialed, dated, and explained (in the margin, if possible) by an appropriate notation. All operating details and conditions should be recorded. Each page will be signed and dated by the individual making the entry and performing the work.

Dust Mitigation Measures

Dust from the Site will be maintained below the California Ambient Air Quality Standard (CAAQS) PM_{10} concentration of 50 $\mu g/m^3$ in accordance with 17 California Code of Regulations [CCR] 70200. Should PM_{10} readings exceed 50 $\mu g/m^3$ (above background) for more than for 5 minutes along the perimeter, or for more than 15 minutes downwind of the grading/earthwork location, graded surfaces of any nature shall be wetted with water or Soil Sement®, or otherwise suitably contained to prevent nuisance from dust or spillage onto city streets or adjacent properties. For high wind days, the upwind/downwind subtraction will be used to calculate the dust contribution from the Site at the property boundary as well as the ten percent contribution above the federal National Ambient Air Quality Standard PM_{10} value of 150 $\mu g/m^3$. For example, the Site would be in compliance with the agency requirement assuming the following:

- PM_{10} (upwind) = 200 $\mu g/m^3$
- PM_{10} (downwind) = 220 $\mu g/m^3$
- Contribution from the Site = 20 $\mu g/m^3$
- Total loading at ten percent of 220 $\mu g/m^3$ = 22 $\mu g/m^3$

Equipment, materials and roadways on the Site shall be used in a manner or treated as to prevent excessive dust conditions. Dust and dirt control activities shall not result in any material entering the storm drain system. These procedures supplement the procedures in the Storm Water Pollution Prevention Plan (SWPPP) approved for the Site grading operations, which include best management practices (BMP) implemented throughout excavation activities.

Dust control measures during any grading, earthwork or handling of aggregate will consist of spraying the minimum amount of water needed to suppress the dust onto the soil and work area, and limiting the speed of traffic through the work area to 15 miles per hour. Any soil not off-hauled from the Site the same day will be stockpiled on plastic sheeting and covered with plastic, if significant rain is expected, or if visible dust is being generated from the stockpiles.

Documentation and Record Keeping: Documentation of all air and dust monitoring will include copies of air and dust monitoring logs and/or written field notes. All monitoring equipment maintenance and

calibration will also be documented. Photos will be taken of the monitoring stations and various dust mitigation measures used at the Site.

Groundwater Control

Although groundwater is not expected to be encountered in the excavation, if necessary, groundwater removal and disposal will be performed to manage any potential groundwater accumulation in the excavation. Depending on the volumes and recharge rates, groundwater will be pumped either directly into vacuum trucks for transport and disposal, or will be pumped into a recovery tank for storage and offsite recycling/disposal at an appropriate facility.

Grading and Erosion Control

The following grading and erosion control best management practices (BMP) will be observed and implemented throughout excavation activities:

- Delineate with field markers clearing limits, easements, setbacks, sensitive or critical areas, buffer zones, trees, and drainage courses.
- Stabilize all denuded areas and install and maintain all temporary erosion and sediment controls continuously between October 15th and April 15th.
- Perform clearing and earth moving activities only during dry weather (without significant rainfall).
- Provisions will be made for diverting onsite runoff around exposed areas and diverting offsite runoff around the Site.
- Provisions for preventing erosion and trapping sediment on Site, storm drain inlet protection, covers for soil stock piles, and/or other measures.
- Store, handle, and dispose of construction materials and wastes properly, so as to prevent their contact with stormwater.
- Control and prevent the discharge of all potential pollutants, including pavement cutting wastes, concrete, petroleum products, chemicals, washwater or sediments, and non-storm water discharges to storm drains and any nearby surface water.
- Avoid cleaning or maintaining vehicles on Site, except in a designated area where washwater is contained and treated.
- Protect adjacent properties and undisturbed areas from construction impacts.
- Limit construction access routes and stabilize designated access points.

- Avoid tracking dirt or other materials off Site; clean offsite paved areas and sidewalks using dry sweeping methods.

- Train and provide instruction to all employees and subcontractors regarding the construction BMPs.

If any storm water catch basins are found in close proximity to excavation, the contractor will implement the following procedures designed to ensure that grading and erosion control practices proposed for the above project comply with best management practices and standards.

- Any catch basin will be protected by silt fencing or other erosion sedimentation prevention devices at all times.

- Erosion control devices will not be moved or modified without approval of the project manager.

- All removable erosion protective devices shall be in place at the beginning and end of each working day at all times.

- All silt and debris shall be removed from streets and public right of way immediately.

- All immediate downstream inlets will be protected.

Criteria for Import of Backfill Material

The import of fill material will be performed in accordance with the ACDEH-LOP *Fill Material Characterization Guidance* dated August 1, 2018. For import of fill material from commercial sources or quarries, letters of certification will be provided by the quarry or commercial business providing the engineered fill, baserock or other material. If the certification information is deemed insufficient, additional soil characterization will be conducted to facilitate the use of imported fill.

For non-commercial facilities, documentation regarding the previous land use and any environmental site assessments performed at the source of the fill will be provided to minimize the potential of introducing contaminated fill material onto the Site. If an environmental site assessment was performed at the fill source site, its findings will be provided.

If adequate documentation cannot be provided, the source fill material will be tested for potential impact to ensure that 'clean' fill is being brought onsite. Per ACDEH direction, the source fill material will be sampled and analyzed for TPH, VOCs, SVOCs, and CAM-17 metals, and results will be compared to RWQCB Tier 1 ESLs. Samples will be submitted under chain-of-custody to a California certified laboratory.

Appendix C

Standard Field Procedures for Excavation Sampling

STANDARD FIELD PROCEDURES FOR EXCAVATION SAMPLING

During remedial excavation activities compliance sampling is typically required to assess the extent of the contamination remaining in site soil. Pangea has developed standard field procedures for compliance sampling and excavation to provide sample collection, handling and documentation in compliance with State and local regulatory agency regulations.

Soil Sampling

Soil samples are typically collected from the bottom and sidewalls of the excavation. If water is present in the excavation, soil samples are typically collected from the soil/water interface. The soil samples are collected in steam-cleaned brass or steel tubes from either a driven split-spoon type sampler or the bucket of a backhoe or excavator. For sampling for volatile organic compounds (VOCs), samples may be collected with special containers (e.g. TerraCore) consistent with EPA Method 5035. When a backhoe or excavator is used, approximately three inches of soil are scraped from the surface and the tube is driven into the exposed soil. The location and number of samples is determined by the environmental professional and/or regulatory agency representatives overseeing the excavation.

When required or requested before sample collection, Pangea field staff screen soil with a portable photo-ionization detector (PID) to qualitatively assess the presence or absence of volatile contaminants. Excavated soil is typically segregated based on contaminant concentration and stockpiled on site on plastic sheeting. When field observations and/or PID measurements indicate that the contaminant-bearing soil has been satisfactorily removed, Pangea collects soil samples from excavation sidewalls and floor for confirmatory analysis at a State-certified analytic laboratory.

Stockpile Soil Sampling

To facilitate soil disposal at approved offsite facilities, Pangea typically collects one four-point composite soil samples for 200 cubic yards or less of stockpiled soil. If the soil stockpile volume is between 200 and 1,000 cubic yards, two four-point composite samples are typically collected. If soil is segregated based on field observations, at least one four-point composite soil sample is collected for each segregated stockpile. To generate a composite sample, Pangea collects four individual soil samples in steam-cleaned brass or steel tubes by hand, or from either a driven split-spoon type sampler or the bucket of a backhoe or excavator. The sample locations and depths are selected to obtain composite soil sample representative of the stockpile. The four individual soil tubes are composited by the state-certified laboratory. For sampling for VOCs, samples may be collected with special containers (e.g. TerraCore) consistent with EPA Method 5035. When hand sampling or backhoe/excavator is used, approximately three inches of soil are scraped from the surface and the tube is driven into the exposed soil. Additional stockpile sampling procedures may be required to facilitate reuse of soil onsite in accordance with regulatory oversight.

Grab Ground Water Sampling

If groundwater enters the excavation, grab ground water samples are typically collected from the open excavation. Grab groundwater sample can be collected from excavator equipment, disposable Tygon® tubing placed into the excavation, or other appropriate sampling equipment placed into the water. The groundwater samples are decanted into the appropriate containers supplied by the analytic laboratory.

Sample Storage, Handling and Transport

Upon removal from the sampler or the backhoe, soil samples are trimmed flush, capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Groundwater samples in appropriate containers are labeled, placed in protective bags, and stored on crushed ice at or below 4° C. All samples are transported under chain-of-custody to a State-certified analytic laboratory.

Duplicates and Blanks

Duplicate or blind duplicate samples can be collected, if requested. For water sampling, laboratory-supplied trip blanks can accompany samples to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory quality assurance/quality control (QA/QC) blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Appendix D

SVE Blower Specifications

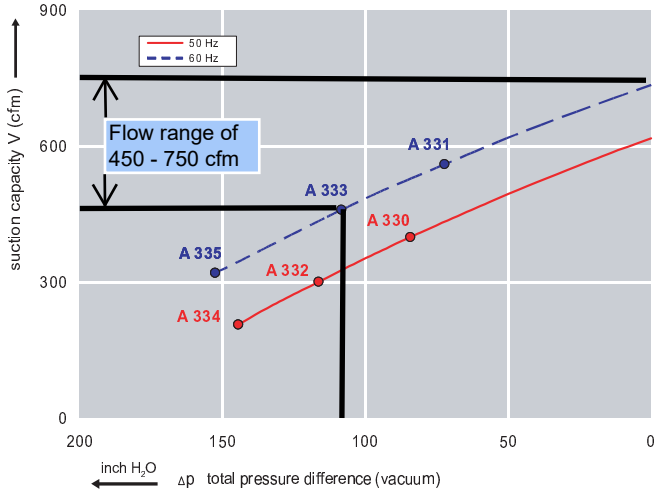
3BA1900

Vacuum/Pressure Regenerative Blower

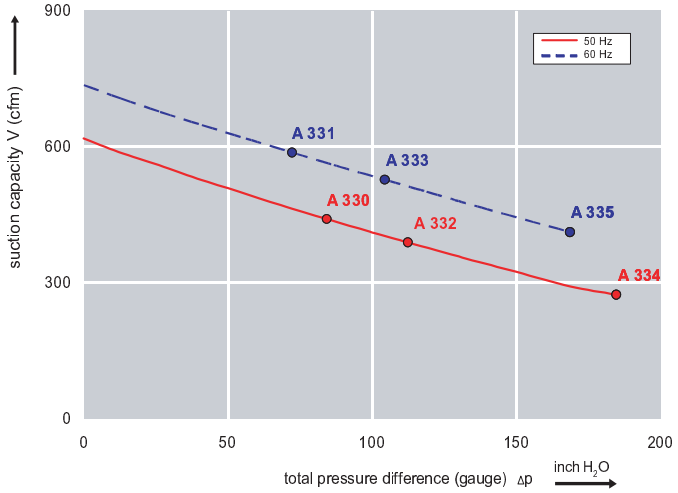
Features:

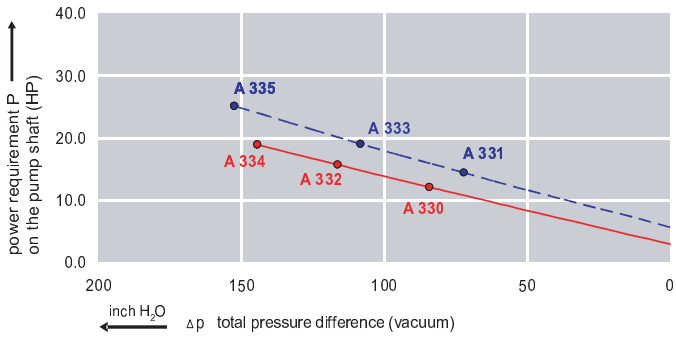
- Cooler running, outboard bearing provides maintenance-free operation
- Environmentally friendly oil-free technology
- Extremely quiet operation
- All motors are standard TEFC with Class F insulation, UL recognized, CE Compliant
  Explosion-Proof motors available
- Custom construction blowers are available
- Rugged die cast aluminum construction

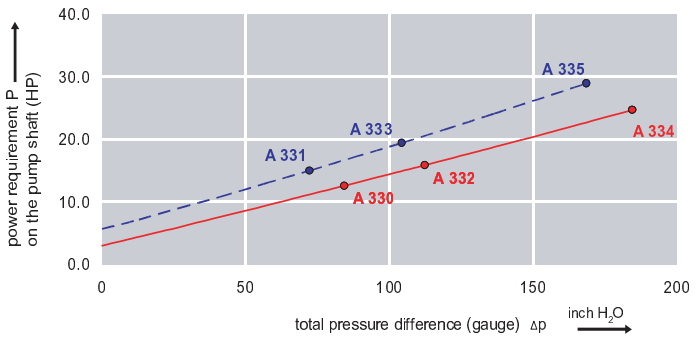
Performance curve for Vacuum pump

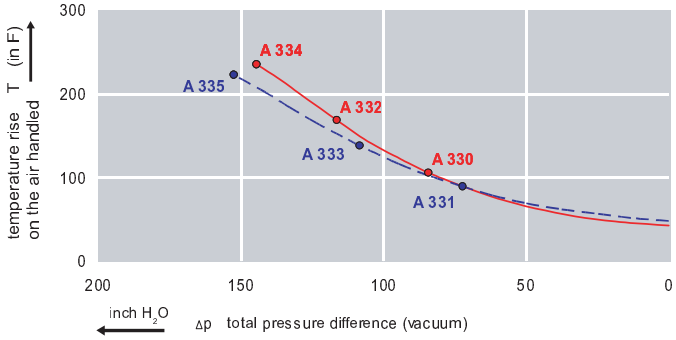


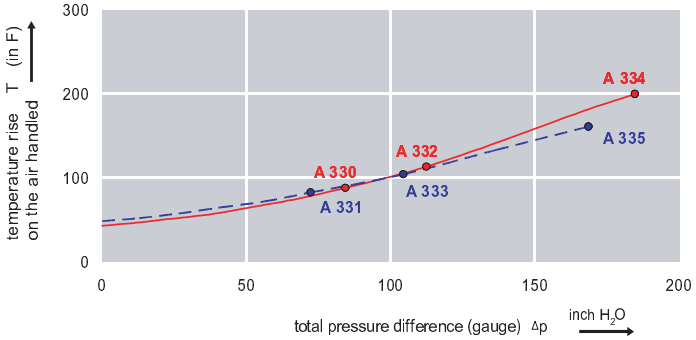
Performance curve for Compressor







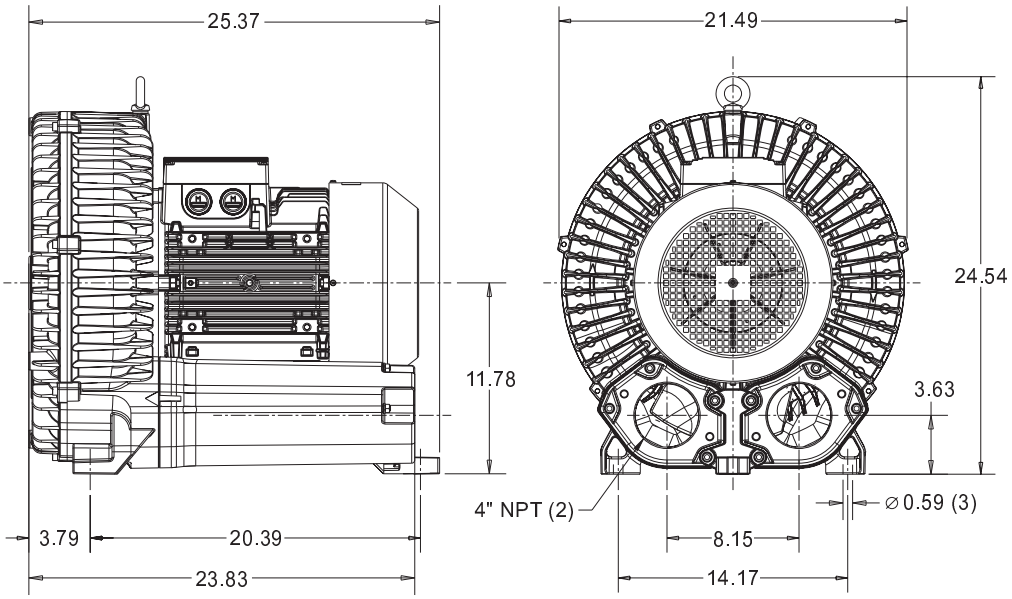




3BA1900

Vacuum/Pressure Regenerative Blower

Dimensions: (inches)



Recommended Accessories:

Relief valve:

VC100Z (Vacuum)

PC100Z (Pressure)

Filter:

ATF-400-21138 (Vacuum)

AFS-234-400-10 (Pressure)

Specifications subject to change without notice. Please contact factory for specification updates.

Selection & Ordering Data - Type 3BA1900

Curve No.	Order No.	Frequency Hz	Rated power HP	Input voltage V		Input current A		Permissible total differential pressure Vacuum inch H2O	Permissible total differential pressure Compressor inch H2O	Sound pressure level dB(A)	Weight lbs
3~ 50/60 Hz IP55 insulation material class F											
A 330	3BA1900-7AT06	50	10.72	200D ... 240D	345Y ... 415Y	31.5D	18.2Y	-76	76	74	265
A 331	3BA1900-7AT06	60	12.06	220D ... 250D	415Y ... 460Y	31.5D	18.2Y	-60	56	79	265
A 332	3BA1900-7AT16	50	16.76	200D ... 240D	345Y ... 415Y	48.5D	28.0Y	-116	112	74	295
A 333	3BA1900-7AT16	60	19.44	220D ... 250D	415Y ... 460Y	50.0D	29.0Y	-108	104	79	295
A 334	3BA1900-7AT36	50	24.80	200D ... 240D	345Y ... 415Y	64.5D	37.0Y	-145	185	74	314
A 335	3BA1900-7AT36	60	28.55	220D ... 250D	415Y ... 460Y	68.0D	39.0Y	-153	169	79	314

Suitable for 208 Volt Operation

All curves are rated at 14.7 psia and 68° F ambient conditions and are reported in SCFM referenced to 68° F and 14.696 psia sea level conditions. Curve values are nominal, actual performance may vary by up to 10% of the values indicated. For inlet temperatures above approximately 80 °F or for handling gases other than air, please contact your Airtech sales representative for assistance.