geologica

FINAL VAPOR INTRUSION MITIGATION PLAN

FAIRCHILD DRIVE ROWHOUSE PROJECT
MV Viewpoint 2013 Inc., Phase II
APN # 160-07-003 and 160-07-004
MOUNTAIN VIEW, CA

PREPARED BY:

GEOLOGICA INC

SUBMITTED TO:

U.S. Environmental Protection Agency, Region 9
75 Hawthorne Street
San Francisco, CA 94105
May 6, 2016

Attn: Alana Lee, MEW Superfund Site Project Manager
lee.alana@epa.gov

City of Mountain View
Community Development Department
500 Castro Street
Mountain View, CA 94041

Attn: Diana Pancholi
Diana.Pancholi@MountainView.gov

TABLE OF CONTENTS

Tables

Figures

Attachments

1.0 INTRODUCTION AND OBJECTIVES

This Vapor Intrusion Mitigation Plan (VIMP) has been prepared by GEOLOGICA, Inc. (GEOLOGICA) on behalf of MV Viewpoint 2013, Inc. (MV Viewpoint) to describe the vapor control system design, implementation, and monitoring procedures to be used during and after redevelopment activities on the approximately 1.8-acre property located east of Tyrella Avenue, between Fairfield Drive and Evandale Drive, in Mountain View, CA (see **Figure 1** for Site Location). Phase II of the planned property redevelopment will include construction of a seven (7) building, 35-unit townhouse project (see Phase II Development Site Plan, **Figure 2**). The subject property comprises assessor parcel numbers (APN) 160-07-003 and APN # 160-07-004.

This VIMP describes the design and construction procedures that will be incorporated into project construction to mitigate potential vapor intrusion through the floor slab into residential units. These measures are intended to provide long term protection of residents from vapor intrusion by volatile organic compounds (VOCs), including trichloroethene (TCE). The planned vapor mitigation system will comprise a sub-slab vapor barrier membrane coupled with an underlying passive sub-slab venting (SSV) system. In addition, the system can be converted from a passive system to a fan/blower driven "active" extraction system, should conditions and/or system monitoring warrant this contingency.

1.1 Guidance and Key Background Documents

The plan presented herein was designed to comply with the following documents:

- Record of Decision Amendment for the Vapor Intrusion Pathway, MEW Superfund Study Area prepared by EPA (2010).

- Statement of Work, Remedial Design & Remedial Action to Address the Vapor Intrusion Pathway, MEW Superfund Study Area (included in the Sept 2011 Amendment to Administrative Order #91-4) prepared by EPA (2011).

- OSWER Vapor Intrusion Mitigation Guidance (EPA, 2015)

This VIMP plan has been prepared based on known conditions and contains a summary of background information and environmental conditions; additional description of this information is presented in the following reports:

- Phase I Environmental Site Assessment (Phase I ESA) prepared by LA&S in 2012 (LA&S, 2012).

- Subsurface Investigation Findings Report (Phase II ESA) prepared by LA&S (LA&S, 2014).

- Grab Groundwater Assessment Report prepared by Geosyntec (2013).

1.2 Quality Management Organization

Detailed quality assurance/quality control (QA/QC) processes are required to demonstrate that the passive venting layer and barrier materials have been correctly emplaced and not damaged during subsequent building construction activities. This section discusses responsibilities for managing this VIMP and the circumstances under which this VIMP may be modified.

The Owner shall oversee implementation of this VIMP for the subject redevelopment project. In addition, the Owner shall make available a copy of the VIMP to Contractors engaging in applicable work activities, unless otherwise excluded herein. The Contractor shall be responsible for adhering to this VIMP, following project specifications. Each Contractor engaging in site work will be required to sign a letter of acknowledgement documenting receipt and agreement to the responsibilities and requirements set forth herein this VIMP. Copies will be maintained in the Owner's files. Contractor also is responsible for providing a copy of the VIMP to its subcontractors. The Consultant, on behalf of the Owner, may observe construction activities, but is not responsible for directing or supervising the Contractor's operations or work.

This VIMP was developed based on our understanding of current conditions at the Project Site and applicable regulations. It may be necessary to modify this VIMP for any of several reasons including:

- Change in property use;
- Change in understanding of environmental conditions (e.g., newly identified chemicals);
- Intrusive activity that is not addressed in the SM&
- New chemical toxicity information for detected constituents at the site; or, new legal requirements.

The Organization Chart for this VIMP, along with contact information, is presented below:

Term	Company/ Agency	Contact	Ph#	email	Description
Owner	MV Viewpoint 2013, Inc.	Josh Vrotsos	(408) 762-7108	jvrotsos@dividendhomes.com	Property Owner for the construction period
EPA	Superfund Division	Alana Lee	(415) 972-3141	Lee.Alana@epa.gov	Oversight agency for MEW Superfund Area and TCE issues
City	Planning Department	Diana Pancholi	(650) 903-6306	Diana.Pancholi@mountainview.gov	Planning/ Development Issues

County	SCCDEH	Jennifer Kaahaaina	(408) 918-4795	Jennifer.Kaahaaina@deh.sccgov.org	Oversight agency for non-VOC issues
VI System Engineer/ QA Manager	GeoKinetics	Kevin Lea	(949) 502-5353	kevin@geokinetics.org	VI System Design Engineer / QA/QC Oversight during Construction
Consultant	GEOLOGICA INC.	Brian Aubry	(415) 722-3629	baubry@geologicagroup.com	Project Environmental Consultant / VI system Oversight after Construction
Architect	Dahlin Group	Tim Nystrom	925-251-7222	tim.nystrom@dahlingroup.com	Architect
Structural Engineer	Max Cheng & Associates	Max Cheng	408-782-6898	Maxcheng@garlic.com	Structural Engineer
Mechanical Engineer	Duct Tester	Mark Praster	209-593-5832	markpraster@ducttesters.com	Mechanical Engineer
Civil Engineer	BKF Engineers	Patrick Chan	(408) 467-9188	pchan@bkf.com	Project Civil Engineer
Contractor	Dividend Homes, Imc.	Rod Martin	408-779-5900	rmartin@dividendhomes.com	Party conducting on-site construction activities as engaged by the Owner or the project General Contractor

2.0 BACKGROUND

2.1 Site Description

The Project Site is comprised of two parcels, identified as Assessor's Parcel Numbers (APN) 160-07-003 and 160-07-004, totaling approximately (1.8) acres. Parcel 160-07-003, with an area of approximately 0.72 acre, is located at 133 Fairchild Drive and is east of Tyrella Avenue between Fairchild Drive to the north and Evandale Avenue to the south. Parcel 160-07-004, with an area of approximately 1.08 acres, is located at 149 Fairchild Drive adjacent to the east side of

Parcel 160-07-003 between Fairchild Drive and Evandale Avenue and abuts the west side of an apartment property.

2.2 Site History

According to tax records, Parcel 160-07-003 was first developed in 1949 and Parcel 160-07-004 in 1948. A 1948 aerial photograph shows several mobile homes on the property. A 1956 aerial photo shows more mobile homes and a paved parking area. By the 1968 aerial photograph all of the subject property has mobile homes on it. There is a one story wood-frame house which is the manager's office/residence and approximately ten wood-frame former motel rooms now rented out as residential units along the east side of the property. Prior to 1948 both land parcels were farmed and used for agricultural row crops.

2.3 Development Plans

The pending redevelopment project, scheduled to begin in the spring of 2016 consists of demolishing the current site buildings and constructing an at-grade townhouse project with seven (7) building clusters, of which five (5) buildings (4, 6, 7, 8 and 9) have five (5) townhouses each, Building 5 has six (6) townhouses and Building 10 has four (4) townhouses (see **Figure 2**). The total footprint for Building 4 is 3,563 square feet. The total footprint of Building 5 is 4,346 square feet. The total footprint of Buildings 6, 7, 8 and 9 is 3,730 square feet each. The total footprint of Building 10 is 2,780 square feet. As shown on **Figure 2**, there also will be a semi-circular driveway, parking spots, landscaped areas and a future city park.

2.3.1 Site Preparation

The Owner will engage an appropriately licensed contractor to conduct asbestos & lead abatement activities, as needed, and demolish existing structures on the property under a demolition permit with the City of Mountain View. Much of the existing pavement and existing utilities will be removed during redevelopment activities. The majority of existing utilities including natural gas, water, electric, and telephone lines are expected to be located within 3 feet of ground surface. Existing storm water conveyance and sanitary sewer pipelines may be present at depths of 4 foot or greater. However, exact depths of existing utilities will be determined during planned demolition activities.

2.3.2 Earthworks

According to earthwork estimates from the project Civil Engineer, the project has an anticipated net surplus of soil of approximately 500 cubic yards (cy) that will be exported offsite. The various excavating and grading activities will inherently involve a larger soil volume, which may include temporary onsite stockpiling. However, to meet various City and general subsurface utility construction requirements, there will be some import of sand bedding/backfill material.

2.3.3 New Utility Construction

As noted above, the majority of new utilities including natural gas, water, electric, and telephone lines are expected to be constructed within 3 feet of ground surface. Proposed locations and depths of planned storm water conveyance, water, and sanitary sewer trenches and joint utility (natural gas, television, telephone, and cable) trenches may be constructed to depths of 4 foot or greater as shown on **Figure 2**.

3.0 ENVIRONMENTAL CONDITIONS

Based on the Phase I ESA results and reconnaissance of the property, no evidence of historic hazardous material use or storage was identified on the subject property. However, the subject property is located within the Middlefield-Ellis-Whisman (MEW) Superfund Study Area (MEW Site) and west of the regional TCE shallow groundwater contamination plume boundary. In 2012, previously undiscovered MEW Site contamination was identified to the west of the presumed MEW regional TCE shallow groundwater contamination plume boundary (and west of the subject property). EPA and MEW Site parties have been conducting investigations in this area to characterize this contamination, and EPA has recently designated this area as Operable Unit 3 (OU3) of the MEW Site. Investigative work to characterize the contamination in OU3 is underway, and future cleanup work is expected to address the contamination in this area. The MEW Site remedy includes activities to contain and clean up subsurface contamination as well as actions to prevent that subsurface contamination from entering into overlying buildings. A map prepared by EPA depicting TCE concentrations in shallow groundwater is shown on **Figure 3**. A map prepared by EPA depicting the Vapor Intrusion Study Area is shown on **Figure 4**.

Because of the proximity of the property to the areas of potentially impacted soil vapor and groundwater associated with the MEW Site, environmental investigations to assess soil vapor and groundwater conditions were conducted at the Project Site in support of the pending redevelopment activities, with details provided in the two LA&S reports cited in the VIMP Introduction. This remainder of this section discusses the pertinent findings of the environmental investigations conducted on the property.

3.1 Chemicals in Soil Vapor

In March 2014, soil vapor samples were collected at a depth of six feet bgs from six (6) locations (LAS-SV-4, LAS-SV-5, LAS-SV-6, LAS-SV-7, LAS-SV-8 and LAS-SV-9) within planned residential building footprints and were analyzed for VOCs (LA&S, 2014). Sampling locations are shown on **Figure 5**; results are summarized in **Table 1**. The only VOC detected in the samples was TCE, which was reported in five of the six samples and a duplicate sample at concentrations ranging from 12 to 1,200 micrograms per cubic meter (ug/m^3).

3.2 Chemicals in Groundwater

Also in March 2014, groundwater "grab" samples were collected from six locations (LAS-GW-4, LAS-GW-5, LAS-GW-6, LAS-GW-7, LAS-GW-8 and LAS-GW-9) within the planned residential building footprints. Three depth-discrete groundwater "grab" samples were collected at each location. Sampling locations are shown on **Figure 5**; groundwater sample results are summarized in **Table 2**. TCE was the primary groundwater constituent found, with detectable concentrations up to 9.3 micrograms per liter (ug/L) in twelve (12) of the eighteen (18) samples.

4.0 BASIS OF VAPOR INTRUSION MITIGATION SYSTEM DESIGN

The EPA Record of Decision Amendment for the Vapor Intrusion Pathway (EPA, 2010) set the residential indoor air cleanup level for TCE at 1 ug/m^3 for the MEW Superfund Area. EPA's 2015 OSWER Vapor Intrusion Mitigation Guidance (EPA, 2015) identified a default attenuation factor of 0.03 for VOC migration from soil vapor to indoor air, indicating that TCE concentrations in soil vapor greater than 33 ug/m^3 pose a potential concern for vapor intrusion. It should be noted that the subject Property is not considered a contributor to the regional chlorinated VOC contamination.

The planned vapor mitigation barrier and passive sub-slab venting (SSV) system described in **Section 5** is a standard and often-employed technology. In addition, the system can be converted from a passive system to a fan/blower driven "active" extraction system, should conditions and/or system monitoring warrant this contingency (see **Section 5.4**).

Throughout this document the term 'sub-slab' is defined to mean the granular zone immediately below the vapor barrier, which lies beneath the concrete floor slab. Further, in compliance with DTSC nomenclature, this VIMP uses the SSV classification for the planned system rather than the sub-slab depressurization (SSD) classification. The wind-driven "passive" system inherently will not *maintain* a depressurized condition *throughout* the buildings' footprints of the degree expected by a true SSD system when the wind is not blowing. However, given that the site is not a source and that soil vapor concentrations below the property are relatively low (see **Section 3.1**), the passive system is considered appropriate.

5.0 VAPOR INTRUSION CONTROL SYSTEM DESIGN

The owners retained GeoKinetics of Irvine, CA to prepare detailed design specifications for the Vapor Intrusion Mitigation System. The design plan-set, entitled *Soil VOC Vapor Mitigation System Plans and Specifications for Viewpoint II, Phase II, Mountain View, California*, is included as **Appendix A**.

The following sections describe the layout and specifications for the two main recommended vapor intrusion mitigation elements: (1) the passive sub-slab venting (SSV) system immediately

beneath the vapor barrier; and (2) the vapor barrier membrane system. If there is a discrepancy between any recommendation or specification and building code, the local building code should be followed. Since the project is new construction, the concrete floor slab is expected to provide an additional inherent degree of protection to vapor intrusion. Natural ventilation is also expected due to diurnal changes in temperature and barometric pressure.

5.1 Sub-Slab Venting (SSV) System

A passive sub-slab venting (SSV) system shall be installed prior to construction of the slab / foundation of the designated buildings. Detailed specifications for this system are presented in **Appendix A** and summarized below.

- A low profile sub-slab vent system vent line shall be placed such that no portion of the foundation is more than 25 feet from any low profile sub-slab vent line. Low profile sub-slab vent system vent lines shall be covered with filter fabric and not less than 12" wide. A minimum length of one foot of slotted pipe will be required for every 75-ft^2 of slab area serviced by a low profile sub-slab vent system vent line.

- The low profile vent piping shall be positioned within a minimum 2" thick zone of sand. The gradation of the sand is specified in **Appendix A**.

- Where piping transitions through building footings, the penetration shall be accomplished in compliance with the Uniform Building Code and with the approval of the Project Structural Engineer and the Building Official.

- Perforated pipes shall be connected to solid vertical vent riser pipe. Vent risers shall be constructed using 2" Schedule 40 PVC or ABS in compliance with Section 1212 of the Uniform Plumbing Code. Risers located within buildings shall terminate at an approved outlet in accordance with Section 506 of the Uniform Building Code. All joints shall be tightly sealed with approved materials. Solid vent pipe may be located within the walls/chases or shall be similarly protected from physical damage.

- Vent pipes shall terminate a minimum of 6" inches above the roof-line adjacent to the vent and 3' min. from any parapet or building wall. Wind-driven turbine fans will be installed at the top of the vent pipes, as shown in Detail I of **Appendix A**. Vent pipes shall terminate at a distance of not less than 10 feet from, or upwind of, any building opening or HVAC air intake and at a distance of at least 3 feet from any property line. Any vent pipe located within an open yard shall terminate at a height of not less than 10 feet above adjacent grade. The vent riser shall be clearly marked to indicate that the pipe may contain chemical vapors.

- Vent pipe shall be convertible to an active venting system without modification or damage to the structure as described in Detail N of **Appendix A**.

5.2 Vapor Barrier Membrane System

The new buildings will be entirely underlain by a continuous geomembrane designed as a vapor barrier and chemically resistant to the expected potential concentrations of chlorinated VOCs. The geomembrane will also serve as a moisture barrier. All membrane penetrations must be sealed to manufacturer specifications, with the penetrations also employing product-compatible 'boots'. The most important aspect to vapor barrier effectiveness is a tight seal to foundation walls and around all penetrations. After installation, the vapor barrier integrity must be verified by means of a 'smoke test' or other process approved by the manufacturer to meet warranty conditions. The following sections summarize the specifications (see **Appendix A** for details**)** of the vapor barrier membrane system to be installed beneath the slab / foundation of all buildings.

- The vapor barrier at this project shall be constructed using a layer of Geo-Seal BASE geotextile sheeting followed by spray-applied Geo-Seal CORE, approved by the Project Vapor Barrier Engineer and City of Mountain View. Fluid applied vapor barrier Geo-Seal CORE is a single course, high build, polymer modified, asphalt emulsion; it is waterborne and spray-applied at ambient temperatures, and is both non-toxic and odorless. The vapor barrier shall have a minimum cured thickness of 60-mils.

- The subgrade under the Geo-Seal Base vapor barrier shall be rolled smooth and well compacted. A minimum 2" sand layer shall be provided between the barrier and the subgrade in order to reduce the potential for damage to the barrier. The gradation of the sand placed below the barrier is specified in **Appendix A**.

- The vapor barrier shall be placed between the bottom of the floor slab and the subgrade, and around or fastened to footings, in accordance with the plans. The barrier shall not be placed more than 6-inches below the bottom of the floor slab, except where the barrier may pass beneath deepened interior or perimeter footings.

- The upper surface of the vapor barrier shall be protected by a layer of Geo-Seal BOND. Prior to placing the protective Geo-Seal BOND course over the barrier, the VI System Engineer/ QA Manager shall inspect, smoke test and approve the vapor membrane in accordance with the plans and specifications. Construction of the floor slab shall not proceed without written certification of the successful installation of the vapor barrier system by the Contractor / Applicator and the VI System Engineer/ QA Manager. No equipment should be driven over the geomembrane even after the sand or geotextile is in-place. Further, the floor slab installer must not be allowed to puncture the geomembrane to drain extra water that may be associated with the concrete placement

process. Any accidental tear or puncture to the membrane must be promptly repaired to manufacturer specifications, with retesting conducted if the damage is significant or widespread.

- Seams shall be over lapped a minimum of 6-inches and sealed in accordance with the specifications set forth in the plans. Reinforcing steel, piping, forms, etc. shall not be supported directly on the membrane or protective covering and equipment shall not be driven over the membrane or its protective covering.

- All piping associated with the Passive Sub-Slab Venting (SSV) System shall be installed below the membrane, or shall be sealed using approved seals or boots in accordance with the plans, where they penetrate the barrier.

5.3 Provisions for Air Monitoring Beneath the Membrane

Each riser will have a readily-accessible vapor sampling port (see **Appendix A**). This will provide two sampling points to the void space beneath each building's vapor barrier for a total of fourteen (14) for the overall development. GEOLOGICA understands that an Owner's Representative will conduct post-construction vapor sampling and testing. The testing results will be provided to EPA. Development of the long term monitoring and maintenance program is discussed in **Section 7**.

5.4 Provisions for System Conversion from Passive to Active

If more rigorous vapor intrusion mitigation is determined to be warranted in the future, any of the exhaust stacks, or vertical risers, can be modified to an active system by installation of an electric in-line fan for air extraction. A design for this is included in **Appendix A**. Air permits from the Bay Area Air Quality Management District (BAAQMD) may be required. Additional costs would be associated with both the retrofit and the operation & maintenance of the active system.

6.0 IMPLEMENTATION PROVISIONS

General provisions for implementing the VIMP are presented below. Additional relevant details are presented in **Appendix A**.

6.1 Quality Assurance (QA) - System Installation and Oversight

Contractor/Installer Qualifications/Requirements – The system installer must be trained and certified in writing by the membrane manufacturer, Land Science Technologies™ for the installation of the Geo-Seal® System. The certified installer is responsible for contacting the VI System Engineer/ QA Manager for inspection. Prior to application of the membrane, a notice period for inspection should be agreed upon between the installer and VI System Engineer/ QA Manager.

Product Materials and Manufacturer – The vapor intrusion barrier materials and system for the entire Phase 2 project will be obtained from a single manufacturer, in this case Land Science Technologies. Any questions regarding procedures, compatibilities, and warranties should be directed to Land Science Technologies. In order to secure a material or labor material warranty, Land Science Technologies typically requires a manufacturer's representative or certified 3rd party inspector (i.e., the VI System Engineer/ QA Manager) to inspect and verify that the membrane has been installed per the manufacturer's recommendations. Smoke Testing is the ideal way to test the seal created around penetrations and terminations. Smoke Testing is conducted by pumping non-toxic smoke underneath the Geo-Seal vapor intrusion barrier and then repairing the areas where smoke appears. For projects that will require a material or labor material warranty, Land Science Technologies typically requires a smoke test. Details regarding warranties should be directed to Land Science and / or GeoKinetics, the VI System Design Engineers.

QA Oversight - The on-site VI System Engineer/ QA Manager will be present on-site periodically during installation to inspect, smoke test, and approve the installation in accordance with the plans and specifications. The inspection and periodic observations of the vapor membrane and venting control measures will be performed by the VI System Engineer/ QA Manager (or his designee). At a minimum, inspection/observation shall take place at the following stages of the installation:

1. During the installation of the (sub-slab) vent piping;
2. After backfilling of the (sub-slab) vent piping;
3. During the installation of the (sub-slab) vapor barrier;
4. After the installation of the (sub-slab) vapor barrier (Prior to backfilling), including smoke testing. This test shall be documented in the as-built report (see **Section 8**).
5. During the placement of the Geo-Seal Bond protective course;
6. Immediately prior to placement of foundation concrete. Prior to placing the concrete slab over the Vapor Barrier, the Vapor Barrier installer & VI System Engineer/ QA Manager shall certify in writing that the Vapor Barrier has been installed and tested in accordance with the manufacturer's specifications and is free of leaks.
7. During, and at the completion of, the vent riser installation for the (sub-slab) vent piping; and,
8. At the completion of construction prior to the issuance of the system certification and certification of occupancy.

6.2 Generalized Schedule

Pre-Installation - A pre-installation conference shall be held prior to application of the vapor intrusion barrier system to assure proper site and installation conditions, to include contractor,

installer, architect/engineer, and other trades influenced by vapor intrusion barrier installation and VI System Engineer/ QA Manager.

Installation – The passive sub-slab venting (SSV) and vapor barrier system will be installed prior to construction of the slab / foundation of the designated buildings beneath the footprint of each building. The installation is expected to take 5-10 working days per building.

Post Installation – 1) As-built plans and final certification of the vapor barrier system shall be submitted to the Owner at the completion of the final inspection. 2) An Implementation Report will be provided to the Owner as described in **Section 8**.

Post-Construction Indoor Air Testing - Confirmation indoor air sampling will be conducted by the Owner's Representative prior to occupancy. An air sampling plan with the proposed sample locations will be provided to EPA prior to sampling. Air sampling results will be provided to EPA prior to occupancy.

6.3 Homeowner Notification

Homeowner notification regarding the vapor mitigation system will be part of the Covenants, Conditions, & Restrictions (CC&R's) to be provided to new buyers. The CC&R's are attached to this document as **Appendix B**.

7.0 LONG-TERM OPERATIONS, MAINTENANCE, AND MONITORING PLAN

A Long-Term Operations, Maintenance and Monitoring Plan of the vapor intrusion control systems will be provided to EPA for review and approval 60 days after construction and testing of the system. It will include a detailed long-term operations, maintenance, and monitoring plan, including an inspection schedule, recordkeeping requirements, and forms.

It is recommended that the HOA maintenance person conduct visual inspections of the risers on an annual basis. Once every five (5) years, a formal inspection by a qualified environmental consultant is recommended, with a brief report that includes documentation from intervening annual inspections.

8.0 VAPOR INTRUSTION CONTROL SYSTEM IMPLEMENTATION REPORT

A Vapor Intrusion Control System Implementation Report will be provided to EPA within 90 days of completion of construction of the vapor intrusion control system. The report will include:

- A summary of construction activities and chronology of events;
- As-built construction drawings and specifications of all components of the vapor intrusion remedy;
- Confirmation sampling and performance monitoring results;

- Contract pre-final inspection and final inspection, and certification;
- Summary of project costs;
- Discussion of and reference to this VIMP, documentation that Instiutional Controls (ICs) are in place, and a schedule for implementation of any ICs that are not in place.

9.0 LIMITATIONS

This VIMP was developed to address previously detected constituents in soil, soil vapor and/or groundwater beneath the subject property and the immediate neighborhood, as summarized in Section 3.0 above. Point sample locations and laboratory results are inherently limited and do not provide a warranty as to the conditions that may exist throughout. Such a warranty is impossible to achieve. Conditions also change over time. This VIMP does not cover potential environmental issues that may be associated with the demolition of existing structures, such as the handling of any remaining on-site wastes and the potential presence of asbestos, lead-containing paint, or mold.

In preparing this VIMP, GEOLOGICA has relied upon certain information and documents prepared by others. To the extent that recommendations are based in whole or in part of such information, those recommendations are contingent on its accuracy and validity. GEOLOGICA assumes no responsibility for any consequences arising from any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to GEOLOGICA. This VIMP and the affiliated work were performed according to standards of care that have been accepted by EPA Region 9, and State and local agencies for these plans and activities. It is expressly understood that while this VIMP is intended to provide guidance and establish a framework for the management of residual chemicals in soil, soil vapor, and groundwater to protect human health and the environment, this VIMP shall not create any warranties or obligations to LA&S as to implementation, adequacy, or success of such protective measures.

No representation is made to any future developer or property owner with respect to future site conditions, other than those specifically identified within this document. The use of this VIMP by third parties is entirely at their own risk.

10.0 REFERENCES

AARST Consortium on National Radon Standards, *SGM-SF Proposed Standard 09-2015, Soil Gas Mitigation Standards for Existing Homes.* September 2015.

ASTM International, ASTM E2121-13, *Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings*. 2013.

California Department of Toxic Substances Control (DTSC) Human and Ecological Risk Office (HERO),2014. *Human Health Risk Assessment (HHRA), Note Number 5. Issue Health-based Indoor Air Screening Criteria for Trichloroethylene (TCE). August 21, 2014*

California Department of Toxic Substances Control (DTSC, 2011), *Vapor Intrusion Mitigation Advisory*, Final, Revision 1, October 2011.

California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB-SF, 2002), *Erosion and Sediment Control Field Manual*, Fourth Edition, August 2002.

EPA Memorandum - *EPA Response Action Levels and Recommendations to Address Near-Term Inhalation Exposures to TCE in Air from Subsurface Vapor Intrusion, June 30, 2014.*

EPA Memorandum - *Compilation of Information Relating to Early/Interim Actions at Superfund Sites and TCE IRIS Assessment.* Office of Superfund Remediation and Technology Innovation. August 27, 2014

EPA Third Five-Year Review report for Middlefield-Ellis-Whisman (MEW) Superfund Study Area, Mountain View and Moffett Field, California. September 2014

EPA OSWER, *OSWER Technical guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air.* June 2015

EPA Record of Decision Amendment for the Vapor Intrusion Pathway, Middlefield-Ellis-Whisman (MEW) Superfund Study Area, Mountain View and Moffett Field, California, August 16, 2010.

EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5, March 2001).

EPA (EPA, 2008), *Engineering Issue, Indoor Air Vapor Intrusion Mitigation Approaches*, EPA/660/R-08/1 15, October 2008.

EPA (EPA, 2010), *Record of Decision Amendment for the Vapor Intrusion Pathway, Middlefield-Ellis-Whisman (MEW) Superfund Study Area*, Mountain View and Moffett Field, California, August 16, 2010.

EPA (EPA, 2011), *Statement of Work for Remedial Design and Remedial Action, Middlefield-Ellis-Whisman (MEW) Superfand Study Area*, Mountain View and Moffett Field, California, 2011.

Geosyntec Consultants (Geosyntec, 2013), *Final Grab-Groundwater Assessment and Proposed Well Installations*, Middlefield-Ellis-Whisman Regional Groundwater Remediation Program, Mountain View, California, unpublished consultant report, September 12, 2013.

Haley & Aldrich, Inc. (Haley & Aldrich, 2013), *Site-Wide Vapor Intrusion Sampling and Analysis Work Plan for Response Action Tiering, Middlefield-Ellis-Whisman Superfund Area*, Mountain View, California, and Moffett Field, unpublished consultant report, September 29, 2001, revised March 2013.

Light, Air & Space (LA&S, 2012), Phase I Environmental Site Assessment for 111 and 123 Fairchild Drive, 639, 625 and 615 Tyrella Avenue and 112, 116, 120, 128A and 128B Evandale Drive (APN # 160-07-001 and 160-07-002), Mountain View, California, 94043, unpublished consultant report, August 29, 2012.

Light, Air & Space (LA&S, 2014), Subsurface Investigation Findings (Phase II ESA) Report, Fairchild-Tyrella-Evandale Property (APN # 160-07-001 through 160-07-004), Mountain View, California, unpublished consultant report, April 25, 2014.

Light, Air & Space (LA&S, 2014b), *Soil Management Plan, Fairchild Drive Rowhouse Project (MV Viewpoint 2013 Inc.), APN # 160-07-001 and 160-07-002*, Mountain View, California, unpublished consultant report, August 12, 2014.

Los Angeles Department of Building and Safety (LADBS, 2004), *Methane Mitigation Standard*, Document No. P/BC 2002-101 (for compliance with LA Building Code Chapter 71), DRAFT, Revised April 20, 2004.

Naval Facilities Engineering Command (NAVFAC, 201 1), *Vapor Intrusion Mitigation in Construction of New Buildings, Fact Sheet.*

ATTACHMENT A

ATTACHMENT B

TABLES

Table 1
SUMMARY OF SOIL VAPOR ANALYSIS DATA
Fairchild-Tyrella-Evandale Property
Mountain View

Concentrations in micrograms per cubic meter (ug/m^3)

								Screening Levels	
	LAS-SV-4 (3/12/14)	LAS-SV-5 (3/12/14)	LAS-SV-6 (3/12/14)	LAS-SV-7 (3/12/14)	LAS-SV-8 (3/12/14)	LAS-SV-9 (3/12/14)	LAS-SV-9R (3/12/14)	Indoor Air*	Subgrade Vapor**
VOCs									
TCE	**1,200**	**42**	**640**	**190**	< 4.9	**12**	**12**	1.0	33
PCE	**6.5**	< 6.4	< 6.8	< 6.9	< 6.2	< 6.6	< 6.6	0.4	13
cis-1,2-DCE	< 3.7	< 3.7	< 4.0	< 4.0	< 3.6	< 3.9	< 3.8	60	2,000
trans-1,2-DCE	< 3.7	< 3.7	< 4.0	< 4.0	< 3.6	< 3.9	< 3.8	60	2,000
Vinyl Choride	< 2.4	< 2.4	< 2.6	< 2.6	< 2.3	< 2.5	< 2.5	0.2	6.7
1,1-DCA	< 3.7	< 3.8	< 4.0	< 4.1	< 3.7	< 3.9	< 3.9	2.0	67
1,1-DCE	< 3.7	< 3.7	< 4.0	< 4.0	< 3.6	< 3.9	< 3.8	210	7,000
other (TO15 suite)	***	***	***	***	***	***	***	---	---
2-propanol ****	< 9.1	< 9.2	< 9.8	< 10	< 9.0	< 9.6	< 9.5	---	---

NOTES:
<3.7 - Not Detected; see laboratory reports for specific detection/reporting limits.

* Residential MEW site-wide indoor air screening levels for 7 VOCs of concern (EPA Record of Decision Amendment for the Vapor Intrusion Pathway, August 2010).

** Subgrade screening levels back-calculated using an attenuation factor of 0.03.

*** See lab report, variety of trace non-target VOCs found.

**** Leak check compound.

Table 2
SUMMARY OF GROUNDWATER ANALYSIS DATA
Fairchild-Tyrella-Evandale Property, Mountain View
concentrations in micrograms per Liter (ug/L)

SAMPLE #	Sample Depth (ft)	Sample Date	TCE	cis-1,2-DCE	Benzene	Toluene	Ethyl-benzene	Xylenes	Other VOCs*
LAS-GW-4A	8.5-10.5	Mar 3	**8.4**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-4B	24.5-26.5	Mar 3	**3.0**	< 0.5	< 0.5	**0.5**	< 0.5	< 0.5	ND
LAS-GW-4C	30-32	Mar 3	**9.3**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-4D	37-39	Mar 3	**2.0**	< 0.5	< 0.5	**0.5**	< 0.5	< 0.5	ND
LAS-GW-5A	21-23	Feb 28	**6.7**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-5B	31.5-33.5	Feb 27	< 0.5	< 0.5	< 0.5	**0.5**	< 0.5	< 0.5	ND
LAS-GW-6A/AA	22-24	Mar 11	**6.8/6.8**	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	ND
LAS-GW-6B	36-38	Mar 11	**2.0**	**1.7**	**1.2**	**1.1**	< 0.5	< 0.5	ND
LAS-GW-6C	55-57	***	---	---	---	---	---	---	---
LAS-GW-7A	8.5-10.5	Mar 11	**2.5**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-7B	23-25	Mar 11	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-7C	37.5-39.5	Mar 11	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-8A/AA	13-15	Feb 28	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	ND
LAS-GW-8B	23-25	Feb 28	<0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-8C	30.5-32.5	Feb 28	**1.1**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-9A	8-10	Feb 28	**1.6**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-9B	18.5-20.5	Feb 28	**5.9**	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	ND
LAS-GW-9C/CC	30-32	Feb 27	**9.1/6.7**	<0.5/<0.5	<0.5/<0.5	<0.5/0.6	<0.5/<0.5	<0.5/<0.5	ND
WQGs			5	6	1	150	300	1,750	various

Notes:

* Volatile Organic Compounds; specifically those reported under EPA Method 8260B

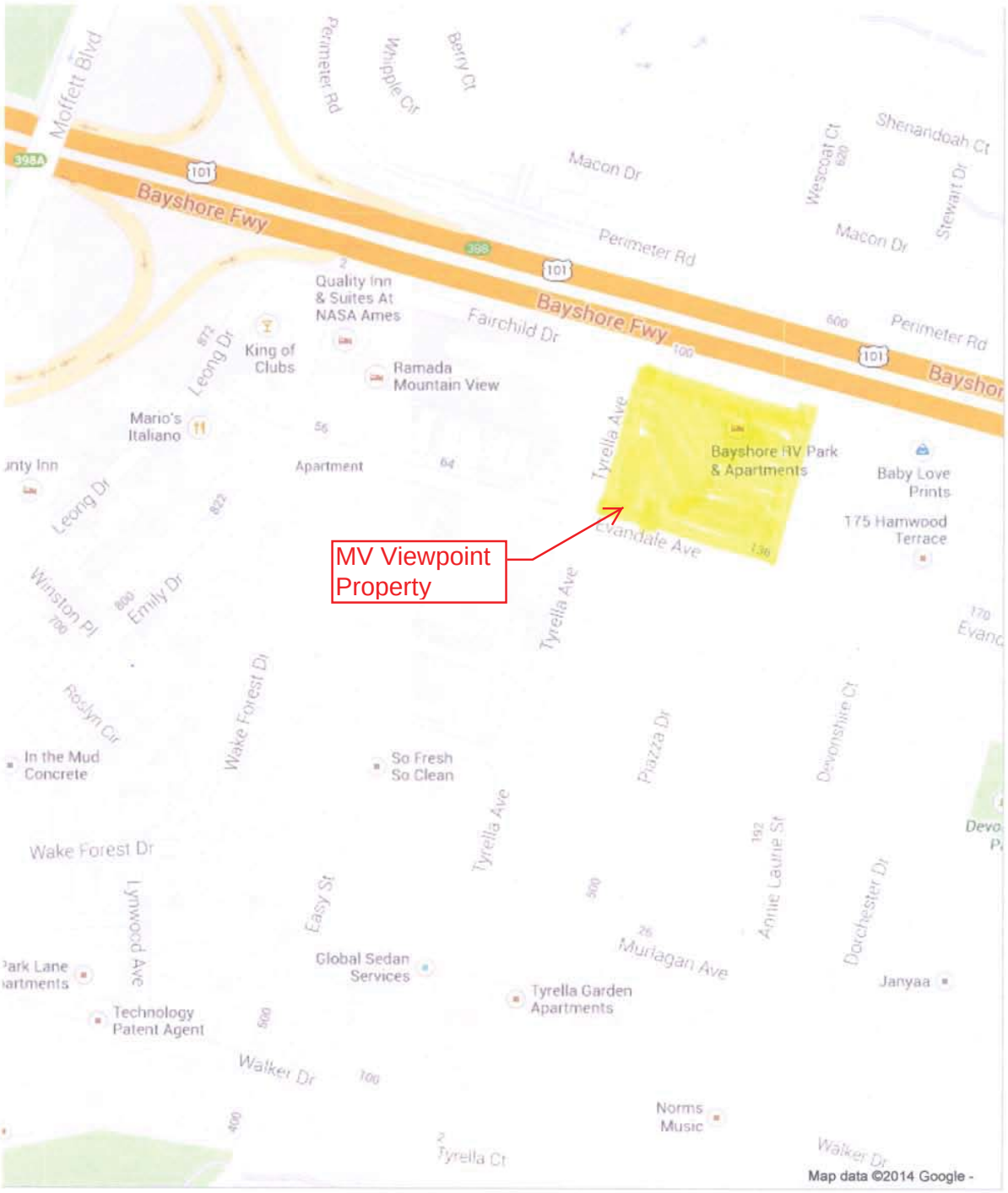
** See laboratory report for sample 254326-003; several VOCs found in this sample of suspect condition (all <150 ug/L).

*** Tried to sample this interval twice, on March 10 and 11, 2014 but thin, limited lenses did not yield water. TCE Trichloroethylene DCE Dichloroethylene

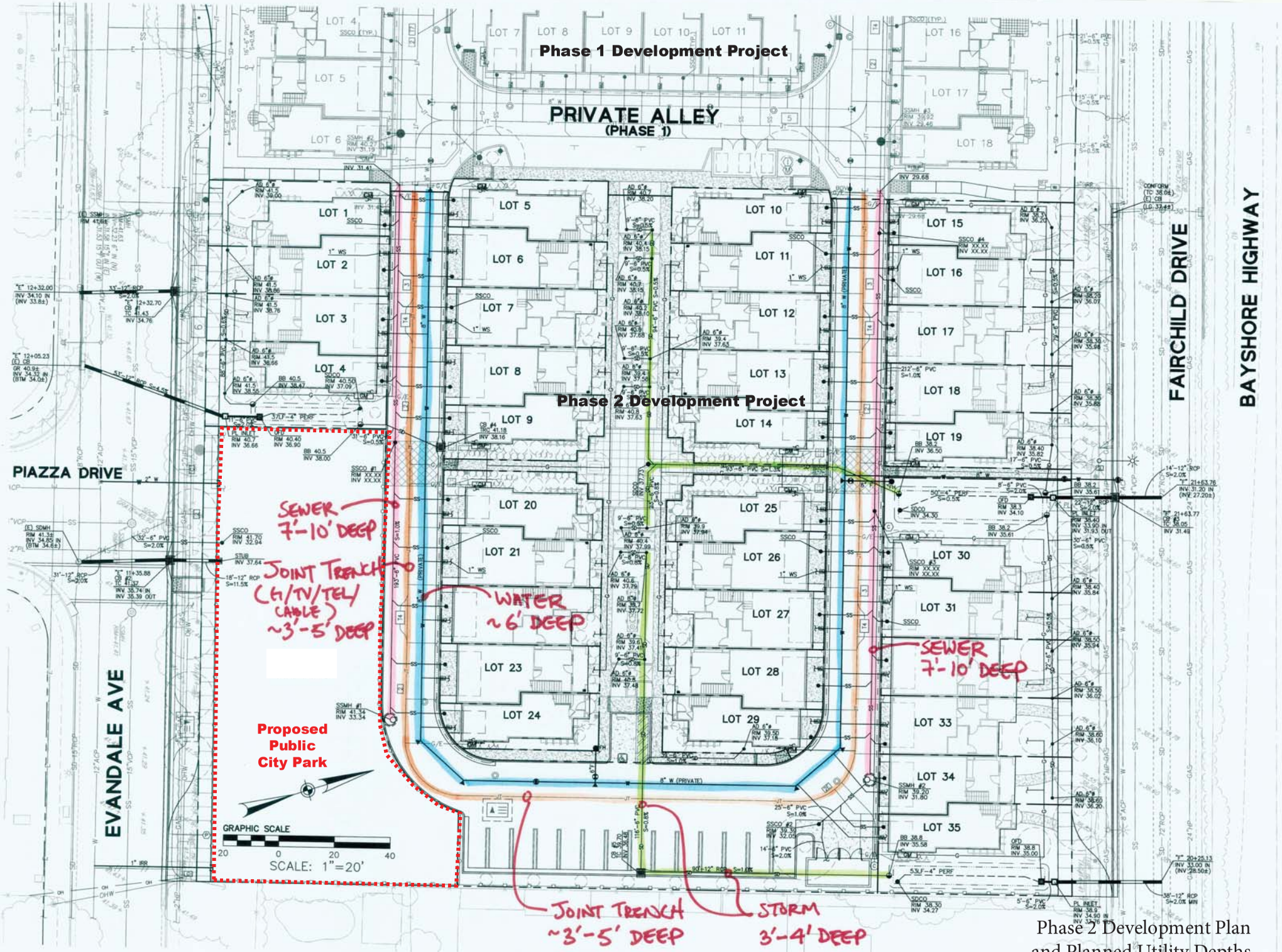
ND Not Detected; see laboratory reports for specific reporting limits.

WQGs Water Quality Goals (California drinking water maximum contaminant levels)

FIGURES

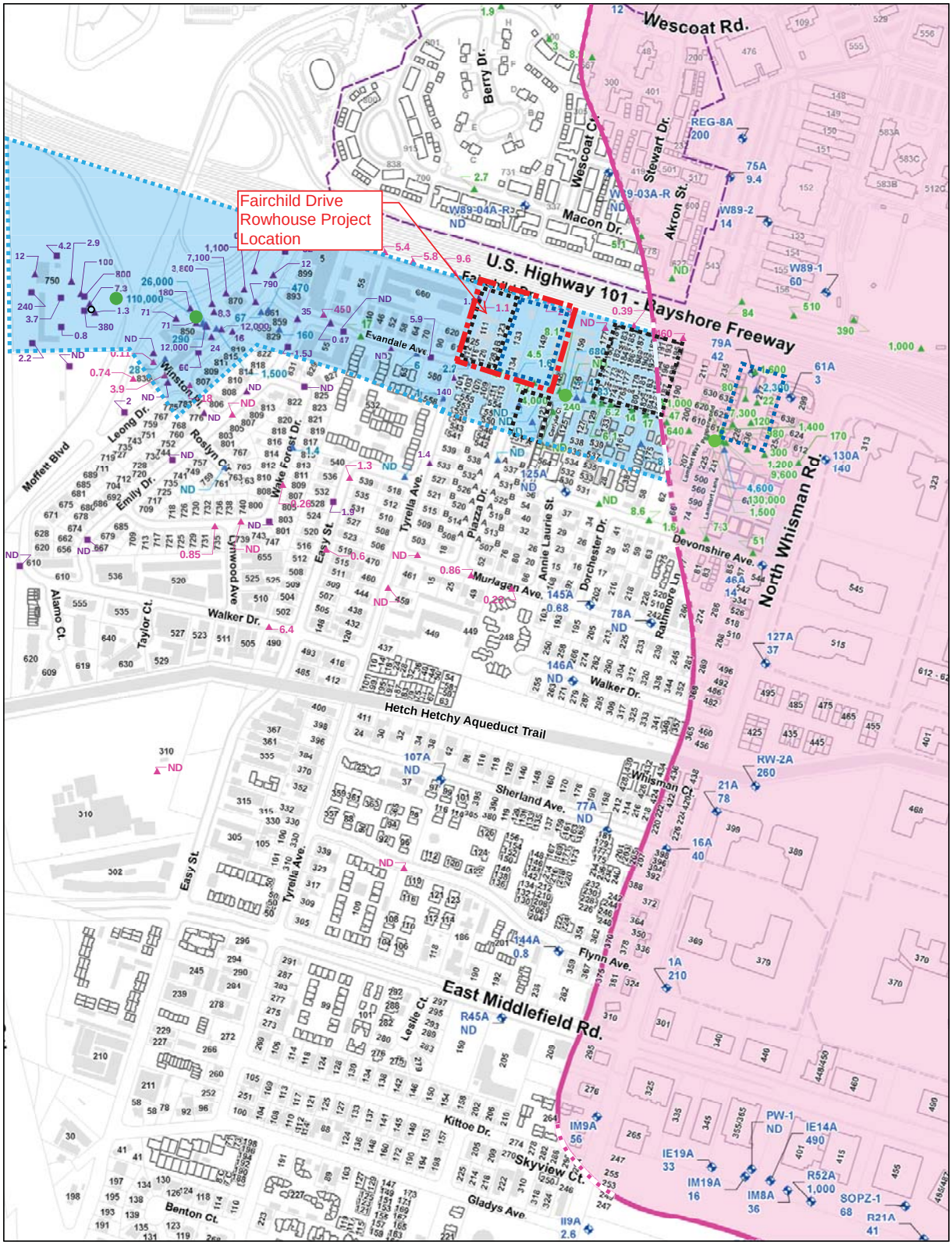


Site Location Map
Figure 1



Phase 2 Development Plan
and Planned Utility Depths

Figure 2



LEGEND

- Slurry Wall (Underground)
- Further groundwater investigation is ongoing (2014) to delineate the 5 ppb TCE plume boundary. Upon completion the figure will be updated.
- Vapor Intrusion Study Area – estimated TCE in groundwater > 5 parts per billion (ppb) (updated based on 2013 groundwater results)
- OU3 Vapor Intrusion Evaluation Area
- Homes built with vapor intrusion control systems.
- Planned developments with vapor intrusion control systems (not yet built).
- Wescoat Village Residential Area (New homes built in 2006 with vapor intrusion control system.)
- TCE Groundwater Hot Spot

Note:
Only selected monitoring well data used to estimate Vapor Intrusion Study Area boundary are shown.

Grab Groundwater Locations

- 2014 EPA grab groundwater location
- 2013 EPA grab groundwater location
- 2012/2013 MEW grab groundwater location
- 2011 EPA grab groundwater location
- 2005 EPA grab groundwater location

The result shown is the maximum TCE concentration in ppb from grab groundwater samples to 40 feet below ground surface.

Groundwater Monitoring Well Locations

- Groundwater monitoring well location

The result shown is the TCE concentration in ppb from groundwater monitoring well samples collected in 2013.

ND = Not Detected (below 0.5 ppb TCE)

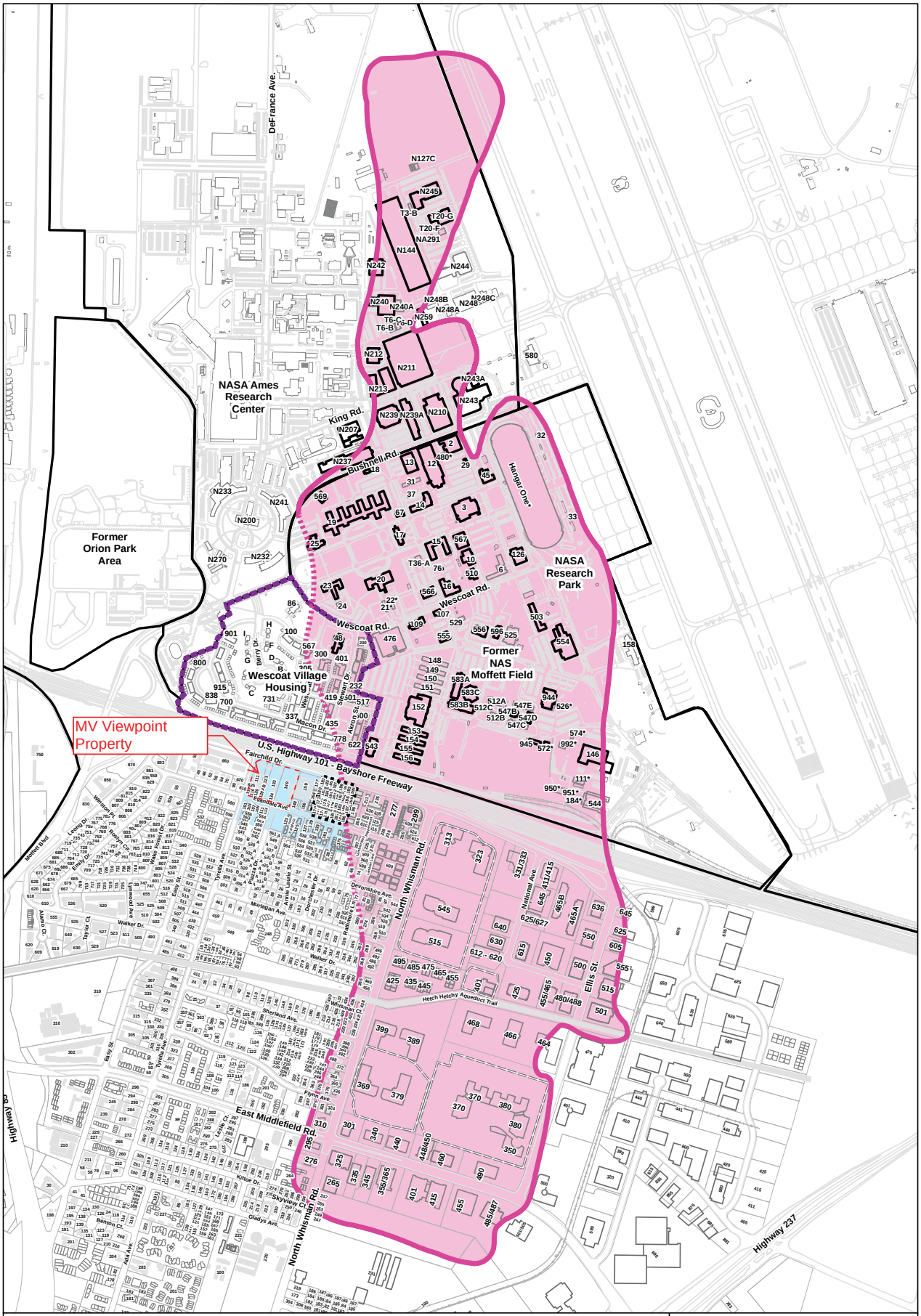
N

0 250 500 Feet

TCE Shallow Groundwater Results
Residential Areas in Vicinity of
MEW Superfund Site
Mountain View, and Moffett Field, CA

Figure 3

BAO \\ZINFANDEL\PROJ\USENVIRONMENTALPROTE\385122\GIS\MAPFILES\2014\AUG_MEETING\TCE_GWRESULTSINSHALLOWGW.MXD MCLAYWAR 8/15/2014
ES080811113812BAO_TCE_GWResultsShallowGW_updated_102815



LEGEND

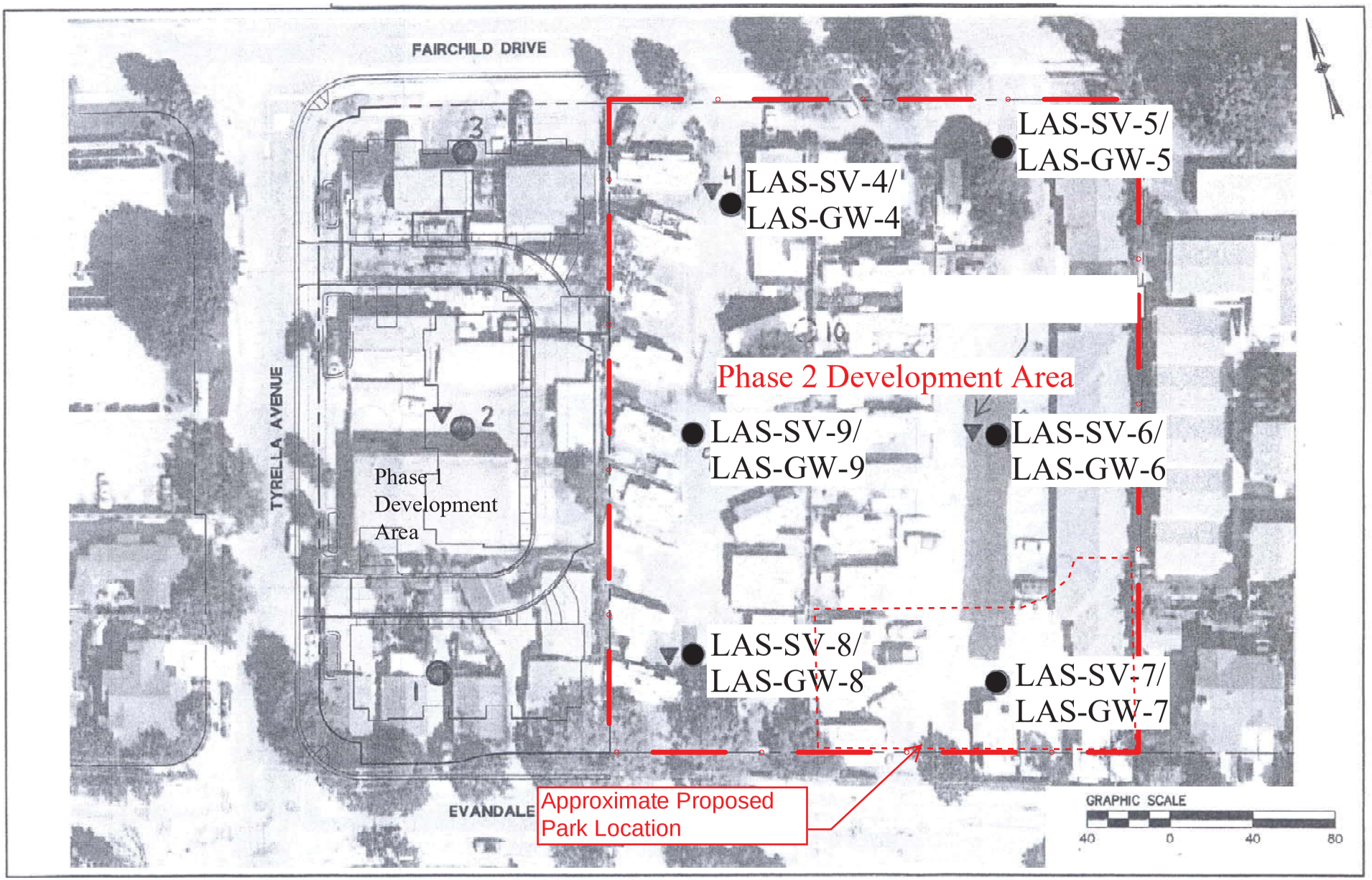
- Slurry Wall (Underground)
- Further groundwater investigation is ongoing (2013-2014) to delineate the 5 ppb TCE plume boundary. Upon completion the figure will be updated.
- Vapor Intrusion Study Area – estimated TCE in groundwater > 5 parts per billion (ppb) (updated based on 2013 groundwater results)
- Residential Indoor Air Sampling Area
- Classics homes built with vapor intrusion control system.
- Wescoat Village Residential Area (New homes built in 2006 with vapor intrusion control system.)

Note:
1. Bold building outlines indicate non-residential buildings that are occupied or to be occupied inside the vapor intrusion study area.
2. * Storage Buildings - Not Suitable For Occupancy

0 500 1,000 Feet

Figure 4
MEW Vapor Intrusion Study Area

Middlefield-Ellis-Whisman (MEW) Superfund Site
Mountain View and Moffett Field, CA



2014 Soil Vapor and
Groundwater Sampling Locations
Figure 5