PHASE II SITE ASSESSMENT REPORT

MUNI UPPER YARD
SAN FRANCISCO, CALIFORNIA 94112

MAYOR'S OFFICE OF HOUSING AND COMMUNITY DEVELOPMENT

1 South Van Ness, 5th Floor
San Francisco, California 94103

June 2014

LEE Incorporated

Engineers • Surveyors • Construction Managers

28 Geary Street, Suite 525
San Francisco, CA 94108

Tel: (415) 421-2758
Fax: (415) 421-6762

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUATION)

FIGURES

TABLES

APPENDICES

1.0 INTRODUCTION

On behalf of San Francisco Mayor's Office of Housing (SFMOH) and Asian Neighborhood Design (AND), LEE Incorporated (LEE) conducted a Phase II Environmental Site Assessment (Phase II ESA) of the San Francisco Municipal Railway (Muni) Upper Yard in San Francisco, California 94112 (*subject property*). Muni is a division of the San Francisco Municipal Transportation Authority (SFMTA) that services the City and County of San Francisco (City). The attached **Figure 1** shows the general location of the *subject property*.

Providing technical assistance to the SFMOH/AND, LEE is contracted to assess the *subject property* as a potential acquisition from SFMTA for affordable housing redevelopment. The Phase II ESA was performed in conformance with the scope and limitations of the American Society of Testing and Materials (ASTM) Standard Designation E1903-05, *Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process*.

The Phase II ESA activities consisted of the drilling of three (3) exploratory borings and the collection of soil and groundwater samples for submittal for laboratory analyses for potential contaminants of concern. This report documents the activities and results of the environmental investigation conducted by LEE between March and June 2014.

2.0 SCOPE OF WORK

The Phase II ESA was performed in general accordance with the scope of work in LEE's *Fee Proposal, Phase II Environmental Site Assessment, Upper Yard Site, San Francisco, California 94112*, dated May 24, 2013. The scope of work was to provide subsurface soil and groundwater characterization of the Muni Upper Yard with respect to potential contaminants of concern.

The scope of work for this investigation included the following:

- The drilling on April 15, 2014 of three (3) exploratory borings to collect soil and groundwater samples for laboratory analyses.

- Laboratory analyses of the soil and groundwater samples for potential contaminants of concern, namely petroleum hydrocarbons, volatile and semi-volatile organic compounds, polychlorinated biphenyls, organochlorine pesticides, cyanide, metals, and asbestos.

- Preparation of this technical report documenting the investigation activities and results.

3.0 PROPERTY DESCRIPTION

The Muni Upper Yard (*subject property*) corresponds to City and County of San Francisco Assessor Parcel Lot 039, Block 6973 which is located to the southwest of the intersection of San Jose Avenue and Geneva Avenue in the Excelsior District of San Francisco. The parcel (Lot 039, Block 6973) comprises 30,750 square feet, and is currently owned by SFMTA. The Excelsior District is a mixed industrial and commercial neighborhood bound by U. S. Highway 280 (Highway 280) to the west and U. S. Highway 101 (Highway 101) to the east. The attached **Figure 2** is a topographical map showing the location of the *subject property*.

3.1 Muni Upper Yard

The attached **Figure 3** is a site plan of the Muni Upper Yard and vicinity. The *subject property* is a paved parking lot enclosed by chain link fencing and is currently used for parking by SFMTA staff. There are no buildings or structures on the *subject property*. The vehicle access gate is at the south end and there is a pedestrian access gate at the north end of the *subject property*. Grade is above that of the surrounding streets and there is a concrete retaining wall that extends along the northeast perimeter fronting Geneva Avenue, and the southeast perimeter fronting San Jose Avenue.

According to historical information presented in a Phase I ESA completed by LEE in April 2013 (LEE, April 2013), the *subject property* was comprised of residential parcels from the early 1900s to late 1940s. In the late 1940s, the residential dwellings were removed and the property was redeveloped by Muni into a paved bus storage yard. With the expansion of Muni metro railcar service and development of light rail vehicles (LRVs) in the 1970s, the *subject property* was then used for the storage of LRVs and other railcars, as well as for parking. Storage of railcars was phased out in the late 2000s, and the *subject property* began to be used exclusively for SFMTA staff parking. Currently in disuse, railtracks extend north-south past the entryway to merge onto the main LRV railtracks on San Jose Avenue.

3.2 Site Vicinity

The following describes the area surrounding the *subject property* (**Figure 3**):

- West: The Bay Area Rapid Transit (BART) right-of-way (ROW) consists of a paved roadway referred to as the Kiss-&-Ride area designed for use by motorists to drop-off and pick-up BART and Muni riders and passengers for the Balboa Park BART Station. The south end of the Balboa Park BART Station is located where the Kiss-&-Ride area intersects Geneva Avenue, and includes access to the BART underground, an auxiliary storage building, and a concrete paved area.

Up to the late 1960s when construction began on BART and Highway 280, a railyard and railcar paint facility where Muni railcars were painted, varnished and washed occupied the adjoining area to the west of the *subject property*. Given the proximity and upgradient to cross-gradient location relative to the *subject property*, there is the potential that hazardous chemical products associated with historical off-site railcar painting, varnishing and washing operations may have impacted subsurface soil and groundwater below the *subject property* (LEE, April 2013).

- South: Directly south of the access gate into the *subject property* is the intersection of BART's Kiss-&-Ride and San Jose Avenue. LRV railtracks from San Jose Avenue extend onto the *subject property*. To the southwest, a landscaped area occurs along the BART ROW between San Jose Avenue and Highway 280. The block bound by San Jose Avenue, Niagara Avenue, Delano Avenue, and Shawnee Avenue is residential.

- East: San Jose Avenue extends along the east side of the *subject property*. The east corner area of San Jose Avenue vs. Niagara Avenue (2377 San Jose Avenue) has a concrete surfaced area that leads to underground parking of a two (2) story commercial building. Residential parcels occur to the southeast along Niagara Avenue.

  The Muni Geneva Railyard (500 Geneva Avenue) is a railyard and maintenance facility used for streetcars and LRVs. The Geneva Office Building and Power House (2301 San Jose Avenue) is located at the southwest corner of San Jose Avenue and Geneva Avenue. To the east of the Muni Geneva Railyard is a residential neighborhood, primarily consisting of single-family dwellings since the 1930s and 1940s.

- Northeast: The northeast corner of San Jose Avenue vs. Geneva Avenue is occupied by a one (1)-story commercial building built with a paved parking area. A mix of low-scale commercial and residential uses occurs along San Jose Avenue to the northeast. Residential parcels dominate to the east and northeast in the block bound by Geneva Avenue, Delano Avenue, Seneca Avenue, and San Jose Avenue.

- North to Northwest: Geneva Avenue extends along the north side of the *subject property*. The Curtis E. Green Annex (425 Geneva Avenue) is a multi-story building that houses Muni's administrative and dispatch functions. The Green Division Light Rail Facility (2200 San Jose Avenue) is a full-service maintenance facility for Muni's LRVs.

3.3 Geological Setting

San Francisco encompasses forty-nine (49) square-miles in the western part of the Coast Ranges along the central California coast. The city spreads across a peninsula bound by the Pacific Ocean on the west and Bay on the north and east. The present topography is the result of erosion of Mesozoic Franciscan Complex rocks of varying hardness with deposits of windblown sand that locally mantle the bedrock exposures. Quaternary tectonism, marine and estuarine deposition, and artificial fill (man-made land) have also contributed to the development of the current topography of San Francisco.

The United States Geological Survey (USGS) has compiled the geological information available for San Francisco in a series of USGS 7.5-minute quadrangle topographic maps and reports. Based on these compilations, San Francisco is underlain by three (3) main geological formations that differ in age: older bedrock, Tertiary strata, and surficial deposits.

- The older bedrock consists of the Franciscan Complex of Cretaceous to Jurassic age. The Franciscan Complex is subdivided into lithological units that include sedimentary rocks at various stages of metamorphism, greenstone, serpentinite, gabbro and diabase, and various other metamorphic and sheared rocks.

- Tertiary rocks are prominent in the southwestern part of the City and represented by the Merced Formation of late Pliocene to Pleistocene age. The Merced Formation consists of sand, silt, and clay basin deposits that originated in a shallow marine and coastal non-marine depositional setting.

- The Colma Formation of Pleistocene age was deposited unconformably on the Merced Formation, notably in the northwestern and central part of the City. The Colma Formation consists of fine- to medium-grained sand with lesser beds of sandy silt, clay and gravel. Other Pleistocene and Holocene surficial deposits consist of rubbly slope debris and ravine fill, old beach deposits, dune deposits, alluvium, bay mud, recent beach deposits, undifferentiated sedimentary deposits, landslides, and artificial fill.

Regional geologic information for the *subject property* vicinity is available in USGS Open File Report 98-354, *Preliminary Geologic Map of the San Francisco South 7.5' Quadrangle and Part of the Hunters Point 7.5' Quadrangle, San Francisco Bay Area, California: A Digital Database* (Bonilla, 1998). According to the geological compilation, the area encompassing the *subject property* is underlain by the Jurassic-Cretaceous Franciscan Complex and unconsolidated Quaternary sediments derived from the weathering and erosion of the Franciscan Complex. Outcrops of the Franciscan Complex occur west to southwest of the *subject property*, and include sandstone and shale, hard where fresh and intact, soft where weathered or sheared. Additionally, artificial fill occurs locally and has been described as containing clay, silt, sand, rock fragments, organic matter, and man-made debris.

Based the topography and available groundwater data (LEE, April 2014), the groundwater flow direction around the *subject property* is inferred to be northeast to east, towards the Bay.

4.0 INVESTIGATION ACTIVITIES

Prior to the field activities, LEE secured a Soil Boring Permit from the City's Department of Public Health, Environmental Health (SFDPH). The permit is provided in **Appendix A**.

The proposed boring locations were marked on the ground with white paint. Underground Service Alert (USA) was notified to provide the required utility clearance. The boring locations were cleared of underground utilities by a contracted private utility locating company, SubDynamic Locating Services, Inc. of San Jose, California.

A health and safety plan was prepared to govern and control the field work by LEE staff and subcontractors. The field work was scheduled with AND, Muni, and SFDPH.

4.1 Drilling and Soil Sampling

Three (3) exploratory borings, designated B-1, B-2 and B-3, respectively, were completed by LEE on April 15, 2014. Vapor Tech Services of Hayward, California, a C57 licensed drilling contractor (C57 #695970), drilled the borings under the direction of a California Professional Geologist for LEE. The drilling was accomplished with the use of direct-push Geoprobe™ drilling equipment providing continuous soil sampling capability. Each of the borings was advanced into the first-encountered groundwater-bearing zone to a depth of approximately forty (40) feet at Boring B-1, and thirty (30) feet at Borings B-2 and B-3.

A hollow core barrel sampler, fitted with an inner 48-inch long acetate liner, was used to obtain a continuous core of soil at each boring location. The core barrel sampler was connected to a one (1)-inch diameter flush jointed probe pipe and hydraulically driven to the target soil sampling depth. The sampler was then removed from the boring and the inner acetate liner was extracted and cut for field screening and lithological examination by the geologist. The soils were field screened for total volatile organics (TVOs) with a portable photo-ionization detector (PID). The soil cores were logged by the geologist using the Unified Soil Classification System.

The geologist collected soil samples from each boring for potential laboratory analyses. Discrete sampling consisted of cutting the liner of the selected depth interval, sealing the ends of the cut liner with Teflon sheets and plastic end caps, and then labeling and placing the sample in an ice chest for cold storage. Following the protocol provided by the laboratory and manufacturer, Terra Core® sampling was also performed as follows. A dedicated syringe was driven into freshly exposed soil to retrieve approximately five (5) grams of soil. The extracted soil was then transferred into laboratory-supplied, 40-milliliter volatile organic analysis vials (40 mL VOAs). The VOAs were promptly sealed with Teflon caps provided, labeled with identification information, and placed in the ice chest. LEE followed chain of custody protocol in the transfer of the soil samples to the laboratory.

All down-hole drilling and sampling equipment was cleaned with environmental detergent and rinsed between uses to prevent cross-contamination. Field PID readings, lithological information, and sampling data are summarized in the boring logs provided in **Appendix B**.

4.2 Groundwater Sampling

Following the drilling and soil sampling at each boring, dedicated polyvinyl chloride (PVC) casing of 0.75-inch diameter was installed to facilitate groundwater sampling. Slotted PVC casing was used across and above the saturated zone. Depth-to-groundwater was measured using an electronic, Solinst® water level meter accurate to within 0.01 inch. Although Boring B-1 was advanced into the first encountered groundwater-bearing zone, no free groundwater was noted in the temporary well casing and no groundwater samples was collected from this boring. Free groundwater was encountered and sampled in Borings B-2 and B-3. Expressed in feet below the top surface (feet bts), depth-to-groundwater was measured at 27.3 feet bts at Boring B-2, and 25.9 feet bts at Boring B-3.

Groundwater sampling was performed with the use of dedicated disposable bailers. Groundwater was transferred into laboratory-supplied containers that included 40 mL VOAs with hydrochloric acid preservative, unpreserved amber glass bottles of 500-ml capacity, unpreserved plastic bottles of 250-ml capacity, and 250-ml plastic bottles with sodium hydroxide preservative. The sample containers were each sealed, labeled, and placed in a field cooler for preservation. The ice chests containing the soil and groundwater samples were transferred with chain-of-custody documentation to a California-certified analytical laboratory for chemical analyses. The groundwater sampling data are summarized in the boring logs, provided in **Appendix B**.

Following sampling activities, the boreholes were backfilled by Vapor Tech with neat cement up to grade, and topped off with concrete flush with the pavement surface.

4.3 Laboratory Analyses

The soil and groundwater samples were submitted with chain of custody documentation to TestAmerica Laboratories, Inc. of Pleasanton, California (TestAmerica). TestAmerica is certified for chemical analyses by the Department of Health Services, Environmental Laboratory Accreditation Program (ELAP No. 2496).

The samples were subjected to the following laboratory analytical methods:

- Purgeable total petroleum hydrocarbons in the gasoline range (TPHg: GRO C5-C12) and volatile organic compounds (VOCs) by Environmental Protection Agency (EPA) Method 8260B;

- Extractable total petroleum hydrocarbons in the diesel range (TPHd: DRO C10-C28) and in the motor oil range (TPHmo: MOR C24-C36) by EPA Method 8015B with silica-gel cleanup;

- Semi-volatile organic compounds (SVOCs) by EPA Method 8270C;

- Polychlorinated biphenyls (PCBs) by EPA Method 8082;

- Organochlorine pesticides (OP) by EPA Method 8081A;

- Cyanide by Standard Method (SM) 4500 CN E; and

- California Code of Regulations (CCR) Title 22, California Administrative Manual (CAM) 17 metals by EPA Method 6010B, except mercury by EPA Method 7470A/7471A, and hexavalent chromium by EPA Method 7196A.

A three (3) point composite of soil Samples B1-3.25/3.75, B2-3.5/4, and B3-4/5 was analyzed for Soluble Threshold Limit Concentration (STLC) by the California Waste Extraction Test (WET) leachate method, EPA Method 6010B/3005A, using a citrate solution.

In addition, the soil samples were each analyzed for moisture content in order to report the soil analytical results on a dry-weight basis.

EMLab P&K of Irvine, California performed asbestos content by polarized light microscopy (PLM) on a selection of soil samples (B1-3.75/4.25, B1-6.5/7, B2-3.5/4, and B3-2.75-3.50) via EPA Method 600/M4-82-020 and 600/R-93-116. For Sample B3-6.5/7, PLM asbestos analysis via California Air Resources (CARB) Method 435 was performed by Asbestos TEM Laboratories, Inc. of Berkeley, California.

The groundwater samples were additionally analyzed for pH by EPA Method 9040B.

The laboratories reported that the samples were received in good condition and with appropriate chain of custody documentation. The analytical results were laboratory certified with no significant anomalies reported in the data.

The laboratory analytical reports are provided in **Appendix C**.

5.0 ENVIRONMENTAL SCREENING LEVELS

The Regional Water Quality Control Board, San Francisco Bay Region (RWQCB, December 2013) guidance, *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater*, presents environmental screening levels (ESLs) for soil and groundwater that address human health exposure risk, ecological habitat protection, and groundwater protection goals in the Basin Plan. For carcinogens, the human health screening levels for carcinogens are based on a target cancer risk of one-in-a-million (10-6). A hazard quotient of 0.2 is the basis for non-carcinogenic risk.

The RWQCB (December 2013) considers two (2) groundwater use scenarios: one where groundwater IS a potential source of drinking water resource, and the other where groundwater IS NOT a potential drinking water resource. Pursuant to the Basin Plan (RWQCB, 1995; January 18, 2007), all groundwater resources in the San Francisco Bay Area are considered to be sources or potential sources of drinking water, unless designated otherwise by the RWQCB. Criteria used for the exclusion of groundwater as suitable or potentially suitable for municipal or domestic water supply, are discussed in the State Water Resources Control Board (SWRCB) Resolution No. 88-63, dated February 1, 2006.

Aquatic habitat protection goals in RWQCB (December 2013) are discounted inasmuch as the *subject property* is in a highly urbanized area and the nearest aquatic habitats are distant, located in the Bay, three (3) miles east of the *subject property*.

The role of environmental screening levels is to screen sites and help identify areas, contaminants and conditions that may require further attention and risk assessment. In general, at sites where contaminants are below screening levels, no further action is warranted provided that the exposure assumptions match or approximate those used in developing the screening levels. Furthermore, contaminants above screening levels does not automatically trigger or require remedial action. According to RWQCB (December 2013), chemical concentrations in soil and groundwater above ESLs could pose negligible risk. Factors, such as background levels, have to be considered in evaluating sample data and the need for remedial action or risk management. Remedial action is generally not warranted for naturally-occurring metals in soil and groundwater.

6.0 INVESTIGATION RESULTS

Three (3) exploratory borings were completed on April 15, 2014 at the Muni Upper Yard. The boring logs are presented in **Appendix B**. The borings encountered fill comprised of a mixture of crushed asphalt concrete, Portland cement concrete, crushed rock and sand that extends below the surface pavement to between seven (7) and nine (9) feet bts. The fill was relatively dry and heterogeneous with variable content of coarse particulates to sand. No overt or visual evidence of serpentinite or other asbestos-containing rocks was observed during field logging of the boring cores.

Below the coarse fill, the borings encountered poorly graded sand comprised mainly of fine- and medium-grained sand with silty fines, and intercalated with thinner layers of silty sand, clayey sand, and sandy silt, to the maximum depth explored of forty (40) feet at Boring B-1 and thirty (30) feet at Borings B-2 and B-3. Relatively saturated sand was noted in the twenty-six (26) to thirty-four (34) feet depth feet interval.

6.1 Soil: Organics

Soil samples from the three (3) to ten (10) feet depth interval were analyzed for petroleum hydrocarbons, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), organochlorine pesticides (OCPs), cyanide, and metals. The soil analytical results for organics are summarized in the attached **Table 1**.

Analytical Results

Except for traces of diesel-range petroleum hydrocarbons and phenol,[1] the laboratory reported no detectable levels of organic constituents in the soil samples. Expressed in milligrams per kilogram (mg/Kg), the laboratory reported 12 mg/Kg of TPHd and 0.28 mg/Kg phenol in Sample B2-7/8 from the 7 to 8 feet depth interval at Boring B-2; 2.0 mg/Kg of TPHd and 0.46 mg/Kg phenol in Sample B3-4/5 from the 4 to 5 feet depth interval at Boring B-3; and 1.7 mg/Kg of TPHd in Sample B1-3.25/3.75 from the 3.25 to 3.75 feet depth interval at Boring B-1. In addition, phenol was detected at 2.5 mg/Kg in Sample B3-9/10 from the 9 to 10 feet depth interval at Boring B-3, and 0.30 mg/Kg phenol in Sample B2-3.5/4 from the 3.5 to 4 feet depth interval at Boring B-2.

The laboratory reporting limits were as follows: 0.160 to 60 mg/Kg for total petroleum hydrocarbons (TPH), 0.074 to 0.39 mg/Kg for SVOCs, and 0.40 to 0.51 mg/Kg for cyanide. Expressed in micrograms per kilogram (µg/Kg), the laboratory reporting limits were 56 to59 µg/Kg for PCBs, 3.2 to 60 µg/Kg for VOCs, and 2.2 to 47 µg/Kg for OCPs (**Table 1**).

[1] Phenol is an aromatic semi-volatile organic compound with the molecular formula C6H5OH. Phenol was first extracted from coal tar, but today is produced from petroleum hydrocarbons. It is an important industrial commodity as a precursor to many materials and compounds such plastics. Phenols are widely used in household products and as intermediates for industrial synthesis. Phenols are also naturally occurring, known to occur in some plants.

Environmental Screening

Except for phenol, the soil analytical results for organics meet the RWQCB (December 2013) ESLs for a residential land use scenario. The phenol results (0.28 to 2.5 mg/Kg) exceed the ESL of 0.076 mg/Kg for soil where groundwater IS a drinking water resource (**Table 1**).

There are no drinking water supply wells on the *subject property* and vicinity, and the *subject property* is in the service area of the municipal potable water supply system. Given the highly urbanized area and likelihood that the first-encountered groundwater is unsuitable for drinking water due to groundwater quality issues, the drinking water resource protection ESL appears to be a too conservative of a groundwater screening level for the *subject property*. The soil phenol results (0.28 to 2.5 mg/Kg) meet the ESL of 3.9 mg/Kg for soil where groundwater IS NOT a drinking water resource (**Table 1**).

6.2 Soil: Metals

Soil samples from the 3.25 to 5 feet depth interval were analyzed for CCR Title 22 CAM 17 metals. The metal analytical results are summarized in the attached **Table 2**.

Analytical Results

Arsenic, barium, chromium, cobalt, copper, lead, nickel, vanadium and zinc were detected above laboratory reporting limits in the soil samples as follows:

- Sample B1-3.25/3.75 from Boring B-1 contained 6.1 mg/Kg arsenic, 93 mg/Kg barium, 160 mg/Kg chromium, 19 mg/Kg cobalt, 30 mg/Kg copper, 6.5 mg/Kg lead, 200 mg/Kg nickel, 67 mg/Kg vanadium, and 55 mg/Kg zinc. In addition, traces of mercury (0.077 mg/Kg) were detected in Sample B1-3.25/3.75.

- Sample B2-3.5/4 from Boring B-2 contained 2.1 mg/Kg arsenic, 31 mg/Kg barium, 40 mg/Kg chromium, 6.5 mg/Kg cobalt, 6.0 mg/Kg copper, 1.8 mg/Kg lead, 30 mg/Kg nickel, 34 mg/Kg vanadium, and 19 mg/Kg zinc.

- Sample B3-4/5 from Boring B-3 contained 1.1 mg/Kg arsenic, 18 mg/Kg barium, 16 mg/Kg chromium, 3.0 mg/Kg cobalt, 3.2 mg/Kg copper, 0.94 mg/Kg lead, 13 mg/Kg nickel, 15 mg/Kg vanadium, and 9.1 mg/Kg zinc.

The laboratory reported no detectable levels of the remaining CAM 17 metals. Laboratory reporting limits were as follows: 0.38 to 2.1 mg/Kg for antimony, 0.076 to 0.42 mg/Kg for beryllium, 0.094 to 0.52 mg/Kg for cadmium, 0.38 to 2.1 mg/Kg for molybdenum, 0.76 to 4.2 mg/Kg for selenium, 0.19 to 1.0 mg/Kg for silver, and 0.38 to 2.1 mg/Kg for thallium (**Table 2**).

Environmental Screening

Metals are naturally occurring and ubiquitous in soils and other geological materials of the San Francisco Bay Area. The background concentration of metals in the *subject property* vicinity has not been established to date. However, the background occurrence of metals in soils has been the subject of research elsewhere in the San Francisco Bay Area. The results of such research and the development of background levels have been published for the Lawrence Berkeley National Laboratory (LBNL, April 2009), Stanford Linear Accelerator Center (SLAC, August 25, 2003), and Santa Clara County (Scott, 1995). Bradford et al (March 1996) provide background levels for California state-wide.

The soil sample data for metals in **Table 2** are compared to published background levels and RWQCB (December 2013) ESLs for a residential land use scenario. Except for arsenic in Samples B1-3.25/3.75, B2-3.5/4, and B3-4/5, and nickel in Sample B1-3.25/3.75, the CAM 17 metals are below residential ESLs and within the range of published background levels.

Arsenic

The arsenic results (1.1 to 6.1 mg/Kg) are above the residential ESL of 0.39 mg/Kg for human health direct exposure. However, RWQCB (December 2013) acknowledges that naturally-occurring arsenic in soils of the San Francisco Bay Area typically exceeds the residential ESL of 0.39 mg/Kg, and provides for the use of background levels to screen for arsenic. Naturally-occurring arsenic in California soils has been reported at 24 mg/Kg for the Lawrence Berkeley National Laboratory (LBNL, April 2009), 12 mg/Kg for Southern California (DTSC, 2009), 7.2 mg/Kg for the Stanford Linear Accelerator Center (SLAC, August 25, 2003), 6 mg/Kg for Los Angeles area schools (DTSC, June 6, 2005), 0.2 to 5.5 mg/Kg for Santa Clara County (Scott, 1995), and 0.6 to 11 mg/Kg for California state-wide (Bradford et al, March 1996).

The arsenic results for soil samples from the *subject property* fall in the range of published background levels for the San Francisco Bay Area and California state-wide (**Table 2**). Furthermore, the total arsenic results of the soil samples (1.1 to 6.1 mg/Kg), and the soluble arsenic result of a composite of Samples B1-3.25/3.75, B2-3.5/4, and B3-4/5 (ND <0.10 mg/L), are below the hazardous waste criteria for arsenic in Title 22 of the California Code of Regulations (CCR), Division 4, Chapter 30, *Minimum Standards for Management of Hazardous and Extremely Hazardous Wastes*.[2] The soil arsenic results for the *subject property* are considered to reflect background conditions and do not warrant remedial action.

[2] Under CCR Title 22, compound-specific toxicity criteria for hazardous waste include the Total Threshold Limit Concentration (TTLC expressed in mg/Kg) and the Soluble Threshold Limit Concentration (STLC expressed in mg/L). A solid waste is hazardous if the total concentration equals or exceeds the TTLC, or the extractable concentration equals or exceeds the STLC. The hazardous waste criteria for arsenic in CCR Title 22 is 500 mg/Kg for TTLC and 5.0 mg/L for STLC.

Nickel

The nickel result (200 mg/Kg) of soil Sample B1-3.25/3.75 is somewhat above the urban area ecotoxicity-based ESL of 150 mg/Kg. The nickel results of all the soil samples meet the residential ESL of 1,500 mg/Kg for human health direct exposure. Furthermore, considering that nickel is naturally occurring in soils of the San Francisco Bay Area, the nickel results for soil samples from the *subject property* (13 to 200 mg/Kg) are in the range of published background levels. Background levels for nickel in soil were reported at 6 to 145 mg/Kg for Santa Clara County (Scott, 1995), 6 to 380 mg/Kg for the Lawrence Berkeley National Laboratory (LBNL, April 2009), and up to 225 mg/Kg at the Stanford Linear Accelerator Center (SLAC, August 25, 2003). Bradford et al (March 1996) reported 9 to 509 mg/Kg for nickel in soils for California state-wide.

Given that background levels of nickel in soils of the San Francisco Bay Area can exceed the urban area ecotoxicity of 150 mg/Kg and, given the soil sample results meet direct exposure human health ESL for nickel and are in the range of published background levels, the nickel result of Sample B1-3.25/3.75 is considered not to be indicative of significant anthropogenic contamination, and does not warrant remedial action.

The total nickel results of the soil samples (13 to 200 mg/Kg), and the soluble nickel result of the composite sample from the *subject property* (0.53 mg/L), are below the hazardous waste criteria of 2,000 mg/Kg TTLC and 20 mg/L STLC for nickel, respectively, in CCR Title 22.

6.3 Soil: Asbestos

The asbestos analytical results are summarized in the attached **Table 3**.

<u>Analytical Results</u>

Serpentinite or friable asbestos-bearing materials were not visually or overtly evident in soils recovered and examined from the exploratory borings completed at the *subject property*. Five (5) soil samples collected from the 2.75 to 7 feet depth interval at Borings B-1, B-2 and B-3 were submitted for laboratory analysis for asbestos via polarized light microscopy (PLM). Expressed in percentage by point count (%), the PLM results by EPA Method 600/R-93/116 indicated no detectable asbestos fibers above the reporting limit of 1% in Samples B1-3.75/54.25, B1-6.5/7, B2-3.5/4, and B3-2.75/3.50. PLM analysis by CARB Method 435 indicated no detectable asbestos fibers above the laboratory reporting limit of 0.25% in Sample B3-6.5/7 (**Table 3**).

Environmental Screening

Based on the soil lithology and the asbestos analytical results, asbestos exposure risk does not appear to be significant or warrant remedial action at the *subject property*.

6.4 Groundwater: Organics

Expressed in micrograms per liter (µg/L), the groundwater analytical results for organics are presented in the attached **Table 4**.

Analytical Results

Except for petroleum hydrocarbons in the diesel to motor oil range detected in groundwater Sample B3-GW, the laboratory reported no detectable levels of organic constituents in the groundwater samples. Laboratory reporting limits were 50 to 100 µg/L for TPH, 10 µg/L for cyanide, 0.50 to 50 µg/L for VOCs, 2.0 to 10 µg/L for SVOCs, and 0.061 to 1.0 µg/L for OCPs (**Table 4**).

Environmental Screening

The TPHd result (600 µg/L) and TPHmo result (2,700 µg/L) exceed the ESL of 100 µg/L for groundwater where groundwater IS a drinking water resource. With respect to the more applicable scenario for the *subject property* where groundwater IS NOT a drinking water resource, only the TPHmo result is above the corresponding ESL of 2,500 µg/L (**Table 4**).

The TPH results of Sample B3-GW are considered to represent a low potential human health and environmental risk inasmuch as VOCs and SVOCs were not detected in the groundwater sample, there are no drinking water supply wells on or near the *subject property*, and human receptors are not significantly susceptible to groundwater contact due to groundwater depth.

6.5 Groundwater: Metals

The groundwater analytical results for metals are summarized in the attached **Table 5.**

Analytical Results

The following CAM 17 metals were detected in the groundwater samples:

- Sample B2-GW from Boring B-2 contained 20 µg/L antimony, 41 µg/L barium, 6.1 µg/L cobalt, 32 µg/L lead, and 85 µg/L molybdenum.

- Sample B3-GW from Boring B-3 contained 60 µg/L barium, 8.4 µg/L cobalt, 37 µg/L lead, 45 µg/L molybdenum, and 13 µg/L g nickel.

The laboratory reported no detectable levels for the remaining eleven (11) CAM 17 metals relative to laboratory reporting limits. Laboratory reporting limits were 20 µg/L for copper, selenium and zinc; 10 µg/L for arsenic, chromium, thallium, and vanadium; 5.0 µg/L for silver; 2.0 µg/L for beryllium and cadmium, and 0.20 µg/L for mercury (**Table 5**).

<u>Environmental Screening</u>

The groundwater analytical results for Sample B2-GW (20 µg/L antimony, 6.1 µg/L cobalt, 32 µg/L lead, and 85 µg/L molybdenum) are above the drinking water resource protection ESLs for groundwater of 6.0 µg/L for antimony, 4.7 µg/L for cobalt, 15 µg/L for lead, 78 µg/L for molybdenum. For Sample B3-GW, the cobalt result (8.4 µg/L) and lead result (37 µg/L) exceed the corresponding drinking water resource protection ESLs (**Table 5**).

Because groundwater is not used as a source of drinking water supply at the *subject property* and vicinity, and given that the detected metals in the groundwater samples are known to be naturally occurring in groundwater elsewhere in California (EKI, April 4, 2003; Hunter et al, March 10, 2005), it is more appropriate to compare the groundwater metal results for the *subject property* with ESLs where groundwater IS NOT a drinking water resource. The metal results for Samples B2-GW and B3-GW meet the corresponding ESLs for non-drinking water resource protection (**Table 5**). Based on these considerations, the groundwater metals data for the *subject property* do not warrant remedial action.

7.0 FINDINGS AND CONCLUSIONS

Although the investigation results indicate low-risk or insignificant levels of petroleum hydrocarbons, phenols and metals in the soil and groundwater samples, LEE recommends the following in the event the *subject property* is to be redeveloped residential:

- A health and safety plan to ensure the safety and protection of the public and construction workers during construction.

- A soil management plan to provide for the proper profiling, handling, stockpiling and disposal of soils generated from grading or excavation activities during construction.

Because the *subject property* is in an area of the City covered by the Maher Ordinance, the Maher Ordinance will apply if construction, grading or excavation activities during the redevelopment project generate more than fifty (50) cubic yards of soil.

8.0 REFERENCES

America Society for Testing and Materials (ASTM, 2011): *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, ASTM Designation E1903-11*.

Bonilla, M. G. (1998): *Preliminary Geologic Map of the San Francisco South 7.5' Quadrangle and Part of the Hunters Point 7.5' Quadrangle, San Francisco Bay Area, California: A Digital Database,* United States Geological Survey Open File Report 98-354.

Bradford, G. R., Chang, A. C., Page, A. L., Bakhtar, D., Frampton, J. A. and Wright, H. (Bradford et al, March 1996): *Background Concentrations of Trace and Major Elements in California Soils*, Kearney Foundation Special Report, Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, March 1996.

Department of Toxic Substances Control (DTSC, June 6, 2005): *Final Report – Background Metals at Los Angeles Unified School Sites - ARSENIC*.

Department of Toxic Substances Control (DTSC, 2009): *Determination of A Southern California Regional Background Arsenic Concentration in Soil*.

Erler and Kalinowsky, Inc. (EKI, April 4, 2003): *Technical Memorandum: Background Concentrations of Metals in Groundwater, Stanford Linear Accelerator Center, Menlo Park, California*.

Hunter, Philip M., Davis, Brian K., and Roach, Frank (Hunger et al, March 10, 2005): *Inorganic Chemicals in Ground Water and Soil: Background Concentrations at California Air Force Bases*, presented at 44th Annual Meeting of Society of Toxicology, New Orleans, Louisiana, March 10, 2005.

Lawrence Berkeley National Laboratory, Environmental Restoration Program (LBNL, April 2009): *Analysis of Background Distributions of Metals in the Soil at Lawrence Berkeley National Laboratory*, prepared by David Diamond, Davis Baskin, Dennis Brown, Loren Lund, Julie Najita, and Iraj Javandel, Environmental Restoration Program, Lawrence Berkeley National Laboratory, June 2002, updated April 2009.

LEE Incorporated (LEE, April 2013): *Phase I Environmental Site Assessment, Upper Yard Site, San Francisco, California 94112*.

LEE Incorporated (LEE, May 23, 2013): *Fee Proposal, Phase II Environmental Site Assessment, Upper Yard Site, San Francisco, California 94112*.

Regional Water Quality Control Board, San Francisco Bay Region (RWQCB, June 1995): *Water Quality Control Plan for the San Francisco Bay Basin*.

Regional Water Quality Control Board, San Francisco Bay (RWQCB, January 18, 2007): *San Francisco Bay (Region 2) Water Quality Control Plan (Basin Plan)*, incorporating all amendments approved by the Office of Administrative Law as of January 18, 2007.

Regional Water Quality Control Board, San Francisco Bay Region (RWQCB, December 2013): *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater*, Volumes I and II, Interim Final – November 2007, updated December 2013.

Scott, Christina M. (Scott, 1995): *Background Metal Concentrations in Soils in Northern Santa Clara County, California*, in: Recent Geologic Studies in the San Francisco Bay Area, Sangines, E. M, Andersen, D. W., and Buising, A. V. (editors), The Pacific Section of the Society of Economic Paleontologists and Mineralogists, Volume 76, May 3-5, 1995.

Stanford Linear Accelerator Center (SLAC, August 25, 2003). *Technical Memorandum: Background Concentrations of Metals in Soil, Stanford Linear Accelerator Center, Menlo Park, California*.

State Water Quality Control Board (SWQCB, February 1, 2006): *State Water Resources Control Board Resolution No. 88-63 (as revised by Resolution No. 2006-0008). Adoption of Policy Entitled Sources of Drinking Water.*

United States Geological Survey (USGS, 1995): *San Francisco South Quadrangle, California, California 7.5-Minute Series (Topographic)*, scale 1:24,000, updated 1995.

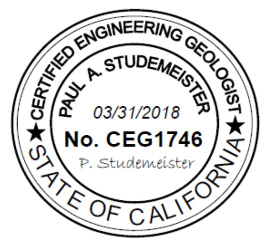
9.0 SIGNATURE PAGE

All engineering information, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by the following professionals:

06/02/14

Ellen Lee
Professional Engineer, PE C20864

Date

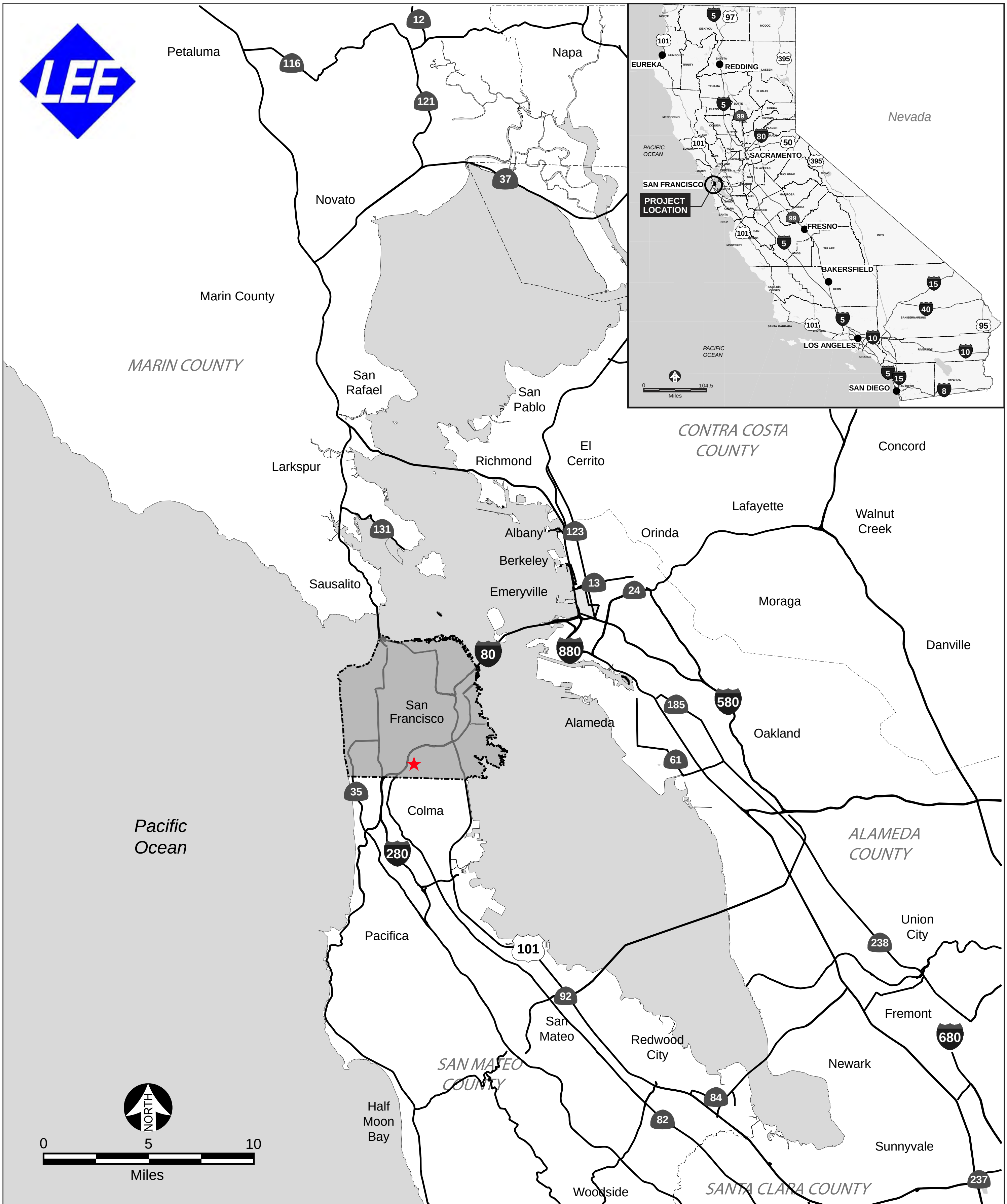


06/02/14

Paul Studemeister
California Certified Engineering Geologist, CEG 1746

Date

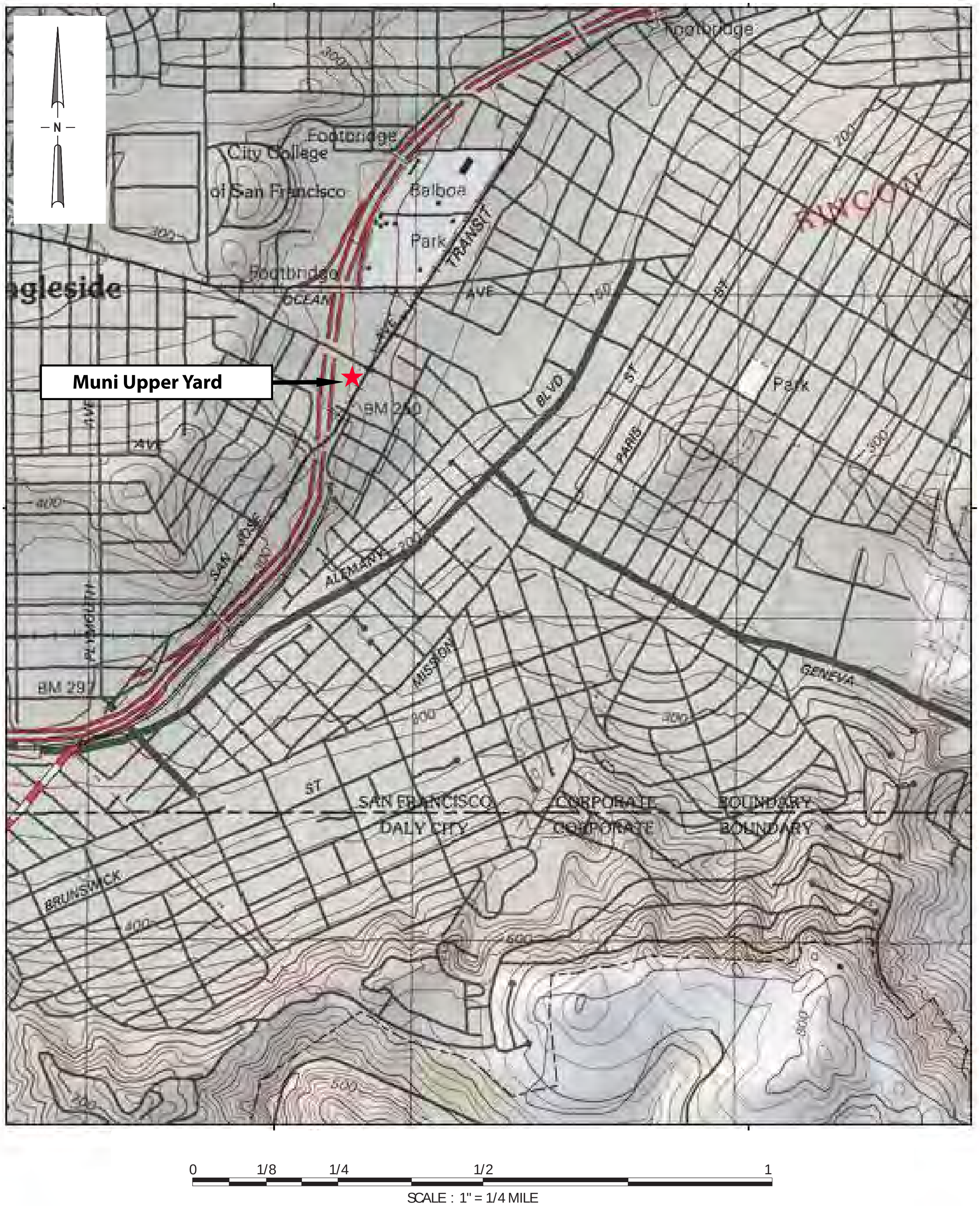
FIGURES



LEE Incorporated
San Francisco, California
email: pstudemeister@leei.com

★ Subject Property Location
Muni Upper Yard,
San Francisco, Califonira 94112

Figure 1.
City and County of San Francisco Regional Map



Basemap:R 7.5-minute USGS topographic map of San Francisco South, California Quadrangle dated 1995, Scale: 1:24,000

LEE Incorporated, San Francisco, California
email: pstudemeister@leei.com

★ Subject Property Location

Figure 2.
Site Location Map
Muni Upper Yard
San Francisco, California 94112