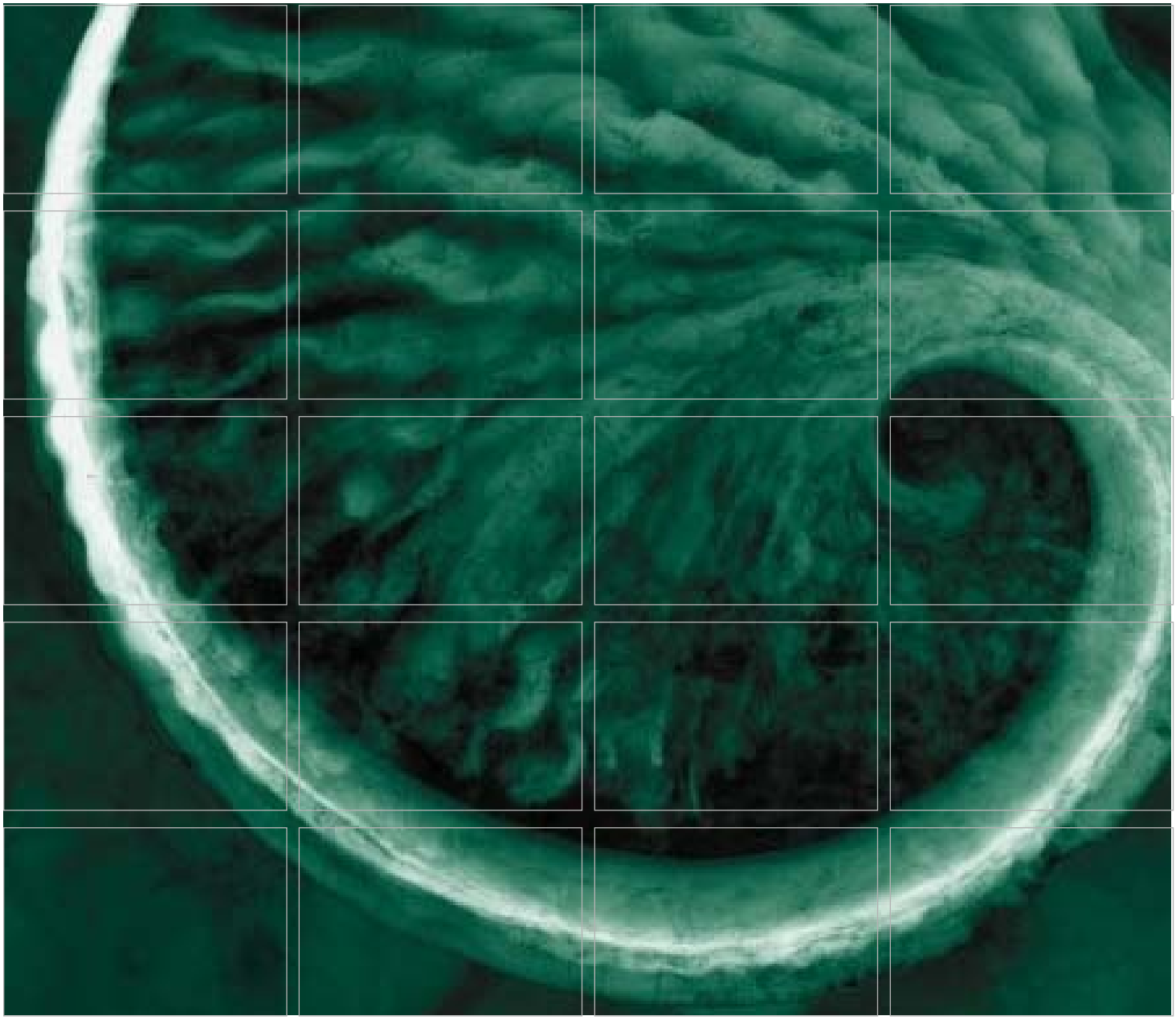


Implementation Report for A-Zone Permeable Reactive Barrier

Hookston Station Site
Pleasant Hill, California

Prepared for:
Hookston Station
Parties

October 2009

www.erm.com

ERM

Delivering sustainable solutions in a more competitive world

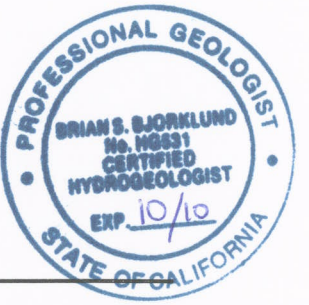
Hookston Station Parties

Implementation Report for A-Zone Permeable Reactive Barrier

Hookston Station Site
Pleasant Hill, California

October 2009

Project No. 0099020.02



Brian Bjorklund, P.G., CHG
Principal-in-Charge

Arun Chemburkar, P.E.
Project Engineer

Environmental Resources Management
1777 Botelho Drive, Suite 260
Walnut Creek, California 94596
T: 925-946-0455
F: 925-946-9968

TABLE OF CONTENTS

LIST OF FIGURES

(Figures immediately follow the text)

LIST OF TABLES

(Tables immediately follow the figures)

LIST OF ACRONYMS

µg/L	Micrograms per liter
bgs	Below ground surface
COC	Chemicals of concern
CPT	Cone penetrometer testing
DCA	Dichloroethane
DCE	Dichloroethene
ERM	ERM-West, Inc.
ESL	Environmental Screening Level
FS	Feasibility Study
ft	Feet
HPG	Hydroxypropylguar
HPIT	Hydraulic pulse interference testing
lb	Pounds
lb/day	Pounds per day
lb/year	Pounds per year
msl	Mean sea level
MTBE	Methyl tertiary-butyl ether
PCB	Polychlorinated biphenyl
QA/QC	Quality Assurance/Quality Control
PRB	Permeable reactive barrier
RDIP	Remedial Design and Implementation Plan
RI	Remedial Investigation
RWQCB	Regional Water Quality Control Board
SVOC	Semivolatile organic compound
TCE	Trichloroethene
TOC	Total organic carbon
TPH	Total petroleum hydrocarbon
USEPA	United States Environmental Protection Agency
VOCs	Volatile organic compounds
ZVI	Zero-valent iron

1.0 INTRODUCTION

ERM-West, Inc. (ERM) has prepared this *Implementation Report for A-Zone Permeable Reactive Barrier* (Implementation Report) for the Hookston Station property in Pleasant Hill, California, on behalf of the parties named in paragraph 3 of the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) Order No. R2-2007-0009, *Adoption of Final Site Cleanup Requirements and Rescission of Order Nos. R2-2003-0035 and R2-2004-0081* (30 January 2007, the "Order"). The named parties (hereinafter the "Hookston Station Parties") include Union Pacific Railroad Company, Daniel C. and Mary Lou Helix, Elizabeth Young, John V. Hook, Steven Pucell, Nancy Ellicock, and the Contra Costa Redevelopment Agency. The Hookston Station "property" is located at the intersection of Hookston and Bancroft Roads in Pleasant Hill, California (Figure 1). Features of the Hookston Station property and surrounding area are shown on Figure 2.

The chemicals of concern (COCs) that originate from the Hookston Station property include trichloroethene (TCE) and its associated degradation compounds. This document details the construction and implementation of the A-Zone ground water remediation plan, which will protect human health and the environment in accordance with the RWQCB Order.

An initial (90%) design plan was submitted to the RWQCB in June 2007, prior to the completion of some necessary pre-design investigations. The final design plan for the A-Zone Permeable Reactive Barrier (PRB) was documented in the *100% Remedial Design and Implementation Plan for A-Zone Permeable Reactive Barrier* (ERM 2008) (RDIP), which was submitted to the RWQCB on 21 November 2008, and was approved by the RWQCB on 12 January 2009.

1.1 DOCUMENT ORGANIZATION

This document is organized as follows:

- Section 1.0 states the purpose of this document and presents the Hookston Station property background information;
- Section 2.0 documents the A-Zone PRB construction activities, including pre-construction activities, PRB installation and quality assurance/quality control (QA/QC) testing, performance monitoring

well installation and development, waste management, site restoration, and survey;

- Section 3.0 describes the activities and results of the initial performance ground water monitoring event and presents the schedule for future performance monitoring events and reporting;
- Section 4.0 presents a summary of this Implementation Report; and
- Section 5.0 provides references used in preparing this Implementation Report.

Tables, figures, and appendices referenced in this report are provided following the text.

1.2 PURPOSE OF REPORT

The purpose of this Implementation Report is to present the construction activities and initial performance monitoring results for the A-Zone portion of the remedial strategy that was approved in the *Feasibility Study* (ERM 2006)(FS). This document was prepared to comply with the requirements of RWQCB Order Number R2-2007-0009.

Volatile organic compounds (VOCs) have impacted the Hookston Station property and the downgradient area. This Implementation Report describes the remediation program that has been constructed for A-Zone ground water that is protective of human health and the environment.

1.3 PROJECT BACKGROUND

This section provides a brief summary of geology, hydrogeology, and chemical occurrence in soil, ground water, soil gas, and indoor air, and the overall remediation strategy for the Hookston Station property and downgradient area. A more detailed description of the project background is provided in *Remedial Investigation Report* (ERM 2004) (RI Report) and the FS.

1.3.1 Geology and Hydrogeology

The Hookston Station property and surrounding area is underlain by unconsolidated deposits that extend to at least 100 ft below ground surface (bgs), as shown on Figure 3 and summarized below:

- Fine-grained clays and silts are present from the ground surface (or immediately below the ground surface cover materials) to depths typically ranging from 30 to 50 ft bgs. ERM has defined this zone as the "A-Zone," which contains discontinuous lenses of sands, silty sands, and gravelly sands that are interbedded in the fine-grained deposits. These coarser-grained lenses are typically only a few inches to a few feet thick.
- Directly beneath the A-Zone, a relatively continuous sand unit that is interbedded with silt and clay lenses is generally present between the depths of approximately 50 and 70 ft bgs. ERM has defined this zone as the "B-Zone." The sands of the B-Zone are generally 5 to 10 feet thick and include sands, clayey sands, and gravelly sands; a few gravel zones are also encountered in this unit. The silt and clay lenses within the B-Zone are up to 10 feet thick, but are generally less than a few feet thick.
- A clay unit that is 10 to 40 feet thick is present beneath the B-Zone.
- A deeper sand unit, defined as the "C-Zone," is present beneath the clay unit and is initially encountered at depths ranging from 65 to 97 ft bgs. The C-Zone is a continuous sand unit that is interbedded with silt and clay lenses. The C-Zone extends to at least 100 ft bgs; the deposits deeper than 100 ft bgs have not been characterized.

Ground water in the A-, B-, and C-Zones flows to the north-northeast. Ground water potentiometric surface maps for each water-bearing zone (based on the First Quarter 2009 monitoring event) are provided as Figures 4 through 6. The potentiometric ground water levels in each of these zones have historically ranged from approximately 12 to 23 ft bgs in the A-Zone, 13 to 24 ft bgs in the B-Zone, and 16 to 21 ft bgs in the C-Zone. The overall hydraulic gradients in the three zones have typically ranged from 0.001 to 0.004 ft/ft across the entire monitored area. Based on ground water level measurements and stratigraphy, the three water-bearing zones are confined to semiconfined.

Aquifer tests were conducted at the site in 2006 to support the FS and in 2008 to support the design of the A-Zone PRB. Based on those aquifer tests, hydraulic conductivities calculated for the A-Zone and B-Zone ranged from 3.4 to 44 ft per day (ft/day) and 4 to 153 ft/day, respectively. The average ground water seepage velocities estimated for the A-Zone and B-Zone were approximately 40 ft/year and 300 ft/year, respectively (ERM 2006 and 2008).

1.3.2 Chemical Occurrence in Soil

Soil samples were collected at the Hookston Station property for laboratory analysis of VOCs, total petroleum hydrocarbons (TPH), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals. The VOC, TPH, SVOC, and PCB concentrations in soil throughout the Hookston Station property are generally low or non-detect, with only a few sample concentrations exceeding the environmental screening levels (ESLs) developed by the RWQCB (RWQCB 2008). Subsurface soil samples collected in one small on-site area contain soil arsenic concentrations above background levels for soils in the San Francisco Bay Area. The results of the *Baseline Risk Assessment* (CTEH 2006) indicate that risks to human health associated with exposure to soils at the Hookston Station property are limited to construction workers that may be exposed to arsenic in soil during invasive activities in a very small portion of the Hookston Station property.

1.3.3 Chemical Occurrence in Ground Water

Ground water quality of the area that encompasses the Hookston Station property has been impacted by multiple sources of COCs, as follows:

- Hookston Station property – TCE source area;
- Vincent Road Source Areas – Over the years, the RWQCB has identified the following properties as potential tetrachloroethene (PCE)/TCE source areas: Walnut Creek Manor (81 Mayhew Way, Walnut Creek, California), Mayhew Center (3301-3341 Vincent Road, Pleasant Hill, California), and Cuff Property Management Company (3343-3355 Vincent Road, Pleasant Hill, California); and
- Pitcock Petroleum (220 Hookston Road, Pleasant Hill, California) – petroleum hydrocarbon source area, including TPH, benzene, and methyl tert-butyl ether (MTBE).

Figure 7 illustrates the locations of these nearby environmental sites.

TCE and its degradation products, cis-1,2-dichloroethene (DCE), 1,1-DCE, and vinyl chloride, are the primary COCs for the Hookston Station property. These VOCs are present in A- and B-Zone ground water. As described above, ground water in the area has also been impacted by separate PCE and TCE source areas located upgradient of the Hookston Station property. The distributions of PCE, TCE, cis-1,2-DCE, 1,1-DCE, and vinyl chloride in A- and B-Zone ground water (based on First Quarter 2009 data) are illustrated on Figures 8 through 17.

Few VOC detections have been reported in C-Zone ground water. The water quality of the C-Zone is monitored annually. VOCs have been non-detect in the C-Zone since 2005. Therefore, remediation of C-Zone ground water is unnecessary and therefore was not addressed in the FS.

The Hookston Station property TCE ground water impacts originate in the southwestern portion of the Hookston Station property and flows to the northeast. PCE/TCE impacted ground water associated with the Vincent Road Source Areas originates west of Vincent Road and flows to the northeast across the northern portion of the Hookston Station property. Based on ground water chemistry and ground water flow data collected by the Hookston Station Parties, the VOCs detected in several monitoring wells in the northern portion of the Hookston Station property (including, for example, MW-1, MW-4, MW-07, and MW-22A/B) (Figures 8 and 9), are not associated with TCE-impacted ground water on the Hookston Station property. These VOC impacts, which include PCE, TCE, cis-1,2-DCE, and vinyl chloride, are attributable to the upgradient Vincent Road PCE/TCE source areas. Impacted ground water from the Hookston Station property and Vincent Road Source Areas commingle in the northern portion of the Hookston Station property and flow off site below portions of the Colony Park neighborhood. Over the years, the RWQCB has identified several potentially responsible parties for PCE/TCE impacted ground water associated with the Vincent Road Source Areas.

Petroleum-related ground water impacts originating from the Pitcock Petroleum (also referred to as the Haber Oil Products Company) property flow to the northeast across the northern portion of the Hookston Station property. For example, based on the ground water chemistry and flow data collected by the Hookston Station Parties, petroleum hydrocarbons detected in wells MW-22A/B are attributed to the Pitcock Petroleum site. These ground water impacts commingle with the impacted ground water from the Vincent Road Source Areas in the northern portion of the Hookston Station property and flow off site.

The A-Zone PRB is designed to treat VOCs originating from the Hookston Station property. As described above, the RWQCB has identified several other sites in the vicinity of the Hookston Station property as being, or suspected of being, sources of VOCs (including PCE, TCE, and associated degradation products) and petroleum-related hydrocarbons (including TPH, benzene, and MTBE) that have been detected in ground water at and around the Hookston Station property. Although the Hookston Station Parties are not responsible for investigating and remediating such off-site sources of contamination, it is expected that impacted ground water emanating from these other sites may flow through some or all of the PRB.

Because the PRB is designed to treat VOCs, VOC-impacted ground water originating from non-Hookston Station property sources that flows through the PRB will be treated by the PRB. Based on current information, the presence of petroleum-related hydrocarbons in ground water is not expected to affect the overall efficiency of the PRB, but possible impacts on efficiency will be evaluated in conjunction with future monitoring of the PRB. The PRB is not designed to treat petroleum-related contamination.

1.3.4 Chemical Occurrence in Soil Vapor

Passive soil vapor surveys, as well as active soil vapor monitoring, have been completed in and around the Hookston Station property. PCE, TCE, and associated degradation products are the most frequently detected VOCs in soil vapor. These VOCs are present in soil vapor in areas that overlie the A-Zone impacted ground water. The distribution of PCE, TCE, cis-1,2-DCE, 1,1-DCE, and vinyl chloride (based on Second Quarter 2009 monitoring data) are shown on Figures 18 through 22.

1.3.5 Chemical Occurrence in Indoor Air

Indoor air quality samples for VOC analyses have been collected from the Hookston Station property and homes in the Colony Park neighborhood since 2004. The most frequently detected VOCs are benzene, 1,2-dichloroethane (1,2-DCA), and PCE; these VOCs do not originate from the Hookston Station property. TCE and vinyl chloride have been detected in indoor air at concentrations above the residential indoor air ESL in selected homes. These residences are generally within or adjacent to the city block bounded by Hookston Road, Hampton Drive, Thames Drive, and Stimel Drive. This city block overlies the portion of impacted A-Zone ground water that contains TCE concentrations greater than approximately 500 micrograms per liter (µg/L). The residential indoor air TCE results for 2004 to 2008 are summarized on Figure 23. Concentrations of vinyl chloride exceeding the residential indoor air ESL have been detected in only two homes since 2004.

1.3.6 Hookston Station Remediation Strategy

The FS provided a detailed comparative analysis to provide a basis for determining which remedial alternative is most appropriate for protecting human health and the environment and managing long-term health risks. Remedial Alternative 4 was selected and was ultimately approved as the preferred remedial alternative. Alternative 4 consists of the following:

- Zero-valent iron (ZVI) PRB for A-Zone ground water;
- Chemical oxidation for B-Zone ground water;
- Institutional controls for arsenic-impacted, on-site subsurface soil in the form of a Soil Management Plan;
- Vapor intrusion prevention components for residences in the Colony Park neighborhood in which TCE is present in indoor air at concentrations that exceed the indoor air ESL;
- Removal of private wells, which are used for irrigation and filling swimming pools, from residences that overlie the impacted A-Zone ground water in the Colony Park neighborhood; and
- Institutional controls for new well installations within the impacted area until ground water cleanup goals are achieved.

This remedial alternative was selected because it ranked higher, or as high, as the other alternatives evaluated in the FS for every evaluation criterion, it satisfied the threshold criteria of protectiveness and compliance with applicable or relevant and appropriate requirements, and is expected to be effective at satisfying all balancing and modifying criteria (long-term effectiveness and permanence, reduction of toxicity, mass, and volume through treatment, short-term effectiveness, implementability, and State and community acceptance).

This Implementation Report has been prepared to document the implementation one component of this overall remedial strategy, the A-Zone PRB. The B-Zone chemical oxidation program is underway, and a workplan for implementing the four remaining components listed above was submitted to the RWQCB on 30 March 2007, as required by the Order. Vapor intrusion prevention systems have been installed in eight homes in the Colony Park neighborhood where homeowners have granted access. All privately owned wells that are located within the area of VOC-impacted ground water have been abandoned where homeowners have granted access. A County-imposed moratorium is also currently in place on the installation of new wells in the area.

2.0 PRB CONSTRUCTION ACTIVITIES

GeoSierra Environmental, Inc. (GeoSierra) was selected as the PRB construction contractor. The PRB was installed as one continuous reactive zone of ZVI extending approximately 480 feet on a northwest-to-southeast alignment across Len Hester Park, proceeding parallel to and then across Hookston Road. The PRB alignment is shown on Figure 24. The construction of the PRB commenced with drilling in March 2009 and was completed in June 2009.

This section provides a brief summary of PRB construction activities, including site preparation tasks, PRB installation and construction parameters, QA/QC monitoring, and post-construction activities including installation of PRB performance monitoring wells, waste characterization and disposal, site restoration, and surveying. A more detailed description of the PRB installation is provided in GeoSierra's *Final Construction Report, A-Zone Aquifer, ZVI Permeable Reactive Barrier Project* (2009) (Final Construction Report), which is included as Appendix A.

2.1 SITE PREPARATION

The activities conducted prior to constructing the PRB are described below.

2.1.1 Permits

Prior to initiating PRB construction, ERM obtained the following permits and notifications:

- Soil boring and well installation permits from the Contra Costa County Environmental Health Department;
- Traffic control plan from the City of Concord; and
- Encroachment permit from the City of Concord.

Copies of these permits and notifications were maintained on site during execution of the work. All conditions of the permits were met during implementation and completion of the PRB. GeoSierra conducted all work in accordance with applicable local, state, and federal laws and regulations.

2.1.2 *Utility Clearance*

All proposed PRB injection locations were cleared for utilities prior to concrete coring, drilling, or other invasive activity. Underground Services Alert was notified at least 48 hours prior to beginning work and a private utility locator was retained to provide utility clearance at each location. The utility locator identified the locations of water, gas, fuel, electrical, communication, storm sewer, and sanitary sewer lines. Invasive work was not initiated until all stages of utility clearance described above were completed. In addition, the upper 5 feet of all borings were hand-augered or air-vacuumed prior to drilling.

2.1.3 *Health and Safety*

PRB construction activities were performed in accordance with the site-specific *Health and Safety Plan for Permeable Reactive Barrier Installation* (ERM 2009) *(*Health and Safety Plan). The procedures described by the plan were implemented and enforced by a health and safety representative during site work. All persons who entered restricted areas for the project were required to comply with the Health and Safety Plan.

2.1.4 *Traffic Control*

Due to the location of the PRB, it was necessary to close one lane of Hookston Road during construction of the portion of the PRB beneath Hookston Road. A traffic control plan was prepared to direct traffic around the project work along Hookston Road located between Bancroft Road and Hampton Drive. The plan was submitted to the City Engineer for approval prior to implementation. All residents retained the ability to access their homes throughout construction, with traffic detours in place for a brief time.

The southern portion of Len Hester Park was also closed during PRB construction. Pedestrian traffic was re-routed to the northern portion of the park to ensure the safety of individuals using the park during construction.

2.2 *A-ZONE PRB CONSTRUCTION*

Azimuth-controlled vertical hydraulic fracturing (hydrofracturing) was utilized to install the PRB, since it involves no soil excavation and causes minimal site disturbance, thus eliminating excavated waste issues, impact on utilities, and neighboring property owner concerns. Using the

hydrofracturing technology, the PRB was constructed in three segments from a series of conventionally drilled boreholes along the PRB alignment, with a specialized fracture casing (frac casing) grouted into the boreholes. The PRB was constructed by injection of the iron filings into these frac casings with real-time QA monitoring of the injections to quantify the PRB geometry and iron-loading densities.

This section briefly describes the A-Zone PRB construction activities, including equipment and material staging, frac casing and resistivity receiver string installations, and ZVI injections. A more detailed description of the PRB construction activities is provided the Final Construction Report, which is included as Appendix A. A photolog of PRB construction activities is included as Appendix F of the Final Construction Report.

2.2.1 Equipment and Material Staging

Initial site setup activities included installation of a temporary 6-foot, chain-link fence around the site perimeter, installation of a silt fence, and setup of site support areas, including fabrication areas, waste handling and storage areas, parking areas, and sanitary facility locations. Signs were posted around specific work areas to prevent unauthorized entrance. An entry/exit point to the project site was established along Hampton Drive and signs were placed at this point to direct visitors and vendors to the field office to check in with the site superintendent.

Once the support areas were constructed and set up, the hydrofracture and support equipment was mobilized to the site. Construction and support equipment included:

- Two 3,000-gallon, stainless-steel mixing tanks;
- Glove box pump skid;
- 350-horsepower hydraulic power unit;
- Scale/auger unit;
- Blending skid;
- Pumping unit;
- Frac Trak trailer with electronic monitoring systems;
- 4,000 pound (lb) capacity concrete hoppers;
- 10,000 lb Lull and Moffett forktrucks; and
- Other miscellaneous support equipment.

GeoSierra and ERM provided site security 24 hours a day, 7 days a week. Security measures included gate locks on the perimeter fence, equipment storage vaults, and off-hours security personnel.

2.2.2 *Hydrofracture Casing Installations*

The PRB was constructed from a series of conventionally drilled boreholes along the PRB alignment, with specialized frac casings grouted into each borehole. Forty boreholes were drilled along the PRB alignment and two frac casings (an upper and lower casing) were installed in each borehole to facilitate construction of individual 15- to 16-foot high panels. The hydraulic frac casing locations are denoted as F1 through F40, as shown on Figure 2 of the Final Construction Report.

Frac casings F1 through F40 were installed utilizing two separate methods. Although the design called for installation via mud-rotary techniques at all locations, overhead utilities present in the area of F37 to F40 necessitated use of a limited access, hollow-stem-auger rig. Because of this deviation, an alternative method of construction was implemented for these frac casings, wherein the augers were advanced to the final depth of the frac casings (approximately 49 feet above mean sea level [ft msl] to the base of the stinger), and the augers were filled with a heavy drilling mud and then removed, while topping off the mud as the augers were withdrawn. Once the augers were withdrawn, the frac casings were set into the boreholes at the design elevation and the ground was allowed to set. The base elevation of the frac casings was targeted for approximately 21 ft msl to allow PRB installation and monitoring from 51 to 19 ft msl. Frac casing installation details are provided on Figure 3 and in Table 2 of the Final Construction Report.

2.2.3 *Resistivity String Installations*

Following the installation of frac casings, a total of 20 subsurface active resistivity receiver strings were installed upgradient from the PRB alignment to monitor the geometry of the PRB during construction. The resistivity receiver string locations are denoted as RR1 through RR20, as shown on Figure 2 of the Final Construction Report.

The resistivity strings were installed using a track-mounted Cone Penetrometer Testing (CPT) rig. Resistivity strings were installed on 24-foot lateral spacing and approximately 20 feet offset from the wall azimuth to provide satisfactory PRB image resolution. The base elevation of the resistivity strings was targeted for approximately 19 ft msl. Each resistivity string contained seven stainless-steel collars (receivers) in direct

contact with surrounding soil and ground water. The receivers were connected to individual, 12-gauge copper wires that terminated at ground surface. Each individual receiver was then hardwired through a junction box and reel to the patch panel within Frac Trak trailer. Following installation, each connection was tested for continuity with the aquifer through a test box via excitement of each receiver and testing for signal in adjacent receivers. Resistivity string installation details are provided on Figure 3 and in Table 3 of the Final Construction Report.

The results of the CPT logging were evaluated for lithologic changes along the PRB alignment that could inhibit construction of the PRB to design specifications. Based on the results of the CPT logging, there were no significant deviations from the design specifications during installation of the PRB.

2.2.4 Zero-Valent Iron Injections

The placement of iron PRBs by azimuth-controlled vertical hydrofracturing requires a fracturing fluid gel that is both compatible with the iron and the hydraulic fracturing process. The fracturing fluid must (1) be compatible with the formation and formation fluids, (2) be capable of controlling viscosity to carry the iron filings, (3) have minimal residue after the cross-linked polymer chains have been removed via enzymatic reactions as designed, and (4) have a low friction coefficient. Hydroxypropylguar (HPG), a natural polymer used in the food industry as a thickener, was used as the fracturing fluid gel. The HPG gel is water soluble in the uncross-linked state and water insoluble in the cross-linked state. In the cross-linked state, the gel can be extremely viscous, ensuring the iron filings remain suspended in the gel at all times during installation. Enzyme and other additives typically break down the HPG after about 1 to 2 hours. Upon breaking down of the gel, the iron mixture in the ground becomes highly permeable with minimal residue. The composition of the fracturing gel is detailed in Table 1 of the Final Construction Report.

The gel was mixed with the iron filings, cross-linked, and pumped into the formation by the injection equipment through the downhole initiation tooling. As described above, frac casings F1 through F40, each consisting of an upper and lower casing, were installed along the PRB alignment to facilitate construction of individual 15- to 16-foot high panels. The PRB was constructed by injecting iron filings into the frac casings to create a continuous zone of ZVI approximately 32 feet in vertical height.

2.2.4.1 F1 – F11 (Segment 1)

PRB construction commenced at frac wells F1 through F11 (Segment 1) in the lower panel. Mechanical packers and riser pipe were installed in each frac well to isolate the lower panel and allow lower panel construction. As shown on Table 4 of the Final Construction Report, a total of 118,350 lb of iron was injected into the lower panel of Segment 1. This is approximately 22,000 lb greater than the design specification required, due to vertical migration of the iron into the upper panel. During real-time monitoring, the active resistivity system showed that leakoff was vertically higher than expected, potentially causing the lower wall to be thinner than designed. As such, an additional 2,000 lb of iron was injected into each of the lower frac casings to ensure that the proper design thickness was constructed.

Once construction of the lower panel was complete, the packers and internal injection piping were removed from each well. Each of the lower casings was filled with iron to approximately 2 to 3 feet above of top of the bottom frac casing and construction of the upper panel commenced. As shown on Table 5 of the Final Construction Report, a total of 88,650 lb of iron was injected into the upper panel in Segment 1. One deviation from the design was noted during the upper panel construction and was related to the quantity of iron injected into frac well F1. Because of its proximity to a high-pressure, large-diameter gas main and the propagation of the fracture into the right-of-way at the surface near the gas main, the total design mass of iron was not injected into F1. A total of 5,856 lb of iron was injected compared to the 8,640 lb design specification. Because F1 is the first frac well in the PRB and is in the lower concentration boundary area of the plume, there should be no effect on the performance of the PRB in this area due to the reduced mass of iron injected.

2.2.4.2 F12 – F25 (Segment 2)

Following completion of Segment 1, PRB construction commenced at frac wells F12 through F25 (Segment 2) in the lower panel. Similar to Segment 1, mechanical packers and riser pipe were installed to isolate the lower panel and allow lower panel construction. There were no deviations from design specifications for the Segment 2 lower panel. As shown on Table 4 of the Final Construction Report, a total of 183,175 lb of iron was injected into the lower panel of Segment 2.

Once the packers were removed and the lower casings were filled with iron, construction of the upper panel commenced. As shown on Table 5 of the Final Construction Report, a total of 183,447 lb of iron was injected into the upper panel in Segment 2. One deviation from the design was

noted during the upper panel construction and was related to frac well F20. Iron could not be injected into the upper casing of this well because the mechanical packer became wedged inside the riser pipe and could not be removed. As such, frac wells F19 and F21 were over-injected with iron planned for F20. Instead of F19 and F21 receiving 13,000 lb of iron per design specifications, each received approximately 19,500 lb. Resistivity imaging confirmed that fractures extended approximately 15 feet along the azimuth of the PRB, resulting in complete coalescence of iron from F19 and F21 around F20.

2.2.4.3 F26 – F40 (Segment 3)

Following completion of Segment 2, PRB construction commenced at frac wells F26 through F40 (Segment 3) in the lower panel. Because these wells were located within Hookston Road, the hydrofracture equipment was trailer-mounted to allow for removal of equipment and reopening of Hookston Road at the end of each day. Similar to Segments 1 and 2, mechanical packers and riser pipe were installed to isolate the lower panel and allow lower panel construction. There were no deviations from design specifications for the Segment 3 lower panel. As shown on Table 4 of the Final Construction Report, a total of 180,450 lb of iron was injected into the lower panel of Segment 3.

Once the packers were removed and the lower casings were filled with iron, construction of the upper panel commenced. As shown on Table 5 of the Final Construction Report, a total of 176,512 lb of iron was injected into the upper panel in Segment 3. Similar to F20 in Segment 2, one deviation from the design occurred when the mechanical packer in F40 was sanded into the casing and it was not possible to remove it from the frac well. Based on this, GeoSierra injected as much of the iron as possible, per the design specifications, and utilized a "chase" of clean gel in an attempt to keep the casing clear to permit additional injections. A total of 3,857 lb of iron was injected in F40 before sanding of the casing prevented further injections. The remaining 4,783 lb was injected in F38 and F39. Because F40 is the last frac well in the PRB and is in a lower concentration boundary area of the plume, there should be no effect on the performance of the PRB in this area due to the reduced mass of iron injected.

2.3 CONSTRUCTION PARAMETERS

This section describes the location, depth, height, and thickness of the PRB alignment as installed. The PRB construction details are shown on Figure 24 of this report and Figure 2 of the Final Construction Report.

2.3.1 Location

The PRB extends 480 feet in length, with approximately 275 feet of the PRB installed beneath Len Hester Park in a northwest-to-southeast orientation (i.e., perpendicular to ground water flow). Approximately 160 feet of the PRB was installed almost due east beneath the northern side of Hookston Road, between Hampton Drive and Stimel Drive, and the remaining 45 feet was installed beneath Hookston Road in a similar northwest-to-southeast orientation as the portion beneath Len Hester Park, terminating on the southern side of Hookston Road. Although the portion of the PRB that is oriented east-west along the northern side of Hookston Road is not directly perpendicular to ground water flow, it is positioned there to reduce the travel time of treated water migrating beneath residential structures, and therefore provide the residential neighborhood the most immediate benefit from this treatment technology. The PRB alignment is shown on Figure 2 of the Final Construction Report.

2.3.2 Depth and Height

The PRB was constructed to a depth of approximately 51 ft msl, which is approximately 11 to 15 ft bgs), to approximately 19 ft msl, which is approximately 44 to 48 ft bgs. Historical well gauging data from nearby well MW-15A show water levels normally fluctuate between approximately 47 and 49.5 ft msl, with one high point of 50.59 ft msl in March 2006, during one of the wettest periods in recent history. The top of the PRB is therefore above the historical seasonal high water levels. The bottom of the PRB is generally above the top of the B-Zone sands, which typically begin at approximately 50 ft bgs. PRB depths are shown on Figure 24.

2.3.3 Thickness

As shown on Figure 2 of the Final Construction Report, approximately 180 feet of the PRB (portions located on the western side of Len Hester Park and the southern side of Hookston Road) was installed with a 3-inch average effective-iron-thickness and approximately 300 feet (portions located on the eastern side of Len Hester Park and the northern side of Hookston Road) was installed with a 4.5-inch average effective-iron-

thickness. Post-installation inclined profile borings completed through Segments 1 and 2 confirmed that the thickness of these segments ranged from 3.85 to 5.15 inches.

2.4 QUALITY ASSURANCE/QUALITY CONTROL TESTS

This section briefly describes the QA/QC tests completed to confirm that the PRB was installed according to design specifications. A more detailed description of QA/QC procedures is provided the Final Construction Report, which is included as Appendix A.

2.4.1 HPG Gel Testing

Forty-six batches of HPG gel (approximately 134,000 gallons) were mixed to complete injections and cleanout of equipment and hoses at the site. Due to vertical migration of the fractures throughout the project, the viscosity of the gel was increased from the design specifications in attempt to reduce the quantity of gel and iron from migrating vertically to the surface. Similarly, due to vertical migration of the gel/iron mixture into the unsaturated zone above the resistivity strings, the actual placement per square foot could not be calculated. Rather the estimated quantity required for each panel based on well spacing and the design height was calculated and used as a guide for injections. The results of these calculations are included on Tables 4 and 5 of the Final Construction Report. Aside from viscosity, there were no other significant deviations from the design specifications for the gel and iron mixture. The results of gel QA/QC monitoring are included as Table 6 of the Final Construction Report.

2.4.2 Active Resistivity Monitoring

The PRB installation was monitored in real time to ensure gel/iron mixture consistency, determine the volume and weights of iron injected, and determine the geometrical extent of the barrier, thus ensuring it was constructed as designed. A general layout of the monitoring system used during construction of a PRB is shown on Figure 4 of the Final Construction Report. During injection, the iron gel mixture was electrically energized with a low-voltage 100-hertz signal. Downhole resistivity receivers were monitored to record the in-phase induced voltage by the propagating fracture. By monitoring the fracture fluid-induced voltages and utilizing an incremental inverse integral model, the

fracture fluid geometry was quantified and displayed during the installation process.

As described above, each resistivity receiver string contained seven stainless-steel receivers in direct contact with surrounding soil and ground water. Up to nine strings were monitored during injection at each frac well. During early injections of Segment 1, the entire array of seven receivers per string was monitored from 51 to 19 ft msl; however, during construction of the upper panels, preferential current flow to the continuous lower panel resulted in washing out of the upper well receiver signal. As such, subsequent injections in Segments 1 through 3 utilized only five receivers in the lower panel (approximately 19 to 44 ft msl) and five receivers in the upper panel during monitoring (26 to 51 ft msl) to negate the washout effect.

The resistivity outputs were used as a guide to ensure that gaps in the wall did not exist and that panels of iron overlapped during construction. Outputs from the resistivity system for each frac well at various well injection timepoints are provided in Appendix B of the Final Construction Report. These images have been provided to show the lateral extent of influence from each frac well that was noted during injections. Generally, each well had as much as a 15- to 20-foot lateral fracture in each direction during construction and there was a 12-foot, center-to-center spacing of the frac wells. This influence provided for significant overlap of iron panels. This was verified during inclined profile testing where iron thicknesses were verified at the center point between frac wells in both the shallow and deep PRB zones, as discussed below.

2.4.3 Inclined Profile Borings

Four post-installation inclined profile borings (ICP-1 to ICP-4) were completed within Segments 1 and 2 to confirm installed PRB thickness within both the upper and lower panels. The locations of the inclined profile borings are shown on Figure 2 of the Final Construction Report. Magnetic field measurements collected at each boring are provided as Appendix D of the Final Construction Report.

2.4.3.1 ICP-1 and ICP-2

ICP-1 and ICP-2 were completed in Segment 1 between F7 and F8. Each boring was advanced at an offset distance from the azimuth of the PRB and at a target angle from vertical. GeoProbe rods were driven through the wall using direct-push methods in attempt to minimally disrupt the iron filings within the wall. A 2-inch, Schedule 40 polyvinyl chloride

(PVC) casing was installed through the wall at the target angle and the GeoProbe rods were removed. Using the target angle and offset distance from the PRB, the location and thickness of the PRB were measured at a targeted depth of approximately 20 to 35 ft bgs, or the center point of the upper and lower casings between the target frac wells. Once the casings were completed, a downhole magnetometer was inserted into the casing and measurements of localized magnetic field were recorded at approximately 2 to 3 feet before and 2 to 3 feet after the anticipated location of the PRB. Magnetic field measurements were collected every 1 inch in the 4- to 6-foot measured interval to determine entrance and exit locations of the magnetometer within the PRB.

ICP-1 was collected within the lower panel with an offset of 34 feet from the PRB azimuth. Following installation of the 2-inch casing at a 46-degree angle from vertical, the azimuth of the PRB was expected to have been located at approximately 48.9 feet within the casing. Based upon the data reduction and evaluation at this location, the PRB was encountered at approximately 48.16 feet within the casing and the magnetometer emerged from the PRB at approximately 48.58 feet, or within 6 inches of the anticipated PRB azimuth. When correcting for the declination angle of the casing compared to the vertical PRB, these measurements represent approximately 3.62 inches of iron. The 3.62-inch-thick iron PRB is consistent with the quantity of iron injected within Segment 1, as one additional ton of iron was injected into the lower panel in frac wells F1 to F11 to account for vertical migration of iron into the upper panel. Finally, the 3.62-inch iron thickness exceeds the design specification for Segment 1, which was specified as 3 inches.

ICP-2 was collected within the upper panel with an offset of 20 feet from the PRB azimuth. Following installation of the 2-inch casing at a 46.3-degree angle from vertical, the azimuth of the PRB was expected to have been located at approximately 28.9 feet within the casing. Based upon the data reduction and evaluation at this location, the PRB was encountered at approximately 29.33 feet within the casing and the magnetometer emerged from the PRB at approximately 29.66 feet. When correcting for the declination angle of the casing, these measurements represent a primary fracture thickness of 2.85 inches, or within 5 percent of the design specification of 3 inches. In addition to the primary fracture measured, there were also secondary fractures measured on both sides of the primary fracture. Once the secondary fracture thicknesses (approximately one-half-inch) are accounted for, the actual iron thickness in the shallow zone is above the 3-inch design specification (approximately 3.85 inches).

2.4.3.2 *ICP-3 and ICP-4*

ICP-3 and ICP-4 were completed in Segment 2 between F13 and F14. Sonic methods were used to install the casings at these locations in an attempt to physically sample the thickness of the PRB. Soil cores were collected from approximately 5 feet before the PRB to 5 feet after.

ICP-3 was collected within the upper panel with an offset of 25 feet from the PRB azimuth. Cores were collected and analyzed at the surface to evaluate iron thickness and fracture locations. The soil core for this ICP-3 was successful in collecting samples of the iron and, similar to the magnetometer results from Segment 1, the primary fracture was surrounded on either side by secondary fractures from below, confirming the results and interpretation of ICP-2 in Segment 1. Following installation of the 2-inch casing at a 47-degree angle from vertical, the azimuth of the PRB was expected to have been located at approximately 36.6 feet within the casing. Based upon the data reduction and evaluation at this location, the primary PRB fracture was encountered at approximately 36 to 36.5 feet within the casing. When correcting for the declination angle of the casing, these measurements represent a primary fracture thickness of approximately 5.17 inches, in excess of the required 4.5-inch thickness in Segment 2. Additionally, secondary fractures were noted at approximately 31 and 33 feet inside the casing, which correspond to smaller secondary fractures identified in the recovered soil core.

ICP-4 was collected within the lower panel with an offset of approximately 35 feet from the PRB azimuth. Collection of soil cores was also attempted at this location; however, the cores collected were not viable based upon liquefaction of the soils immediately adjacent to the PRB from the sonic drill rig. Based upon the data reduction and evaluation at this location, the measurements represent an effective iron thickness of over 9 inches. Based on the mass of iron injected and the approximate fracture geometry at this location from active resistivity imaging, this thickness is not feasible; therefore, although iron was measured in this location, its exact thickness could not be confirmed with a degree of precision.

2.4.4 *Hydraulic Pulse Interference Testing*

Hydraulic pulse interference testing (HPIT) was conducted prior to and following the installation of the PRB to verify that the local ground water flow characteristics (primarily related to the hydraulic conductivity of the surrounding formation) are not reduced by the installation of the PRB. HPIT conducted in July 2008, prior to PRB installation, indicated that the

average hydraulic conductivity is approximately 14 ft/day for the upper portion of the A-Zone and approximately 20 ft/day for the deeper portion of the A-Zone. The results of the July 2008 testing are detailed in the PRB RDIP.

Eight monitoring wells were tested in the vicinity of the PRB including MW-30A, MW-30A2, MW-31A, MW-31A2, MW-32A, MW-32A2, MW-33A, and MW-33A2. All wells were 2 inches in diameter with the "A" wells screened in the shallow A-Zone horizon and the "A2" wells screened in the deep A-Zone horizon. HPIT was conducted across all monitoring wells to provide detailed hydrogeological characterization of the site by cross hole paths, perpendicular to the PRB alignment. The locations of the monitoring wells respective to the PRB are shown on Figure 2 of the Final Construction Report.

The hydraulic conductivity and storativity values computed for each well pair are detailed in Table 7 of the Final Construction Report. The hydraulic conductivity calculated from the test data range from a low of approximately 1 ft/day to a high of approximately 64 ft/day. The calculated storativity values from the test data range from low 1.43E-05 to a high of 2.23E-04. Based on these field data, good hydraulic connection exists between all well pairs, with higher conductivities encountered in the deeper well pairs compared to the shallow well pairs.

To compare the results from the pre- and post-PRB installation hydraulic pulse interference testing, the results from both test events and the percent change between the events are detailed on Table 7 of the Final Construction Report. Although the results vary slightly, the mean changes to the shallow and deep well pairs were approximately 2 and 0.45 ft/day, respectively. Based on these results, there are no apparent impacts of the PRB construction on the natural aquifer characteristics and ultimately the natural ground water flow through the PRB.

2.5 POST-CONSTRUCTION TASKS

Following completion and verification of all segments of the PRB, frac wells and resistivity receivers were abandoned in accordance with the requirements of the State of California and under the supervision of the Contra Costa County Environmental Health Department. Frac well and resistivity receiver boxes were removed during site restoration activities conducted in July 2009.

2.6 POST-CONSTRUCTION PERFORMANCE MONITORING WELLS

The following sections describe the installation and development of 16 new A-Zone performance monitoring wells.

2.6.1 Installation

Sixteen A-Zone performance monitoring wells (MW-37A through MW-46A, MW-39A2 through MW-41A2, and MW-44A2 through MW-46A2) were installed on 15-16 June and 15-17 and 20-21 July 2009. These new performance monitoring wells are located approximately 4 feet upgradient and downgradient of the A-Zone PRB (Figure 24). Ten of the new wells (MW-37A through -46A) were completed at the water table, from approximately 15 to 30 ft bgs. The six remaining new monitoring wells were installed in a deeper portion of the A-Zone (from approximately 33 to 43 ft bgs) to monitor the higher concentrations found in this depth interval. All well installation and development activities were conducted in accordance with the Standard Operating Procedures provided in the *Phase I Remedial Investigation Sampling and Analysis Plan* (ERM 2000).

During well installation activities, soil samples were collected continuously for logging and field-screening purposes. An ERM geologist prepared boring logs in the field using the Unified Soil Classification System to describe soils (Appendix B). The soils were screened in the field with a photoionization detector for the presence of VOCs. Well completion details, including well materials used, total depths, and screen intervals, are also included on the logs presented in Appendix B. Soil cuttings generated during the well installations were containerized and stored on site pending off-site disposal at a licensed disposal facility.

The new well locations were surveyed on 28 July 2009 for horizontal and vertical control by Foresite Engineering, a surveyor from Pleasant Hill, California.

2.6.2 Development and Sampling

The monitoring wells were developed on 19 June, 23-24 July, and 27 July 2009 by a combination of bailing, surging, and pumping. Ten well casing volumes of water were removed from each well during development. The development water was containerized in 55-gallon drums and stored on site pending off-site disposal at a licensed facility.

Following development, the monitoring wells were purged and sampled with disposable bailers on 23-24 and 27 July 2009. Three casing volumes

were removed prior to sampling. During well purging activities, water quality parameters (including temperature, pH, and specific conductance) were measured and noted on the field forms. Once purging was completed, ground water samples were collected from each well for laboratory analysis of VOCs by USEPA Method 8260 and total organic carbon (TOC) by Standard Methods 5310C.

2.7 WASTE CHARACTERIZATION, STORAGE, AND DISPOSAL

Construction-derived wastes included soil cuttings from installation of the injection points and performance monitoring wells, iron spoils generated during decontamination of the injection points, and, as described above, ground water generated during well development activities. Soil cuttings and ground water were placed in roll-off bins and 55-gallon drums, respectively, appropriately labeled, and stored at the equipment staging area, pending off-site disposal at a licensed facility. Iron spoils were placed into a roll-off bin and the iron was left to settle out of the water. The water was pumped out of the bin and transferred to a storage tank in the equipment staging area. Both the iron and water were disposed of at licensed facilities.

2.8 SITE RESTORATION

Site restoration activities included the removal of storm water pollution prevention measures, fence removal, restoration of Hookston Road, and restoration of Len Hester Park. Restoration activities were conducted during July 2009.

Hay bales and wattles were removed from the site and recycled to farms or other sites, if reusable. Drain covers were left in place until the end of restoration to protect the storm water system.

Restoration of Hookston Road commenced with the removal and replacement of asphaltic concrete along the northern side of Hookston Road, between Hampton Drive and Stimel Drive. Areas of the road that were damaged during PRB construction were ground to the existing baserock layer and replaced with an asphalt blend approved by the City. Frac well and resistivity receiver boxes located in the middle of Hookston Road were broken out in 2-foot-square boxes and those areas of the road were hot-patched. Frac wells and resistivity receivers were previously abandoned. The handicap ramp on the western side of the intersection of Hookston Road and Hampton Drive was removed and replaced in

accordance with current City codes. Final cleanup activities included pressure-washing of curbs, sidewalks, and the street to remove underground utility markings.

Restoration of Len Hester Park commenced with the removal and replacement of the bike path within the work area. The new path was graded to match seamlessly into the new handicap ramp. Following replacement of the bike path, the temporary perimeter fence was removed and areas of the park within and around the work area were mowed to remove all high grass and weeds. Ruts and surface damage caused by the PRB construction work were removed and replaced with topsoil. The impacted areas were then seeded with playing field seed purchased from the same supplier the City uses and topcoated with compost to protect the seed from birds. At the completion of park restoration activities, the City of Concord Parks Department performed a site walk-through.

3.0 PERFORMANCE GROUND WATER MONITORING

Performance ground water monitoring activities and results are documented in the following sections. The schedule for future performance monitoring events and reporting is also described.

3.1 BASELINE WATER QUALITY MONITORING

The baseline ground water monitoring event was completed during September 2007 and documented in the *Third Quarter 2007 Monitoring Report* (ERM 2007b). All well sampling activities were conducted in accordance with the Standard Operating Procedures provided in the *Phase I Remedial Investigation Sampling and Analysis Plan* (ERM 2000) and in accordance with the *Remedial Design and Implementation Plan for A-Zone Permeable Reactive Barrier* (ERM 2007a), which the Water Board conditionally approved on 16 August 2007.

Performance monitoring wells MW-15A2, -30A, -30A2, -32A, and -32A2, were purged and sampled with disposable bailers. Three casing volumes were removed prior to sampling. During well purging activities, water quality parameters (including temperature, pH, and specific conductance) were measured and noted on the field forms. Once purging was completed, ground water samples were collected from each well for laboratory analysis of VOCs.

Performance monitoring wells MW-31A, -31A2, -33A, and -33A2 were purged and sampled with a peristaltic pump. Three casing volumes were removed prior to sampling. During well purging activities, water quality parameters (including temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen, turbidity, and salinity) were measured with an in-line flow cell and water quality meter and noted on the field forms. Once purging was completed, ground water samples were collected from these upgradient performance monitoring wells for laboratory analysis of the following:

- VOCs by United States Environmental Protection Agency (USEPA) Method 8260;
- Dissolved metals (potassium, sodium, calcium, magnesium, manganese, iron, aluminum, and barium) by USEPA Methods 3010A and 6010B;

- Anions (sulfate, chloride, bromide, and nitrate as nitrogen) by USEPA Methods 300.0 and 9056A;
- Fluoride by USEPA Method 340.2/Standard Methods 4500-F-C;
- Alkalinity by USEPA Method 310.1/Standard Methods 2320B;
- Dissolved and total organic carbon by Standard Methods 5310C;
- Total dissolved solids by USEPA Method 160.1/Standard Methods 2540C; and
- Total suspended solids by USEPA Method 160.2/Standard Methods 2540D.

Purge water generated during the baseline sampling event was stored on site in 55-gallon drums and then disposed off site at a licensed facility.

3.2 POST-CONSTRUCTION PERFORMANCE MONITORING

3.2.1 Ground Water Elevation Data

In accordance with the PRB RDIP, depth-to-water measurements are currently being collected monthly in 26 monitoring wells located along and near the A-Zone PRB (MW-15A, MW-15A2, MW-30A through MW-33A, MW-30A2 through MW-33A2, MW-37A through MW-46A, MW-39A2 through MW-41A2, and MW-44A2 through MW-46A2). Depth-to-water measurements were collected on 5 and 17 August 2009 and 1 September 2009.

3.2.2 Water Quality Monitoring

In accordance with the PRB RDIP, the first performance monitoring event was completed approximately 3 months following the installation of the A-Zone PRB. Ground water samples were collected from the 26 monitoring wells located along and near the A-Zone PRB. This first performance monitoring event was completed from 1 to 3 September 2009.

All performance monitoring wells were sampled for VOCs by USEPA Method 8260 and TOC by Standard Methods 5310C. VOC samples were collected from passive diffusion bags that were previously installed in the wells. The TOC samples were collected by the traditional purge-and-sample method using disposable bailers. Three casing volumes were removed prior to sampling. During well purging activities, water quality parameters (including temperature, pH, and specific conductance) were

measured and noted on the field forms. Once purging was completed, ground water samples were collected from each well for laboratory analysis of TOC.

In addition to VOCs and TOC, ground water samples for additional analyses were collected from MW-30A, MW-30A2, MW-32A, and MW-32A2. These wells were purged and sampled with a peristaltic pump. Three casing volumes were removed prior to sampling. During well purging activities, water quality parameters (including temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen, turbidity, and salinity) were measured with an in-line flow cell and water quality meter and noted on the field forms. Once purging was completed, ground water samples were collected for laboratory analysis of the following:

- VOCs by USEPA Method 8260;
- Dissolved metals (potassium, sodium, calcium, magnesium, manganese, iron, aluminum, and barium) by USEPA Methods 3010A and 6010B;
- Anions (sulfate, chloride, bromide, and nitrate as nitrogen) by USEPA Methods 300.0 and 9056A;
- Alkalinity by USEPA Method 310.1/Standard Methods 2320B;
- Dissolved and total organic carbon by Standard Methods 5310C;
- Total dissolved solids by USEPA Method 160.1/Standard Methods 2540C; and
- Total suspended solids by USEPA Method 160.2/Standard Methods 2540D.

Purge water generated during the first performance monitoring event was stored on site in 55-gallon drums and then disposed of off site at a licensed facility.

3.3 RESULTS

Baseline and performance ground water monitoring results are documented in the following sections.

3.3.1 Ground Water Elevation Data

Depth-to-water measurements and corresponding elevations are summarized on Table 1. Ground water elevations were compared for

upgradient/downgradient well pairs for both "A" wells screened in the shallow A-Zone horizon and "A2" wells screened in the deep A-Zone horizon (i.e., MW-42A/MW-37A and MW-44A2/MW-39A2). Results indicate that ground water elevations are slightly higher in the monitoring wells upgradient of the PRB and elevation differences across well pairs are greater for "A" wells. During the most recent ground water monitoring event, elevation differences across well pairs ranged from 0.04 foot for MW-45A2/MW-40A2 and MW46A2/MW-41A2 to 0.99 foot for MW-43A/MW-38A. The greater elevation differences observed in shallow A-Zone well pairs is consistent with the results of the HPIT, which indicated that lower hydraulic conductivities are observed in the shallow A-Zone well pairs compared to the deeper A-Zone well pairs. The hydraulic head differences observed between proximal A2-Zone wells are expected based on regional background gradients. The hydraulic head differences observed between A-Zone wells MW-43A/MW-38A is greater than what would be expected between these wells, but chemical data demonstrates that groundwater is flowing through the PRB at this location, as the downgradient well (MW-38A) has shown significant reductions in TCE concentrations (see below).

3.3.2 Water Quality Monitoring

Analytical results for ground water samples collected during the baseline monitoring event, immediately following well development, and during the first performance monitoring event are summarized in Tables 2 and 3.

As shown on Figure 25 and in Table 2, TCE concentrations in several performance monitoring wells immediately downgradient of the PRB during the first performance monitoring event (September 2009) were lower than the concentrations observed in their associated upgradient wells. Some examples of TCE concentration decreases observed in September 2009 include:

Upgradient/Downgradient Well Pair Numbers	Upgradient TCE Concentration, µg/L	Downgradient TCE Concentration, µg/L
MW-42A/MW-37A	265	ND<1.0
MW-43A/MW-38A	80.1	0.74
MW-44A2/MW-39A2	305	17.9
MW-45A/MW-40A	2.1	ND<1.0
MW-46A/MW-41A	90.4	0.83

Additionally, VOC concentrations in several performance monitoring wells immediately downgradient of the PRB in September 2009 were lower than the results observed in these wells following well development in July 2009. For example, TCE concentrations at MW-39A, -39A2, and -40A in September 2009 decreased by one to two orders of magnitude compared to July 2009 concentrations.

VOC concentrations in wells further downgradient from the PRB (MW-15A, -15A2, -30A to -33A, and -30A2 to -33A2) remained within the range of historical concentrations previously observed at these wells. There are other wells along the PRB alignment where we have not yet observed chemical decreases; however, because the seepage velocity of groundwater can vary within heterogeneous aquifer materials, and because these results represent only the first monitoring event performed shortly after the PRB construction was completed, we did not expect to observe chemical decreases in all of the downgradient monitoring wells. Future monitoring will be performed to observe long-term chemical decreases within this area.

3.4 FUTURE PERFORMANCE MONITORING ACTIVITIES AND REPORTING

The next A-Zone PRB ground water performance monitoring event is scheduled for December 2009. The activities and results of that monitoring event will be documented in the Fourth Quarter 2009 monitoring report, which will be submitted to the RWQCB on 30 January 2010.

Water levels will be measured in each of the monitoring wells along and near the PRB alignment monthly for the first year of PRB operation. These data will be used to verify that no significant hydraulic buildup behind the PRB is occurring throughout all seasons. Following this initial year of well gauging, water levels will be collected semiannually in accordance with the Self-Monitoring Program of the Order. All monitoring wells along and near the PRB alignment will be analyzed for VOCs quarterly for the first year. Following the first year of operation, the Hookston Station Parties will evaluate the data to determine the appropriate sampling frequency and locations. Results of the quarterly performance monitoring events conducted during the first year will be documented in routine quarterly monitoring reports that are currently required by the existing Self-Monitoring Program. Remedy effectiveness status reports will also be submitted to the RWQCB on 31 December 2009, 31 December 2012, and every 5 years thereafter, in accordance with Task 9 of the Order.

4.0 SUMMARY

This Implementation Report documents the construction activities and initial performance monitoring results for the A-Zone portion of the remedial strategy for the Hookston Station property.

The PRB was installed as one continuous reactive zone of ZVI extending approximately 480 feet on a northwest-to-southeast alignment across Len Hester Park, proceeding parallel to and then across Hookston Road. PRB thickness ranged from 3.8 to 5.1 inches and depths ranged from approximately 51 ft msl (approximately 11 to 15 ft bgs, adjusting for topographic changes along the proposed alignment) to 19 ft msl (approximately 44 to 48 ft bgs). The construction of the PRB commenced with drilling in March 2009 and was completed in June 2009. The PRB was designed and installed to specification to degrade chlorinated VOCs in site ground water to below their respective cleanup goals. Preliminary results from the monitoring network that show concentration decreases in downgradient monitoring wells indicate that the PRB is working as designed.

5.0 REFERENCES

Center for Toxicology and Environmental Health, L.L.C. (CTEH). 2006. *Baseline Risk Assessment, Hookston Station Site, Pleasant Hill, California*. February 2006.

ERM-West, Inc. (ERM). 2000. *Phase I Remedial Investigation Sampling and Analysis Plan, Hookston Station Site, Pleasant Hill, California*. December 2000.

ERM. 2004. *Remedial Investigation Report, Hookston Station Site, Pleasant Hill, California.* August 2004.

ERM. 2006. *Feasibility Study, Hookston Station Site, Pleasant Hill, California.* 10 July 2006.

ERM. 2007a. *Remedial Design and Implementation Plan for A-Zone Permeable Reactive Barrier, Hookston Station Site, Pleasant Hill, California.* 29 June 2007.

ERM. 2007b. *Third Quarter 2007 Monitoring Report, Hookston Station Site, Pleasant Hill, California.* 30 October 2007.

ERM. 2008. *100% Remedial Design and Implementation Plan for A-Zone Permeable Reactive Barrier, Hookston Station Site, Pleasant Hill, California.* 21 November 2008.

ERM. 2009. *Health and Safety Plan for Permeable Reactive Barrier Installation, Hookston Station.* 4 March 2008.

Regional Water Quality Control Board (RWQCB). 2008. *Screening for Environmental Concerns at Sites with Contaminated Soil and Ground Water, Volume 1: Summary Tier 1 Lookup Tables*. Interim Final November 2007 (Revised May 2008).

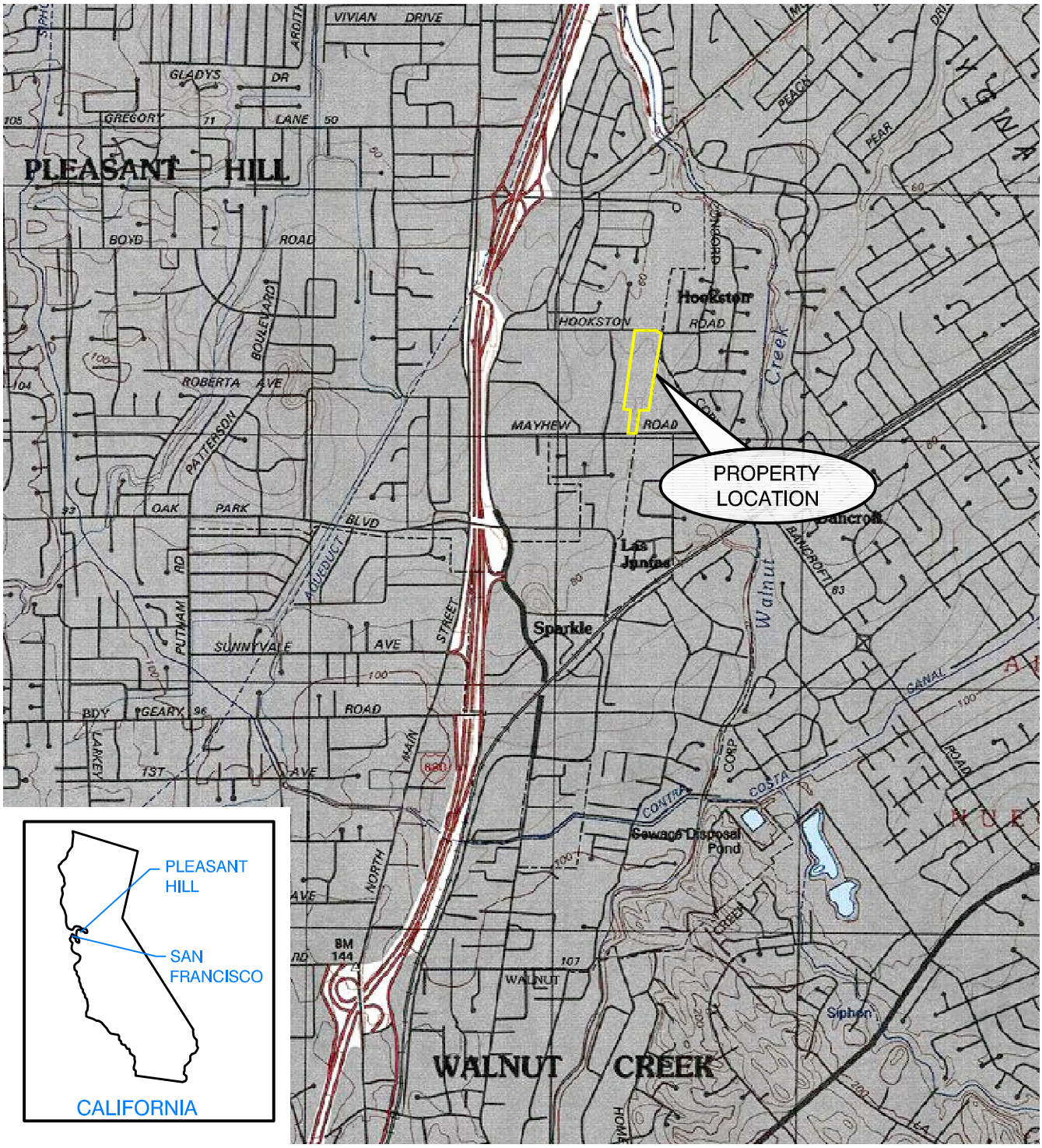
Figures

Project No. 0099020.02

Date: 09/29/09

Drawn By: R. Olson

CAD File: g:\\0099020\02\009902002-01.dwg



SCALE 1: 24,000

1 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

N

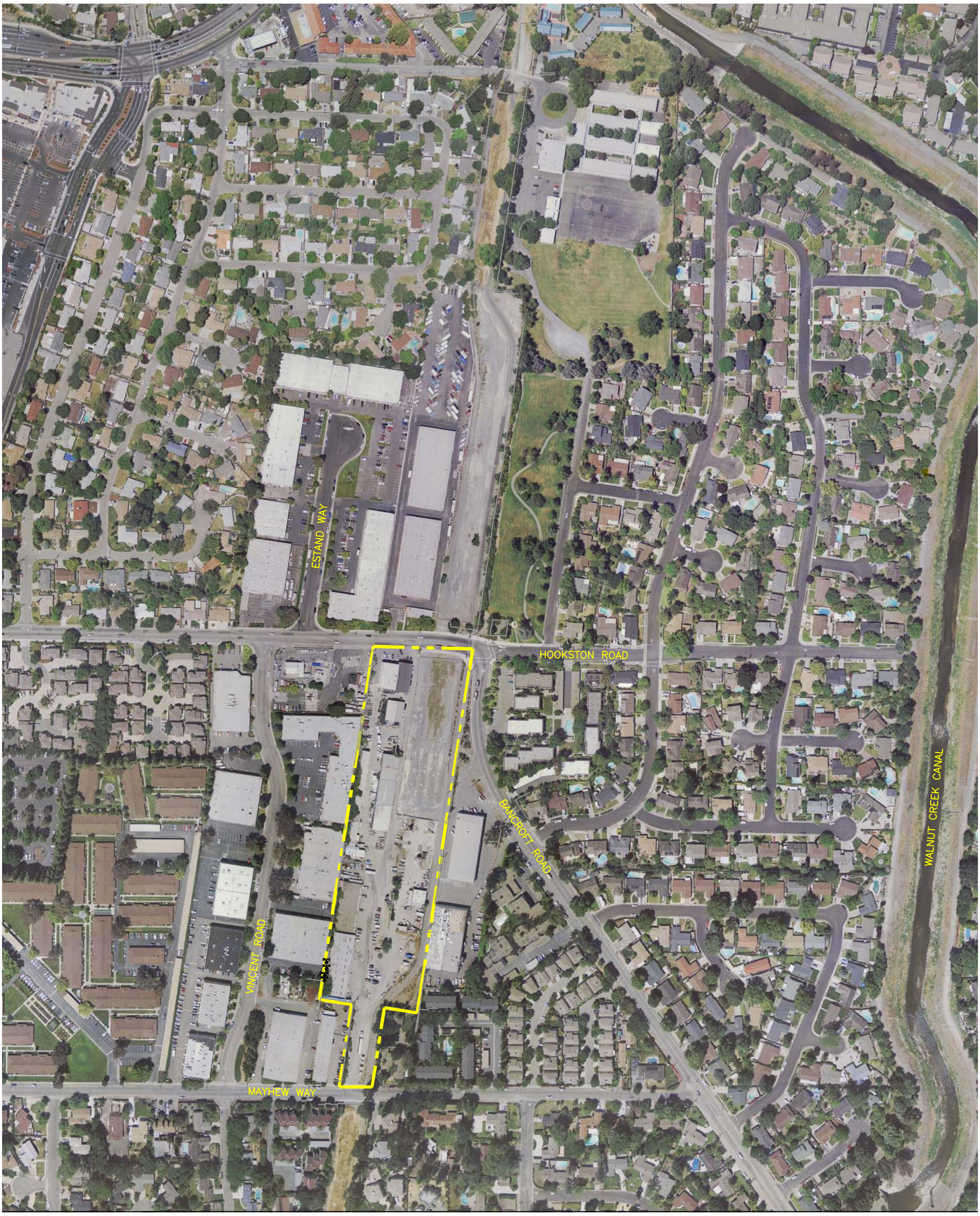
References:
TOPO!® Software
U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle,
Walnut Creek, California
Dated: 1995

Figure 1

Property Location Map
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-02.dwg	R. Olson	10/06/09	0099020.02



Aerial photograph from HJW Geospatial, Inc.
Date of photograph is May 15, 2006

LEGEND

Hookston Station Property Boundary

N

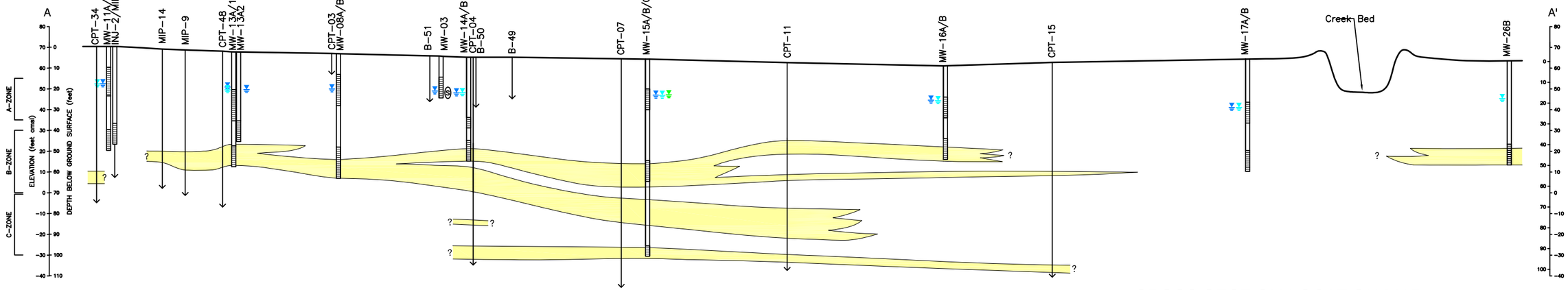
0 300

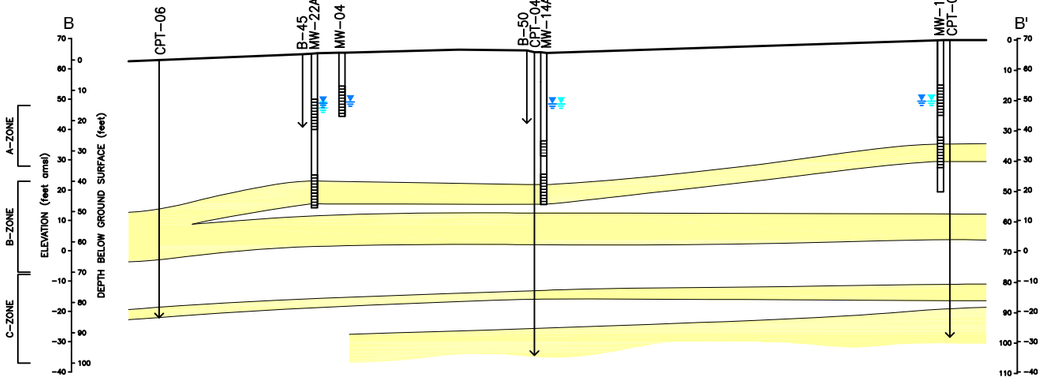
FEET

Figure 2
Hookston Station Vicinity Map
Hookston Station
Pleasant Hill, California

CAD File: G:\0099020\02\00990200 2-23.dwg

Drawn By: R. Olson | Date: 09/29/09 | Project No. 0099020.02





(Vertical Exaggeration = 5X)

0

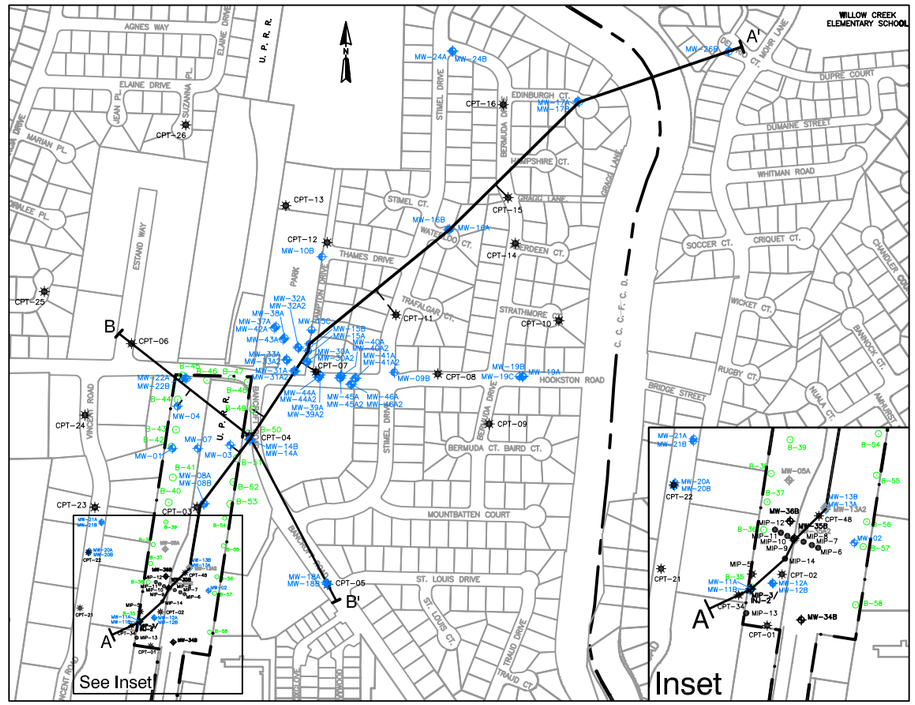
VERTICAL SCALE IN FEET 1" = 50'

50

0 250

HORIZONTAL SCALE IN FEET 1" = 250'

CROSS SECTION LOCATION MAP



Legend

- Monitoring Well, A Zone
- Monitoring Well, B Zone
- Monitoring Well, C Zone
- CPT Groundwater Sample Location
- Shallow Hydropunch Location
- Sewer Pipe

A–Zone	A–Zone Aquifer; Generally 15–35 ft below ground surface
B–Zone	B–Zone Aquifer; Generally 40–70 ft below ground surface
C–Zone	C–Zone Aquifer; Generally 70–100 ft below ground surface

- A–Zone Groundwater Elevation (ft amsl)
- B–Zone Groundwater Elevation (ft amsl)
- C–Zone Groundwater Elevation (ft amsl)

Note: Water Levels measured in January/ February 2009

MONITORING WELL
Screened Interval
Coarse–Grained Deposits

HYDROPUNCH/CPT BORINGS

0 300 600
FEET

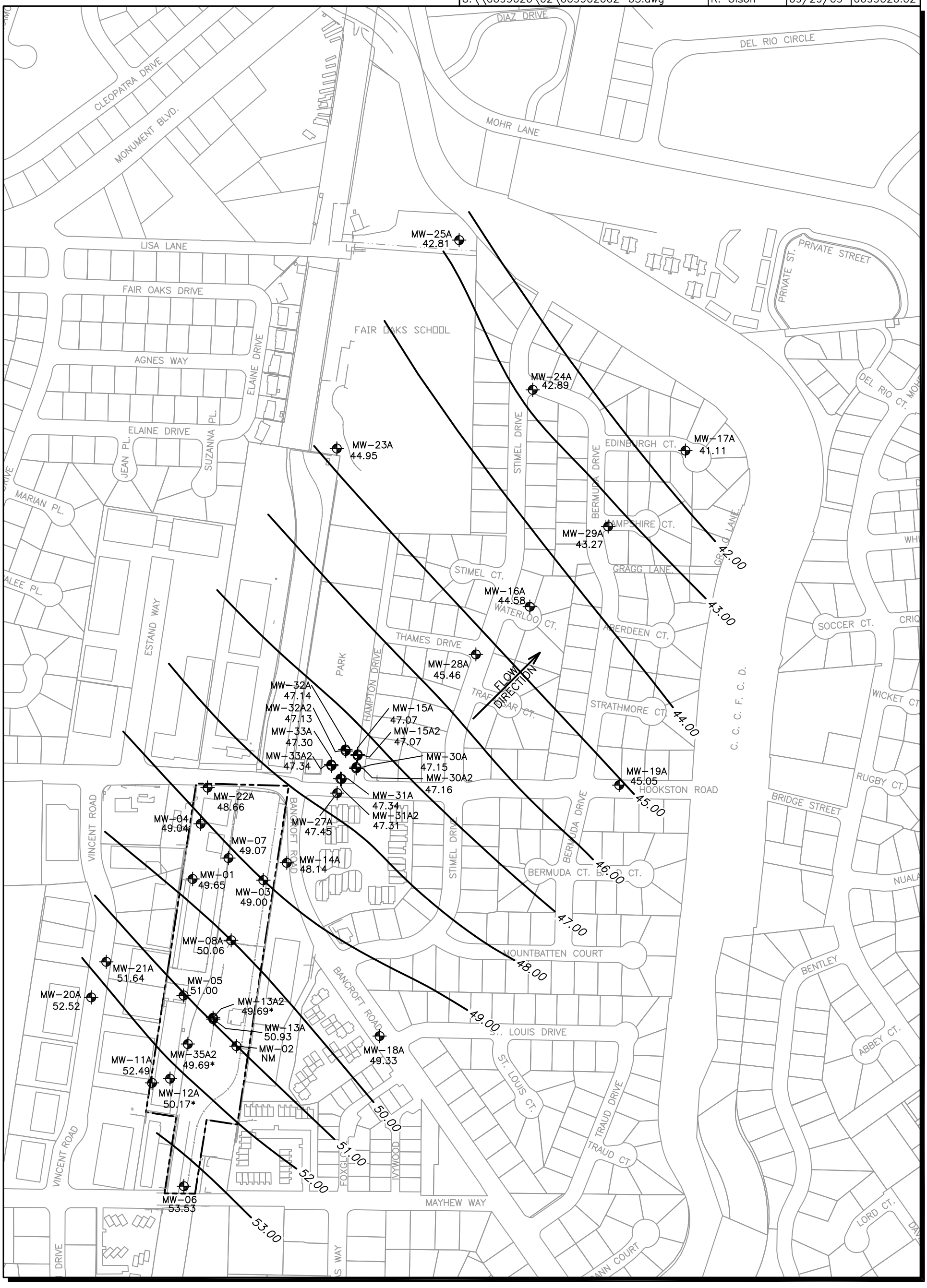
Hookston Station Property Boundary

Figure 3

Geological Cross Sections
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-03.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- A-Zone Monitoring Well
- Hookston Station Property Boundary
- 49.00 Groundwater Elevation Contour; 1.0 Foot Interval
- Groundwater Flow Direction
- NM Not Measured
- * Datum Not Used for Contouring

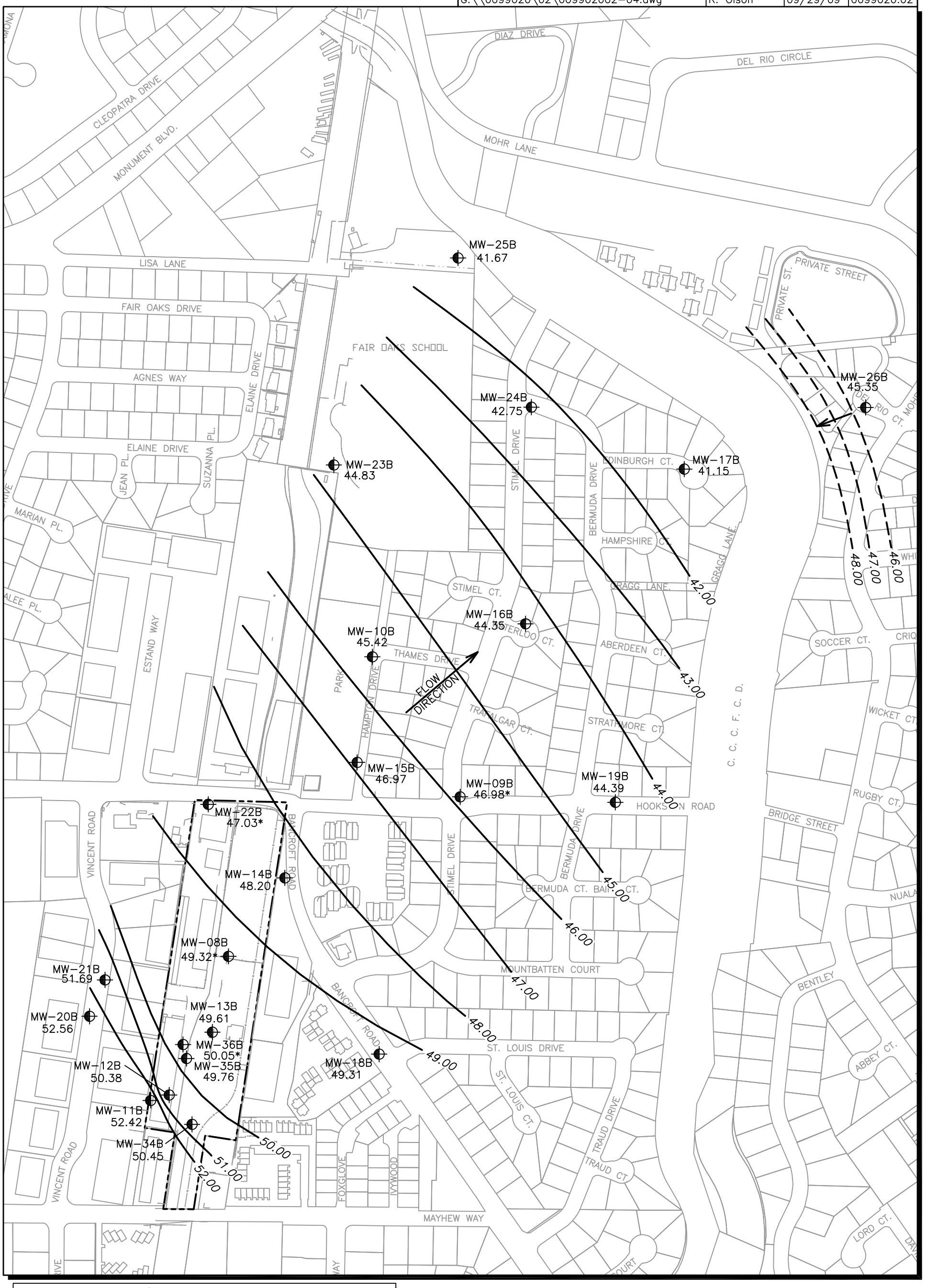
Note: MW-01 water level measured on 21 January 2009.

Figure 4

Groundwater Elevation Map, A-Zone
13 January 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-04.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- B–Zone Monitoring Well
- Hookston Station Property Boundary
- 49.00 — Groundwater Elevation Contour; 1.0 Foot Interval; Dashed Where Inferred
- Groundwater Flow Direction
- NM — Not Measured
- * — Datum Not Used for Contouring

Note: MW–08B and MW–36B water levels measured on 11 and 12 February 2009 respectively (not used for contouring).

N

0 300

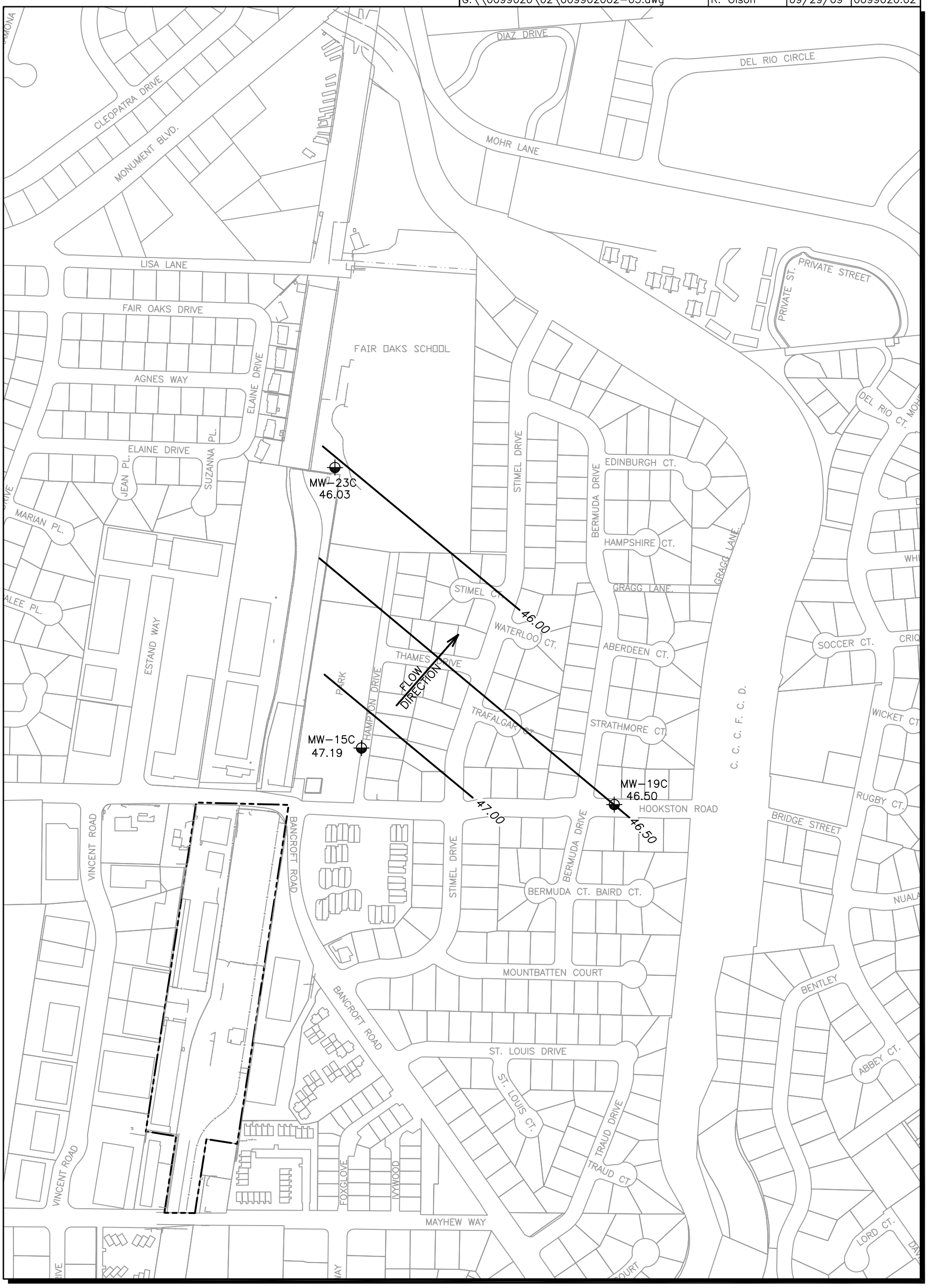
FEET

Figure 5

Groundwater Elevation Map, B-Zone
13 January 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-05.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- C-Zone Monitoring Well
- Hookston Station Property Boundary
- 47.00 Groundwater Elevation Contour; 0.5 Foot Interval
- Groundwater Flow Direction

N

0 300

FEET

Figure 6

Groundwater Elevation Map, C-Zone

13 January 2009

Hookston Station

Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
g:\\0099020\02\009902002-06.dwg	J. Estrada	10/15/09	0099020.02

Aerial photograph from HJW Geospatial, Inc.
Date of photograph is May 15, 2006

LEGEND

Hookston Station Property Boundary

N

0 300

FEET

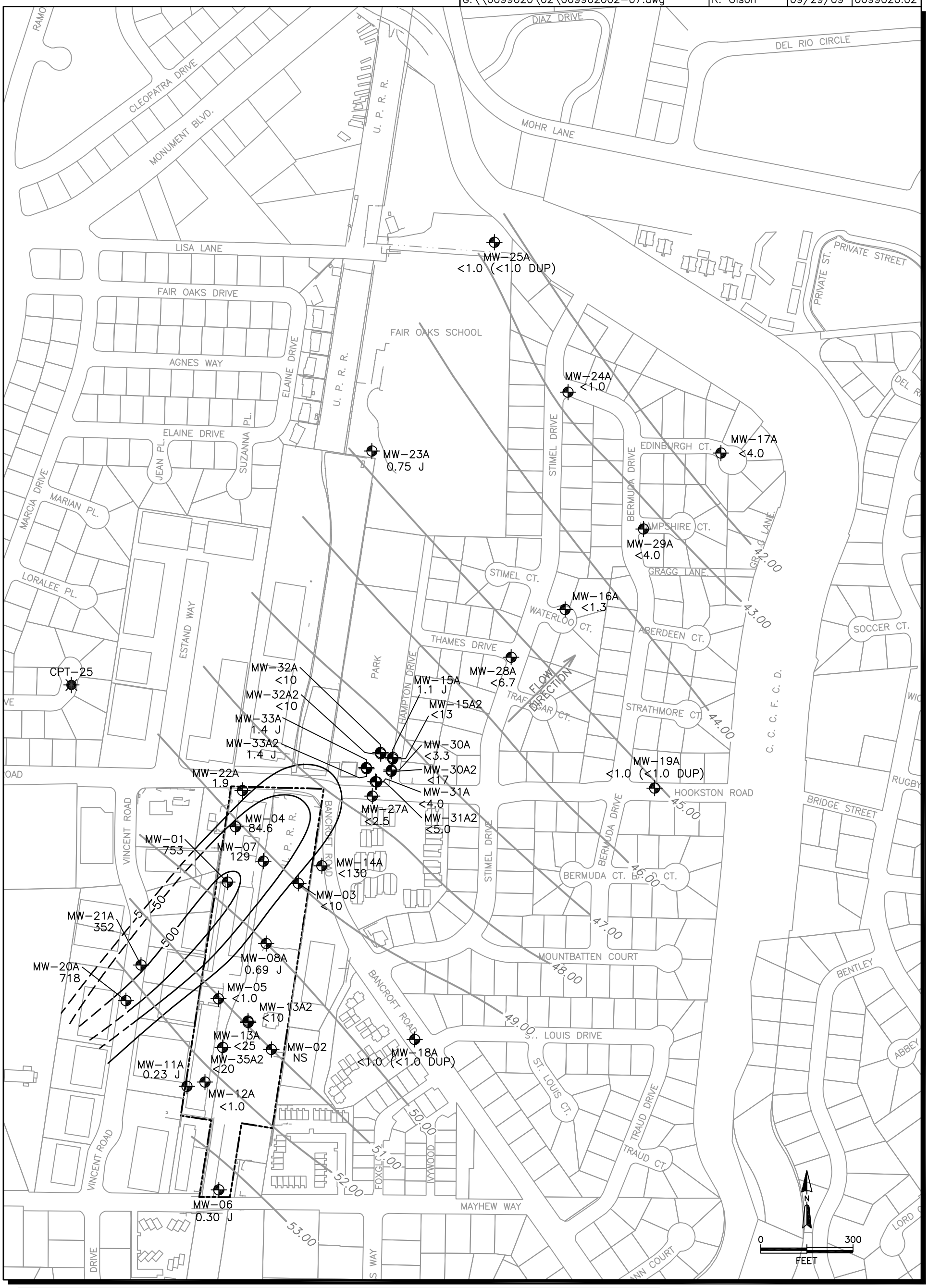
Figure 7

Hookston Station and Adjacent Environmental Sites

Hookston Station

Pleasant Hill, California

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-07.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- Monitoring Well Location
- 170 PCE Concentration (μg/L)
- CPT-25 Cone Penetrometer Test Location, Data Collected September 2002
- NS Not Sampled
- J Estimated Value
- 50 PCE in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 Groundwater Elevation Contour, A-Zone, 13 January 2009 (feet above mean sea level)
- Hookston Station Property Boundary

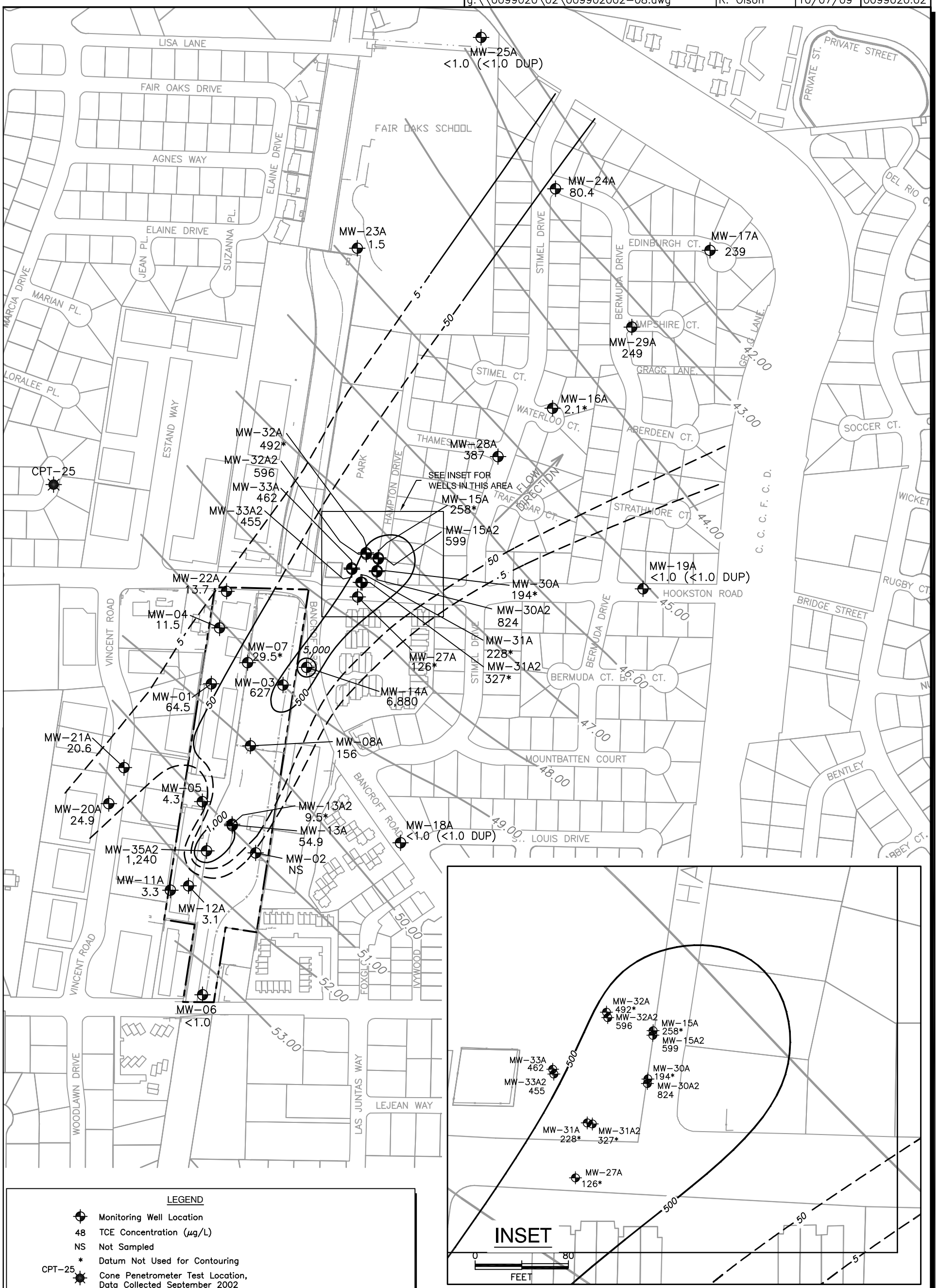
PCE is not a chemical of concern for the Hookston Station site; therefore there is no Hookston Station ground water cleanup goal for PCE. The Maximum Contaminant Level for PCE in drinking water is 5 μg/L.

Figure 8

PCE Isoconcentration Map
A-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
g:\\0099020\02\009902002-08.dwg	R. Olson	10/07/09	0099020.02



LEGEND

- Monitoring Well Location
- 48 — TCE Concentration (µg/L)
- NS — Not Sampled
- * — Datum Not Used for Contouring
- CPT–25 — Cone Penetrometer Test Location, Data Collected September 2002
- 50 ——— TCE in Groundwater Contour, Solid Based on Third Quarter 2009 Monitoring Well Data; Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 ——— Groundwater Elevation Contour, A–Zone, 13 January 2009 (feet above mean sea level)
- ——— Hookston Station Property Boundary

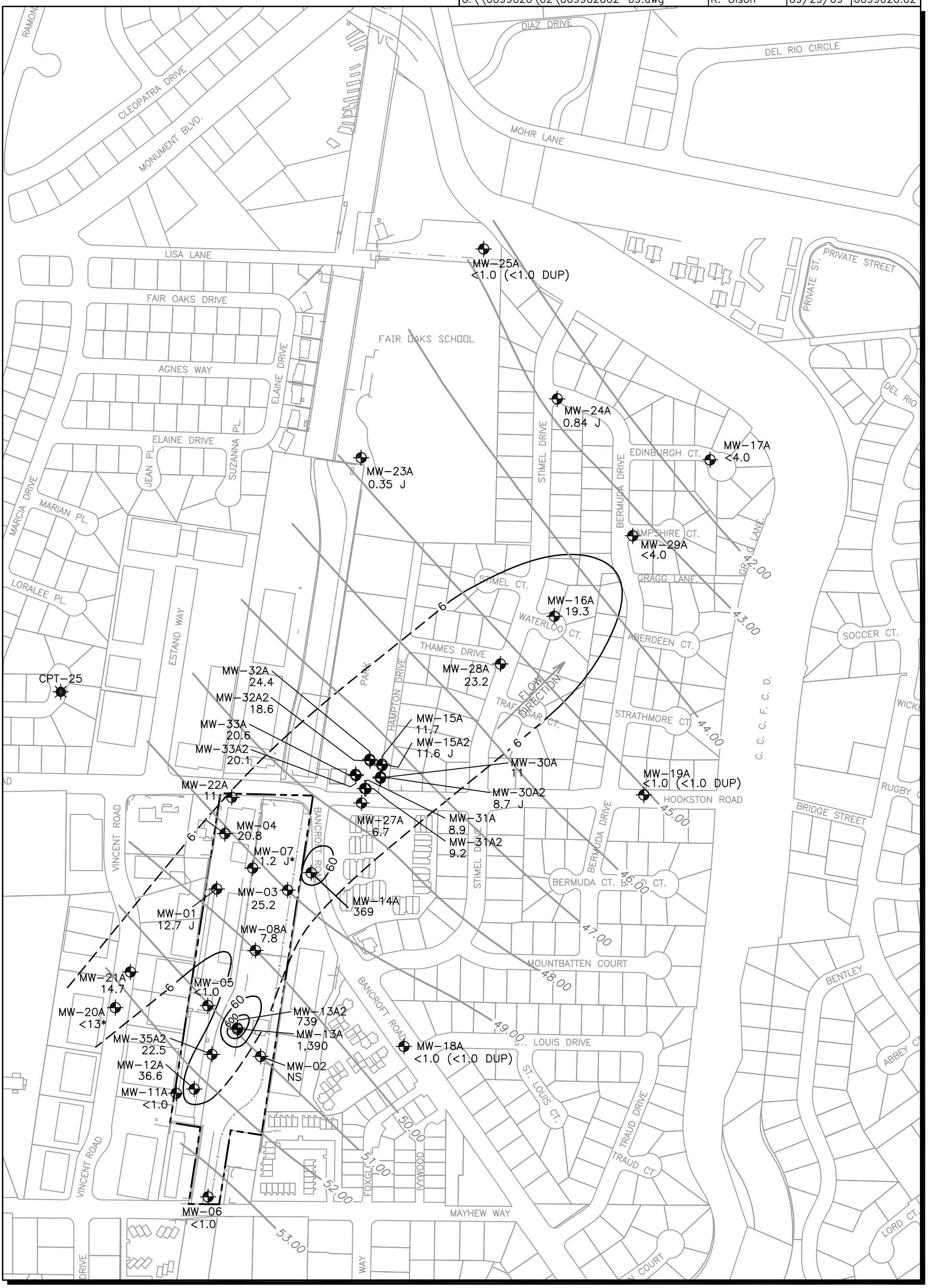
The Maximum Contaminant Level for TCE in drinking water and Hookston Station TCE groundwater cleanup goal is 5 µg/L.

Figure 9

TCE Isoconcentration Map
A-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 10/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-09.dwg	R. Olson	09/29/09	0099020.02



LEGEND

⊕	Monitoring Well Location	*	Datum Not Used for Contouring
12	cis-1,2-DCE Concentration (µg/L)	J	Estimated Value
CPT-25 ✳	Cone Penetrometer Test Location, Data Collected September 2002	NS	Not Sampled
60	cis-1,2-DCE in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.		
49.00	Groundwater Elevation Contour, A-Zone, 13 January 2009 (feet above mean sea level)		
	Hookston Station Property Boundary		

The Maximum Contaminant Level for cis-1,2-DCE in drinking water and Hookston Station Groundwater cleanup goal for cis-1,2-DCE is 6 µg/L.

N

0 300

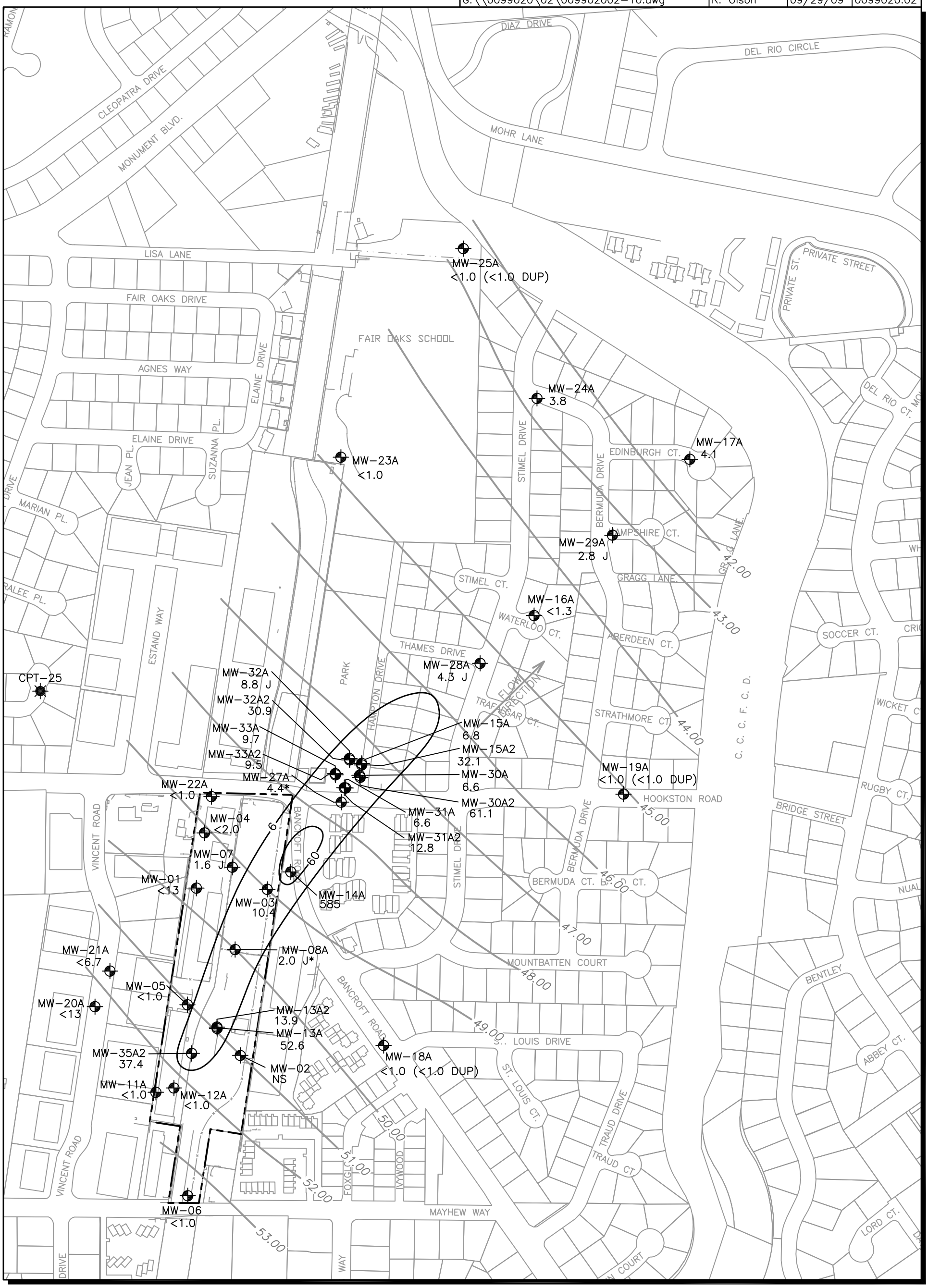
FEET

Figure 10

cis-1,2-DCE Isoconcentration Map
A-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-10.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- Monitoring Well Location
- 70 1,1-DCE Concentration (µg/L)
- CPT-25 Cone Penetrometer Test Location, Data Collected September 2002
- NS Not Sampled
- * Datum Not Used for Contouring
- 60 — 1,1-DCE in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 — Groundwater Elevation Contour, A-Zone, 13 January 2009 (feet above mean sea level)
- Hookston Station Property Boundary

The Maximum Contaminant Level for 1,1-DCE in drinking water and Hookston Station Groundwater cleanup goal for 1,1-DCE is 6 µg/L.

N

0 300

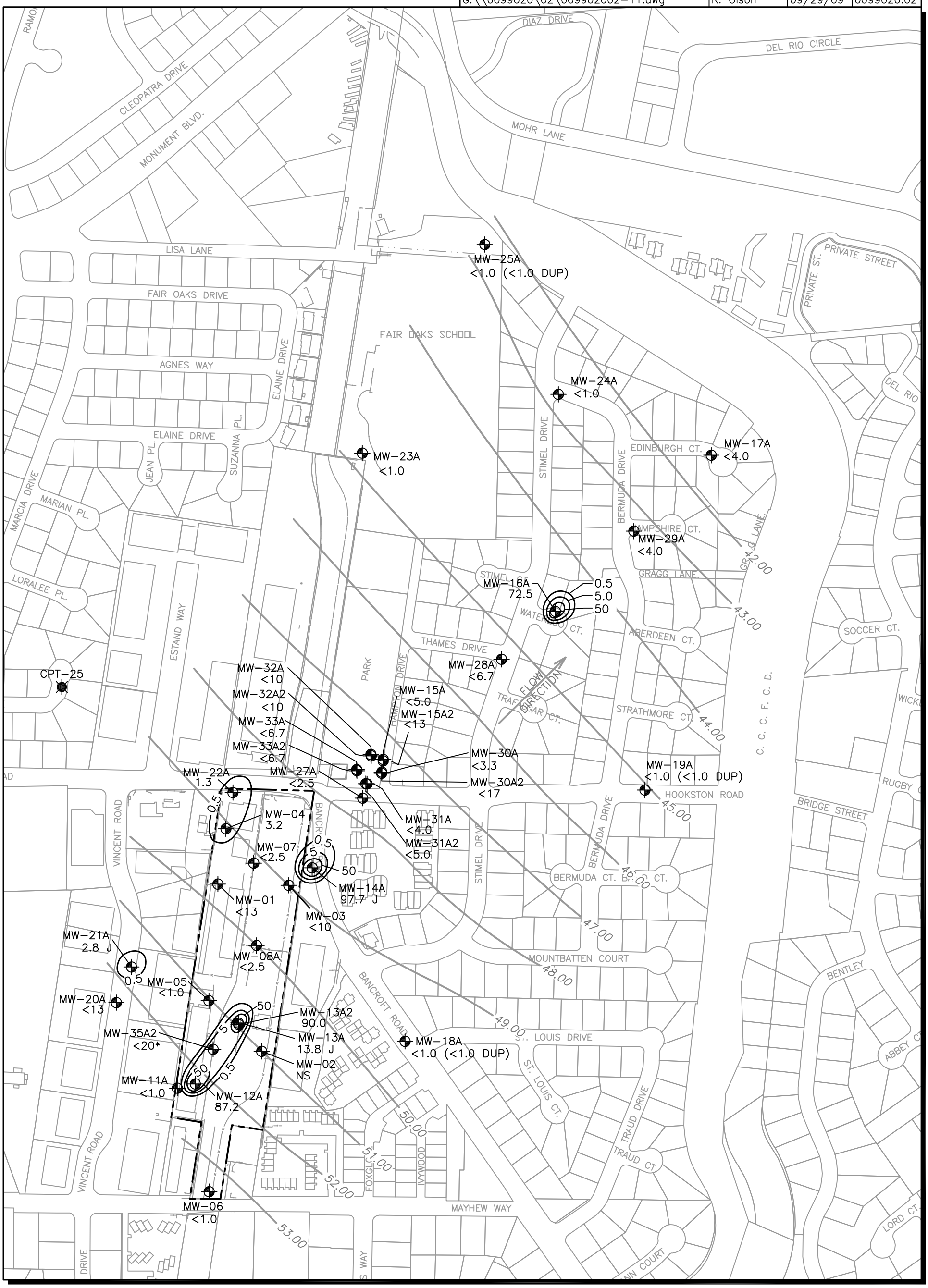
FEET

Figure 11

1,1-DCE Isoconcentration Map
A-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-11.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- Monitoring Well Location
- 5 — Vinly Chloride Concentration (µg/L)
- CPT-25 — Cone Penetrometer Test Location, Data Collected September 2002
- NS — Not Sampled
- * — Datum Not Used for Contouring
- 5 ——— Vinyl Chloride in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 ——— Groundwater Elevation Contour, A-Zone, 13 January 2009 (feet above mean sea level)
- ——— — — ——— Hookston Station Property Boundary

The Maximum Contaminant Level for Vinyl Chloride in drinking water and Hookston Station Groundwater cleanup goal for Vinyl Chloride is 0.5 µg/L.

N

0 300

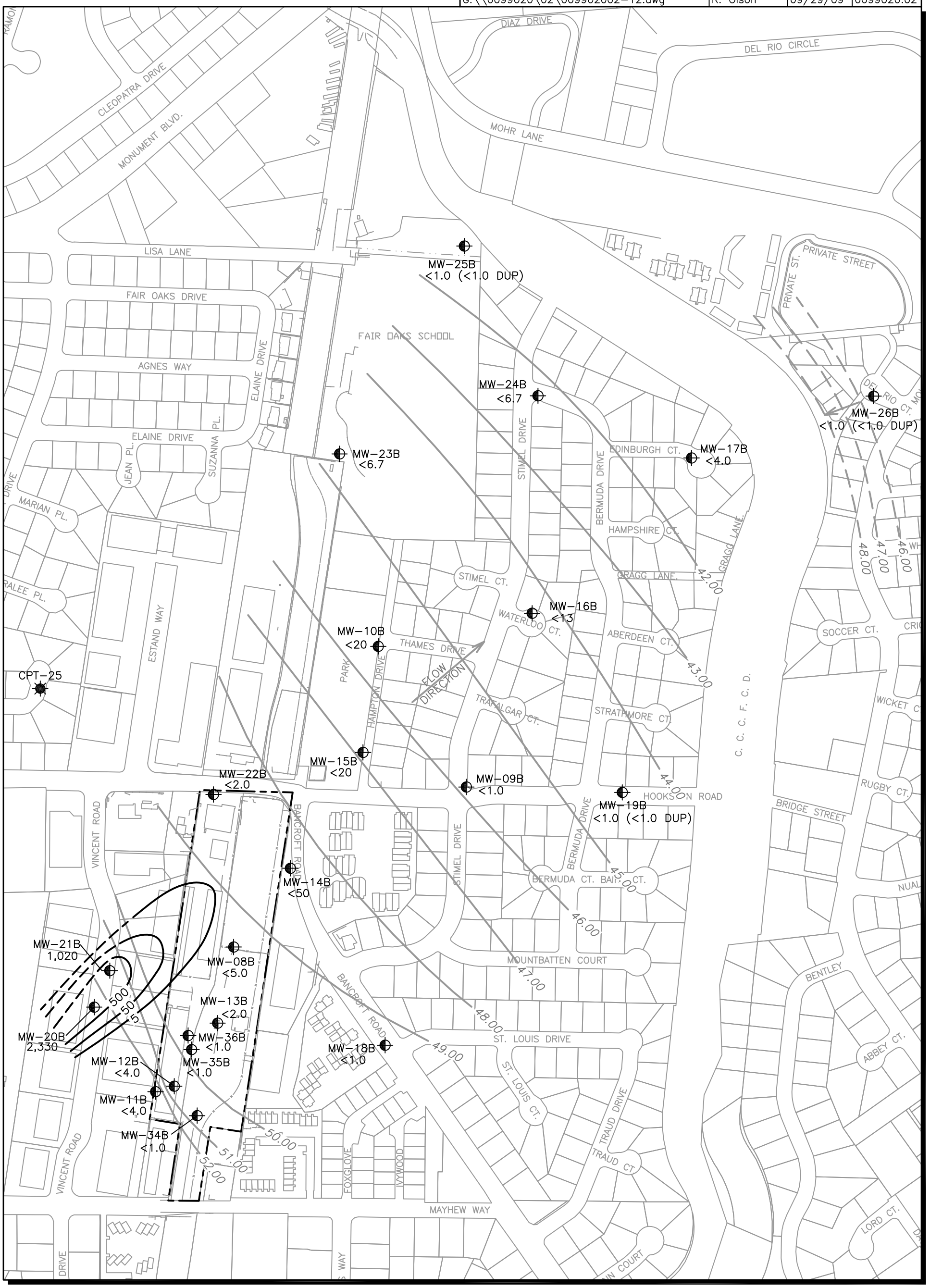
FEET

Figure 12

Vinyl Chloride Isoconcentration Map
A-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-12.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- Monitoring Well Location
- 840 — PCE Concentration (µg/L)
- CPT-25 — Cone Penetrometer Test Location, Data Collected September 2002
- 50 — PCE in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 — Groundwater Elevation Contour, B-Zone, 13 January 2009 (feet above mean sea level)
- Hookston Station Property Boundary

PCE is not a chemical of concern for the Hookston Station site; therefore there is no Hookston Station ground water cleanup goal for PCE. The Maximum Contaminant level for PCE in drinking water is 5 µg/L.

N

0 300

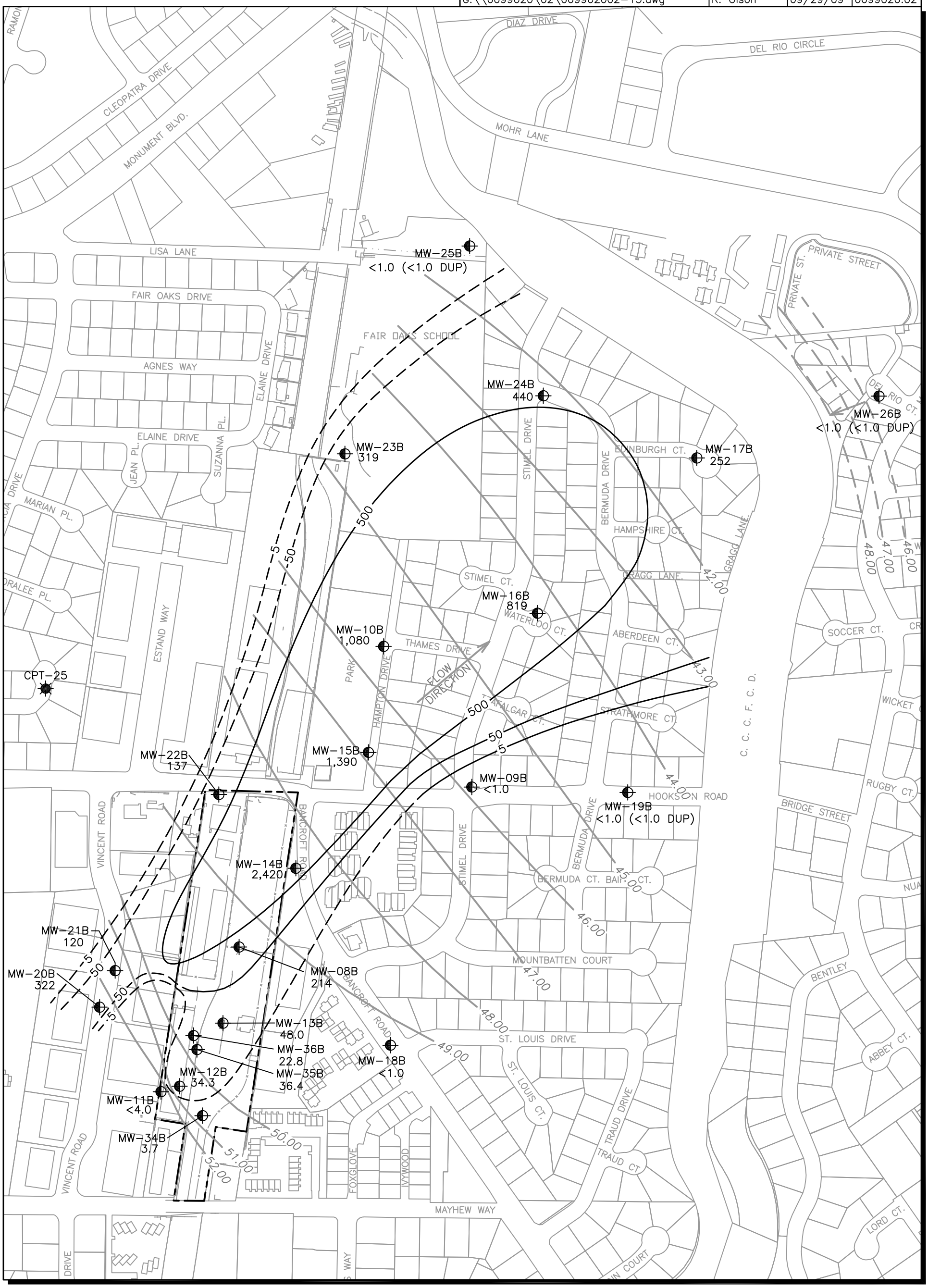
FEET

Figure 13

PCE Isoconcentration Map
B-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-13.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- Monitoring Well Location; 165 TCE Concentration (µg/L)
- CPT-25 Cone Penetrometer Test Location, Data Collected September 2002
- 50 — TCE in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 — Groundwater Elevation Contour, B-Zone, 13 January 2009 (feet above mean sea level)
- Hookston Station Property Boundary

The Maximum Contaminant Level for TCE in drinking water and Hookston Station TCE ground water cleanup goal is 5 µg/L.

N

0 300

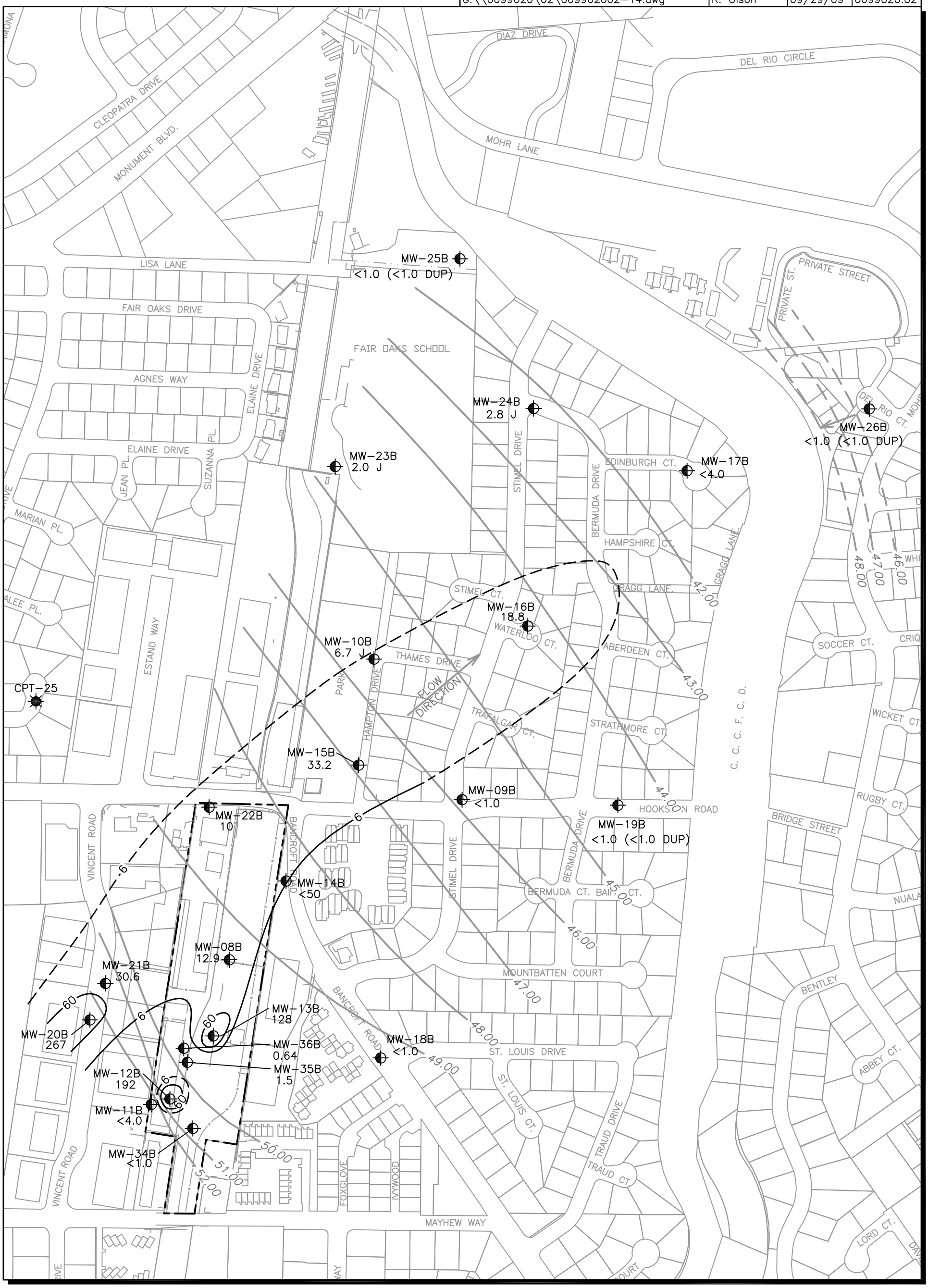
FEET

Figure 14

TCE Isoconcentration Map
B-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-14.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- Monitoring Well Location
- 9.6 — cis-1,2-DCE Concentration (µg/L)
- CPT-25 — Cone Penetrometer Test Location, Data Collected September 2002
- 60 ——— cis-1,2-DCE in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 ——— Groundwater Elevation Contour, B-Zone, 13 January 2009 (feet above mean sea level)
- ——— — — Hookston Station Property Boundary

The Maximum Contaminant Level for cis-1,2-DCE in drinking water and Hookston Station ground water cleanup goal for cis-1,2-DCE is 6 µg/L.

N

0 300

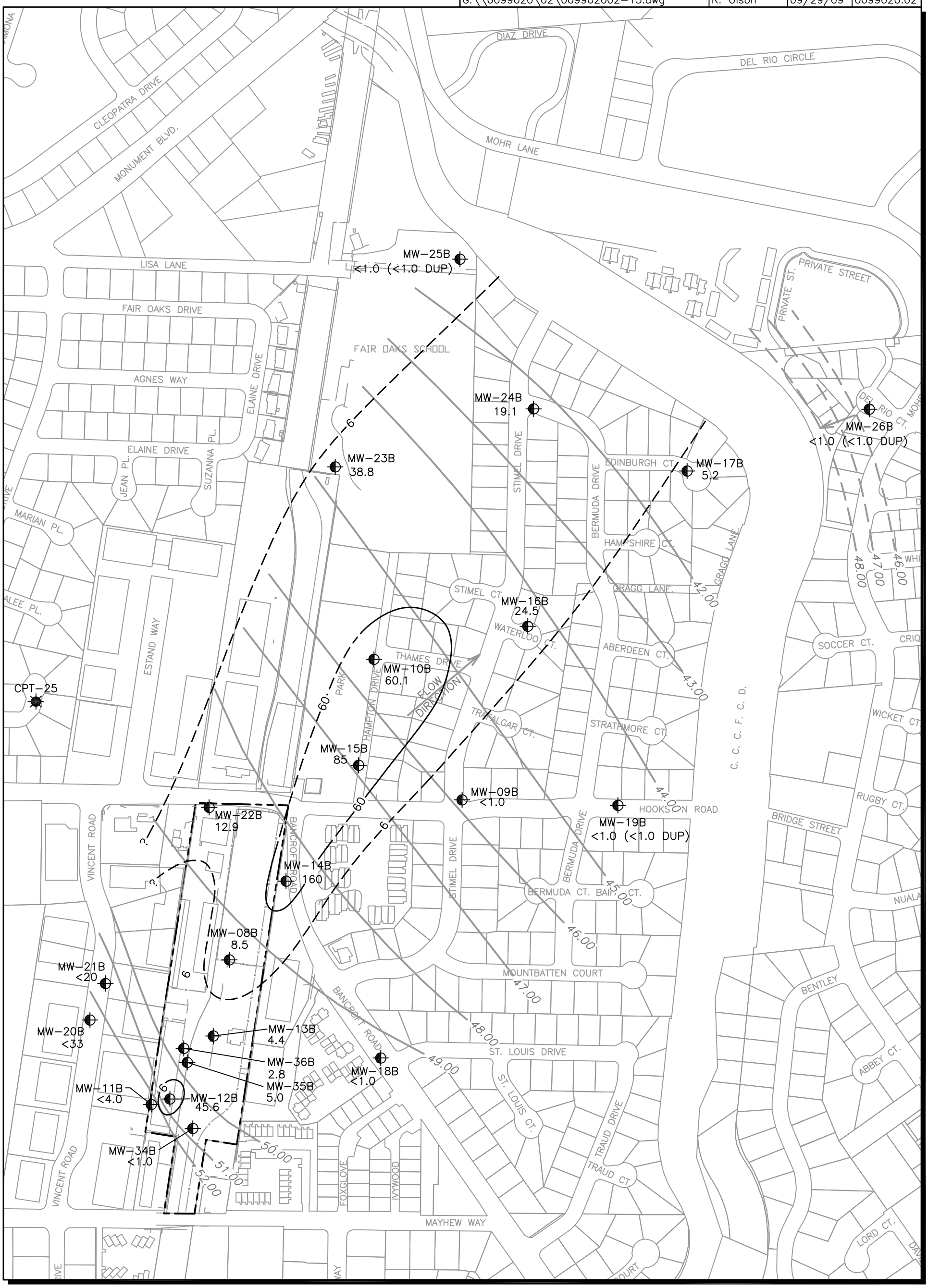
FEET

Figure 15

cis-1,2-DCE Isoconcentration Map
B-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-15.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- Monitoring Well Location; 6.7 — 1,1-DCE Concentration (µg/L)
- CPT-25 — Cone Penetrometer Test Location, Data Collected September 2002
- 60 — 1,1-DCE in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 — Groundwater Elevation Contour, B-Zone, 13 January 2009 (feet above mean sea level)
- Hookston Station Property Boundary

The Maximum Contaminant Level for 1,1-DCE in drinking water and Hookston Station ground water cleanup goal for 1,1-DCE is 6 µg/L.

N

0 300

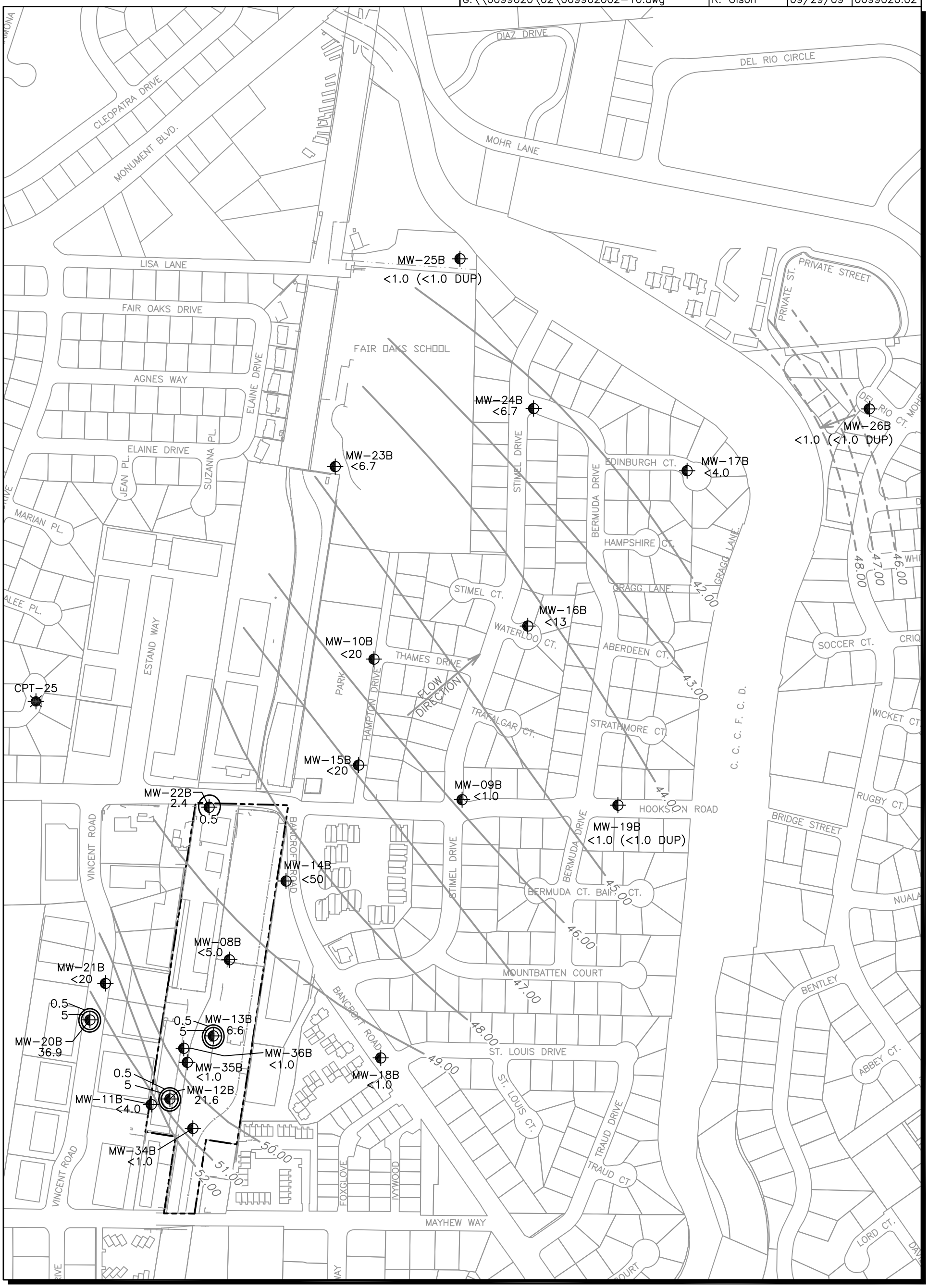
FEET

Figure 16

1,1-DCE Isoconcentration Map
B-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-16.dwg	R. Olson	09/29/09	0099020.02



LEGEND

- Monitoring Well Location
- CPT-25 — Cone Penetrometer Test Location, Data Collected September 2002
- 34 — Vinyl Chloride Concentration (µg/L)
- 5 — Vinyl Chloride in Groundwater Contour, Solid Based on First Quarter 2009 Monitoring Well Data, Dashed Where Inferred from Historical Grab Groundwater Sampling or Investigation Data Collected at Nearby Properties by Others.
- 49.00 — Groundwater Elevation Contour, B-Zone, 13 January 2009 (feet above mean sea level)
- Hookston Station Property Boundary

The Maximum Contaminant Level for Vinyl Chloride in drinking water and Hookston Station Groundwater cleanup goal for Vinyl Chloride is 0.5 µg/L.

N

0 300

FEET

Figure 17

Vinyl Chloride Isoconcentration Map
B-Zone Groundwater
First Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-17.dwg	J. Estrada	09/29/09	0099020.02

LEGEND

- Hookston Station Property Boundary
- SVP-11 — Soil Vapor Monitoring Probe Location
- SVP-17 — Nested Soil Vapor Monitoring Probe Location
- NS — Not Sampled During Second Quarter 2009
- NS* — Not Sampled Due To Low Flow Conditions
- 220/190 (5')
  - Sample Depth (feet below ground surface)
  - Duplicate Sample Result
  - PCE Soil Vapor Concentration ($\mu g/m^3$)

PCE is not a chemical of concern for the Hookston Station site; therefore, there is no Hookston Station soil vapor cleanup goal for PCE. The San Francisco Bay Regional Water Quality Control Board environmental screening level for PCE in soil vapor in a residential setting = 410 $\mu g/m^3$. The PCE ESL was not exceeded during Second Quarter 2009.

N

0 150

FEET

Figure 18

PCE in Soil Vapor
Second Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-18.dwg	J. Estrada	09/29/09	0099020.02

STIMEL DRIVE
BERMUDA DRIVE
EDINBURGH CT.
SVP-13
<65 (5')
HAMPSHIRE CT.
GRAGG LANE
STIMEL CT.
SVP-12
<64 (5')
WATERLOO CT.
ABERDEEN CT.
THAMES DRIVE
SVP-14
<64 (5')
SVP-6
180 (5')
PARK
HAMPTON DRIVE
SVP-1
940 (5')
SVP-2
6,000 (5')
TRAFALGAR CT.
STRATHMORE CT.
SVP-5
22,000/21,000 (5')
SVP-15
560 (5')
NS* (10')
SVP-16
<59 (5')
750 (10')
SVP-4
4,600 (5')
SVP-17
330 (5')
3,700 (10')
SVP-19
<58 (5')
NS* (10')
SVP-18
<59 (5')
<200 (10')
SVP-3
350/330 (5')
SVP-8
NS (5')
SVP-7
NS (5')
HOOKSTON
SVP-11
<61 (5')
BANCROFT ROAD
SVP-9
NS (5')
STIMEL DRIVE
BERMUDA DRIVE
BERMUDA CT.
BAIRD CT.
SVP-10
NS (5')
MOUNTBATTEN COURT
BANCR

N

0 150
FEET

LEGEND

- Hookston Station Property Boundary
- SVP-11 — Soil Vapor Monitoring Probe Location
- SVP-17 — Nested Soil Vapor Monitoring Probe Location
- NS — Not Sampled During Second Quarter 2009
- NS* — Not Sampled Due To Low Flow Conditions
- 220/190 (5') — TCE Soil Vapor Concentration (µg/m³); Duplicate Sample Result; Sample Depth (feet below ground surface)
- Gray shading indicates concentration is greater than the Hookston Station offsite soil vapor cleanup standard for TCE (1,200 µg/m³)

Figure 19
TCE in Soil Vapor
Second Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-19.dwg	J. Estrada	09/29/09	0099020.02

LEGEND

- Hookston Station Property Boundary
- SVP-11 — Soil Vapor Monitoring Probe Location
- SVP-17 — Nested Soil Vapor Monitoring Probe Location
- NS — Not Sampled During Second Quarter 2009
- NS* — Not Sampled Due To Low Flow Conditions
- 220/190 (5')
  - Sample Depth (feet below ground surface)
  - Duplicate Sample Result
  - cis-1,2-DCE Soil Vapor Concentration ($\mu g/m^3$)

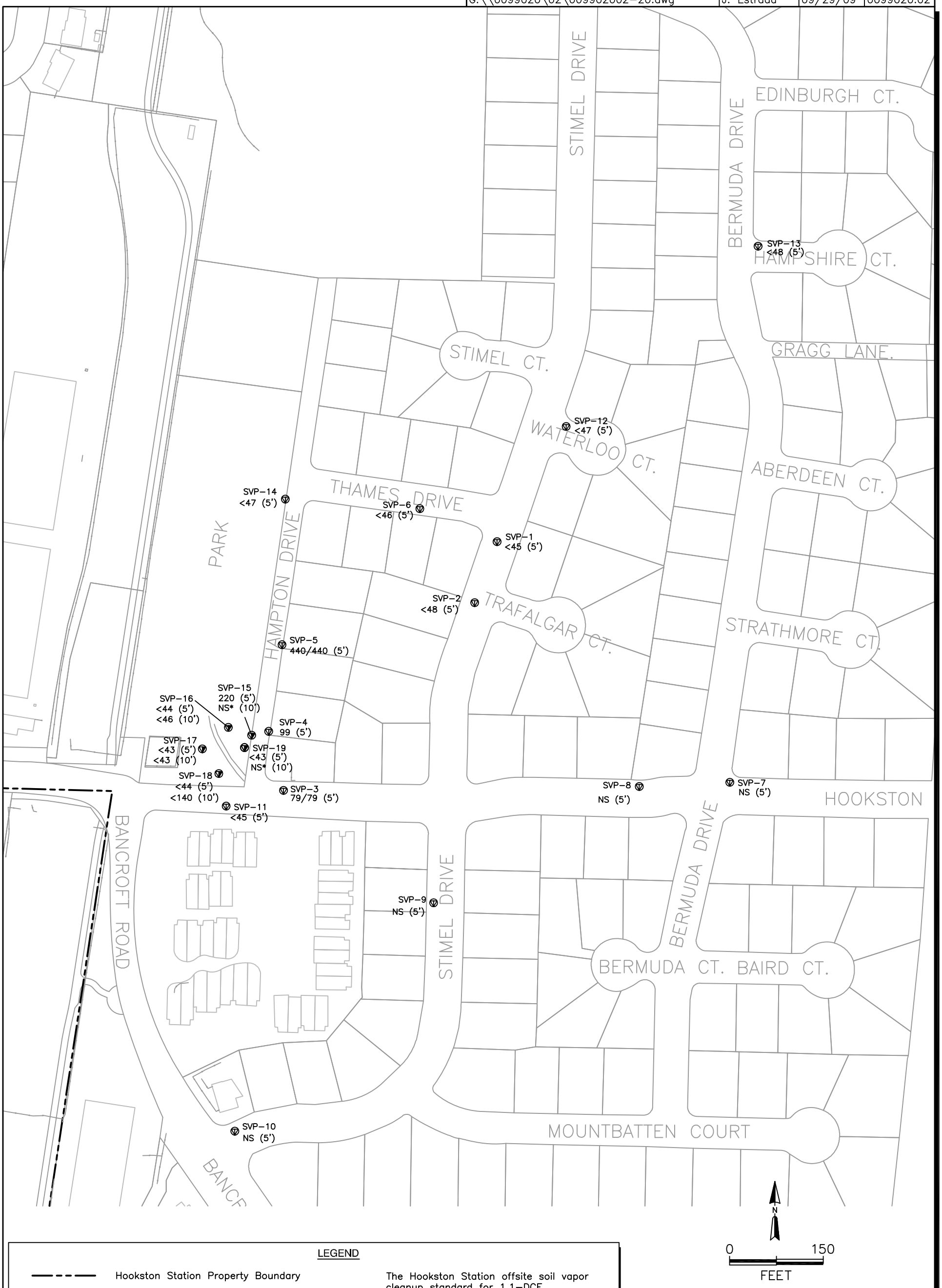
Gray shading indicates concentration is greater than the Hookston Station offsite soil vapor cleanup standard for cis-1,2-DCE (7,300 $\mu g/m^3$)

Figure 20

cis-1,2-DCE in Soil Vapor
Second Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-20.dwg	J. Estrada	09/29/09	0099020.02



LEGEND

———	Hookston Station Property Boundary
SVP–11	Soil Vapor Monitoring Probe Location
SVP–17	Nested Soil Vapor Monitoring Probe Location
NS	Not Sampled During Second Quarter 2009
NS*	Not Sampled Due To Low Flow Conditions

220/190 (5')
- Sample Depth (feet below ground surface)
- Duplicate Sample Result
- 1,1–DCE Soil Vapor Concentration ($\mu g/m^3$)

The Hookston Station offsite soil vapor cleanup standard for 1,1–DCE (42,000 $\mu g/m^3$). The 1,1–DCE cleanup standard was not exceeded during Second Quarter 2009.

Figure 21

1,1-DCE in Soil Vapor
Second Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-21.dwg	J. Estrada	09/29/09	0099020.02

LEGEND

- Hookston Station Property Boundary
- SVP–11 Soil Vapor Monitoring Probe Location
- SVP–17 Nested Soil Vapor Monitoring Probe Location
- NS Not Sampled During Second Quarter 2009
- NS* Not Sampled Due To Low Flow Conditions
- Gray shading indicates concentration is greater than the Hookston Station offsite soil vapor cleanup standard for Vinyl Chloride (32 µg/m³).

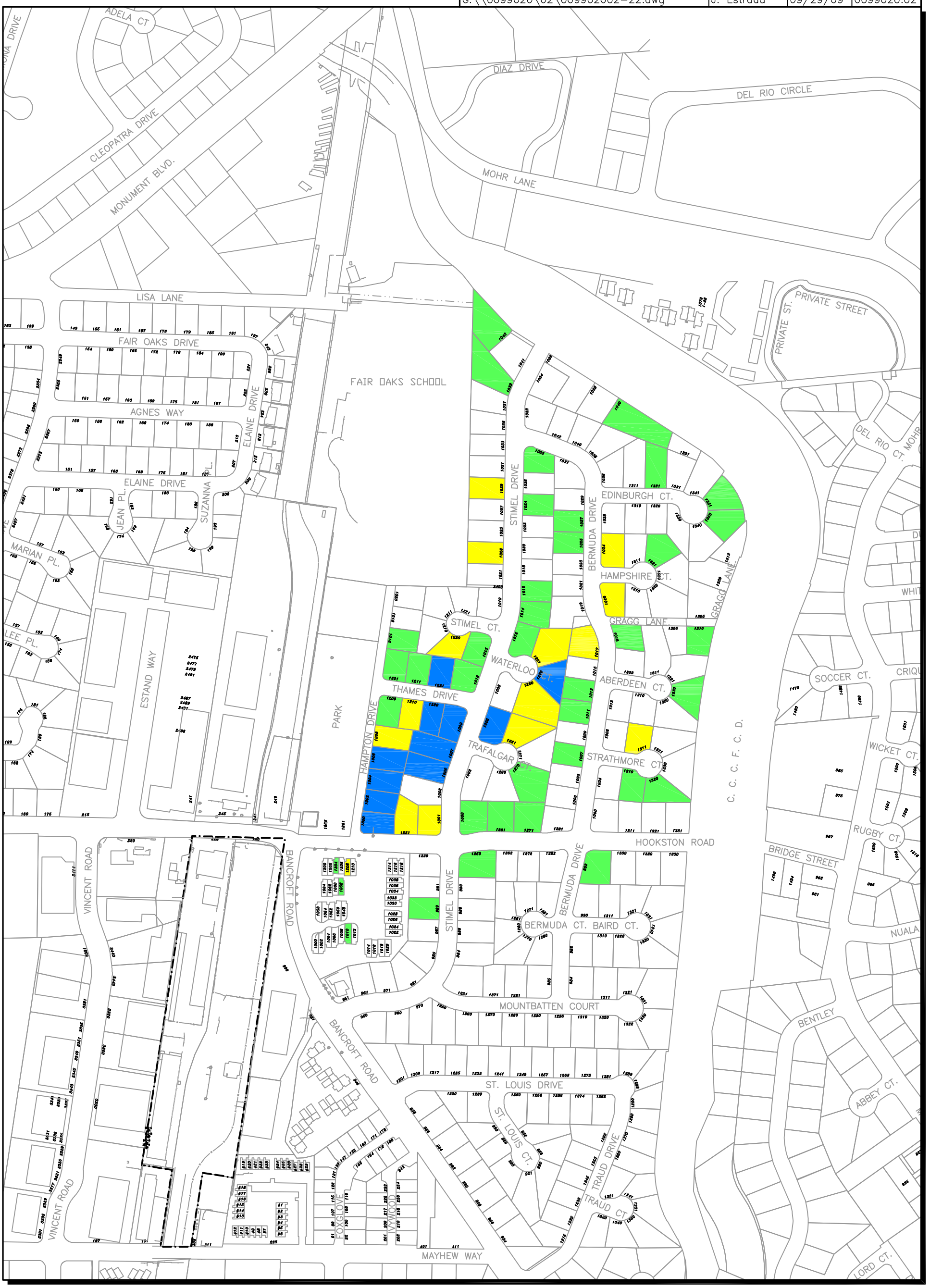
220/190 (5')
- 5' — Sample Depth (feet below ground surface)
- 190 — Duplicate Sample Result
- 220 — Vinyl Chloride Soil Vapor Concentration (µg/m³)

Figure 22

Vinyl Chloride in Soil Vapor
Second Quarter 2009
Hookston Station
Pleasant Hill, California

ERM 09/09

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-22.dwg	J. Estrada	09/29/09	0099020.02



LEGEND

- Hookston Station Property Boundary
- TCE Not Detected in Indoor Air Above Laboratory Reporting Limit
- TCE Detected in Indoor Air At a Concentration Below 1.2 $\mu g/m^3$ (Residential ESL)
- TCE Detected in Indoor Air At a Concentration of 1.2 $\mu g/m^3$ or Greater (Residential ESL)

Note: For homes sampled more than once, figure is based on the maximum TCE concentrations detected in indoor air.

Note: Graphic depicts highest concentrations detected historically to show extent of impacts. Many homes have been fitted with vapor intrusion prevention systems which have reduced indoor air concentrations to below ESLs. Based on data collected through November 2008. Crawl space air results not included.

N

0 300

FEET

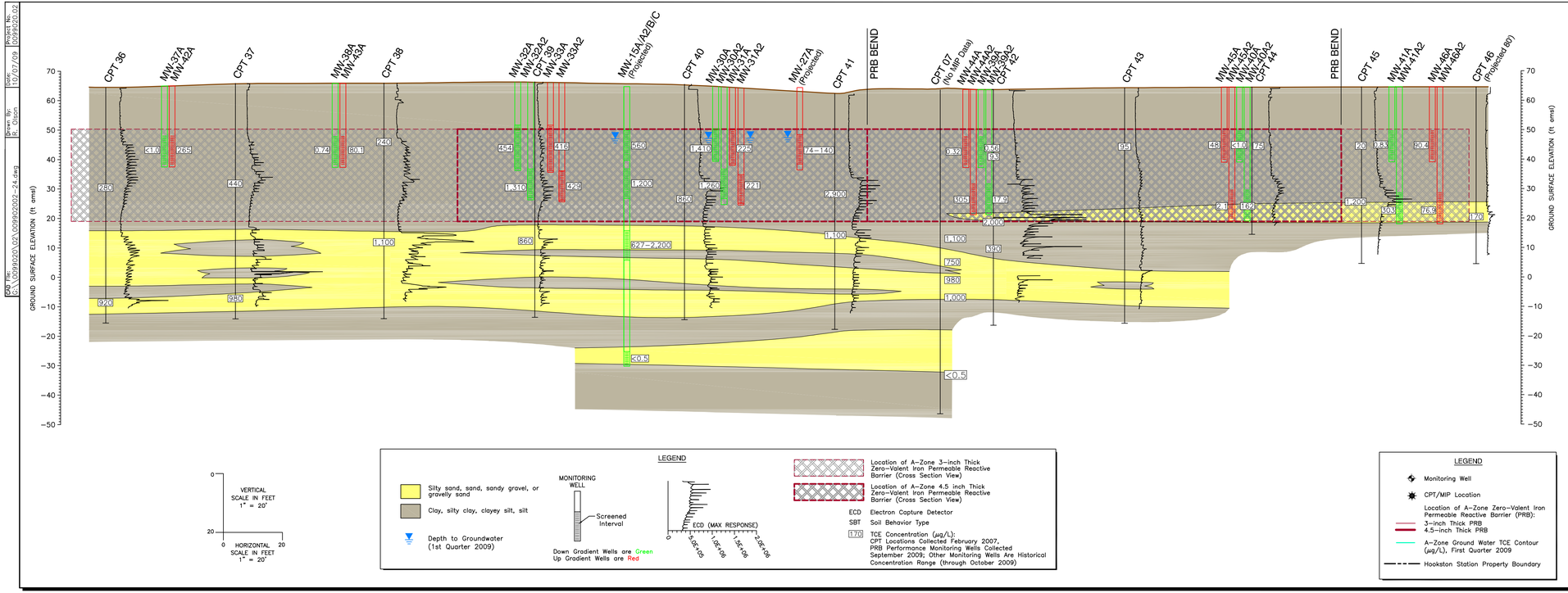
Figure 23

TCE in Residential Indoor Air (2004 - 2008)

Hookston Station

Pleasant Hill, California

ERM 09/09



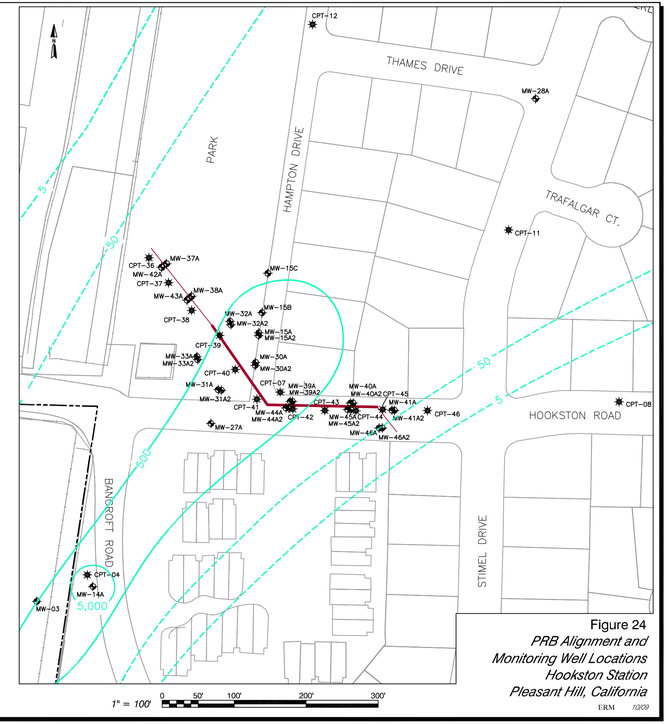
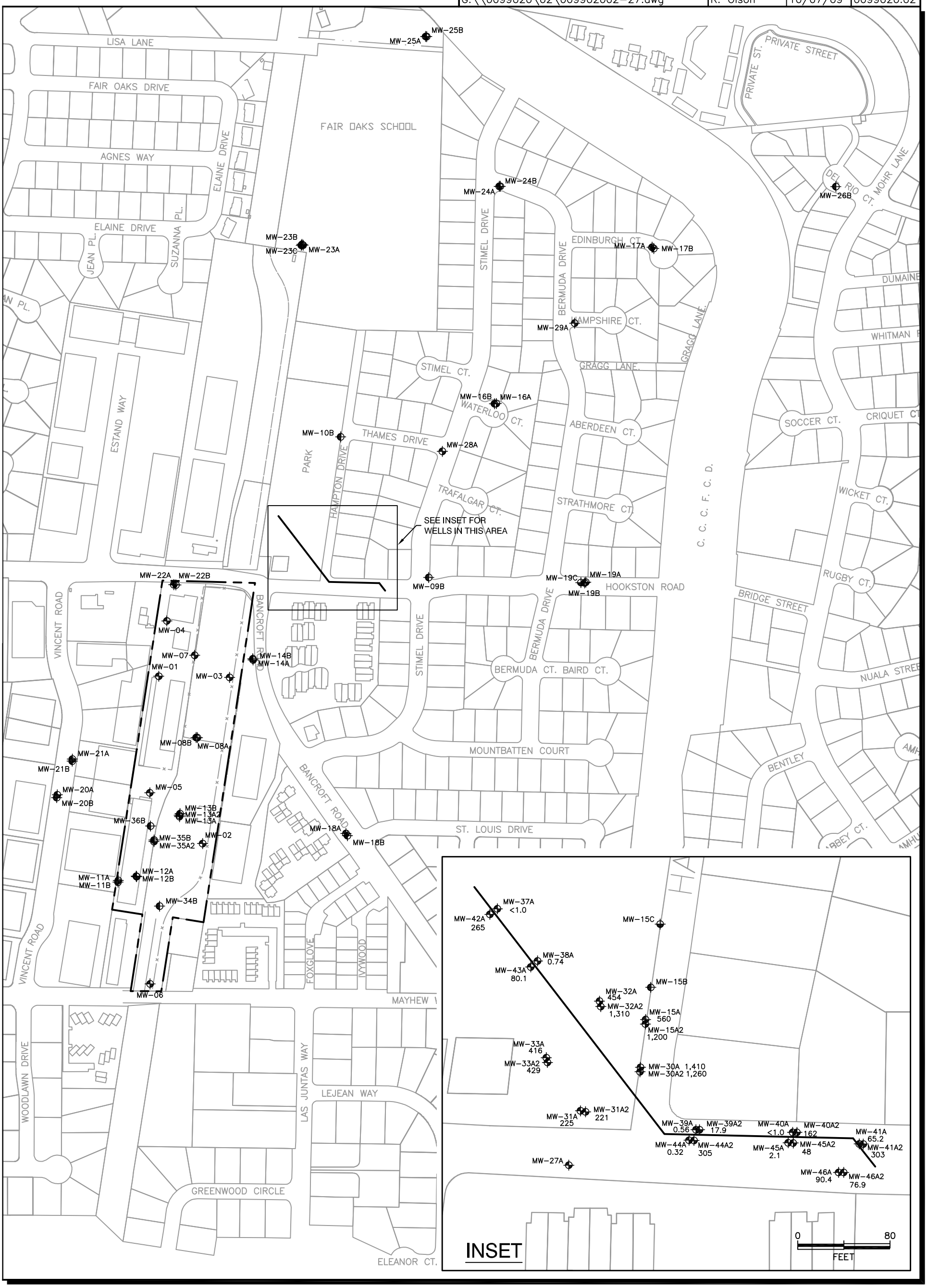


Figure 24
PRB Alignment and Monitoring Well Locations
Hookston Station
Pleasant Hill, California
ERM 7/2009

Project No. 0099220.02
Date 10/07/09
Drawn By: R. Olson
CAD File: C:\...\0099920\02\0099920002 - 24.dwg

CAD File:	Drawn By:	Date:	Project No.
G:\\0099020\02\009902002-27.dwg	R. Olson	10/07/09	0099020.02



LEGEND

- A–Zone Monitoring Well
- B–Zone Monitoring Well
- C–Zone Monitoring Well
- 17.9 TCE Concentration (µg/L)
- Hookston Station Property Boundary
- Location of A–Zone Zero–Valent Iron Permeable Reactive Barrier (PRB)

N

0 300

FEET

Figure 25

TCE in A-Zone Groundwater

PRB Performance Monitoring Wells

September 2009

Hookston Station

Pleasant Hill, California

ERM *10/09*

Tables

Table 1
A-Zone PRB Performance Monitoring - Ground Water Elevations
Hookston Station Site
Pleasant Hill, California

Location	Date	Screen Interval (ft bgs)	Top of Casing Elevation (ft msl)	Depth to Water (feet)	Ground Water Elevation (ft msl)
Upgradient Wells					
MW-31A	8/5/2009	11-26	63.36	15.69	47.67
MW-31A	8/17/2009	11-26	63.36	NM	NC
MW-31A	9/1/2009	11-26	63.36	15.86	47.50
MW-31A2	8/5/2009	28-38	63.44	15.97	47.47
MW-31A2	8/17/2009	28-38	63.44	NM	NC
MW-31A2	9/1/2009	28-38	63.44	16.18	47.26
MW-33A	8/5/2009	15-30	63.71	16.07	47.64
MW-33A	8/17/2009	15-30	63.71	NM	NC
MW-33A	9/1/2009	15-30	63.71	16.24	47.47
MW-33A2	8/5/2009	30-40	63.92	16.44	47.48
MW-33A2	8/17/2009	30-40	63.92	NM	NC
MW-33A2	9/1/2009	30-40	63.92	16.68	47.24
MW-42A	8/5/2009	20-30	65.24	17.77	47.47
MW-42A	8/17/2009	20-30	65.24	17.87	47.37
MW-42A	9/1/2009	20-30	65.24	17.96	47.28
MW-43A	8/5/2009	19-29	66.41	18.84	47.57
MW-43A	8/17/2009	19-29	66.41	18.92	47.49
MW-43A	9/1/2009	19-29	66.41	19.01	47.40
MW-44A	8/5/2009	16-26	64.03	16.80	47.23
MW-44A	8/17/2009	16-26	64.03	16.87	47.16
MW-44A	9/1/2009	16-26	64.03	17.00	47.03
MW-44A2	8/5/2009	32-42	64.04	17.24	46.80
MW-44A2	8/17/2009	32-42	64.04	17.38	46.66
MW-44A2	9/1/2009	32-42	64.04	17.48	46.56
MW-45A	8/5/2009	15-25	65.18	18.46	46.72
MW-45A	8/17/2009	15-25	65.18	18.59	46.59
MW-45A	9/1/2009	15-25	65.18	18.69	46.49
MW-45A2	8/5/2009	35-45	65.19	18.54	46.65
MW-45A2	8/17/2009	35-45	65.19	18.65	46.54
MW-45A2	9/1/2009	35-45	65.19	18.79	46.40
MW-46A	8/5/2009	15-25	64.68	18.03	46.65
MW-46A	8/17/2009	15-25	64.68	18.17	46.51
MW-46A	9/1/2009	15-25	64.68	18.28	46.40

Table 1
A-Zone PRB Performance Monitoring - Ground Water Elevations
Hookston Station Site
Pleasant Hill, California

Location	Date	Screen Interval (ft bgs)	Top of Casing Elevation (ft msl)	Depth to Water (feet)	Ground Water Elevation (ft msl)
MW-46A2	8/5/2009	36-46	64.66	18.06	46.60
MW-46A2	8/17/2009	36-46	64.66	18.19	46.47
MW-46A2	9/1/2009	36-46	64.66	18.32	46.34
Downgradient Wells					
MW-30A	8/5/2009	15-25	64.00	17.54	46.46
MW-30A	8/17/2009	15-25	64.00	NM	NC
MW-30A	9/1/2009	15-25	64.00	17.83	46.17
MW-30A2	8/5/2009	28-38	63.90	17.11	46.79
MW-30A2	8/17/2009	28-38	63.90	NM	NC
MW-30A2	9/1/2009	28-38	63.90	17.29	46.61
MW-32A	8/5/2009	14.5-29.5	66.70	20.21	46.49
MW-32A	8/17/2009	14.5-29.5	66.70	NM	NC
MW-32A	9/1/2009	14.5-29.5	66.70	20.49	46.21
MW-32A2	8/5/2009	29.5-39.5	66.81	20.34	46.47
MW-32A2	8/17/2009	29.5-39.5	66.81	NM	NC
MW-32A2	9/1/2009	29.5-39.5	66.81	20.61	46.20
MW-37A	8/5/2009	20-30	65.39	18.61	46.78
MW-37A	8/17/2009	20-30	65.39	18.75	46.64
MW-37A	9/1/2009	20-30	65.39	18.88	46.51
MW-38A	8/5/2009	19-29	66.07	19.37	46.70
MW-38A	8/17/2009	19-29	66.07	19.50	46.57
MW-38A	9/1/2009	19-29	66.07	19.66	46.41
MW-39A	8/5/2009	16-26	64.11	17.60	46.51
MW-39A	8/17/2009	16-26	64.11	17.71	46.40
MW-39A	9/1/2009	16-26	64.11	17.91	46.20
MW-39A2	8/5/2009	32-42	64.15	17.41	46.74
MW-39A2	8/17/2009	32-42	64.15	17.52	46.63
MW-39A2	9/1/2009	32-42	64.15	17.65	46.50
MW-40A	8/5/2009	15-25	65.09	18.70	46.39
MW-40A	8/17/2009	15-25	65.09	18.84	46.25
MW-40A	9/1/2009	15-25	65.09	18.98	46.11
MW-40A2	8/5/2009	35-45	65.03	18.41	46.62
MW-40A2	8/17/2009	35-45	65.03	18.55	46.48
MW-40A2	9/1/2009	35-45	65.03	18.67	46.36

Table 1
A-Zone PRB Performance Monitoring - Ground Water Elevations
Hookston Station Site
Pleasant Hill, California

Location	Date	Screen Interval (ft bgs)	Top of Casing Elevation (ft msl)	Depth to Water (feet)	Ground Water Elevation (ft msl)
MW-41A	8/5/2009	15-25	64.39	18.08	46.31
MW-41A	8/17/2009	15-25	64.39	18.20	46.19
MW-41A	9/1/2009	15-25	64.39	18.37	46.02
MW-41A2	8/5/2009	36-46	64.33	17.77	46.56
MW-41A2	8/17/2009	36-46	64.33	17.90	46.43
MW-41A2	9/1/2009	36-46	64.33	18.03	46.30
MW-15A	8/5/2009	14.5-24.5	63.68	17.24	46.44
MW-15A	8/17/2009	14.5-24.5	63.68	NM	NC
MW-15A	9/1/2009	14.5-24.5	63.68	18.05	45.63
MW-15A2	8/5/2009	28-38	63.57	16.72	46.85
MW-15A2	8/17/2009	28-38	63.57	NM	NC
MW-15A2	9/1/2009	28-38	63.57	16.99	46.58

Notes:

ft bgs = Feet below ground surface.
ft msl = Feet above mean sea level.
NM = Depth to water measurement was not measured.
NC = Ground water elevation was not calculated.

Table 2
A-Zone PRB Performance Monitoring Ground Water Data - VOCs and Dissolved Organic Carbon
Hookston Station Site
Pleasant Hill, California

Sample Location	Date	Well Diameter (inch)	Sample Depth (feet)	Sample Type	PCE (µg/L)	TCE (µg/L)	c-1,2-DCE (µg/L)	t-1,2-DCE (µg/L)	1,1-DCE (µg/L)	Vinyl Chloride (µg/L)	Total Organic Carbon (mg/L)	Dissolved Organic Carbon (mg/L)
				California State MCL:	*5*	*5*	*6*	*10*	*6*	*0.5*	--	--
				Hookston Station Ground Water Cleanup Standard:	*n/a*	*5*	*6*	*10*	*6*	*0.5*	--	--
				Hookston Station Ground Water Cleanup Standard (for vapor intrusion):	*n/a*	*530*	*6,200*	*6,700*	*6,300*	*3.8*	--	--
MW-15A	7/17/2007	2	17.7-18.9	passive	<5.0	**180**	**17**	**1.1 J**	**7.0**	<5.0	*NA*	*NA*
MW-15A	7/22/2009	2	18.1-19.3	traditional	<5.0	**413**	**13.9**	<5.0	**15.1**	**4.8 J**	*NA*	*NA*
MW-15A DUP	7/22/2009	2	28.7-29.9	traditional	<10.0	**615**	**16.5**	<10	**25.1**	**12.0**	*NA*	*NA*
MW-15A	9/2/2009	2		passive/low flow	<10	**560**	**36.4**	<10	**24.6**	<10	**2.6**	*NA*
MW-15A2	9/14/2007	2	28-38	traditional	<10	**1,400**	<10	<10	**82**	<10	*NA*	*NA*
MW-15A2	7/23/2009	2	28.7-29.9	traditional	<10	**945**	**5.5 J**	<10	**54.8**	<10	*NA*	*NA*
MW-15A2	9/2/2009	2	28-38	passive/low flow	<20	**1,200**	**7.8 J**	<20	**66.7**	<20	**1.4**	*NA*
MW-30A	9/14/2007	2	15-25	traditional	<1.0	**110**	**12**	<1.0	**4.4**	<1.0	*NA*	*NA*
MW-30A	7/21/2009	2	22-23.2	traditional	<13	**1,010**	**8.8 J**	<13	**69**	**5.8 J**	*NA*	*NA*
MW-30A	9/2/2009	2	15-25	passive/low flow	<25	**1,410**	**48.5**	<25	**120**	**35.5**	**1.4**	**3**
MW-30A2	9/14/2007	2	28-38	traditional	<5.0	**390**	**12**	<5.0	**30**	<5.0	*NA*	*NA*
MW-30A2	7/22/2009	2	30.5-31.7	traditional	<17	**1,340**	**5.4 J**	<17	**103**	<17	*NA*	*NA*
MW-30A2	9/2/2009	2	28-38	passive/low flow	<25	**1,260**	<25	<25	**81.5**	<25	**1.2**	**1.4**
MW-31A	9/13/2007	2	11-26	low flow	**3.1**	**170**	**12**	<1.0	**6.5**	**3.1**	*NA*	*NA*
MW-31A	7/22/2009	2	22-23.2	traditional	<4.0	**142**	**10.5**	<4.0	**4.4**	<4.0	*NA*	*NA*
MW-31A[a]	9/2/2009	2	11-26	passive/low flow	<4.0	**225**	**16.4**	<4.0	**8.2**	<4.0	**1.9**	*NA*
MW-31A2	9/13/2007	2	28-38	low flow	<25	**2,300**	<25	<25	**240**	<25	*NA*	*NA*
MW-31A2	7/22/2009	2	32-33.2	traditional	<5.0	**235**	**12.9**	<5.0	**9.6**	<5.0	*NA*	*NA*
MW-31A2[b]	9/2/2009	2	28-38	passive/low flow	<4.0	**221**	**15.7**	<4.0	**8.4**	<4.0	**1.9**	*NA*
MW-32A	9/14/2007	2	15-30	traditional	<5.0	**350**	**26**	<5.0	<5.0	<5.0	*NA*	*NA*
MW-32A	7/22/2009	2	22-23.2	traditional	<10	**389**	**55.8**	<10	**7.4 J**	<10	*NA*	*NA*
MW-32A	9/2/2009	2	15-30	passive/low flow	<10	**454**	**66.7**	<10	**8.7 J**	<10	**3.8**	**3.3**
MW-32A2	9/14/2007	2	30-40	traditional	<5.0	**330**	**26**	<5.0	**6.1**	<5.0	*NA*	*NA*
MW-32A2	7/22/2009	2	32.6-33.8	traditional	<5.0	**1,170**	**11.3 J**	<5.0	**89.8**	<5.0	*NA*	*NA*
MW-32A2	9/2/2009	2	30-40	passive/low flow	<25	**1,310**	**216**	<25	**139**	<25	**2**	**1.4**
MW-33A	9/13/2007	2	15-30	low flow	**7.0**	**260**	**14**	<2.5	**4.7**	<2.5	*NA*	*NA*
MW-33A	7/22/2009	2	22-23.2	traditional	<10	**313**	**22.0**	<10	**5.6 J**	<10	*NA*	*NA*
MW-33A	9/1/2009	2	15-30	passive/low flow	<10	**416**	**42.0**	<10	**11.2**	<10	<1.0	*NA*
MW-33A2	9/13/2007	2	30-40	low flow	**6.8**	**420**	**13**	<2.5	**20**	<2.5	*NA*	*NA*
MW-33A2	7/22/2009	2	33.1-34.3	traditional	<5.0	**265**	**18.1**	<6.7	**7.6**	<6.7	*NA*	*NA*
MW-33A2	9/1/2009	2	30-40	passive/low flow	<10	**429**	**31.3**	<10	**11**	<10	<1.0	*NA*
MW-37A	7/23/2009	2	20-30	traditional	<1.0	**0.73 J**	**91.5**	<1.0	<1.0	**29.2**	**25.4**	*NA*
MW-37A-DUP	7/23/2009	2	20-30	traditional	<1.0	**0.60 J**	**92.4**	**0.34 J**	<1.0	**29.5**	**23.9**	*NA*
MW-37A[c]	9/1/2009	2	20-30	passive/low flow	<1.0	<1.0	**24.7**	**0.36 J**	<1.0	**47.4**	**16.2**	*NA*
MW-37A-DUP[d]	9/1/2009	2	20-30	passive/low flow	<1.0	<1.0	**24**	**0.44 J**	<1.0	**43.7**	**17.1**	*NA*

Table 2
A-Zone PRB Performance Monitoring Ground Water Data - VOCs and Dissolved Organic Carbon
Hookston Station Site
Pleasant Hill, California

Sample Location	Date	Well Diameter (inch)	Sample Depth (feet)	Sample Type	PCE (µg/L)	TCE (µg/L)	c-1,2-DCE (µg/L)	t-1,2-DCE (µg/L)	1,1-DCE (µg/L)	Vinyl Chloride (µg/L)	Total Organic Carbon (mg/L)	Dissolved Organic Carbon (mg/L)
				California State MCL:	*5*	*5*	*6*	*10*	*6*	*0.5*	--	--
				Hookston Station Ground Water Cleanup Standard:	*n/a*	*5*	*6*	*10*	*6*	*0.5*	--	--
				Hookston Station Ground Water Cleanup Standard (for vapor intrusion):	*n/a*	*530*	*6,200*	*6,700*	*6,300*	*3.8*	--	--
MW-38A	7/23/2009	2	19-29	traditional	<1.0	**1.1**	**52.0**	<1.0	**0.45 J**	**2.0**	**33.1**	*NA*
MW-38A[e]	9/1/2009	2	19-29	passive/low flow	<1.0	**0.74 J**	**33.3**	**0.52 J**	**0.27 J**	**2.8**	**24.3**	*NA*
MW-39A	7/24/2009	2	16-26	traditional	<1.0	**5.7**	**18.5**	<1.0	**0.98 J**	**0.61 J**	**62.3**	*NA*
MW-39A[m]	9/2/2009	2	16-26	passive/low flow	<1.0	**0.56 J**	**9.1**	<1.0	<1.0	**0.63 J**	**26.9**	*NA*
MW-39A2	7/24/2009	2	32-42	traditional	<25	**2,250**	**14.0 J**	<25	**166**	<25	**6.9**	*NA*
MW-39A2[f]	9/2/2009	2	32-42	passive/low flow	<17	**17.9**	**917.0**	**5.5 J**	**47.1**	**131.0**	**12.1**	*NA*
MW-40A	7/24/2009	2	15-25	traditional	<1.0	**7.2**	**18.3**	<1.0	**0.43 J**	<1.0	**579**	*NA*
MW-40A[n]	9/2/2009	2	15-25	passive/low flow	<1.0	<1.0	**9.6**	<1.0	<1.0	<1.0	**490**	*NA*
MW-40A2	7/27/2009	2	35-45	traditional	<5.0	**420.0**	**6.6**	<5.0	**21.6**	<5.0	**2.8**	*NA*
MW-40A2[g]	9/2/2009	2	35-45	passive/low flow	<3.3	**162.0**	**7.5**	<3.3	**12 J**	<3.3	**5.9**	*NA*
MW-41A	7/27/2009	2	15-25	traditional	<1.0	**1.6**	**41.9**	**1.6**	**1.7**	<1.0	**140**	*NA*
MW-41A[o]	9/3/2009	2	15-25	passive/low flow	<1.0	**0.83 J**	**65.2**	**1.3**	**0.98 J**	<1.0	**91.9**	*NA*
MW-41A2	7/27/2009	2	36-46	traditional	<4.0	**287**	**5.0**	<4.0	**14**	<4.0	**2.4**	*NA*
MW-41A2	9/3/2009	2	36-46	passive/low flow	<6.7	**303**	**7.3**	<6.7	**14.7**	<6.7	**1.6**	*NA*
MW-42A	7/23/2009	2	20-30	traditional	**0.88 J**	**225**	**122**	**1.2 J**	**5.6**	**3.7**	**3.5**	*NA*
MW-42A[h]	9/1/2009	2	20-30	passive/low flow	<5.0	**265**	**76**	**2.8 J**	**4.5 J**	**4.4 J**	**2.1**	*NA*
MW-42A DUP[i]	9/1/2009	2	20-30	passive/low flow	<5.0	**224**	**58**	**7.5**	<5.0	**1.5 J**	**2.2**	*NA*
MW-43A	7/23/2009	2	19-29	traditional	**0.74 J**	**214**	**76.6**	**0.8**	**5.4**	**1.5 J**	**2.9**	*NA*
MW-43A[j]	9/1/2009	2	19-29	passive/low flow	<2.0	**80.1**	**106.0**	**0.90 J**	**3.2**	**7.6**	**1.9**	*NA*
MW-44A	7/23/2009	2	16-26	traditional	<1.0	**23**	**20.4**	**0.50 J**	**1.9**	**1.1**	**3.9**	*NA*
MW-44A	9/3/2009	2	16-26	passive/low flow	<1.0	**0.32 J**	**29.3**	**0.47 J**	<1.0	**18.3**	**2**	*NA*
MW-44A2	7/23/2009	2	32-42	traditional	<20	**1,530**	**30.0**	<20	**106**	<20	**84.6**	*NA*
MW-44A2[k]	9/3/2009	2	32-42	passive/low flow	<6.7	**305**	**364.0**	**2.2 J**	**41.4**	**6.7**	**30**	*NA*
MW-45A	7/24/2009	2	15-25	traditional	<1.0	**23.7**	**6.6**	<1.0	**0.98 J**	<1.0	**86.1**	*NA*
MW-45A[p]	9/3/2009	2	15-25	passive/low flow	<1.0	**2.1**	**34.9**	<1.0	**0.71 J**	**0.36 J**	**10.2**	*NA*
MW-45A2	7/24/2009	2	35-45	traditional	<5.0	**404**	**5.8**	<5.0	**20.4**	<5.0	**3.2**	*NA*
MW-45A2[l]	9/3/2009	2	35-45	passive/low flow	<1.0	**48**	**15.2**	**0.52 J**	**3.9**	**0.39 J**	**4.5**	*NA*
MW-46A	7/23/2009	2	15-25	traditional	<1.0	**84.8**	**62.9**	**3.3**	**2.8**	**0.52 J**	**2.7**	*NA*
MW-46A	9/3/2009	2	15-25	passive/low flow	<2.0	**90.4**	**66.5**	**3.4**	**3.1**	<2.0	**1.6**	*NA*
MW-46A2	7/23/2009	2	36-46	traditional	<1.0	**92.8**	**4.3**	**0.45 J**	**4.1**	<1.0	**2**	*NA*

Table 2
A-Zone PRB Performance Monitoring Ground Water Data - VOCs and Dissolved Organic Carbon
Hookston Station Site
Pleasant Hill, California

Sample Location	Date	Well Diameter (inch)	Sample Depth (feet)	Sample Type	PCE (µg/L)	TCE (µg/L)	c-1,2-DCE (µg/L)	t-1,2-DCE (µg/L)	1,1-DCE (µg/L)	Vinyl Chloride (µg/L)	Total Organic Carbon (mg/L)	Dissolved Organic Carbon (mg/L)
				California State MCL:	*5*	*5*	*6*	*10*	*6*	*0.5*	--	--
				Hookston Station Ground Water Cleanup Standard:	*n/a*	*5*	*6*	*10*	*6*	*0.5*	--	--
				Hookston Station Ground Water Cleanup Standard (for vapor intrusion):	*n/a*	*530*	*6,200*	*6,700*	*6,300*	*3.8*	--	--
MW-46A2	9/3/2009	2	36-46	passive/low flow	<2.0	**76.9**	**3.5**	<2.0	**3.3**	<2.0	**1.5**	*NA*

Notes:
California State MCL = Maximum Contaminant Level for drinking water from Title 22 of the California Code of Regulations
Hookston Station Ground Water Cleanup Standard and Ground Water Cleanup Standard for Vapor Intrusion are established in the *Final Site Cleanup Requirements for the Hookston Station Site (California Regional Water Quality Control Board, San Francisco Bay Region*
Highlighting indicates the detected concentration is greater than the California MCL or Hookston Station Ground Water Cleanup Standard
(µg/L) = Micrograms per Liter
Sample Type = 'traditional' indicates samples were collected by traditional purge-and-sample techniques; 'passive' indicates samples were collected with passive diffusion bags. 'Low Flow' indicates samples collected using low flow purge technique with a peris
< = Not detected.
J = The result is an estimated value.

Additional VOCs detected:
[a] 1.4J µg/L of 1,1-DCA detected in sample
[b] 1.2J µg/L of 1,1-DCA detected in sample
[c] 1.1 µg/L of 1,1-DCA and 0.97J µg/L of BZ detected in sample
[d] 1.1 µg/L of 1,1-DCA and 0.93J µg/L of BZ detected in sample
[e] 0.82J µg/L of 1,1-DCA and 1.1 µg/L of BZ detected in sample
[f] 5.5J µg/L of 1,1-DCA detected in sample
[g] 1.5J µg/L of 1,1-DCA detected in sample
[h] 1.8J µg/L of 1,1-DCA detected in sample
[i] 1.9J µg/L of 1,1-DCA and 0.63J of CE detected in sample
[j] 1.5J µg/L of 1,1-DCA detected in sample
[k] 3.7J µg/L of 1,1-DCA and 2.5J µg/L of BZ detected in sample
[l] 0.58J µg/L of 1,1-DCA and 0.77J µg/L of BZ detected in sample
[m] 2.0 µg/L of BZ and 5.4J µg/L of Mek detected in sample
[n] 4.1 µg/L of BZ and 9.3J µg/L of Mek detected in sample
[o] 1.5 µg/L of BZ and 5.1J µg/L of Mek detected in sample
[p] 1.2 µg/L of BZ detected in sample

Chemicals:
PCE = Tetrachloroethene
TCE = Trichloroethene
c-1,2-DCE = cis-1,2-dichloroethene
t-1,2-DCE = trans-1,2-dichloroethene
1,1-DCE = 1,1-dichloroethene
1,1-DCA=1,1-dichloroethane
BZ=Benzene
Mek=Methyl ethyl ketone
CE=Chloroethane

Table 3
A-Zone PRB Performance Monitoring Ground Water Data - Additional Water Quality Parameters
Hookston Station Site
Pleasant Hill, California

Sample Location	Date	Well Diameter (inch)	Sample Depth (feet)	Sample Type	ORP (mV)	pH	Temperature (Celsius)	Spec. Cond (µS/cm)	DO (mg/L)	Turbidity (NTU)	Alkalinity (mg/L)	Chloride (mg/L)	Bromide (mg/L)	Nitrate as N (mg/L)	Sulfate (mg/L)	Fluoride (mg/L)
MW-15A	9/2/2009	2	17.7-18.9	passive/low flow	42.3	7.07	19.11	1821	0.4	6.3	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-15A2	9/14/2007	2	28-38	traditional	*NA*	6.98	20.1	1961	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-15A2	9/2/2009	2	28-38	passive/low flow	-59.6	6.97	20.25	1642	1.35	28	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-30A	9/14/2007	2	15-25	traditional	*NA*	6.83	20	2096	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-30A	9/2/2009	2	15-25	passive/low flow	69	6.94	20.5	1612	0.44	69.1	**526**	**181**	**0.5**	**0.71**	**137**	**0.43**
MW-30A2	9/14/2007	2	28-38	traditional	*NA*	6.99	20.1	2102	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-30A2	9/2/2009	2	28-38	passive/low flow	95.9	6.78	20.75	1629	0.63	65.3	**524**	**179**	**0.47**	**1**	**140**	**0.41**
MW-31A	9/13/2007	2	11-26	low flow	-34.7	6.83	19.59	1772	0.39	1.9	*NA*	**150**	**1.2**	**3.5**	**200**	**0.50**
MW-31A	9/2/2009	2	11-26	passive/low flow	-149	6.82	19.39	1700	1.39	-182	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-31A2	9/13/2007	2	28-38	low flow	9.4	7.05	19.59	1492	0.82	1.3	*NA*	**210**	**0.66**	<0.10	**120**	**0.65**
MW-31A2	9/2/2009	2	28-38	passive/low flow	78.9	7.04	19.33	1744	0.35	0.5	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-32A	9/14/2007	2	15-30	traditional	*NA*	6.75	19.1	2136	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-32A	9/2/2009	2	15-30	passive/low flow	-115	6.48	19.66	1830	0.94	11.5	**614**	**205**	**0.82**	**1.1**	**184**	**0.35**
MW-32A2	9/14/2007	2	30-40	traditional	*NA*	6.98	19.0	2150	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-32A2	9/2/2009	2	30-40	passive/low flow	-149.4	7.02	21.08	1475	1.84	-183.9	**466**	**178**	**0.56**	<0.10	**115**	**0.46**
MW-32A2-DUP	9/2/2009	2	30-40	passive/low flow	-149.4	7.02	21.08	1475	1.84	-183.9	**477**	**179**	**0.56**	<0.10	**115**	**0.47**
MW-33A	9/13/2007	2	15-30	low flow	0.6	6.81	19.64	1900	0.67	1.4	*NA*	**160**	**1.9**	**4.6**	**230**	**0.51**
MW-33A	9/1/2009	2	15-30	passive/low flow	-89.8	6.78	20.15	1741	1.93	14	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-33A2	9/13/2007	2	30-40	low flow	-86.9	6.89	19.86	1790	0.44	7.6	*NA*	**180**	**0.90**	**3.5**	**200**	**0.53**
MW-33A2	9/1/2009	2	30-40	passive/low flow	77.9	7.04	19.51	1754	0.22	0.7	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-37A	9/1/2009	2	20-30	passive/low flow	-131.5	7.19	19.95	1087	0.37	3.9	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-37A-DUP	9/1/2009	2	20-30	passive/low flow	-131.5	7.19	19.95	1087	0.37	3.9	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-38A	9/1/2009	2	19-29	passive/low flow	-84.4	6.91	20.32	1042	0.43	4.5	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-39A	9/2/2009	2	16-26	passive/low flow	-84	6.90	21.99	1311	0.39	55.8	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-39A2	9/2/2009	2	32-42	passive/low flow	-103.9	6.91	20.55	1777	0.28	8.2	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-40A	9/2/2009	2	15-25	passive/low flow	-64.9	6.56	23.85	3241	0.62	17.1	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Table 3
A-Zone PRB Performance Monitoring Ground Water Data - Additional Water Quality Parameters
Hookston Station Site
Pleasant Hill, California

Sample Location	Date	Well Diameter (inch)	Sample Depth (feet)	Sample Type	ORP (mV)	pH	Temperature (Celsius)	Spec. Cond (µS/cm)	DO (mg/L)	Turbidity (NTU)	Alkalinity (mg/L)	Chloride (mg/L)	Bromide (mg/L)	Nitrate as N (mg/L)	Sulfate (mg/L)	Fluoride (mg/L)
MW-40A2	9/2/2009	2	35-45	passive/low flow	-40.1	7.02	22.22	1682	0.4	53.9	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-41A	9/3/2009	2	15-25	passive/low flow	-95.5	6.54	23.33	2651	0.68	23	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-41A2	9/3/2009	2	36-46	passive/low flow	-203.4	6.65	21.58	1807	0.76	65.3	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-42A	9/1/2009	2	20-30	passive/low flow	24.9	6.79	19.89	1702	0.64	24	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-42A-DUP	9/1/2009	2	20-30	passive/low flow	24.9	6.79	19.89	1702	0.64	24	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-43A	9/1/2009	2	19-29	passive/low flow	-70.4	6.80	20.27	1600	0.92	14.2	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-44A	9/3/2009	2	16-26	passive/low flow	-102	7.32	21.6	1610	0.6	18.8	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-44A2	9/3/2009	2	32-42	passive/low flow	-294.7	6.76	21.38	1745	0.64	64.6	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-45A	9/3/2009	2	15-25	passive/low flow	-131	7.26	24.06	1616	0.58	29.3	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-45A2	9/3/2009	2	35-45	passive/low flow	-254.2	6.83	21	1774	0.77	828.8	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-46A	9/3/2009	2	15-25	passive/low flow	-194.2	6.51	21.71	1878	0.86	36.4	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-46A2	9/3/2009	2	36-46	passive/low flow	99	6.71	22.7	1838	0.66	357.3	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Notes:
Above parameters recorded during sampling
NA = Not Analyzed

Table 3
A-Zone PRB Performance Monitoring Ground Water Data - Additional Water Quality Parameters
Hookston Station Site
Pleasant Hill, California

Sample Location	Date	Well Diameter (inch)	Sample Depth (feet)	Sample Type	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Barium (mg/L)	Aluminum (mg/L)	Calcium (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Potassium (mg/L)	Sodium (mg/L)
MW-15A	9/2/2009	2	17.7-18.9	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-15A2	9/14/2007	2	28-38	traditional	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-15A2	9/2/2009	2	28-38	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-30A	9/14/2007	2	15-25	traditional	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-30A	9/2/2009	2	15-25	passive/low flow	**1080**	**64**	**94.1**	<50	**128000**	<50	**74700**	**165**	**657**	**186000**
MW-30A2	9/14/2007	2	28-38	traditional	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-30A2	9/2/2009	2	28-38	passive/low flow	**1100**	**91**	**186**	<50	**132000**	<50	**77200**	**2220**	**697**	**190000**
MW-31A	9/13/2007	2	11-26	low flow	**1200**	<5.0	**0.080**	<0.050	**140**	<0.050	**77**	**0.12**	**1.7**	**200**
MW-31A	9/2/2009	2	11-26	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-31A2	9/13/2007	2	28-38	low flow	**1000**	<5.0	**0.12**	<0.050	**110**	<0.050	**66**	**0.46**	**1.6**	**170**
MW-31A2	9/2/2009	2	28-38	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-32A	9/14/2007	2	15-30	traditional	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-32A	9/2/2009	2	15-30	passive/low flow	**1260**	**27**	**121**	<50	**148000**	<50	**86100**	**108**	**774**	**225000**
MW-32A2	9/14/2007	2	30-40	traditional	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-32A2	9/2/2009	2	30-40	passive/low flow	**1000**	**37**	**163**	<50	**118000**	<50	**66000**	**983**	**713**	**170000**
MW-32A2-DUP	9/2/2009	2	30-40	passive/low flow	**990**	**41**	**156**	<50	**113000**	<50	**63300**	**951**	**699**	**164000**
MW-33A	9/13/2007	2	15-30	low flow	**1300**	**5.0**	**0.084**	<0.050	**150.00**	<0.050	**83**	**0.014**	**2.7**	**230.00**
MW-33A	9/1/2009	2	15-30	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-33A2	9/13/2007	2	30-40	low flow	**1200**	<5.0	**0.11**	<0.050	**120**	<0.050	**73**	**0.49**	**1.4**	**220.00**
MW-33A2	9/1/2009	2	30-40	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-37A	9/1/2009	2	20-30	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-37A-DUP	9/1/2009	2	20-30	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-38A	9/1/2009	2	19-29	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-39A	9/2/2009	2	16-26	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-39A2	9/2/2009	2	32-42	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-40A	9/2/2009	2	15-25	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Table 3
A-Zone PRB Performance Monitoring Ground Water Data - Additional Water Quality Parameters
Hookston Station Site
Pleasant Hill, California

Sample Location	Date	Well Diameter (inch)	Sample Depth (feet)	Sample Type	Total Dissolved Solids (mg/L)	Total Suspended Solids (mg/L)	Barium (mg/L)	Aluminum (mg/L)	Calcium (mg/L)	Iron (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Potassium (mg/L)	Sodium (mg/L)
MW-40A2	9/2/2009	2	35-45	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-41A	9/3/2009	2	15-25	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-41A2	9/3/2009	2	36-46	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-42A	9/1/2009	2	20-30	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-42A-DUP	9/1/2009	2	20-30	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-43A	9/1/2009	2	19-29	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-44A	9/3/2009	2	16-26	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-44A2	9/3/2009	2	32-42	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-45A	9/3/2009	2	15-25	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-45A2	9/3/2009	2	35-45	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-46A	9/3/2009	2	15-25	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
MW-46A2	9/3/2009	2	36-46	passive/low flow	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Notes:
Above parameters recorded during sampling
NA = Not Analyzed

Appendix A
Final Construction Report,
GeoSierra (2009)
(On CD)

Appendix B
A-Zone Performance Monitoring Well Logs
(On CD)

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-37A

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 06/15/09

Initial Water Level: 18.00'

X-Coordinate: NA

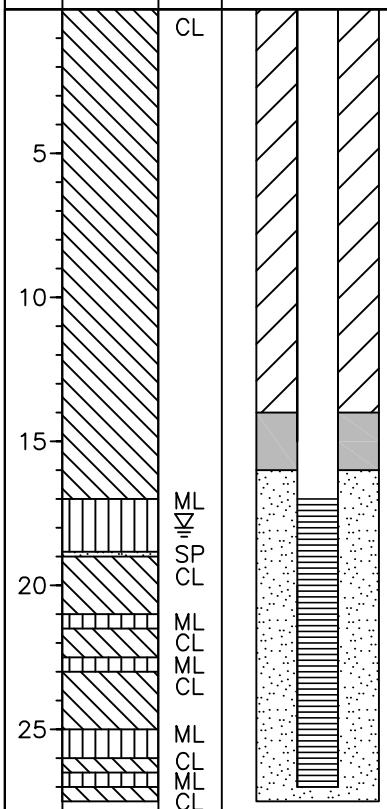
Y-Coordinate: NA

Total Depth: 27.50'

Completed Depth: 27.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 17.00'
Screens:				
type: Slotted	size: 0.020in	dia: 2.00in	fm: 17.00'	to: 27.00'
Annular Fill:				
type: Grout			fm: 0.00'	to: 14.00'
type: Bentonite			fm: 14.00'	to: 16.00'
type: Monterey #3 Sand			fm: 16.00'	to: 27.50'



Sample Recovery | Blow Count | PID (ppm)

Soil Description and Observations

Hand augered to 5.0', then blind drilled. Lithological descriptions adapted from MW-42A.
CLAY (CL): brown (7.5YR 4/3), silt (25%), fine to coarse sand (10%), trace gravel 3/4" (<5%), moist, from hand auger.
CLAY (CL): strong brown (7.5YR 4/6), medium plasticity, moist, from hand auger.
CLAY (CL): black (7.5YR 2.5/1), high plasticity, moist, from hand auger.
CLAY (CL): black (2.5Y 2.5/1), stiff, high plasticity, moist.
CLAY (CL): very dark grayish brown (2.5Y 3/2), medium stiff, medium plasticity, moist.
CLAY (CL): dark grayish brown (2.5Y 4/2), stiff, high plasticity, moist.
No Recovery.
SILT (ML): dark grayish brown (2.5Y 4/2), fine sand (10%), soft, low plasticity, wet.
SAND (SP): dark grayish brown (2.5Y 4/2), fine sand, loose, wet.
CLAY (CL): dark grayish brown (2.5Y 4/2), medium stiff, high plasticity, moist.
CLAY (CL): dark grayish brown (2.5Y 4/2), soft, medium plasticity, moist.
SILT (ML): dark grayish brown (2.5Y 4/2), fine sand (10%), soft, medium plasticity, moist.
CLAY (CL): dark grayish brown (2.5Y 4/2), soft, medium plasticity, moist.
SILT (ML): dark grayish brown (2.5Y 4/2), fine sand (10%), soft, medium plasticity, moist.
CLAY (CL): dark grayish brown (2.5Y 4/2), soft, medium plasticity, moist.
No Recovery.
SILT (ML): brown (10YR 4/3), brown, fine sand (10%), soft, low plasticity, moist.
CLAY (CL): dark grayish brown (10YR 4/2), medium stiff, high plasticity, moist.
SILT WITH SAND (ML): brown (10YR 4/3), fine sand (20%), soft, no plasticity, moist.
CLAY (CL): dark grayish brown (10YR 4/2), medium stiff, high plasticity, moist.
Total Depth - 27.5' bgs

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

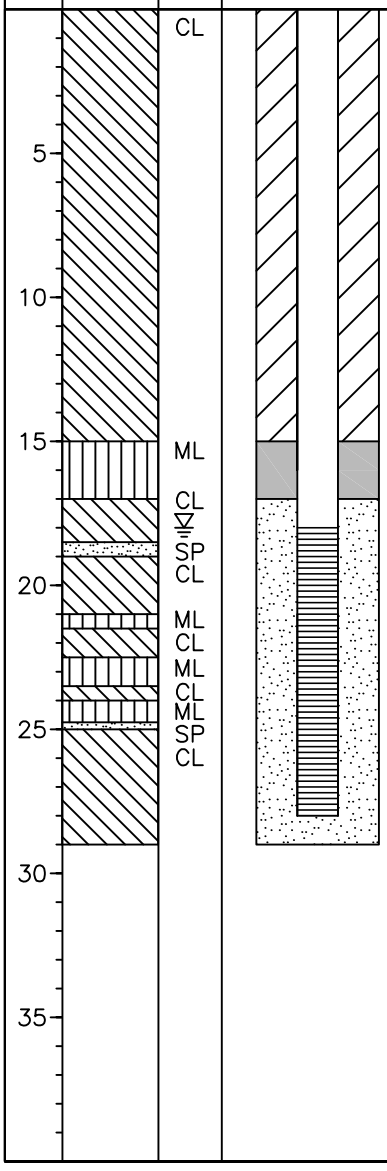
BOREHOLE LOG

Site Id: MW-38A

Project Number: 0099020.01
Project Name: Hookston Station
Location: Pleasant Hill
Contractor: Gregg
Drilling Method: Hollow Stem Auger
Logged By: E. Oehlschlager
Date(s): 06/16/09
Initial Water Level: 18.00'
X-Coordinate: NA
Y-Coordinate: NA

Total Depth: 29.00'
Completed Depth: 29.00'
Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 18.00'
Screens:				
type: Slotted	size: 0.020in	dia: 2.00in	fm: 18.00'	to: 28.00'
Annular Fill:				
type: Grout			fm: 0.00'	to: 15.00'
type: Bentonite			fm: 15.00'	to: 17.00'
type: Monterey #3 Sand			fm: 17.00'	to: 29.00'



Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
			Hand augered to 5.0', then blind drilled. Lithological descriptions adapted from MW-43A.
			CLAY (CL): black (2.5Y 2.5/1), stiff, highly plastic, moist.
			CLAY (CL): very dark grayish brown (10YR 3/2), medium stiff, highly plastic, moist.
			CLAY (CL): as above.
			SILT (ML): dark yellowish brown (10YR 4/6), soft, low plasticity, moist.
			CLAY (CL): dark yellowish brown (10YR 4/6), medium stiff, medium plasticity, moist.
			CLAY (CL): as above.
			SAND (SP): olive gray (5Y 4/2), fine grained, loose, wet.
			CLAY (CL): dark brown (10YR 3/3), medium stiff, medium plasticity, moist.
			CLAY (CL): as above.
			SILT (ML): brown (10YR 4/3), soft, low plasticity, moist, 1.0" fine sand stringer, wet.
			CLAY (CL): dark brown (10YR 3/3), medium stiff, medium plasticity, moist, with 1.0" sand stringer, fine grained, medium dense, wet.
			SILT (ML): brown (10YR 4/3), soft, low plasticity, moist.
			CLAY (CL): dark brown (10YR 3/3), medium stiff, medium plasticity, moist.
			SILT (ML): brown (10YR 4/3), soft, low plasticity, moist.
			SAND WITH SILT (SP): brown (10YR 5/3), fine grained, silt (10%), medium dense, wet.
			CLAY (CL): dark brown (10YR 3/3), medium stiff, medium plasticity, moist.
			CLAY (CL): as above.
			Total Depth - 29.0' bgs

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-39A2

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Macrocore, Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 07/20/09

Initial Water Level: 17.23'

X-Coordinate: NA

Y-Coordinate: NA

Total Depth: 42.00'

Completed Depth: 42.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 32.00'
type: PVC End Cap		dia: 2.00in	fm: 42.00'	to: 42.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 32.00'	to: 42.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 29.00'
type: Bentonite			fm: 29.00'	to: 31.00'
type: #3 Sand Filter			fm: 31.00'	to: 42.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
							Lithological descriptions from MW-44A2. 0-5.0' Hand augered.
5		CL					CLAY (CL): dark brown (10YR 3/3), medium plasticity, medium stiff, moist.
							CLAY (CL): brown (10YR 4/3), low plasticity, soft, moist.
		NR					[NO RECOVERY 8-10']
10		ML					SILT (ML): dark gray (5Y 4/1), low plasticity, soft, moist.
		CL					CLAY (CL): very dark grayish brown (10YR 3/2), medium plasticity, medium stiff, moist.
		NR					CLAY (CL): dark gray (5Y 4/1), low plasticity, medium stiff, moist. [NO RECOVERY 12-13']
		ML					SILT (ML): gray (5Y 5/1), soft, moist.
15							SILT (ML): as above, with 1" sand stringer, gray (5Y 5/1), fine grained, loose, moist.
		NR					SILT (ML): as above, with 1" sand stringer, gray (5Y 5/1), fine grained, loose, moist. [NO RECOVERY 16-18']
		CL					CLAY (CL): light olive brown (2.5Y 5/3), low plasticity, soft, moist.
20		GP					CLAY (CL): dark brown (10YR 3/3), high plasticity, medium stiff, moist.
		CL					GRAVEL with sand (GP): brown (10YR 5/3), coarse (40%), medium (25%), fine (30%), fine to coarse sand (15%), poorly graded, very loose, wet.
		GP					CLAY (CL): brown (10YR 5/3), high plasticity, medium stiff, moist.
25							GRAVEL (GP): dark bluish gray (GLEY2 4/1), fine, poorly graded, coarse sand (10%), loose, wet.
		CL					CLAY (CL): brown (10YR 5/3), high plasticity, medium stiff, moist.
							CLAY (CL): as above.
		ML					SILT (ML): brown (10YR 5/3), low plasticity, soft, moist.
30		SP					SAND (SP): brown (10YR 5/3), fine, medium dense, wet.
		ML					SILT (ML): brown (10YR 5/3), low plasticity, soft, moist.
		CL					CLAY (CL): dark brown (10YR 3/3), medium plasticity, medium stiff, moist.
		GP					GRAVEL (GP): dark bluish gray (GLEY2 4/1), fine, poorly graded, coarse sand (10%), loose, wet.
		CL					CLAY (CL): brown (10YR 5/3), trace coarse sand, low plasticity, medium stiff, moist.
35		GP					GRAVEL with sand (GP): fine gravel (1/4"), fine sand (15%), poorly graded, loose, wet.
		ML					SILT (ML): brown (10YR 5/3), trace coarse sand, soft.
		GP					GRAVEL (GP): fine gravel (1/4"), fine sand (15%), poorly graded, loose, wet.
		ML					SILT (ML): brown (10YR 5/3), some fine sand, soft.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Project Number: 0099020.01
Project Name: Hookston Station
Location: Pleasant Hill
Contractor: Gregg
Drilling Method: Macrocore, Hollow Stem Auger
Logged By: E. Oehlschlager
Date(s): 07/20/09
Initial Water Level: 17.23'
X-Coordinate: NA
Y-Coordinate: NA

Total Depth: 42.00'
Completed Depth: 42.50'
Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 32.00'
type: PVC End Cap		dia: 2.00in	fm: 42.00'	to: 42.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 32.00'	to: 42.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 29.00'
type: Bentonite			fm: 29.00'	to: 31.00'
type: #3 Sand Filter			fm: 31.00'	to: 42.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
		CL					CLAY (CL): dark brown (10YR 3/3), medium plasticity, medium stiff. [39.5-40']
							[NO RECOVERY 40-42']
45							
50							
55							
60							
65							
70							
75							

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-40A

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 07/20/09

Initial Water Level: 18.58'

X-Coordinate: NA

Y-Coordinate: NA

Total Depth: 25.50'

Completed Depth: 25.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 15.00'
type: PVC End Cap		dia: 2.00in	fm: 25.00'	to: 25.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 15.00'	to: 25.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 12.00'
type: Bentonite			fm: 12.00'	to: 14.00'
type: #3 Sand Filter			fm: 14.00'	to: 25.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
							Lithological descriptions from MW-45A2 0-5.0' Hand augered.
5		CL					CLAY (CL): dark gray (10YR 4/1), medium plasticity, medium stiff, moist.
							CLAY (CL): as above.
10		ML					SILT with sand (ML): yellowish brown (10YR 5/4), fine sand (15%), soft, moist.
		CL					CLAY (CL): dark grayish brown (10YR 4/2), medium plasticity, medium stiff, moist.
15		ML					SILT with sand (ML): thin stringer, light olive brown (2.5Y 5/3), fine sand (15%), medium stiff, moist.
		CL					CLAY (CL): dark grayish brown (10YR 4/2), medium plasticity, medium stiff, moist.
20							CLAY (CL): as above.
		ML					SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (15%), trace coarse sand, soft, moist.
25							SILT (ML): olive brown (2.5Y 4/3), fine sand (10%), soft, moist. SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (20%), soft, moist. Total Depth - 25.5' bgs
30							
35							

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-40A2

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Macrocore, Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 07/21/09

Initial Water Level: NA

X-Coordinate: NA

Y-Coordinate: NA

Total Depth: 45.00'

Completed Depth: 45.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 35.00'
type: PVC End Cap		dia: 2.00in	fm: 45.00'	to: 45.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 35.00'	to: 45.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 32.00'
type: Bentonite			fm: 32.00'	to: 34.00'
type: #3 Sand Filter			fm: 34.00'	to: 45.50'

Depth (ft)	USCS Code	Soil Description and Observations
		Lithological Descriptions from MW-45A2 0-5.0' Hand augered.
5	CL	CLAY (CL): dark gray (10YR 4/1), medium plasticity, medium stiff, moist.
	CL	CLAY (CL): as above.
10	ML	SILT with sand (ML): yellowish brown (10YR 5/4), fine sand (15%), soft, moist.
	CL	CLAY (CL): dark grayish brown (10YR 4/2), medium plasticity, medium stiff, moist.
15	ML	SILT with sand (ML): thin stringer, light olive brown (2.5Y 5/3), fine sand (15%), medium stiff, moist.
	CL	CLAY (CL): dark grayish brown (10YR 4/2), medium plasticity, medium stiff, moist.
20	CL	CLAY (CL): as above.
	ML	SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (15%), trace coarse sand, soft, moist.
25	ML	SILT (ML): olive brown (2.5Y 4/3), fine sand (10%), soft, moist. SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (20%), soft, moist.
	CL	CLAY (CL): very dark grayish brown (10YR 3/2), high plasticity, stiff, moist. CLAY (CL): as above.
	ML	SILT with sand (ML): brown (10YR 5/3), soft, moist.
30	CL	CLAY (CL): grayish brown (2.5Y 5/2), low plasticity, soft, moist.
	ML	SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (15%), soft, moist.
	CL	CLAY (CL): olive brown (2.5Y 4/3), low plasticity, soft, moist.
	ML	SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (15%), soft, moist.
35	CL	CLAY (CL): olive brown (2.5Y 4/3), medium plasticity, stiff, moist.
	ML	SILT with sand (ML): dark grayish brown (2.5Y 4/2), fine sand (15%), soft, moist.
	CL	CLAY (CL): olive brown (2.5Y 4/3), medium plasticity, stiff, moist.
	SM	SILTY SAND (SM): dark grayish brown (2.5Y 4/2), fine sand (50%), medium dense.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Project Number: 0099020.01
Project Name: Hookston Station
Location: Pleasant Hill
Contractor: Gregg
Drilling Method: Macrocore, Hollow Stem Auger
Logged By: E. Oehlschlager
Date(s): 07/21/09
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA

Total Depth: 45.00'
Completed Depth: 45.50'
Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 35.00'
type: PVC End Cap		dia: 2.00in	fm: 45.00'	to: 45.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 35.00'	to: 45.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 32.00'
type: Bentonite			fm: 32.00'	to: 34.00'
type: #3 Sand Filter			fm: 34.00'	to: 45.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
45		CL SP					CLAY (CL): dark grayish brown (2.5Y 4/2), low plasticity, soft, moist. [Wet tools] SAND (SP): light olive brown (2.5Y 5/4), fine to medium grained, loose, wet, flowing sand. SAND (SP): light olive brown (2.5Y 5/4), trace gravel, fine to coarse grained, loose, wet. Total Depth – 45.5' bgs
50							
55							
60							
65							
70							
75							

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-41A

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 07/21/09

Initial Water Level: NA

X-Coordinate: NA

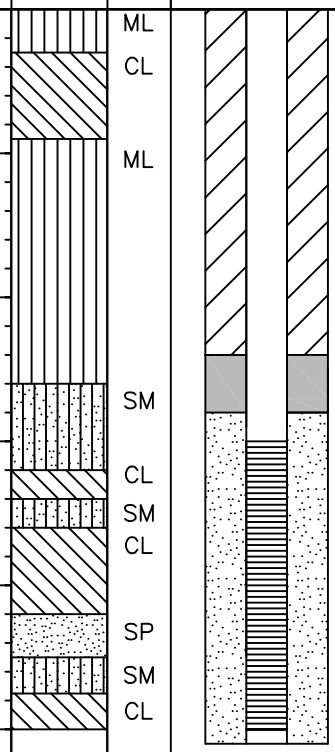
Y-Coordinate: NA

Total Depth: 25.50'

Completed Depth: 25.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 15.00'
type: PVC End Cap		dia: 2.00in	fm: 25.00'	to: 25.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 15.00'	to: 25.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 12.00'
type: Bentonite			fm: 12.00'	to: 14.00'
type: #3 Sand Filter			fm: 14.00'	to: 25.50'



Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
			Lithological descriptions from MW-46A.
			SILT with sand (ML): grayish brown (10YR 4/3), fine sand (20%), clay nodules (5%), soft, dry, crumbly.
			CLAY (CL): dark brown (10YR 2/1), trace silt, high plasticity, stiff, moist.
			SILTY CLAY (CL): dark brown (10YR 2/1), silt (40%), low plasticity, stiff, moist.
			CLAYEY SILT (ML): dark brown (10YR 2/1), clay (35%), low plasticity, stiff, moist.
			CLAYEY SILT (ML): brown (10YR 3/3), some red staining, clay (35%), low plasticity, medium stiff, moist, root structures.
			SILT with clay (ML): brown (10YR 4/2), some orange mottling, clay (20%), soft, dry.
			SILT (ML): as above
			SILT (ML): as above
			SILT (ML): brown to light brown (10YR 4/3), clay (10%), trace sand, soft, moist.
			SILT (SM): grayish brown (10YR 4/3), very fine sand (10%), soft, moist.
			SILT (SM): grayish brown (10YR 4/3), some orange staining, very fine sand (10%), soft, moist.
			SAND with silt (SM): brown (10YR 3/6), fine to medium grained, silt (15%), loose, moist.
			SILTY CLAY with sand (CL): grayish brown (10YR 4/3), silt (40%), fine sand (15%), low plasticity, soft, moist.
			SILT with sand (SM): grayish brown (10YR 4/3), sand (30%), fine to medium grained, soft,
			CLAY with silt (CL): orangish brown (10YR 4/6), silt (30%), high plasticity, soft, moist.
			CLAY with silt (CL): orangish brown (10YR 4/6), silt (15%), high plasticity, soft, sticky, moist.
			SAND (SP): grayish brown (10YR 4/3), clay nodules (<5%), fine to coarse grained, loose, moist to wet.
			SILTY SAND (SM): grayish brown (10YR 4/3), loose, moist to wet.
			CLAY with silt (CL): orangish brown (10YR 4/4), silt (20%), soft, moist, some organic material (black matter).
			Total Depth – 25.5' bgs

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-41A2

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Macrocore, Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 07/21/09

Initial Water Level: NA

X-Coordinate: NA

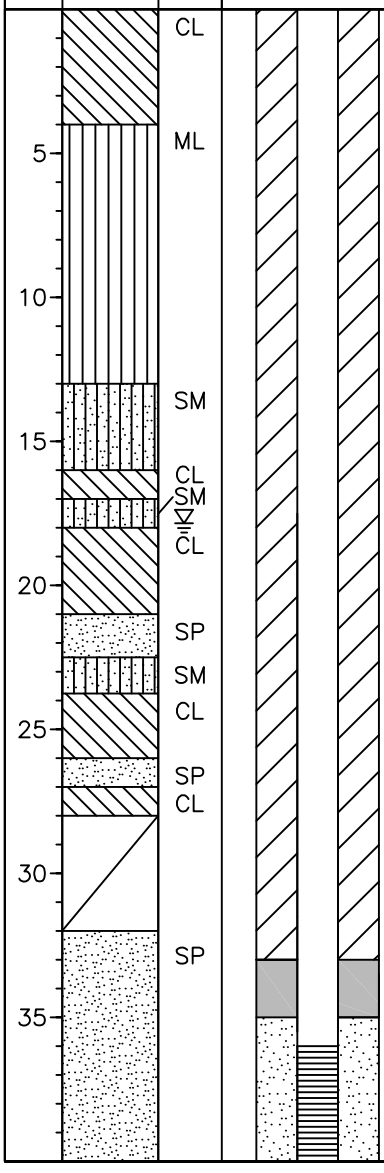
Y-Coordinate: NA

Total Depth: 46.00'

Completed Depth: 46.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 36.00'
type: PVC End Cap		dia: 2.00in	fm: 46.00'	to: 46.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 36.00'	to: 46.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 33.00'
type: Bentonite			fm: 33.00'	to: 35.00'
type: #3 Sand Filter			fm: 35.00'	to: 46.50'



Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
			0-5.0' Hand augered. Lithological descriptions from 0-32' from MW-46A2.
			CLAY (CL): dark brown (10YR 2/1), medium plasticity, stiff, moist.
			CLAY (CL): as above.
			SILT with clay (ML): brown (10YR 2/2), clay (15%), medium stiff, moist.
			SILT (ML): dark brown (10YR 2/2), clay (5%), soft, moist.
			SILT (ML): grayish brown (10YR 4/2), clay (10%), soft, dry to slightly moist.
			SILT (ML): grayish brown (10YR 4/2), clay (10%), very soft, dry to slightly moist.
			SILT (ML): brown to light brown (10YR 4/3), clay (10%), trace sand, soft, moist.
			SILT (SM): grayish brown (10YR 4/3), very fine sand (10%), soft, moist.
			SILT (SM): grayish brown (10YR 4/3), some orange staining, very fine sand (10%), soft, moist.
			SAND with silt (SM): brown (10YR 3/6), fine to medium grained, silt (15%), loose, moist.
			SILTY CLAY with sand (CL): grayish brown (10YR 4/3), silt (40%), fine sand (15%), low plasticity, soft, moist.
			SILT with sand (SM): grayish brown (10YR 4/3), sand (30%), fine to medium grained, soft, moist.
			CLAY with silt (CL): orangish brown (10YR 4/6), silt (30%), high plasticity, soft, moist.
			CLAY with silt (CL): orangish brown (10YR 4/6), silt (15%), high plasticity, soft, sticky, moist.
			SAND (SP): grayish brown (10YR 4/3), clay nodules (<5%), fine to coarse grained, loose, moist to wet.
			SILTY SAND (SM): grayish brown (10YR 4/3), loose, moist to wet.
			CLAY with silt (CL): orangish brown (10YR 4/4), silt (20%), soft, moist, some organic material (black matter).
			CLAY with sand and silt (CL): orangish brown (10YR 4/4), fine sand (25%), silt (20%), soft, moist, some organic material (black matter).
			SAND (SP): grayish brown (10YR 4/3), fine to coarse grained, small gravel (0.25"), loose, wet.
			CLAY with silt (CL): grayish brown (10YR 4/3), some orange mottling, silt (15%), high plasticity, soft, moist.
			CLAY (CL): brown (10YR 5/3), small rounded gravel (10%), moderately stiff, moist.
			[NO RECOVERY 28'-32']
			SAND (SP): yellowish brown (10YR 5/4), fine to medium grained, flowing, very loose, wet.
			SAND (SP): yellowish brown (10YR 5/4), medium to coarse grained, trace fine gravel (0.25"), very loose, wet.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Project Number: 0099020.01
Project Name: Hookston Station
Location: Pleasant Hill
Contractor: Gregg
Drilling Method: Macrocore, Hollow Stem Auger
Logged By: E. Oehlschlager
Date(s): 07/21/09
Initial Water Level: NA
X-Coordinate: NA
Y-Coordinate: NA

Total Depth: 46.00'
Completed Depth: 46.50'
Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 36.00'
type: PVC End Cap		dia: 2.00in	fm: 46.00'	to: 46.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 36.00'	to: 46.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 33.00'
type: Bentonite			fm: 33.00'	to: 35.00'
type: #3 Sand Filter			fm: 35.00'	to: 46.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
45							SAND (SP): as above Total Depth – 46.5' bgs
50							
55							
60							
65							
70							
75							

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-42A

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Geoprobe/HSH

Logged By: E. Oehlschlager

Date(s): 06/15/09

Initial Water Level: 18.00'

X-Coordinate: NA

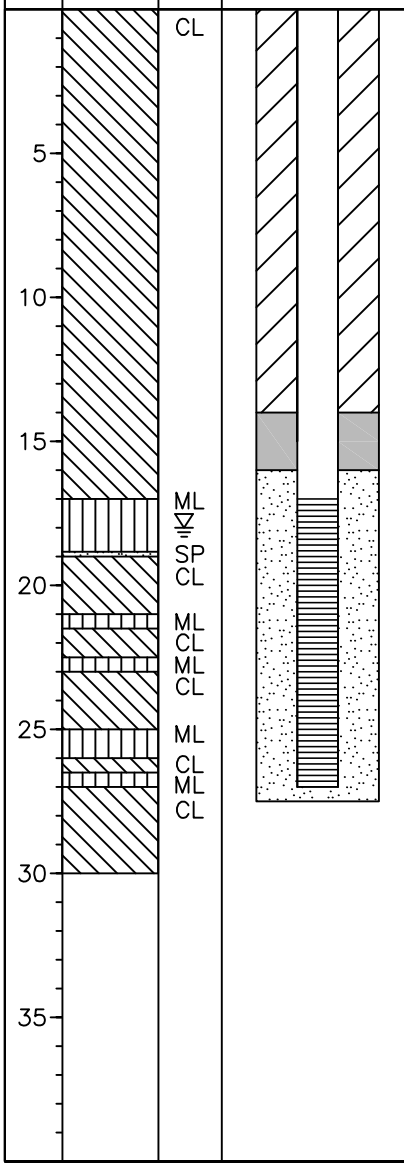
Y-Coordinate: NA

Total Depth: 30.00'

Completed Depth: 27.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 17.00'
Screens:				
type: Slotted	size: 0.020in	dia: 2.00in	fm: 17.00'	to: 27.00'
Annular Fill:				
type: Grout			fm: 0.00'	to: 14.00'
type: Bentonite			fm: 14.00'	to: 16.00'
type: Monterey #3 Sand			fm: 16.00'	to: 27.50'



PID (ppm)	Soil Description and Observations
0.0	Hand Auger to 5.0 feet.
	CLAY (CL): brown (7.5YR 4/3), silt (25%), fine to coarse sand (10%), trace gravel 3/4" (<5%), moist, from hand auger.
0.0	CLAY (CL): strong brown (7.5YR 4/6), medium plasticity, moist, from hand auger.
0.0	CLAY (CL): black (7.5YR 2.5/1), high plasticity, moist, from hand auger.
	CLAY (CL): black (2.5Y 2.5/1), stiff, high plasticity, moist.
	CLAY (CL): very dark grayish brown (2.5Y 3/2), medium stiff, medium plasticity, moist.
	CLAY (CL): dark grayish brown (2.5Y 4/2), stiff, high plasticity, moist.
	No Recovery.
	SILT (ML): dark grayish brown (2.5Y 4/2), fine sand (10%), soft, low plasticity, wet.
0.0	SAND (SP): dark grayish brown (2.5Y 4/2), fine sand, loose, wet.
0.0	CLAY (CL): dark grayish brown (2.5Y 4/2), medium stiff, high plasticity, moist.
	CLAY (CL): dark grayish brown (2.5Y 4/2), soft, medium plasticity, moist.
	SILT (ML): dark grayish brown (2.5Y 4/2), fine sand (10%), soft, medium plasticity, moist.
0.0	CLAY (CL): dark grayish brown (2.5Y 4/2), soft, medium plasticity, moist.
0.0	SILT (ML): dark grayish brown (2.5Y 4/2), fine sand (10%), soft, medium plasticity, moist.
0.0	CLAY (CL): dark grayish brown (2.5Y 4/2), soft, medium plasticity, moist.
	No Recovery.
	SILT (ML): brown (10YR 4/3), brown, fine sand (10%), soft, low plasticity, moist.
0.0	CLAY (CL): dark grayish brown (10YR 4/2), medium stiff, high plasticity, moist.
	SILT WITH SAND (ML): brown (10YR 4/3), fine sand (20%), soft, no plasticity, moist.
0.0	CLAY (CL): dark grayish brown (10YR 4/2), medium stiff, high plasticity, moist.
0.0	[Wet tools at 28 feet.]
	CLAY (CL): dark brown (7.5YR 3/2), trace black 2 mm inclusions (<5%), medium stiff, high plasticity, moist.
	Total Depth - 30.0' bgs

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-43A

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Direct Push/Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 06/16/09

Initial Water Level: 18.00'

X-Coordinate: NA

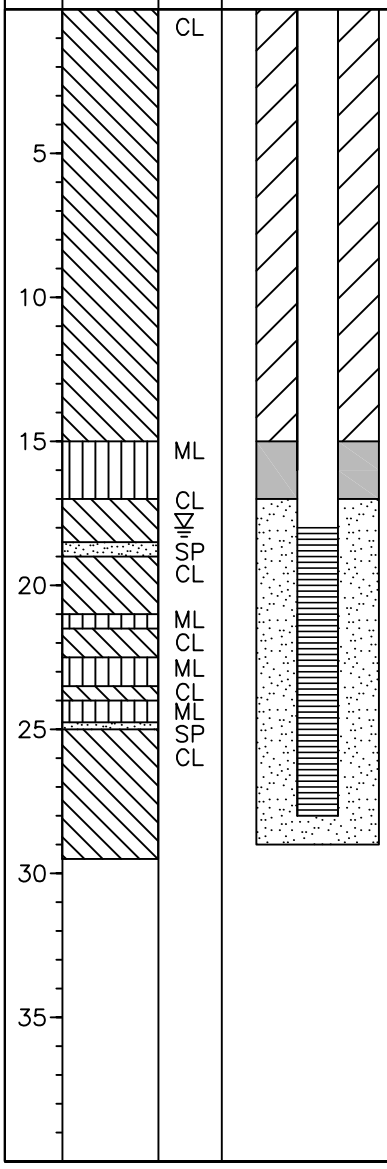
Y-Coordinate: NA

Total Depth: 29.50'

Completed Depth: 29.00'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 18.00'
Screens:				
type: Slotted	size: 0.020in	dia: 2.00in	fm: 18.00'	to: 28.00'
Annular Fill:				
type: Grout			fm: 0.00'	to: 15.00'
type: Bentonite			fm: 15.00'	to: 17.00'
type: Monterey #3 Sand			fm: 17.00'	to: 29.00'



PID (ppm)	Soil Description and Observations
	Hand cleared to 5.0'.
	CLAY (CL): black (2.5Y 2.5/1), stiff, highly plastic, moist.
	CLAY (CL): very dark grayish brown (10YR 3/2), medium stiff, highly plastic, moist.
	CLAY (CL): as above.
	SILT (ML): dark yellowish brown (10YR 4/6), soft, low plasticity, moist.
0.0	CLAY (CL): dark yellowish brown (10YR 4/6), medium stiff, medium plasticity, moist.
	CLAY (CL): as above.
0.0	SAND (SP): olive gray (5Y 4/2), fine grained, loose, wet.
	CLAY (CL): dark brown (10YR 3/3), medium stiff, medium plasticity, moist.
	CLAY (CL): as above.
0.0	SILT (ML): brown (10YR 4/3), soft, low plasticity, moist, 1.0" fine sand stringer, wet.
0.0	CLAY (CL): dark brown (10YR 3/3), medium stiff, medium plasticity, moist, with 1.0" sand stringer, fine grained, medium dense, wet.
	SILT (ML): brown (10YR 4/3), soft, low plasticity, moist.
0.0	CLAY (CL): dark brown (10YR 3/3), medium stiff, medium plasticity, moist.
0.0	SILT (ML): brown (10YR 4/3), soft, low plasticity, moist.
0.0	SAND WITH SILT (SP): brown (10YR 5/3), fine grained, silt (10%), medium dense, wet.
	CLAY (CL): dark brown (10YR 3/3), medium stiff, medium plasticity, moist.
	CLAY (CL): as above.
	Total Depth - 29.5' bgs

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-44A

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Hollow Stem Auger

Logged By: K. Watson

Date(s): 07/17/09

Initial Water Level: 16.65'

X-Coordinate: NA

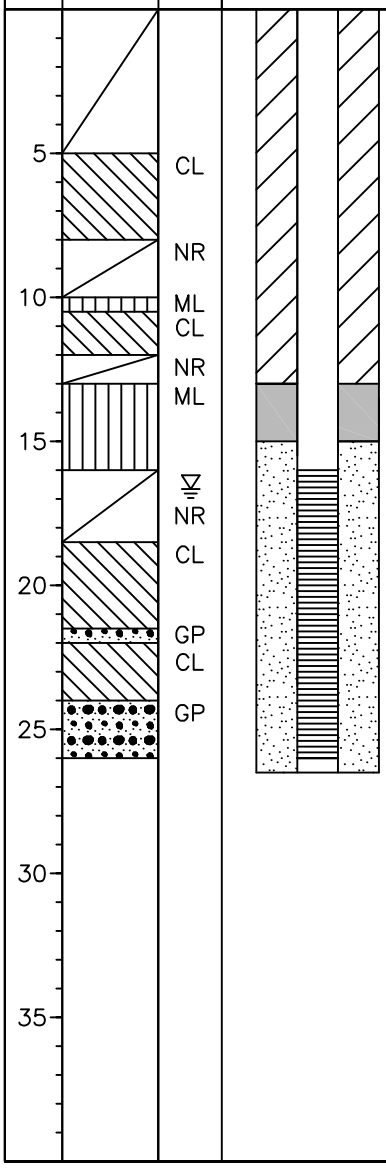
Y-Coordinate: NA

Total Depth: 26.50'

Completed Depth: 26.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 16.00'
type: PVC End Cap		dia: 2.00in	fm: 26.00'	to: 26.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 16.00'	to: 26.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 13.00'
type: Bentonite			fm: 13.00'	to: 15.00'
type: #3 Sand Filter			fm: 15.00'	to: 26.50'



Sample Recovery | Blow Count | PID (ppm)

Soil Description and Observations

Lithological descriptions from MW-44A2
0-5.0' Hand augered.

CLAY (CL): dark brown (10YR 3/3), medium plasticity, medium stiff, moist.

CLAY (CL): brown (10YR 4/3), low plasticity, soft, moist.

[NO RECOVERY 8-10']

SILT (ML): dark gray (5Y 4/1), low plasticity, soft, moist.
CLAY (CL): very dark grayish brown (10YR 3/2), medium plasticity, medium stiff, moist.
CLAY (CL): dark gray (5Y 4/1), low plasticity, medium stiff, moist.
[NO RECOVERY 12-13']
SILT (ML): gray (5Y 5/1), soft, moist.
SILT (ML): as above, with 1" sand stringer, gray (5Y 5/1), fine grained, loose, moist.
SILT (ML): as above, with 1" sand stringer, gray (5Y 5/1), fine grained, loose, moist.
[NO RECOVERY 16-18']

CLAY (CL): light olive brown (2.5Y 5/3), low plasticity, soft, moist.
CLAY (CL): dark brown (10YR 3/3), high plasticity, medium stiff, moist.
GRAVEL with sand (GP): brown (10YR 5/3), coarse (40%), medium (25%), fine (30%), fine to coarse sand (15%), poorly graded, very loose, wet.
CLAY (CL): brown (10YR 5/3), high plasticity, medium stiff, moist.
GRAVEL (GP): dark bluish gray (GLEY2 4/1), fine, poorly graded, coarse sand (10%), loose, wet.

Total Depth - 26.5' bgs

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-44A2

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Macrocore, Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 07/15/09

Initial Water Level: 16.15'

X-Coordinate: NA

Y-Coordinate: NA

Total Depth: 42.00'

Completed Depth: 42.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 32.00'
type: PVC End Cap		dia: 2.00in	fm: 42.00'	to: 42.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 32.00'	to: 42.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 29.00'
type: Bentonite			fm: 29.00'	to: 31.00'
type: #3 Sand Filter			fm: 31.00'	to: 42.50'

Depth (ft)	USCS Code	PID (ppm)	Soil Description and Observations
			0-5.0' Hand augered.
5	CL	0.0	CLAY (CL): dark brown (10YR 3/3), medium plasticity, medium stiff, moist.
		0.0	
		0.0	CLAY (CL): brown (10YR 4/3), low plasticity, soft, moist.
	NR		[NO RECOVERY 8-10']
10	ML	0.0	SILT (ML): dark gray (5Y 4/1), low plasticity, soft, moist.
	CL	0.0	CLAY (CL): very dark grayish brown (10YR 3/2), medium plasticity, medium stiff, moist.
			CLAY (CL): dark gray (5Y 4/1), low plasticity, medium stiff, moist.
	NR		[NO RECOVERY 12-13']
	ML	0.0	SILT (ML): gray (5Y 5/1), soft, moist.
15		0.0	SILT (ML): as above, with 1" sand stringer, gray (5Y 5/1), fine grained, loose, moist.
	▽	0.0	SILT (ML): as above, with 1" sand stringer, gray (5Y 5/1), fine grained, loose, moist.
	NR		[NO RECOVERY 16-18']
	CL		[WET TOOLS AT 19']
20			CLAY (CL): light olive brown (2.5Y 5/3), low plasticity, soft, moist.
			CLAY (CL): dark brown (10YR 3/3), high plasticity, medium stiff, moist.
	GP		GRAVEL with sand (GP): brown (10YR 5/3), coarse (40%), medium (25%), fine (30%), fine to coarse sand (15%), poorly graded, very loose, wet.
	CL		CLAY (CL): brown (10YR 5/3), high plasticity, medium stiff, moist.
	GP		GRAVEL (GP): dark bluish gray (GLEY2 4/1), fine, poorly graded, coarse sand (10%), loose, wet.
25			
	CL		CLAY (CL): brown (10YR 5/3), high plasticity, medium stiff, moist.
			CLAY (CL): as above.
	ML	0.1	SILT (ML): brown (10YR 5/3), low plasticity, soft, moist.
	SP		SAND (SP): brown (10YR 5/3), fine, medium dense, wet.
30	ML		SILT (ML): brown (10YR 5/3), low plasticity, soft, moist.
	CL		CLAY (CL): dark brown (10YR 3/3), medium plasticity, medium stiff, moist.
	GP		GRAVEL (GP): dark bluish gray (GLEY2 4/1), fine, poorly graded, coarse sand (10%), loose, wet.
	CL		CLAY (CL): brown (10YR 5/3), trace coarse sand, low plasticity, medium stiff, moist.
			[WET, FLOWING]
35	GP		GRAVEL with sand (GP): fine gravel (1/4"), fine sand (15%), poorly graded, loose, wet.
	ML		SILT (ML): brown (10YR 5/3), trace coarse sand, soft.
	GP		GRAVEL (GP): fine gravel (1/4"), fine sand (15%), poorly graded, loose, wet.
	ML		SILT (ML): brown (10YR 5/3), some fine sand, soft.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Project Number: 0099020.01
Project Name: Hookston Station
Location: Pleasant Hill
Contractor: Gregg
Drilling Method: Macrocore, Hollow Stem Auger
Logged By: E. Oehlschlager
Date(s): 07/15/09
Initial Water Level: 16.15'
X-Coordinate: NA
Y-Coordinate: NA

Total Depth: 42.00'
Completed Depth: 42.50'
Borehole Dia.: 8.00in

Blank Casing:					
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 32.00'
type: PVC End Cap		dia: 2.00in	fm: 42.00'	to: 42.50'
Screens:					
type: Slotted	size: 0.010in	dia: 2.00in	fm: 32.00'	to: 42.00'
Annular Fill:					
type: Grout			fm: 0.50'	to: 29.00'
type: Bentonite			fm: 29.00'	to: 31.00'
type: #3 Sand Filter			fm: 31.00'	to: 42.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
		CL					CLAY (CL): dark brown (10YR 3/3), medium plasticity, medium stiff. [39.5-40'] [NO RECOVERY 40-42']
45							
50							
55							
60							
65							
70							
75							

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-45A

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 07/16/09

Initial Water Level: 18.30'

X-Coordinate: NA

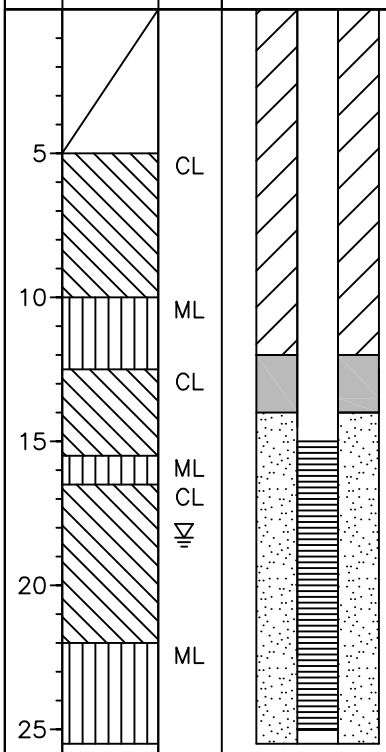
Y-Coordinate: NA

Total Depth: 25.50'

Completed Depth: 25.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 15.00'
type: PVC End Cap		dia: 2.00in	fm: 25.00'	to: 25.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 15.00'	to: 25.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 12.00'
type: Bentonite			fm: 12.00'	to: 14.00'
type: #3 Sand Filter			fm: 14.00'	to: 25.50'



Sample Recovery | Blow Count | PID (ppm)

Soil Description and Observations

Lithological descriptions from MW-45A2
0-5.0' Hand augered.

CLAY (CL): dark gray (10YR 4/1), medium plasticity, medium stiff, moist.

CLAY (CL): as above.

SILT with sand (ML): yellowish brown (10YR 5/4), fine sand (15%), soft, moist.

CLAY (CL): dark grayish brown (10YR 4/2), medium plasticity, medium stiff, moist.

SILT with sand (ML): thin stringer, light olive brown (2.5Y 5/3), fine sand (15%), medium stiff, moist.
CLAY (CL): dark grayish brown (10YR 4/2), medium plasticity, medium stiff, moist.

CLAY (CL): as above.

SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (15%), trace coarse sand, soft, moist.

SILT (ML): olive brown (2.5Y 4/3), fine sand (10%), soft, moist.
SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (20%), soft, moist.
Total Depth - 25.5' bgs

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-45A2

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Macrocore, Hollow Stem Auger

Logged By: E. Oehlschlager

Date(s): 07/16/09

Initial Water Level: 40.00'

X-Coordinate: NA

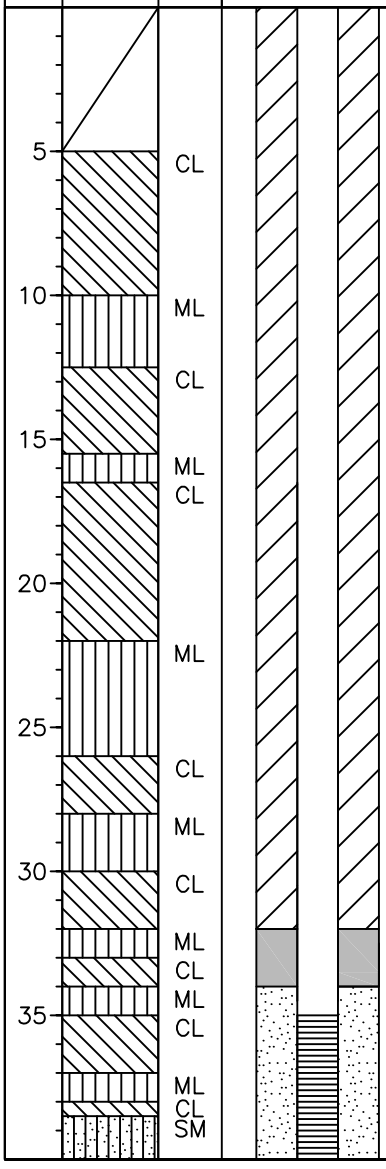
Y-Coordinate: NA

Total Depth: 45.00'

Completed Depth: 45.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 35.00'
type: PVC End Cap		dia: 2.00in	fm: 45.00'	to: 45.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 35.00'	to: 45.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 32.00'
type: Bentonite			fm: 32.00'	to: 34.00'
type: #3 Sand Filter			fm: 34.00'	to: 45.50'



Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
						0-5.0' Hand augered.
	CL				0.0	CLAY (CL): dark gray (10YR 4/1), medium plasticity, medium stiff, moist.
					0.0	
					0.0	
					0.0	CLAY (CL): as above.
					0.0	
	ML				0.0	SILT with sand (ML): yellowish brown (10YR 5/4), fine sand (15%), soft, moist.
					0.0	
	CL				0.0	CLAY (CL): dark grayish brown (10YR 4/2), medium plasticity, medium stiff, moist.
					0.0	
					0.0	
	ML				0.0	SILT with sand (ML): thin stringer, light olive brown (2.5Y 5/3), fine sand (15%), medium stiff, moist.
	CL				0.0	CLAY (CL): dark grayish brown (10YR 4/2), medium plasticity, medium stiff, moist.
					0.0	
					0.0	
					0.0	CLAY (CL): as above.
					0.0	
	ML				0.0	SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (15%), trace coarse sand, soft, moist.
					0.0	
					0.0	SILT (ML): olive brown (2.5Y 4/3), fine sand (10%), soft, moist.
					0.0	SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (20%), soft, moist.
	CL				0.0	CLAY (CL): very dark grayish brown (10YR 3/2), high plasticity, stiff, moist.
					0.0	CLAY (CL): as above.
	ML				0.0	SILT with sand (ML): brown (10YR 5/3), soft, moist.
					0.0	
	CL				0.0	CLAY (CL): grayish brown (2.5Y 5/2), low plasticity, soft, moist.
					0.0	
	ML				0.0	SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (15%), soft, moist.
	CL				0.0	CLAY (CL): olive brown (2.5Y 4/3), low plasticity, soft, moist.
	ML				0.0	SILT with sand (ML): olive brown (2.5Y 4/3), fine sand (15%), soft, moist.
	CL				0.0	CLAY (CL): olive brown (2.5Y 4/3), medium plasticity, stiff, moist.
					0.0	
	ML				0.0	SILT with sand (ML): dark grayish brown (2.5Y 4/2), fine sand (15%), soft, moist.
	CL				0.0	CLAY (CL): olive brown (2.5Y 4/3), medium plasticity, stiff, moist.
	SM				0.0	SILTY SAND (SM): dark grayish brown (2.5Y 4/2), fine sand (50%), medium dense.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Project Number: 0099020.01
Project Name: Hookston Station
Location: Pleasant Hill
Contractor: Gregg
Drilling Method: Macrocore, Hollow Stem Auger
Logged By: E. Oehlschlager
Date(s): 07/16/09
Initial Water Level: 40.00'
X-Coordinate: NA
Y-Coordinate: NA

Total Depth: 45.00'
Completed Depth: 45.50'
Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 35.00'
type: PVC End Cap		dia: 2.00in	fm: 45.00'	to: 45.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 35.00'	to: 45.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 32.00'
type: Bentonite			fm: 32.00'	to: 34.00'
type: #3 Sand Filter			fm: 34.00'	to: 45.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
		CL				0.0	CLAY (CL): dark grayish brown (2.5Y 4/2), low plasticity, soft, moist. [Wet tools]
						0.0	
		SP				0.0	SAND (SP): light olive brown (2.5Y 5/4), fine to medium grained, loose, wet, flowing sand.
						0.0	
45						0.0	SAND (SP): light olive brown (2.5Y 5/4), trace gravel, fine to coarse grained, loose, wet.
						0.0	Total Depth – 45.5' bgs
50							
55							
60							
65							
70							
75							

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-46A

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Hollow Stem Auger

Logged By: K. Watson

Date(s): 07/17/09

Initial Water Level: 17.81'

X-Coordinate: NA

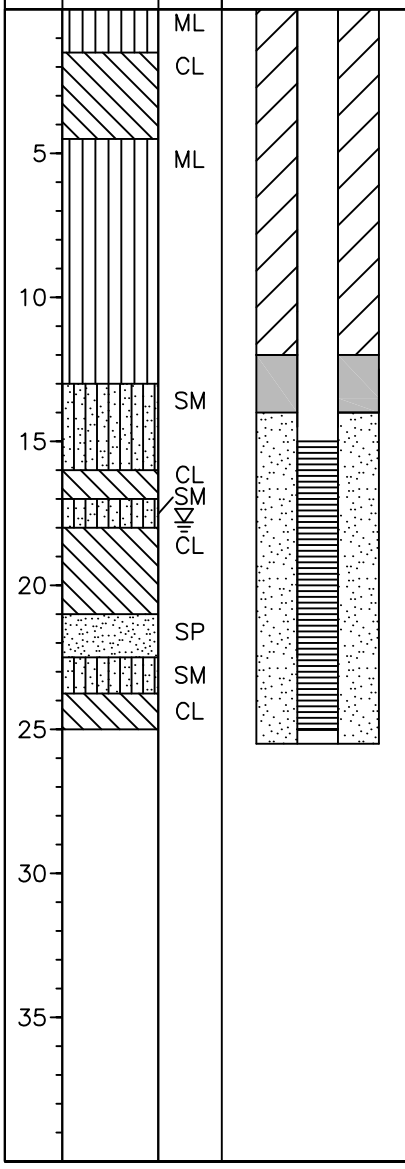
Y-Coordinate: NA

Total Depth: 25.50'

Completed Depth: 25.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 15.00'
type: PVC End Cap		dia: 2.00in	fm: 25.00'	to: 25.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 15.00'	to: 25.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 12.00'
type: Bentonite			fm: 12.00'	to: 14.00'
type: #3 Sand Filter			fm: 14.00'	to: 25.50'



Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
		0.0	SILT with sand (ML): grayish brown (10YR 4/3), fine sand (20%), clay nodules (5%), soft, dry, crumbly.
		0.0	CLAY (CL): dark brown (10YR 2/1), trace silt, high plasticity, stiff, moist.
		1.3	SILTY CLAY (CL): dark brown (10YR 2/1), silt (40%), low plasticity, stiff, moist. [SAMPLE: MW-46A-4-4.5']
		0.3	CLAYEY SILT (ML): dark brown (10YR 2/1), clay (35%), low plasticity, stiff, moist.
		0.5	CLAYEY SILT (ML): brown (10YR 3/3), some red staining, clay (35%), low plasticity, medium stiff, moist, root structures.
		0.3	SILT with clay (ML): brown (10YR 4/2), some orange mottling, clay (20%), soft, dry.
		0.1	SILT (ML): as above
		0.0	SILT (ML): as above
		0.1	SILT (ML): brown to light brown (10YR 4/3), clay (10%), trace sand, soft, moist.
			SILT (SM): grayish brown (10YR 4/3), very fine sand (10%), soft, moist.
			SILT (SM): grayish brown (10YR 4/3), some orange staining, very fine sand (10%), soft, moist.
			SAND with silt (SM): brown (10YR 3/6), fine to medium grained, silt (15%), loose, moist.
			SILTY CLAY with sand (CL): grayish brown (10YR 4/3), silt (40%), fine sand (15%), low plasticity, soft, moist.
			SILT with sand (SM): grayish brown (10YR 4/3), sand (30%), fine to medium grained, soft,
			CLAY with silt (CL): orangish brown (10YR 4/6), silt (30%), high plasticity, soft, moist.
			CLAY with silt (CL): orangish brown (10YR 4/6), silt (15%), high plasticity, soft, sticky, moist.
			SAND (SP): grayish brown (10YR 4/3), clay nodules (<5%), fine to coarse grained, loose, moist to wet.
			SILTY SAND (SM): grayish brown (10YR 4/3), loose, moist to wet.
			CLAY with silt (CL): orangish brown (10YR 4/4), silt (20%), soft, moist, some organic material (black matter).
			Total Depth - 25.5' bgs

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Site Id: MW-46A2

Project Number: 0099020.01

Project Name: Hookston Station

Location: Pleasant Hill

Contractor: Gregg

Drilling Method: Macrocore, Hollow Stem Auger

Logged By: K. Watson

Date(s): 07/17/09

Initial Water Level: 17.85'

X-Coordinate: NA

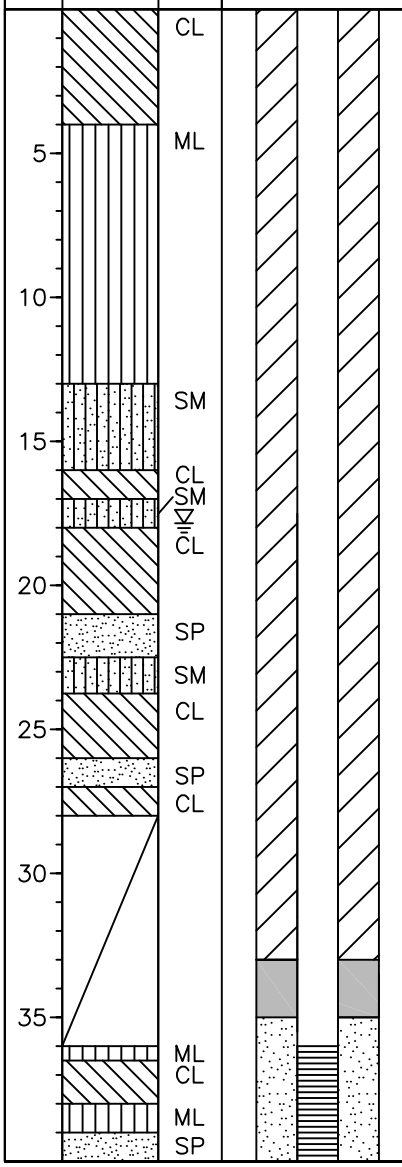
Y-Coordinate: NA

Total Depth: 46.00'

Completed Depth: 46.50'

Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 36.00'
type: PVC End Cap		dia: 2.00in	fm: 46.00'	to: 46.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 36.00'	to: 46.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 33.00'
type: Bentonite			fm: 33.00'	to: 35.00'
type: #3 Sand Filter			fm: 35.00'	to: 46.50'



Depth (ft)	USCS Code	PID (ppm)	Soil Description and Observations
	CL	30.8	0-5.0' Hand augered. CLAY (CL): dark brown (10YR 2/1), medium plasticity, stiff, moist.
			CLAY (CL): as above.
5	ML	21.5	SILT with clay (ML): brown (10YR 2/2), clay (15%), medium stiff, moist.
		33.8	
		29.0	SILT (ML): dark brown (10YR 2/2), clay (5%), soft, moist.
		31.4	
		13.1	SILT (ML): grayish brown (10YR 4/2), clay (10%), soft, dry to slightly moist.
10		12.8	SILT (ML): grayish brown (10YR 4/2), clay (10%), very soft, dry to slightly moist.
		18.8	SILT (ML): brown to light brown (10YR 4/3), clay (10%), trace sand, soft, moist.
		11.8	SILT (SM): grayish brown (10YR 4/3), very fine sand (10%), soft, moist.
	SM	20.9	SILT (SM): grayish brown (10YR 4/3), some orange staining, very fine sand (10%), soft, moist.
15		6.0	SAND with silt (SM): brown (10YR 3/6), fine to medium grained, silt (15%), loose, moist.
	CL	11.7	SILTY CLAY with sand (CL): grayish brown (10YR 4/3), silt (40%), fine sand (15%), low plasticity, soft, moist.
	SM	2.5	SILT with sand (SM): grayish brown (10YR 4/3), sand (30%), fine to medium grained, soft, moist.
	CL	4.0	CLAY with silt (CL): orangish brown (10YR 4/6), silt (30%), high plasticity, soft, moist.
20		0.0	CLAY with silt (CL): orangish brown (10YR 4/6), silt (15%), high plasticity, soft, sticky, moist.
	SP	1.3	SAND (SP): grayish brown (10YR 4/3), clay nodules (<5%), fine to coarse grained, loose, moist to wet.
		0.5	
	SM	0.0	SILTY SAND (SM): grayish brown (10YR 4/3), loose, moist to wet.
	CL	0.0	CLAY with silt (CL): orangish brown (10YR 4/4), silt (20%), soft, moist, some organic material (black matter).
25		0.2	CLAY with sand and silt (CL): orangish brown (10YR 4/4), fine sand (25%), silt (20%), soft, moist, some organic material (black matter).
	SP	0.0	SAND (SP): grayish brown (10YR 4/3), fine to coarse grained, small gravel (0.25"), loose, wet.
	CL	0.0	CLAY with silt (CL): grayish brown (10YR 4/3), some orange mottling, silt (15%), high plasticity, soft, moist.
30			CLAY (CL): brown (10YR 5/3), small rounded gravel (10%), moderately stiff, moist.
			[WATER AT 28']
			[NO RECOVERY 28'-36']
35			SILT (ML): grayish brown (10YR 4/3), very soft, very wet.
	ML		CLAY with silt (CL): brown (10YR 5/3), silt (15%), small rounded gravels (10%), high plasticity, moderately stiff, wet.
	CL	0.0	SILT with fine sand (ML): grayish brown (10YR 4/3), small rounded gravels (10%), soft, wet.
	ML		SILT with gravel (ML): grayish brown (10YR 4/3), small rounded gravels (20%), soft, wet.
	SP	0.0	SAND with silt (SP): brown (10YR 5/3), fine to coarse grained, silt (15%), wet.

ERM
1777 Botelho Drive
Suite 260
Walnut Creek, California 94596
(925) 946-0455

BOREHOLE LOG

Project Number: 0099020.01
Project Name: Hookston Station
Location: Pleasant Hill
Contractor: Gregg
Drilling Method: Macrocore, Hollow Stem Auger
Logged By: K. Watson
Date(s): 07/17/09
Initial Water Level: 17.85'
X-Coordinate: NA
Y-Coordinate: NA

Total Depth: 46.00'
Completed Depth: 46.50'
Borehole Dia.: 8.00in

Blank Casing:				
type: Sch 40 PVC		dia: 2.00in	fm: 0.0'	to: 36.00'
type: PVC End Cap		dia: 2.00in	fm: 46.00'	to: 46.50'
Screens:				
type: Slotted	size: 0.010in	dia: 2.00in	fm: 36.00'	to: 46.00'
Annular Fill:				
type: Grout			fm: 0.50'	to: 33.00'
type: Bentonite			fm: 33.00'	to: 35.00'
type: #3 Sand Filter			fm: 35.00'	to: 46.50'

Depth (ft)	Graphic Log	USCS Code	Well Construction	Sample Recovery	Blow Count	PID (ppm)	Soil Description and Observations
		ML				0.0	SANDY SILT (ML): grayish brown (10YR 4/3), some small gravels, soft, wet.
							[NO RECOVERY 42'-44']
45		SP				0.0	SAND with gravel (SP): brown (10YR 3/3), coarse, rounded, loose, wet.
		ML				0.0	CLAYEY SILT (ML): light brown to brown (10YR 5/4), soft, wet.
							Total Depth - 46.5' bgs
50							
55							
60							
65							
70							
75							