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Alameda County
Environmental Health

Mr. Jerry Wickham
Hazardous Materials Specialist
Alameda County Health Care Services Agency
Environmental Health Services
Environmental Protection
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

RE: Eagle Gas Station
4301 San Leandro Street
Oakland, California 94601
LOP StID# 2118
Fuel Leak Case No. RO0000096
USTCF Claim No. 014551
Clearwater Group Project # ZP046D

Dear Mr. Wickham,

As the legally authorized representative of the above-referenced project location, I have reviewed the *2008 Soil and Groundwater Investigation Work Plan* prepared by my consultant of record, Clearwater Group. I declare, under penalty of perjury, that the information and/or recommendations contained in this report are true and correct to the best of my knowledge.

Sincerely,

Muhammad Jamil

Mr. Muhammad Jamil

Date: 7-7-08

CLEARWATER GROUP

Environmental Services

July 2, 2008

Mr. Jerry Wickham, PG, CEG, CHG
Hazardous Materials Specialist
Alameda County Health Care Services Agency
Environmental Health Services
Environmental Protection
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

RE: 2008 Soil and Groundwater Investigation Work Plan
Eagle Gas Station
4301 San Leandro
Oakland, California 94601
LOP StID# 2118
ACEH Case No. RO0000096
Clearwater Group Project # ZP046D

Dear Mr. Wickham:

Clearwater Group (Clearwater) is pleased to submit this *2008 Soil and Groundwater Investigation Work Plan*, Eagle Gas Station, 4301 San Leandro Street, Oakland, for your review. Due to data gaps in our understanding of the on-site and off-site occurrences of petroleum hydrocarbons in the soil and groundwater, Clearwater proposes the following activities:

- Conducting an off-site Gore-Sorber soil vapor survey
- Installing of five off-site wells and one on-site well
- Determining whether the 42nd Avenue (Highway 77) lowered freeway on-ramp leading to Highway 880 acts as a groundwater discharge area.
- Performing a high-vacuum dual phase extraction (HVDPE) pilot test. This in-situ technology shows promise for reducing the contamination at the site, while allowing the current business to operate with as little disruption as possible.

Please call me at (510) 307-9943, extension 237, if you have any questions or concerns.

Sincerely,
Clearwater Group

Robert L. Nelson

Robert L. Nelson, PG, CEG
Senior Geologist

Enclosure: *2008 Soil and Groundwater Investigation Work Plan*

cc: Ms. Farah Naz and
Mr. Muhammad Jamil
40092 Davis Street
Fremont, CA 94538

CLEARWATER
GROUP
Environmental Services

2008 SOIL AND GROUNDWATER INVESTIGATION WORK PLAN

Eagle Gas Station
4301 San Leandro Street
Oakland, California 94601

LOP StID# 2118
ACEH Case No. RO0000096
Clearwater Group Project # ZP046D

Prepared for:

Ms. Farah Naz and
Mr. Muhammad Jamil
40092 Davis Street
Fremont, CA 94538

Prepared by:

Clearwater Group
229 Tewksbury Avenue
Point Richmond, CA 94801

July 2, 2008

CLEARWATER
GROUP
Environmental Services

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1.0 INTRODUCTION

Clearwater Group (Clearwater) has been retained by Ms. Farah Naz and Mr. Muhammad Jamil, Underground Storage Tank Cleanup Fund claimants for the property at 4301 San Leandro Street, Oakland, California (site, aka Eagle Gas), to generate this *2008 Soil and Groundwater Investigation Work Plan* (Work Plan). This Work Plan describes proposed on-site and off-site investigative efforts to better define soil and groundwater contamination detected in previous site investigations, per regulatory request in the Alameda County Environmental Health Services, Environmental Protection (ACEH) letter dated January 10, 2008 (**Attachment A**).

This Work Plan also presents the results of recent field observations by Clearwater, which were undertaken to establish possible causes of anomalous groundwater flow directions and gradients. An off-site feature (the 42nd Avenue, below ground level, on-ramp leading to Interstate Highway 880) may act as a groundwater discharge area. A discussion of this feature is presented in Section 3.

2.0 BACKGROUND

2.1 Site Description

The site is located in the southern portion of the City of Oakland, Alameda County, California, approximately 1,100 feet northeast of Interstate Highway 880, at the southern corner of the intersection of San Leandro Street and High Street (Site Vicinity Map, **Figure 1**). The site is an active gasoline service station and is bordered by commercial properties to the southeast and southwest, by High Street to the northwest, and San Leandro Street to the northeast (**Figure 2**). The Site Plan, with on-site groundwater monitoring well locations, is presented in **Figure 3**.

2.2 Site Investigation History

On April 21 and 22, 1999, Artesian Environmental (now Clearwater) oversaw the removal of five underground storage tanks (USTs) consisting of two 6,000-gallon gasoline tanks, two 4,000-gallon diesel tanks, and one 300-gallon used-oil tank from the site. Strong petroleum odors were detected from soils near the former UST locations during the UST removals. Five soil samples were collected from the UST excavation for confirmation sampling. The results suggest that an unauthorized release of petroleum had occurred. The former UST excavation area is shown on **Figure 3**.

In a letter dated May 10, 1999, ACEH recommended that the soil be remediated by over-excavation and "as much groundwater as possible" be pumped from the excavation. Approximately 800 tons of petroleum-impacted soils were excavated and disposed of as Class II non-hazardous waste, and approximately 1,000 gallons of petroleum-impacted groundwater were pumped from the excavation and removed from the site. Groundwater did not recharge quickly after the initial pumping. Interlocking steel shoring was used to support the UST excavation. Over-excavation beyond this area was not economically feasible due to the nearby and adjacent (brick wall) buildings, which limited the amount of soil that could be safely excavated. Soil samples collected from the excavation walls and product-piping trenches indicated that residual concentrations of petroleum hydrocarbons and methyl tert-butyl ether (MTBE) remained.

On August 4 and 5, 1999, approximately 100 linear feet of subsurface product piping was removed. Vent piping from the area between the former USTs and the south corner of the on-site building was also removed. On August 5, 1999, six confirmation soil samples were collected along the piping trench from approximately 3 feet below ground surface (bgs). Laboratory analytical results indicated that hydrocarbon-related contamination existed along the piping trenches.

On September 26, 2000, three borings were drilled to approximately 25 feet bgs to collect soil samples. The three borings were converted into groundwater monitoring wells MW-1 through MW-3. Initial groundwater samples collected from these wells contained 83,000 to 250,000 micrograms per liter (μg/L) Total Petroleum Hydrocarbons as gasoline (TPH-g) and 33,000 to 400,000 μg/L MTBE.

On August 3, 2001, Clearwater submitted its *Groundwater Monitoring Report—Second Quarter 2001* and *Sensitive Receptor Survey and Work Plan for Continuing Investigation*. It was determined that there were no major ecological receptors, permanent surface waters, or domestic-use wells within a 2,000-foot radius of the site. The proposed scope of work included the installation of eight groundwater monitoring wells around the site. In response to Clearwater's work plan, the ACEH, in a letter dated October 18, 2001, recommended that the additional off-site wells not be installed for the time being. Instead, the ACEH requested that further characterization of subsurface soils and groundwater on the site be completed prior to the installation of any off-site wells. Quarterly monitoring was suspended after the Third Quarter 2001 event of August 3, 2001. Quarterly monitoring resumed in July 2003 (Third Quarter 2003) and has continued on a quarterly basis since then.

Clearwater submitted an *Interim Remedial Action Plan* (IRAP) on January 14, 2004. ACEH provided its review comments for the IRAP and the *First Quarter 2005 Groundwater Monitoring Report* in a letter dated May 26, 2005. Clearwater submitted its *Soil and Groundwater Investigation Work Plan* on August 10, 2005. In review letters dated September 21, 2005, and November 1, 2005, ACEH approved the implementation of a modified IRAP proposed in Clearwater's June 13, 2005, letter entitled *Recommendations for Interim Remedial Actions* and the August 10, 2005, *Soil and Groundwater Investigation Work Plan*. An evolution of designs culminated in a remediation compound design, which was proposed with combined granulated activated carbon (GAC) filtering of discharge groundwater and an in-situ enhanced bioremediation treatment system. A limited groundwater pump test in well MW-2 (November 2005) determined an extremely low recharge rate in the shallow zone, thus dictating a temporary shelving of the plan, permitted by the East Bay Municipal Utility District, to pump, treat, and dispose of extracted groundwater.

Between December 15 and 21, 2005, groundwater monitoring wells MW-4 through MW-8, MW-4D, MW-5D; interim remediation wells IS-1 through IS-6; and extraction wells EW-1 and EW-2 were installed. Groundwater monitoring wells MW-4, MW-6, MW-7, and MW-8 were screened in the "shallow-zone" between 10 to 25 feet bgs. Monitoring wells MW-4D and MW-5D were screened in the "deep-zone" between 35 to 45 feet bgs. "Shallow-zone" and "deep-zone" refer to apparent aquifer layers but do not imply separate, discontinuous, or confined aquifers.

Wells IS-1 through IS-6 were installed as remediation wells. Wells EW-1 and EW-2 were installed as groundwater extraction wells. All these wells were screened between 10 and 25 feet bgs, pending installation of the remediation compound. Deep-zone soil borings SB-4D through SB-8D were drilled to approximately 50 feet bgs to investigate the lithology and degree of contamination within the deep-zone.

2.3 2006 Soil and Groundwater Investigation Results

Clearwater presented the results of its May 30, 2006, *Soil and Groundwater Investigation Report* (2006 Report) to the ACEH staff. The 2006 Report indicated that:

- The site lithology is heterogeneous and is characterized by low permeability clays with occasional lenses of soil with relatively higher permeability.
- A clayey gravel layer, having a thickness of approximately 5 to 15 feet, exists in the shallow-zone under the site. This relatively more permeable layer is located between low permeability clays. Clayey sand is found in a limited area within clayey layers.
- Below the relatively more permeable clayey gravel layer is another clayey layer approximately 20 to 30 feet thick. Multiple sandy/silty lenses of limited thickness exist within this thick clayey layer and impose heterogeneities. Below this thick clayey layer is another sandy/silty layer. The thickness of this sandy/silty layer or lens has not been determined.
- Comparison of the groundwater elevations in shallow/deep well pairs MW-4/MW-4D and MW-5/MW-5D indicates that the groundwater elevations are higher in the shallow-zone wells relative to the deep-zone wells, by an average of approximately 7.5 feet, and that a downward vertical gradient between the shallow-zone and deep-zone groundwater zones exists.

- Shallow-zone groundwater with a principal flow in both the southwestern and northwestern directions was first identified during the First Quarter 2006 groundwater monitoring event following installation of additional groundwater monitoring wells.
- In the deep-zone, only two of the borings were found to be impacted by petroleum hydrocarbons; samples from soil boring SB-6D contained TPH-g and Total Petroleum Hydrocarbons as Diesel (TPH-d) at concentrations above the method detection limits; samples from soil boring SB-5D contained MTBE and tertiary butyl alcohol (TBA) at concentrations above the method detection limits.
- Based on the first quarter 2006 groundwater monitoring event, the ranges of MTBE and tertiary butyl alcohol (TBA) concentrations in the shallow-zone were 21,000 to 770,000 micrograms per liter (μg/L) and 24,000 to 210,000 μg/L, respectively. The source of the high MTBE and TBA concentrations is uncertain. Concentrations of the above-mentioned compounds in the deep-zone ranged from 8.1 to 440 μg/L for MTBE and less than the method reporting limit (MRL) of 5.0 μg/L to 5.5 μg/L for TBA. Concentrations of TPH-g, TPH-d, and benzene in the deep-zone were less than their associated MRLs of 90, 50, and 0.9 μg/L, respectively.
- As a result of the interference of high concentrations of MTBE and TBA, the concentrations of TPH-g and TPH-d, as determined by analyses of the First Quarter 2006 groundwater monitoring samples from the shallow-zone, had relatively high MRLs, at 150,000 μg/L and 8,000 μg/L, respectively.
- MTBE, TBA, and TPH-g have been identified as the constituents of concern (COCs) for the subject site. Although elevated hydrocarbon concentrations have been detected, the concentration of petroleum hydrocarbons is generally lower than the concentration of the oxygenates. The subsurface impact primarily exists in the shallow-zone (depth interval of 25 feet bgs or less). Although a downward hydraulic gradient has been identified, the observed impact in the deep-zone is relatively low.
- Since a clayey gravel layer (relatively more permeable than the surrounding clays) exists in the shallow-zone, and the shallow groundwater has been greatly impacted, the potential of

off-site migration of contaminated groundwater is high. Although a sandy/silty layer exists in the deep-zone, the deep-zone did not appear to have been significantly impacted.

2.4 2007 Soil and Groundwater Investigation

On December 5, 2007, Clearwater presented the results of its *2007 Soil and Groundwater Investigation Report* to the ACEH.

2.4.1 Scope of Investigation

The scope of the 2007 Soil and Groundwater Investigation included the following tasks:

- Inspection of the sewer lateral to identify any pipe leaks; testing of the water lines for any leaks.
- Installation of on-site groundwater monitoring wells MW-1D and MW-7D, with their screened intervals set within the "deep-zone," at 35–45 feet bgs.
- Driving of ten off-site soil borings in the adjacent streets (three on High Street and seven on San Leandro Street) and driving five off-site soil borings in adjacent properties. One of the borings was in an interior patio and was driven to 30 ft bgs. The remainder of the borings were to driven to at least 50 feet bgs. The borings were driven to collect grab groundwater samples to determine the vertical and lateral extent of contamination in the deep-zone, and to determine whether contamination originating from the site reached these locations (soil boring locations SB-9, SB-10A, and SB-10B, and SB-11 through SB-22, **Figure 2**).
- Driving of cone penetrometer test (CPT) borings at two locations to corroborate soil boring logs (SB-9 and SB-16).
- Collection of samples for a Persulfate Bench Test; this test was undertaken to determine whether the application of persulfate to remediate the soil and groundwater contamination is a viable remediation option.
- Construction and sampling of six shallow vapor wells (VP-1 through VP-6) with three discrete sampling depths (at 3, 6, and 9 feet bgs) in each of the six well locations (**Figure 3**).

2.4.2. <u>2007 Soil and Groundwater Investigation Findings</u>

- Historic determinations of the groundwater flow in the shallow-zone, since April 2006 when fifteen on-site wells were installed, have consistently indicated an apparent mounding of the groundwater surface, with steep gradients to the northwest, southwest, northeast, and southeast. The 2006 investigation determined that on-site leakage from the domestic water supply and sewer is contributing to the site groundwater and may provide enough water to maintain the groundwater mounding. Calculation of the site groundwater elevation contour pattern from measurements of the site's depth to groundwater on November 13, 2007, indicates that the pattern of mounded groundwater is still occurring.
- The water and sewer lateral lines were inspected on April 11, 2007, by Pipe Pros, Inc. of Concord, California. During the inspection no leak was detected in the water line. However, two leaks were detected in the sewer lateral line near well IS-1. Pipe Pros noted (1) a possible crack in the cast-iron sewer line lateral pipe at 32.4 feet (measured from the sewer clean-out within the site building toward the High Street lateral/main junction) and (2) an offset in the pipe at the transition from cast-iron to clay piping at 35.2 feet measured from the same clean-out. (Because the offset inlet pipe is higher than the downstream pipe, no blockage is occurring.) The results of the water and sewer line lateral sampling were originally reported in Clearwater's June 4, 2007, *Quarterly Groundwater Monitoring Report – First Quarter 2007*.
- In the deep-zone (Zone B) the groundwater elevation contours for the November 13, 2007, groundwater monitoring event indicate a partial, elongated groundwater depression, which appears to discharge due north, at a gradient of 0.075. The groundwater elevation contours for November 27, 2007, indicate a partial groundwater depression, which appears to discharge due north at a gradient of 0.067.
- The groundwater flow direction in the lower, deep-zone is separate from the groundwater flow direction in the shallow-zone, as evidenced by the differences in groundwater levels between pairs of nearby wells (MW1/MW-1D, MW-4/MW-4D, MW5/MW-5D, and MW7/MW-7D. The groundwater flow direction within the deep-zone is due north, on the basis of two determinations of groundwater elevations using wells MW-1D, MW-4D,

MW-5D, and MW-7D on November 13 and 27, 2007. There appears to be a downward gradient between the shallow-zone and the deep-zone, as determined by the difference in groundwater elevations in between the two zones. Downward transport of groundwater may be restricted by the clayey soil, which acts as an aquitard.

- Soil boring logs and lithologic cross sections of the site and nearby off-site areas indicated that the site lithology consists primarily of interbedded clayey sediments (lean clays to fat clays, and sandy clays) of low permeability, with thin interbeds of relatively more permeable clayey sands and clayey gravels, typical of alluvial deposits along the (San Francisco) bay margin.
- The groundwater within the deep-zone is relatively less contaminated than that within the shallow-zone, but the deep-zone groundwater is still contaminated with as much as 14,000 μg/L MTBE and 33,000 μg/L TBA (at boring SB-18 off site and southwest of the site at 40 feet bgs). An off-site concentration as high as 23,000 μg/L TPH-g occurs at a depth of 52 feet bgs in off-site soil boring SB-13, which, according to the gradient calculated for the deep-zone, is up-gradient of the site.
- The soil and grab groundwater analytical results indicate that the shallow-zone is highly contaminated on site and also off site to the south, southwest, and in the general direction of High Street.
- The off-site plume of contamination has yet to be defined in the horizontal direction to threshold MTBE Environmental Screening Limits. In addition, the extent of soil and groundwater contamination has yet to be defined to the non-detectable concentration in the vertical direction.
- Clearwater divided the site and vicinity lithology into two zones, which are drawn on the cross sections and identified as Zone A and Zone B. Zone A corresponds to the shallow-zone and Zone B corresponds to the deep-zone. Zone A is the zone extending from the ground surface to a depth of approximately 25 to 30 feet bgs. Zone A consists primarily of clays with discontinuous, or possibly meandering, layers of clayey gravel. Zone B is the zone extending from approximately 25 to 30 feet bgs to at least 58 feet bgs, the deepest depth explored. The lithology of Zone B is primarily sands (poorly graded sand, well graded sand,

silty sand) with thin interbeds of lean clay. The top of Zone B appears to be the hard layer where several of the Geoprobe® borings (SB-9, SB-10, and SB-12) met refusal.

- Representative soil samples were collected during the 2007 field investigation so that a persulfate bench test could be performed to determine the feasibility of using sodium persulfate to remediate clayey soils contaminated with petroleum hydrocarbons. The persulfate bench test was performed by Environmental Bio-Systems, Inc. (EBS), of Mill Valley, California, for Clearwater. EBS' January 25, 2008, report, *Bench Test Report, Sodium Persulfate with Three Activators, Eagle Gas, 4301 San Leandro Street, Oakland, California*, was presented to ACEH as a separate report. The EBS report indicated that chemical oxidation using sodium persulfate could be used effectively for source zone treatment at the site. However, a side effect of the use of sodium persulfate was a significant increase in the release of heavy metals into the groundwater, and the ramification of this result must be carefully evaluated before any in-situ treatment is considered.
- Based on groundwater elevation data from the quarterly groundwater monitoring events, all the shallow-zone wells are installed such that the depths of the top of their screened intervals (10 feet bgs; **Table 1**) are normally below the top of the site groundwater (**Table 2**). The high concentrations of MTBE in the shallow-zone groundwater (observed over seven years of monitoring) could correlate with an (as yet) unconfirmed presence of free product (i.e., MTBE) floating on the top of the groundwater. During the Fourth Quarter 2007 groundwater monitoring event on November 13, 2007, a slick substance was observed on the bailers used to purge groundwater from wells IS-5 and MW-8.
- The six onsite soil vapor wells (VP-1 through VP-6) were sampled. Each well had separate sample points at depths of 3, 6, and 9 feet bgs. A sample was not collected from well VP-1 at 9 feet, because this sample point was below the site groundwater. The 2007 Report presented soil vapor concentration contour maps for each depth interval (3, 6, and 9 feet bgs) for MTBE, TBA, benzene, and TPH-g. In general, the soil vapor contaminant concentration maps showed that the greatest concentrations occurred near the center of the site.

3.0 RECENT FIELD OBSERVATIONS BY CLEARWATER

Clearwater reviewed the site's historic groundwater elevation data. The groundwater elevation data from recent groundwater monitoring events have shown that the deep-zone groundwater appears to flow northward from the site. The shallow groundwater along the north corner of the site also flows north, at an unusually steep gradient (approximately 1.0). **Attachment B** presents shallow-zone and deep-zone groundwater elevation contour maps for November 13 and 27, 2007.

To identify groundwater discharge points or a discharge area, Clearwater recently searched the area to the north of the site. One block (approximately 460 feet) northwest of the site is the 42nd Avenue (also known as State Highway 77), below ground level, excavated on-ramp leading to Interstate Highway 880 (**Figure 4**). The 42nd Avenue on-ramp extends from Interstate Highway 880 approximately 1,800 feet to the north-east, beyond the site. Clearwater staff made field measurements and estimated that the road surface of the on-ramp is approximately 20 feet, or more, below the ground surface elevation of the site. This below ground structure is a likely groundwater discharge area. In April 2008, Clearwater staff observed water seepage in the on-ramp excavation sidewalls (both north and south sidewalls), along the bottom of the on-ramp, near where San Leandro Street crosses over the onramp. The water drained into catchment basins.

Clearwater has requested from the California Department of Transportation (Caltrans) as-built construction drawings of the on-ramp excavation, showing the finished grade elevations of the on-ramp and the locations, elevations, and piping diagrams of all sumps and drains. Caltrans indicated to Clearwater, by letter on May 2, 2008, that the as-built drawings would not be available until about June 2, 2008. As of July 2, 2008, Caltrans has not been able to locate the as-built drawings. When the drawings are located, at a later date, they will be presented in the next report.

4.0 2008 SOIL AND GROUNDWATER INVESTIGATION WORK PLAN

4.1 Purpose

As requested in the January 10, 2008 ACEH letter, the purpose of the 2008 Soil and Groundwater Investigation is to determine the extent of off-site petroleum hydrocarbon contamination originating from the site. The investigation will further evaluate the extent of groundwater contamination in the shallow- and deep-zones, determine groundwater flow directions and gradients, contaminant flow pathways, and routes of exposure in the shallow- and deep-zones. Data from the proposed investigation will be used to re-evaluate the current site conceptual model and determine if up-gradient and/or cross-gradient sources are contributing to the contaminant plume. A phased approach will be used in this investigation, in order to optimally place the groundwater monitoring well screen intervals in three-dimensional space. A "Gore-Sorber Survey" (W. L. Gore & Associates, Inc. of Elkton, Maryland) (Gore) soil vapor survey(s) will be used to optimize the horizontal location of the proposed groundwater monitoring wells. Before each well is installed, a pilot boring will be driven to optimize the vertical location of the well screen interval.

4.2 Preparatory Activities

4.2.1 Access Agreements

Before the offsite properties are entered, or work is performed on them, access agreements will be obtained from the property owners. The access agreements will indemnify Clearwater, its subcontractors, the City of Oakland, and ACEH.

4.2.2 Permitting

Encroachment and Excavation Permits

Any work within City of Oakland roads or right of ways will require an encroachment permit from the City of Oakland Department of Public Works, as well as an Excavation Permit from the City of Oakland Building Department.

Boring and Well Permitting

Groundwater monitoring well installation permits will be obtained from the Alameda County Public Works Agency (ACPWA). Well Completion Reports will be filed with the California Department of Water Resources following the installation of groundwater monitoring wells. The 30-inch deep borings for the Gore survey soil vapor modules do not require well or soil boring permits.

4.2.3 Traffic Control

The site is bordered along two property boundaries by busy city streets. The proposed offsite soil vapor probe and boring/well locations will be in or near active sidewalks or traffic lanes. Clearwater will submit a traffic control plan to the City of Oakland Department of Public Works prior to performing activities within the sidewalks or streets.

4.2.4 Underground Utility Clearance

Prior to any subsurface work, the proposed drilling locations will be marked with white paint, and Underground Service Alert (USA) will be notified to have those utility companies with underground utilities in the investigation area mark their utilities. Facility representatives of the offsite properties will be queried as to the location of their underground utilities. In addition, a private underground utility locating service will be contracted to locate and mark the underground utilities in the areas suspected of having underground utilities.

4.2.5 Health and Safety Plan

Prior to the start of field work the project Health and Safety Plan will be reviewed and updated to reflect changes to the scope of work.

4.3 Site Investigation

4.3.1 Passive Soil Vapor Survey Description

In order to determine the extent and distribution of petroleum hydrocarbon contamination in shallow soil and groundwater, Clearwater proposes to use a Gore-Sorber passive soil gas survey. The results from the survey will be used to assist in selecting the optimal locations of the groundwater monitoring wells. Details of the survey procedures and answers to frequently asked questions are provided in **Attachment C**.

Gore-Sorbers are soil vapor sampling modules, temporarily installed in shallow, hand-driven soil borings at a depth of approximately 30 inches. Organic vapors released from petroleum hydrocarbons (and additives such as MTBE) in the soil and groundwater are adsorbed into the modules during the recommended 10- to 14-day exposure period.

Soil Vapor Sample Module Location Rationale

Figure 5 shows the proposed location of the initial Gore-Sorber survey lines, with 70 offsite modules at approximate 24-foot spacing and 2 modules placed onsite. Also shown on **Figure 5** are 33 optional Gore-Sorber module locations, with modules also spaced at approximate 24-footspacing. A 24-foot spacing was selected as being approximately twice the average depth to groundwater, as specified in **Attachment C**. The module lines will be installed in orthogonal intersecting lines, so as to be able to create a two-dimensional color-contoured map of contaminant concentrations. The optional Gore-Sorber survey lines will be installed if the results from the initial survey do not provide sufficient data to adequately plot iso-concentration contour diagrams of the soil vapor concentrations.

The installation of nine modules along San Leandro Street and four modules along High Street, northwest of the site, are proposed to investigate whether the apparent northward flow of deep-zone groundwater is carrying dissolved petroleum hydrocarbons in this direction, possibly toward a groundwater discharge zone along the 42nd Avenue (State Highway 77) onramp.

Data from the line of twenty-one modules extending to the southwest of the site, along High Street, will be used to corroborate the extent of groundwater contamination previously identified in grab groundwater samples collected from previous borings SB-16, SB-18, and SB-19. The line of ten modules extending down the driveway at Creative Iron (along the railroad spur by the Vulcan Lofts property) will be used to corroborate the extent of groundwater contamination identified in previous borings SB-13 through SB-15. The four modules to be installed inside of

Costko Smog Check (immediately southeast of site, **Figure 2**) will be placed to determine potential sources of contaminated groundwater moving onto the site from the southeast. The line of twelve modules extending to the southeast along San Leandro Street will corroborate previous soil and grab groundwater sample results (soil boring SB-9 through SB-11 and SB-20 through SB-22) and investigate potential sources of contamination to the southeast of the site. Two additional modules will be placed onsite, in areas of known contamination, to help define the iso-concentration contouring.

Gore-Sorber Procedure

The modules will be placed no closer than 15 feet from existing groundwater monitoring wells which might act as conduits to the groundwater; however, the modules can be placed near utility trenches, according to Gore representatives. If necessary, the modules can be placed in holes cored through concrete slabs.

The modules will be removed from the boreholes after they have been emplaced for approximately 14 days. The emptied module boreholes will be filled with bentonite pellets and hydrated with clean water. The top of the borehole will be filled with soil or other material to match the existing ground surface.

Following module retrieval, the modules will be labeled, secured, and shipped to Gore under fully documented chain-of-custody procedures. The modules will be analyzed at Gore's analytical laboratory using modified versions of EPA Methods 8260 (volatile organics) and 8270 (semi-volatile organics). The analyses will include MTBE, TBA, TPH-g, benzene, and TPH-d.

The module locations will be mapped with a global positioning system (GPS) capable of sub-meter accuracy. Clearwater will provide Gore with a basemap of the module GPS-determined locations and geographic features such as the site boundaries, offsite buildings, and streets. Following module analyses, Gore will prepare a map with the analytical results plotted on the basemap and color-contoured to show the contaminant distribution relative to the site and geographic features. The module results will be presented in micrograms (µg), a unit of mass, which cannot be directly correlated to the soil or groundwater contaminant concentrations. Clearwater will request Gore to prepare color-contoured concentration maps of MTBE, TBA, TPH-g, benzene, and TPH-d. Clearwater's experience with Gore® Surveys on other projects is that, if necessary, Gore can merge the results from future, additional Gore® Surveys into a cumulative survey and plot the results of the cumulative survey. This process is often used to fill in data gaps and to further define contaminant flowpaths, hotspots, and source areas.

4.3.2 Gore-Sorber Module Security

Clearwater has experienced problems on other nearby project sites, where the modules were prematurely removed from the ground by unknown persons. This site and its surrounding area have a significant homeless and transient population. In order to secure the modules in place for the approximate 14-day exposure period, Clearwater will measure and map the module locations relative to fixed features (building corners, posts, rail lines, curbs, etc.). A flat steel washer, or disk, will be placed over the module's cork, several inches below the ground surface, within the module hole. The remainder of the hole will be filled with soil, or other material to match the ground surface, and carefully smoothed over to disguise the module location and prevent module tampering. The holes for the modules placed through concrete will be temporarily capped with an inch thick layer of thin-patch concrete. When the modules are ready to be retrieved their locations will be measured from the fixed features, and a metal detector will be used to locate the buried modules.

4.3.3 Groundwater Monitoring Well Locations

The locations of the additional groundwater monitoring wells will be determined based upon previous historic knowledge of the site and off site area, the results of the Gore® Sorber survey color-contoured contaminant iso-concentration maps, and the availability of safe sites accessible to a soil drilling/well installation rig and well sampling technicians. A map of the proposed groundwater monitoring well locations will be sent to ACEH staff for their concurrence prior to permitting and installing the wells.

4.3.4 Pilot Borings for Groundwater Monitoring Wells

Clearwater estimates that initially four offsite groundwater monitoring wells and one onsite groundwater monitoring well will need to be installed (two shallow-zone wells and three deep-zone wells). The number of wells could change following review of the Gore-Sorber Survey data. Before each well is installed, a direct-push pilot boring will be drilled to determine the optimum depth interval for the well screen. The drilling subcontractor will have a valid California C-57 license. The pilot borings will be logged for lithologic characterization by a California Professional Geologist. **Attachment D** presents Clearwater's Direct-Push Drilling Investigation Procedures. The pilot borings may also be logged using a cone penetrometer test (CPT) boring, in order to accurately locate the more permeable lithologic intervals within which to set the well screen interval. The CPT pilot boring may also be used to prepare a continuous record of the lithology in case of poor soil recovery over some depth intervals. Clearwater's experience with CPT at this site and nearby area is that a smaller (25 ton) CPT rig can not penetrate through the top of the lower Zone B and that a larger (40 ton or greater) CPT rig will be needed.

4.3.5 Groundwater Monitoring Well Installation

Clearwater will use a phased approach for installing the offsite groundwater monitoring wells. The currently known extent of the affected offsite area will eventually require the installation of more than the two off-site well pairs proposed for this phase of investigation. Analyses of the groundwater data (analytical results and groundwater flow direction and gradient) will determine where additional offsite wells will need to be installed.

One deep-zone well is proposed to be installed onsite, adjacent to existing shallow-zone well MW-3 (**Figure 6**). This well, to be named MW-3D, will be used to collect groundwater samples from the deep-zone. The 2007 Report indicated that the deep-zone groundwater flow under the site appears to discharge toward the north (**Attachment B**). This determination was based on groundwater elevation data from the four onsite deep-zone wells (MW-1D, MW-4D, MW-5D, and MW-7D). Water level data from new well MW-3D will help confirm and refine the groundwater flow direction and gradient in the deep-zone and provide a sample point from which to collect groundwater samples of deep-zone water exiting the site.

Proposed shallow/deep-zone well pairs MW-9/MW-9D and MW-10/MW-10D are located along High Street and the alleyway off High Street, respectively (**Figure 6**). At each of these locations, grab groundwater samples collected during the 2007 soil and groundwater investigation indicated high concentrations of petroleum hydrocarbons in both the shallow- and deep-zones. In addition, these well pairs will provide depth to groundwater data for the shallow- and deep-zones, useful in determining the groundwater flow direction and gradient when combined with data from the onsite wells.

The pilot borings for the wells will be over-drilled, at a later date, with a hollow-stem auger drill to install the wells. The well installation contractor will have a California C-57 license. The well screen interval will be based on the lithologic record and pilot boring logs. The screened intervals will extend across the zones of interest (permeable layer, layer of obvious contamination). However, the screen length will not exceed 20 feet.

The wells will be constructed with 2-inch diameter, Schedule 40 PVC well casings. The screen slots will be 0.010 inch in diameter, and #2/16 sand will be used for the filter packs. The filter pack will extend approximately 2 feet above the screened interval. After initially setting the filter pack, the well will be surged with a surge block for approximately 5 minutes to settle the filter pack; then the depth to the top of the filter pack will be checked, and additional sand will be added to raise the filter pack to the correct depth. A 2-foot thick, or greater, well seal consisting of bentonite pellets will be set above the filter pack. If the pellets are placed above the site's groundwater level, clean water will be added to hydrate the pellets. The pellets will be allowed to hydrate for at least 45 minutes before the well is grouted. Each well will be grouted using lean cement mixed with approximately 5% bentonite powder. Grout will be added to the borehole to bring the grout up to the bottom of the well box excavation prior to setting the well box. A steel well box will be set in concrete with its lid approximately one inch above the surrounding concrete, asphalt, or ground surface, to prevent rainwater or surface drainage from entering the well. The top of the well casing will be sealed with a locking watertight expansion plug and padlock. **Attachment D** presents Clearwater's Monitoring Well Installation and Development Procedures.

At well locations with multiple permeable lithologic layers separated by less permeable layers (aquitards), multiple wells may be set with separate filter pack intervals across the more permeable layers. If many separate, permeable layers are encountered, Clearwater will propose the use of Continuous Multi-Channel Tubing wells (www.solinst.com/prod/data/403.pdf) and will seek ACEH concurrence before installing them.

4.3.6 Well Development

The new groundwater monitoring wells will be developed 48 hours, or more, after their installation. The wells will be surged, bailed, and then pumped until the discharged water is clear and free of sediment. Approximately ten well volumes will be purged from each well. **Attachment D** presents Clearwater's well development protocol.

4.3.7 Well Location Survey

The new groundwater monitoring well locations will be surveyed by a California licensed surveyor, to a vertical accuracy of 1/100th foot. Several existing wells and site features with previously surveyed locations will be resurveyed to confirm the validity of the survey.

4.4 Investigation Derived Wastes

All investigation derived wastes will be temporarily stored onsite in labeled, Department of Transportation approved, 55-gallon drums, while the wastes are being characterized for disposal. After characterization, the wastes will be disposed of at an appropriate disposal facility.

4.5 Incorporation of New Wells into Quarterly Groundwater Monitoring Program

The new wells will be incorporated into the current quarterly groundwater monitoring program. The new wells will be sampled and analyzed for the same analytical suite as the other wells, except that during the initial quarterly monitoring of the new wells, the analytical suite will include ethylene dibromide (EDB), ethylene dichloride (EDC), methanol, and ethanol. If these contaminants of concern are detected, their analysis will be included in future quarterly groundwater monitoring events. At the direction of the ACEH (**Attachment A**), natural attenuation parameters have been removed from the groundwater sample analyses for all groundwater samples, and the field measurements of natural attenuation parameters will not be performed during the quarterly groundwater monitoring events.

4.6 Modifications to Existing Groundwater Monitoring Program

The following modifications to the quarterly groundwater monitoring program are proposed in order to conserve the available funds and streamline the investigative process.

- The number of onsite wells sampled per quarterly groundwater monitoring event will be decreased. Clearwater proposes eliminating the quarterly sampling of wells MW-6, IS-1, IS-2, IS-3, IS-6, and EW-1. All the groundwater monitoring wells, proposed to be installed under this Work Plan, will be sampled quarterly for a minimum of one year (4 quarters) to determine annual fluctuations in groundwater contaminant of concern concentrations.
- All the shallow- and deep-zone groundwater monitoring wells will be used to collect depth to groundwater measurements during each quarterly monitoring event, even though not all the wells will be sampled. The data will be used to calculate groundwater elevations and prepare separate groundwater elevation contour diagrams for the shallow and deep zones.
- The analyses of natural attenuation parameters will be discontinued at this time, as the current Site Conceptual Model indicates that the onsite groundwater is highly contaminated and that the offsite groundwater conditions have not been fully defined.

4.7 Proposed High Vacuum Dual Phase Extraction Test

Clearwater proposes conducting a High Vacuum Dual Phase Extraction (HVDPE) test on site, using a specially installed HVDPE extraction well and three HVDPE Radius of Influence (ROI) wells.

4.7.1 HVDPE Test Objectives

The objectives of the HVDPE test will be to;

- Determine the effectiveness of HVDPE in removing contaminant mass.
- Determine the effectiveness of HVDPE versus distance away from the HVDPE extraction test well (radius of influence).
- Determine changes in the mass removal rate over time using HVDPE.
- Determine the projected duration of the remediation using HVDPE.
- Determine the expected drawdown of the site groundwater elevations during HVDPE remediation.
- Determine the expected rate of groundwater recovery, in order to determine groundwater treatment and/or disposal requirements.

4.7.2 HVDPE Pilot Test Procedure

A portable high-vacuum soil vapor extraction (SVE) unit will be used to conduct an HVDPE pilot test. The vacuum will be applied to a specially installed HVDPE extraction well to draw soil vapor from the area surrounding the well screen into the well. To avoid up-coning of the groundwater (and create a cone-of depression) during the HVDPE pilot test, the stinger method will be used. In the stinger method, the vacuum is applied via a 1 or 2-inch diameter stinger tube inserted inside the test well casing. The stinger tube is used to remove both soil vapor and (slurp) groundwater from the area surrounding the test well screen. Using this method, an evaluation of both soil vapor flow rates and groundwater extraction rates can be obtained.

The SVE unit will consist of a trailer-mounted, thermal oxidizer and vacuum pump capable of generating a vacuum of up to 29 inches of mercury at a 450 cubic feet per minute (cfm) flow rate. The SVE unit will be powered by an electrical generator. The SVE unit's thermal oxidizer will be fueled by propane. The HVDPE test well will be connected to the SVE unit using flexible hosing.

4.7.3 Data Collection During HVDPE Tests

Magnehelic gauges fitted to each ROI well will measure the induced vacuum in the ROI well during the test. Air-flow within the extraction well will be measured with a portable anemometer hourly, or more frequently. Continuous photoionization detector (PID) readings of the extracted soil vapors will be collected throughout the test and recorded using the data-logging capability of the PID. Data collected during the HVDPE test will include well flow rates, applied well vacuums, petroleum hydrocarbon concentrations in extracted soil vapors, induced vacuum in the ROI test wells, and propane consumption rate.

Samples of the soil vapor extracted from the HVDPE well test will be collected for laboratory analysis before and after each test. The soil vapor samples will be collected using 1-liter SUMMA® canisters and submitted for analyses to a State of California certified laboratory. The soil vapor samples will be analyzed for TPH-g, MTBE, TBA, and BTEX by EPA Method TO-15.

4.7.4 Duration of HVDPE Tests

Multiple HVDPE tests will be run over 6 hour or greater intervals. If the planned 6 hour pilot test duration is not sufficient to create an effective cone of depression (depressed groundwater surface) around the HDVPE test well, the test duration will be extended. The number of test runs will be determined in the field in consultation with the HVDPE subcontractor. The entire test is expected to occur over five days. The pilot test should be planned for a period of seasonal low water level, thereby reducing the required amount of dewatering to expose the well screens.

4.7.5 Calculation of Mass of Petroleum Hydrocarbons Combusted During HVDPE Test

The SVE unit automatically adjusts the flow of propane to the SVE thermal oxidizer to keep the oxidizer operating at the proper temperature. The flow of propane to the oxidizer is adjusted according to the mass of petroleum hydrocarbons extracted, because combustion of the petroleum hydrocarbons adds thermal energy to the oxidizer (the mass of propane consumed is inversely proportional to the mass of extracted petroleum hydrocarbons combusted). The

HVDPE unit measures the mass of propane consumed over time to operate the SVE unit. The mass of petroleum hydrocarbons combusted is calculated from this data.

4.7.6 Installation of HVDPE Test Wells

Warren Chamberlain, P.E., of Menlo Park, California, evaluated the current configuration of the onsite wells (**Attachment E**). Warren Chamberlain is a consultant to Clearwater. Clearwater also engaged Remediation Services, International (RSI) of Ventura, California, a HVDPE subcontractor, to evaluate the onsite well configuration. RSI staff concurred with Warren Chamberlain that the screen intervals of the existing onsite groundwater monitoring wells were not optimum for conducting an HVDPE test and recommended that new dedicated HVDPE wells be constructed, with the well screens placed from 3.5 feet bgs to the base of the clayey gravel layer, so that non-saturated soil is exposed to create an effective soil vapor extraction pathway. The clayey gravel layer is believed to be of relatively greater permeability soil within the generally clayey shallow zone and may act as a reservoir of petroleum hydrocarbons and oxygenates.

The HVDPE test will be performed according to **Attachment E**, modified with the installation of four dedicated HVDPE wells. An effective radius of influence (ROI_{SVE}) is typically taken to be the radial distance at which an induced vacuum of 0.10 inch of water can be measured. To determine the ROI of the HVDPE test, one extraction well and three ROI wells are recommended. **Figure 7** shows a proposed HVDPE test well location, along with three HVDPE ROI test wells. The ROI wells are located at distances ranging from 7 feet to 15 feet from the HVDPE test well, in order to provide test results over different ROIs.

4.7.7 Construction of HVDPE Pilot Test Wells

The HVDPE extraction well will be a 4-inch diameter well, screened from 1 foot below the top of the clayey gravel layer to the base of the clayey gravel layer, from approximately 3.5 to 13 feet bgs (**Figure 8**). The borehole diameter will be 8 inches. The filter pack will consist of #2/16 sand and the well casing slot size will be 0.010 inch. The filter pack will extend from 3 feet to 13 feet bgs. A well seal of bentonite pellets will be set above the filter pack, from 1.5 foot to 3 feet bgs, and will be hydrated with clean water to form a seal. The well annulus above the well seal will be filled with lean cement grout. The top of the well will be set in a ground level, steel well vault set in concrete. A locking plug will seal the top of the well casing when the well is not in use.

The three ROI wells will be constructed as 2-inch diameter wells, screened from 1 foot below the top of the clayey gravel layer to the base of the clayey gravel layer. The borehole diameter will be 6 inches. The filter pack will consist of #2/16 sand and the slot size will be 0.010 inch. The filter pack will extend from 3 feet to the base of the clayey gravel layer. A well seal of bentonite pellets will be set above the filter pack, from 1.5 foot to 3 feet bgs, and hydrated with clean water to form a seal. The well annulus above the well seal will be filled with lean cement grout. The top of the well will be set in a ground level, steel well vault set in concrete. A locking plug will seal the top of the well casing when the well is not in use.

4.7.8 Potential Use of Existing Soil Vapor Monitoring Wells as Radius of Influence Monitoring Wells

Existing soil vapor monitoring well VP-6 and extraction well EW-2 (**Figure 3**) may serve as ROI wells for distances beyond 15 feet. Biocide treatment of these wells prior to the test has been recommended, to eliminate any biofouling, which may have occurred.

4.8 Geotechnical Analyses of Soil Samples

Warren Chamberlain recommended that sieve/hydrometer analysis be performed on representative soil samples collected during the installation of the HVDPE and groundwater monitoring wells to verify the interpretation of soil types and grain size ranges presented on previous soil borings (**Attachment E**). Therefore, Clearwater will submit approximately 4 samples of representative soil types encountered during the installation of the HVDPE test well and the additional groundwater monitoring wells to a geotechnical laboratory. The samples will be analyzed for grain size distribution by American Society for Testing and Materials (ASTM) Method D6913-04e1 Standard Test Method for Particle Size Distribution (Gradation) of Soils and ASTM Method D 4220-63 (2007) Standard Test Method for Particle-Size Analysis of Soils

(Hydrometer). Two of the soil samples will also be tested to determine their hydraulic conductivity by ASTM Method D5084-03 (Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Material Using a Flexible Wall Permeameter).

4.9 Determination if the 42nd Avenue On-Ramp Excavation is a Groundwater Discharge Area Affecting the Site and Nearby Area Groundwater

Section 3.0 discusses recent field observations by Clearwater staff. Clearwater will attempt to determine if the 42nd Avenue (State Highway 77) on-ramp excavation leading to Interstate Highway 880) (**Figure 4**) is a groundwater discharge area affecting the site and nearby area groundwater. The onramp is depressed relative to the surrounding area and has a drainage infrastructure below the roadbed, which is pumped dry by one or more pumps. **Figure 4** also shows the location of a Caltrans pump station. The final destination of the water discharged from the on-ramp is unknown. The on-ramp excavation will be investigated using the following techniques.

- Clearwater will persist in its attempts to locate Caltrans as-built diagrams of the on-ramp construction, in order to construct a cross section view showing the site, surrounding area, and onramp. If the as-built diagrams cannot be located in a reasonable amount of time, Clearwater will physically measure the cross-sectional dimensions of the on-ramp and survey the elevation difference between the site and the on-ramp to determine their difference in elevation.
- The proposed Gore-Sorber soil vapor survey includes lines of survey modules located between the site and the on-ramp excavation. Contouring of the contaminants of concern iso-concentrations from the Gore-Sorber survey may identify whether a contaminant plume extends toward the on-ramp excavation.
- New on-site, deep-zone groundwater monitoring well MW-3D (**Figure 6**) will add a fifth groundwater elevation data point for refining the flow direction and gradient determination of the deep-zone groundwater. The current groundwater flow direction for the deep-zone aquifer is toward the north.

- Groundwater sample analytical results from the deep-zone wells will be plotted and contoured to determine if a plume of contaminated groundwater extends toward the on-ramp.
- Clearwater will incorporate groundwater elevation data from nearby sites, if available, to construct groundwater elevation contour maps incorporating the area from approximately 500 feet southeast of the site to the on-ramp area. Based on environmental database site locator reports in Clearwater's possession, Clearwater is aware of one site (former Clorox property) which has active groundwater monitoring wells. The benchmarks used for each site will be surveyed, so that all of the top of groundwater monitoring well casing elevations may be referenced to the same benchmark. Clearwater will review ACEH files for sites located near the site and the on-ramp excavation.
- If the above data indicates that the on-ramp excavation is a potential groundwater discharge area affecting the site and nearby area, Clearwater will propose to collect a sample of the water observed flowing through the on-ramp excavation's south sidewall. The sample will be analyzed for TPH-d, TPH-g, BTEX, and TBA, to determine whether the water's chemistry is similar to the site's groundwater.

4.10 Sewer and Water Line Leaks at the Site

In a letter dated January 4, 2007, ACEH staff concurred with Clearwater's recommendation to find and repair suspected leaks from the onsite water line and the sewer system. Clearwater investigated the suspected leaks in 2007 and presented the results in its June 4, 2007, *Quarterly Groundwater Monitoring Report – First Quarter 2007*. In the report Clearwater stated that no leak had been detected in the water line, but two leaks had been detected in the sewer line near well IS-1. Clearwater is discussing the repair of the sewer line with the site owner and has met with a sewer repair subcontractor to acquire bids for the repair, either a replacement of the leaking sections of the line or an in place sleeving of the line. Following resolution of this issue, Clearwater will notify ACEH of the repair decision in a separate report.

5.0 REPORTING

The *2008 Soil and Groundwater Investigation Report* (2008 Report) will present data on the extent of onsite and offsite occurrence of the contaminants of concern, lithology and groundwater hydrology, groundwater parameters, recommendations for site-specific, efficient, remedial techniques, and a Conceptual Model for the Site and Affected Area.

The 2008 Report will include soil boring and well installation diagrams, cross section views incorporating the onsite and offsite areas, tables of soil and grab groundwater sample results, tables of Gore-Sorber results, color-contoured plots of Gore-Sorber results for TPH-g, BTEX, MTBE, and TBA, groundwater elevation contour diagrams incorporating data from newly installed wells, and a copy of the surveyor's report of the well locations.

The report will include a cross section view showing the site and the 42nd Avenue underpass excavation infrastructure, and will present findings as to whether the underpass excavation serves as a ground water discharge area for contaminated groundwater originating at the site.

While more information about the source and transport of the contaminant will be produced from the next investigation effort, Clearwater does not anticipate that this study will completely define the horizontal and vertical extent of contamination off site; and it may not adequately define the onsite area well enough to proceed with onsite remediation.

6.0 LICENSED PROFESSIONALS

In-house licensed professionals direct all projects. These professionals, including geologists, engineers, and environmental managers, shall be guided by the highest standards of ethics, honesty, integrity, fairness, personal honor, and professional conduct. To the fullest extent possible, the licensed professional shall protect the public health and welfare and property in carrying out professional duties. In the course of normal business, recommendations by the in-house professional may include the use of equipment, services, or products in which the Company has an interest. Therefore, the Company is making full disclosure of potential or perceived conflicts of interest to all parties.

CLEARWATER GROUP
Environmental Services

7.0 CERTIFICATION

This report was prepared under the supervision of a State of California licensed Professional Geologist at Clearwater. All statements, conclusions, and recommendations are based solely upon published results from previous consultants, field observations by Clearwater, and laboratory analysis performed by California Department of Health Services-certified laboratories related to the work performed by Clearwater. Information and interpretation presented herein are for the sole use of the client and regulating agency. A third party should not rely upon the information and interpretation contained in this document. The service performed by Clearwater has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions in the area of the site. No other warranty, expressed or implied, is made.

Sincerely,
Clearwater Group

REGISTERED GEOLOGIST
ROBERT L. NELSON
No. 2087
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Robert L. Nelson, PG #6270, CEG #2087
Senior Geologist

PROFESSIONAL GEOLOGIST
JAMES ALAN JACOBS
NO. 88
CERTIFIED HYDROGEOLOGIST
STATE OF CALIFORNIA

James A. Jacobs, PG #4815, CHG #88
Chief Hydrogeologist

CLEARWATER GROUP
Environmental Services

FIGURES:

Figure 1:	Site Vicinity Map
Figure 2:	Site and Previously Driven Offsite Soil Boring Locations
Figure 3:	Site Plan
Figure 4:	Site and 42nd Avenue Underpass Leading to Highway 880.
Figure 5:	Proposed Gore-Sorber® Locations
Figure 6:	Proposed Groundwater Monitoring Well Locations
Figure 7:	Proposed HVDPE Test Well Locations
Figure 8:	Proposed HVDPE Extraction Well

TABLES:

Table 1:	Well Construction Data
Table 2:	Historic Groundwater Elevation Data

ATTACHMENTS:

Attachment A:	Regulatory Correspondence (letter from Alameda County Environmental Health Services Division, January 10, 2008)
Attachment B:	Groundwater Elevation Contour Maps, November 13 and 27, 2007
Attachment C:	Passive Gore-Sorber® Soil Gas Survey Procedures
Attachment D:	Clearwater Group Protocols: Direct-Push Drilling Investigation Procedures Field Procedure for Soil Borehole Drilling and Groundwater Monitoring Well Installation and Development
Attachment E:	Site Date (sic) Review and Design of HVDPE Pilot Test Plan, June 18, 2007

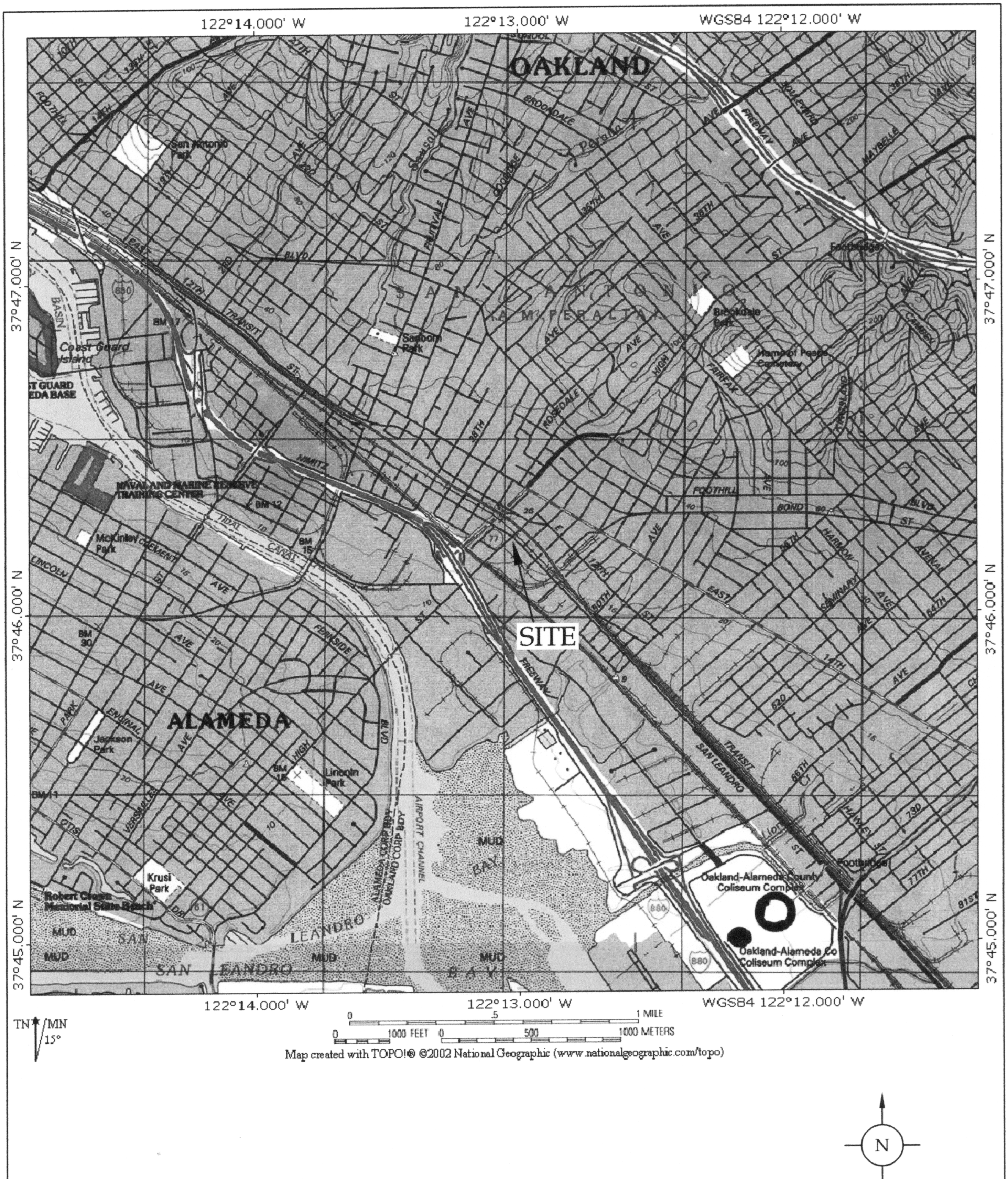
REFERENCES:

Clearwater Group, May 30, 2006, *Soil and Groundwater Investigation Report, Eagle Gas, 4301 San Leandro Street, Oakland, California*

Clearwater Group, December 5, 2007, *Soil and Groundwater Investigation Report, Eagle Gas, 4301 San Leandro Street, Oakland, California*

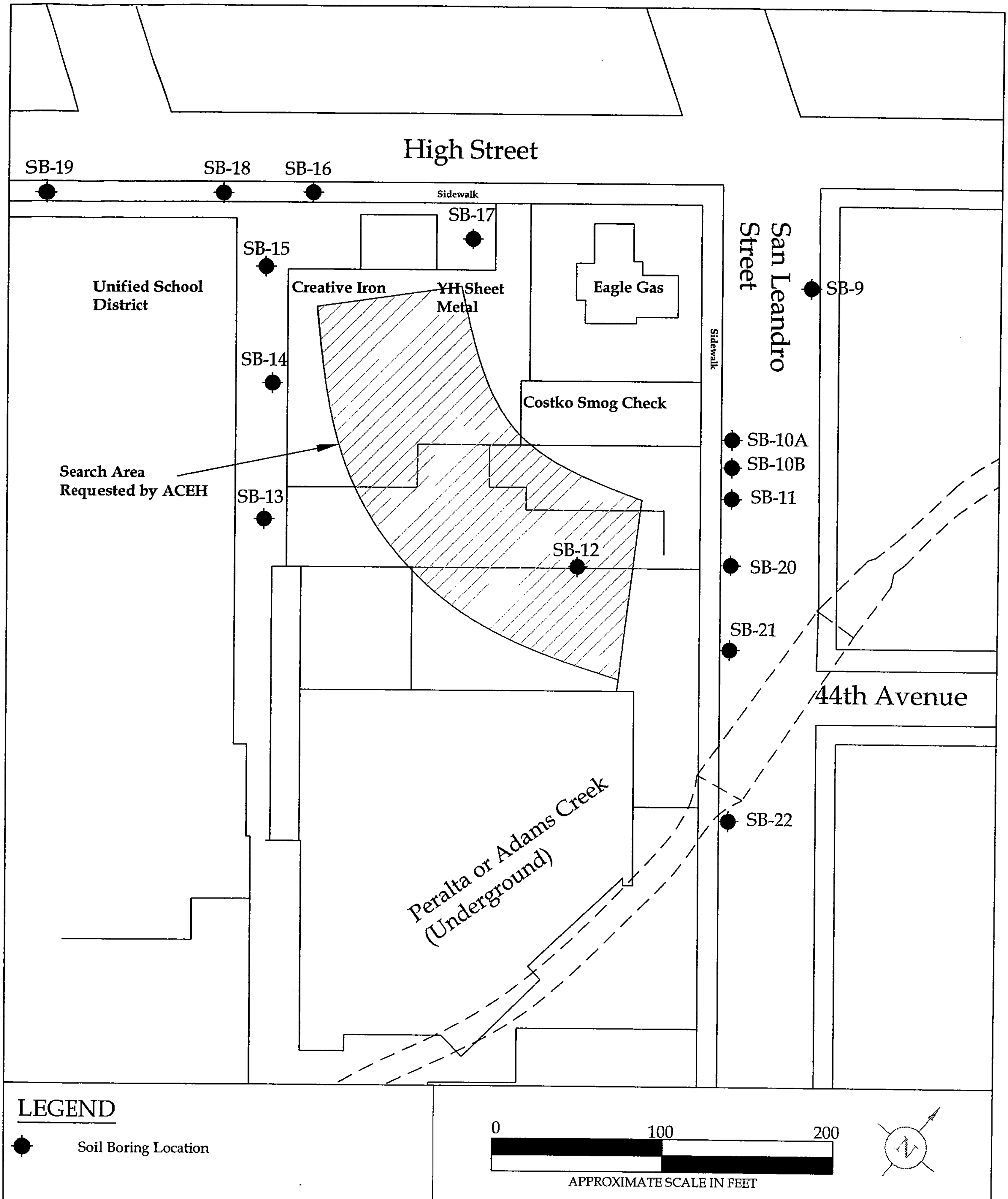
Clearwater Group, June 4, 2007, *Quarterly Groundwater Monitoring Report – First Quarter 2007, Eagle Gas, 4301 San Leandro Street, Oakland, California*

FIGURES



SITE VICINITY MAP
Eagle Gas
4301 San Leandro Street
Oakland, California

CLEARWATER GROUP		
Project No. **ZP046**	Figure Date **1/08**	Figure **1**



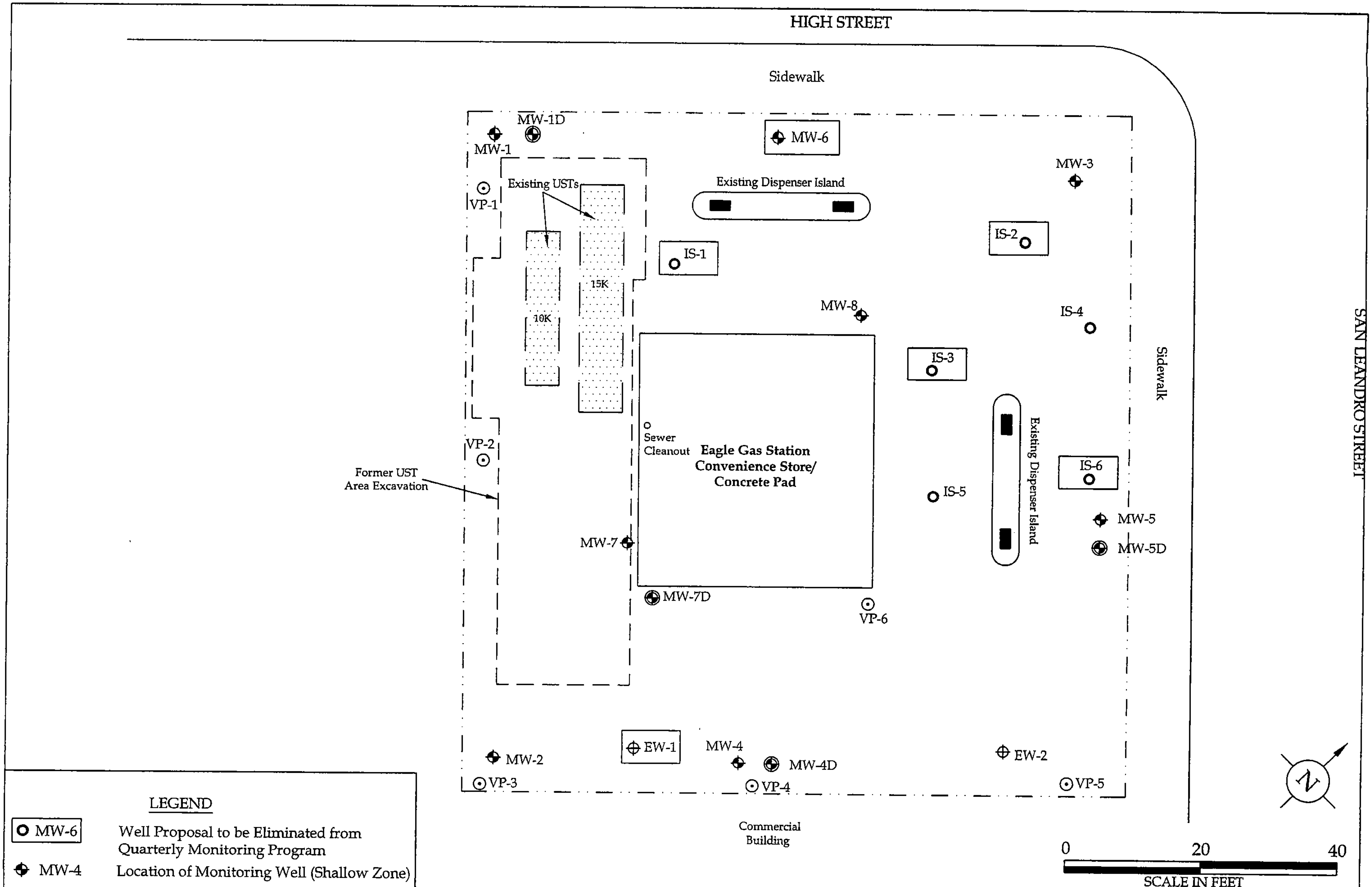
Site and Previously Driven Offsite Soil Boring Locations

Eagle Gas
4301 San Leandro Street
Oakland, California

CLEARWATER GROUP

Project No.	Figure Date	Figure
ZP046D	**3/08**	**2**

\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\2008 Work Plan\Graphics\Fig 2 Site and Previously Driven Off-site Soil Boring Location



LEGEND

MW-6	Well Proposal to be Eliminated from Quarterly Monitoring Program
MW-4	Location of Monitoring Well (Shallow Zone)
EW-1	Location of Extraction Well
IS-1	Location of iSOC Well
MW-1D	Location of Monitoring Well (Deep Zone)
VP-1	Soil Vapor Well Location
— · · —	Property Line

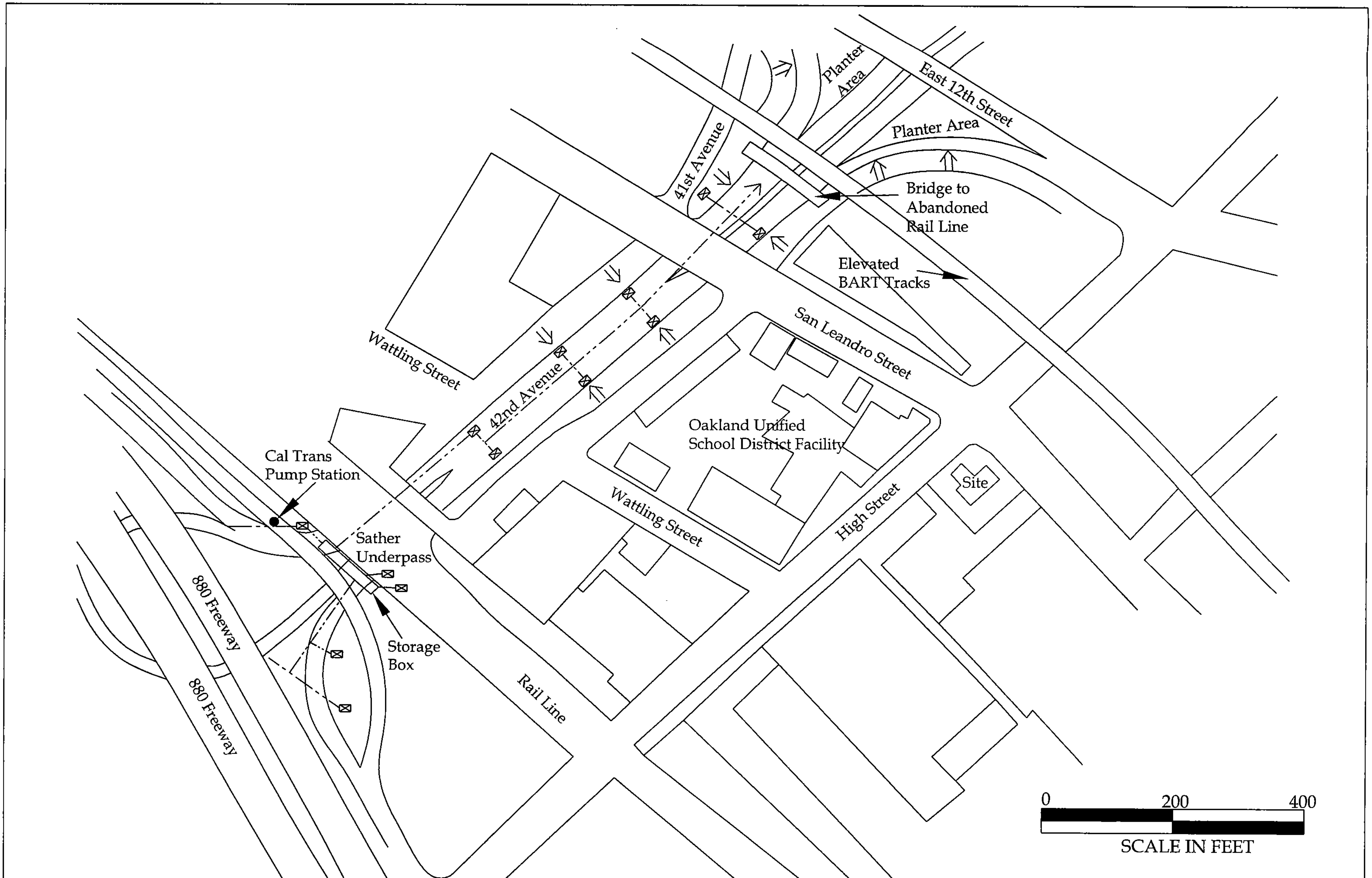
Site Plan

Eagle Gas
4301 San Leandro Street
Oakland, California

CLEARWATER GROUP

Project No.	Figure Date	Figure
ZP046D	**4/08**	**3**

\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\2008 Work Plan\Graphics\Fig 3 Site Plan



Legend

- Downslope Direction on Bank of Underpass
- Storm sewer drain
- Drain Trenches

Site and 42nd Street Underpass Leading to Highway 880

Eagle Gas
4301 San Leandro Street
Oakland, California

CLEARWATER GROUP

Project No.	Figure Date	Figure
ZP046D	**6/08**	**4**

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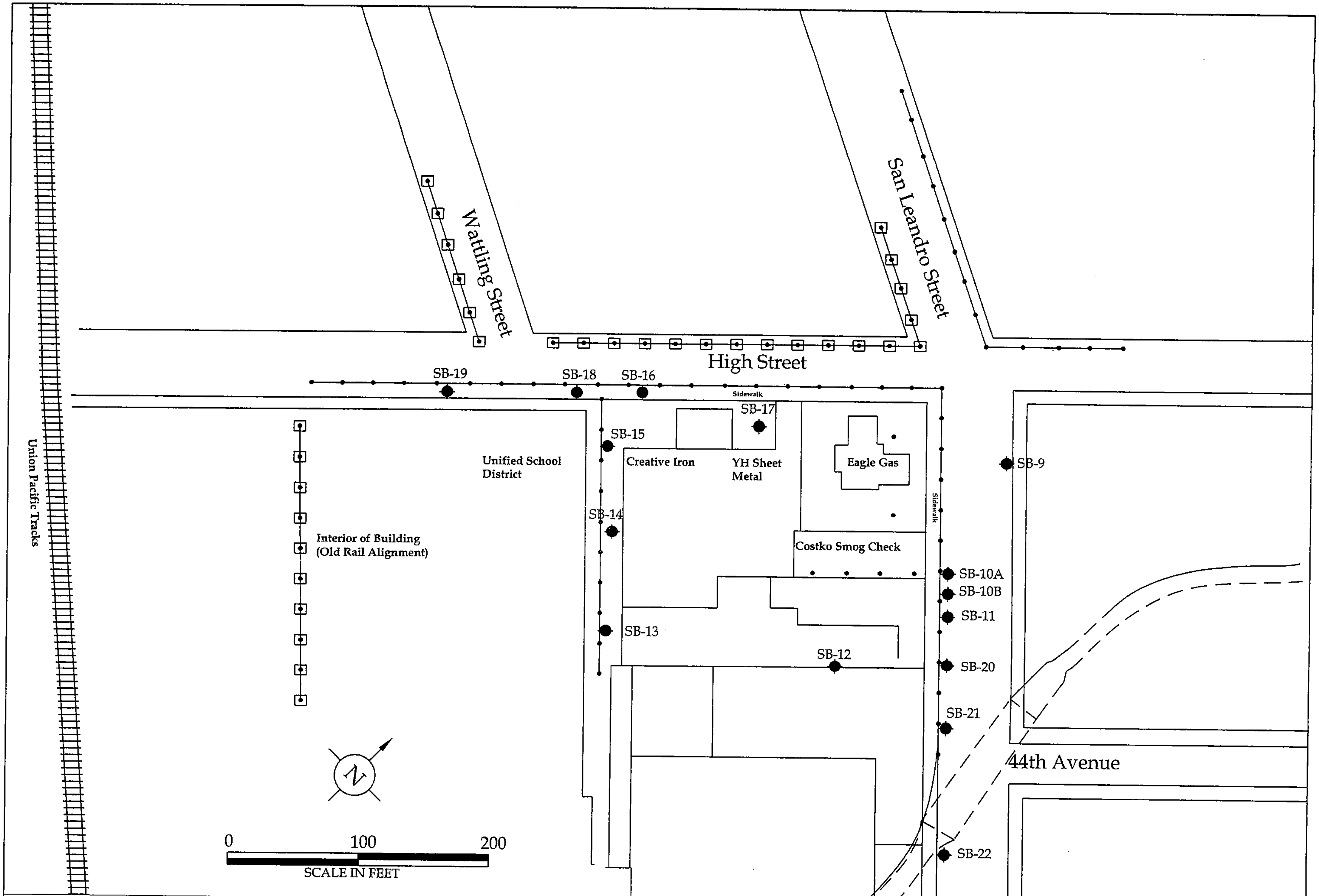


LEGEND

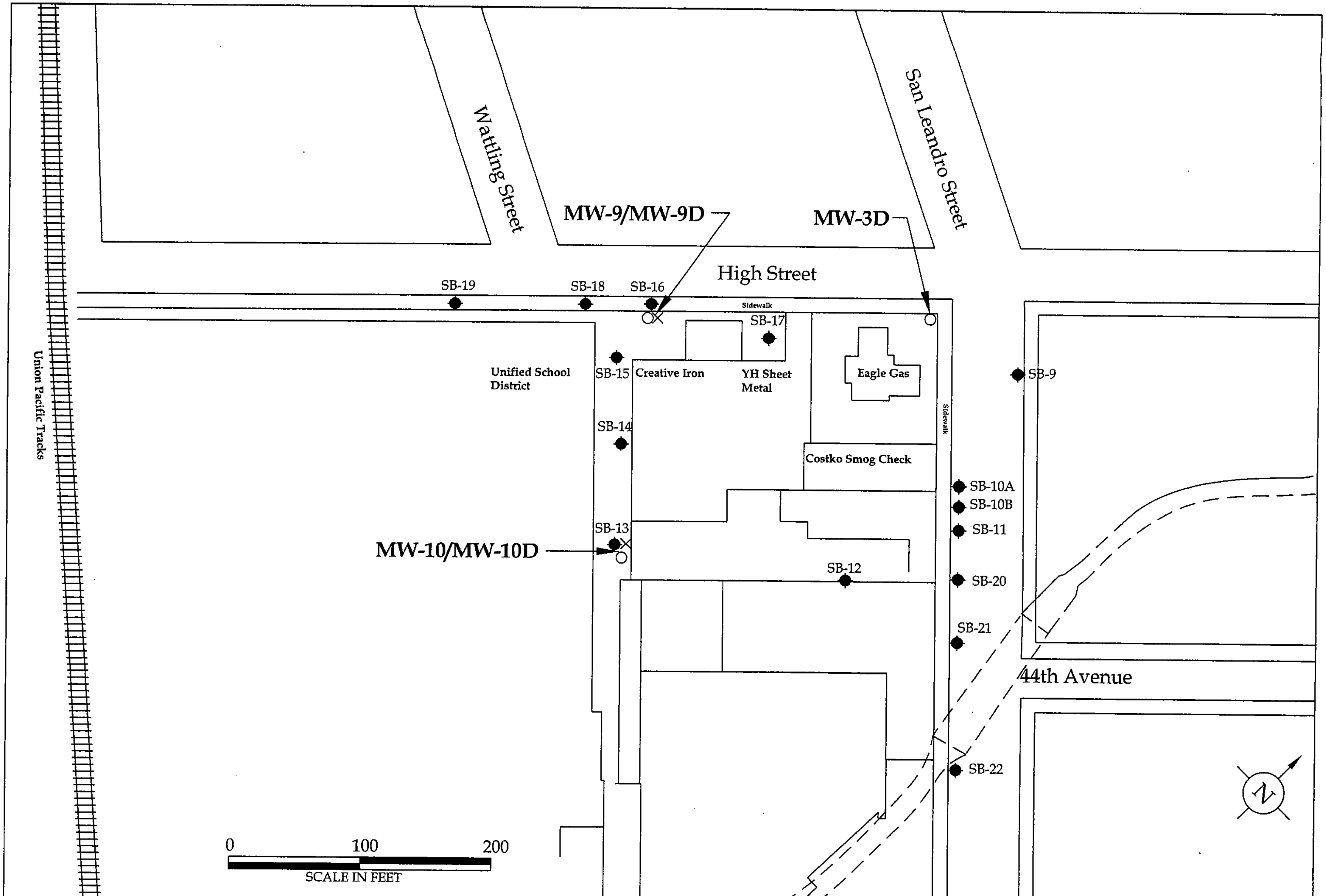
- Soil Boring Location
- Initial Gore-Sorber Survey "Line" with Modules at approximate 24' spacing
- Optional Gore-Sorber Survey "Line" with Modules at approximate 24' spacing

Proposed Gore-Sorber Locations
Eagle Gas
4301 San Leandro Street
Oakland, California

CLEARWATER GROUP

Project No.	Figure Date	Figure
ZP046D	6/08	5

\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\2008 Work Plan\Graphics\Fig 5 Proposed Gore-Sorber Locations



LEGEND

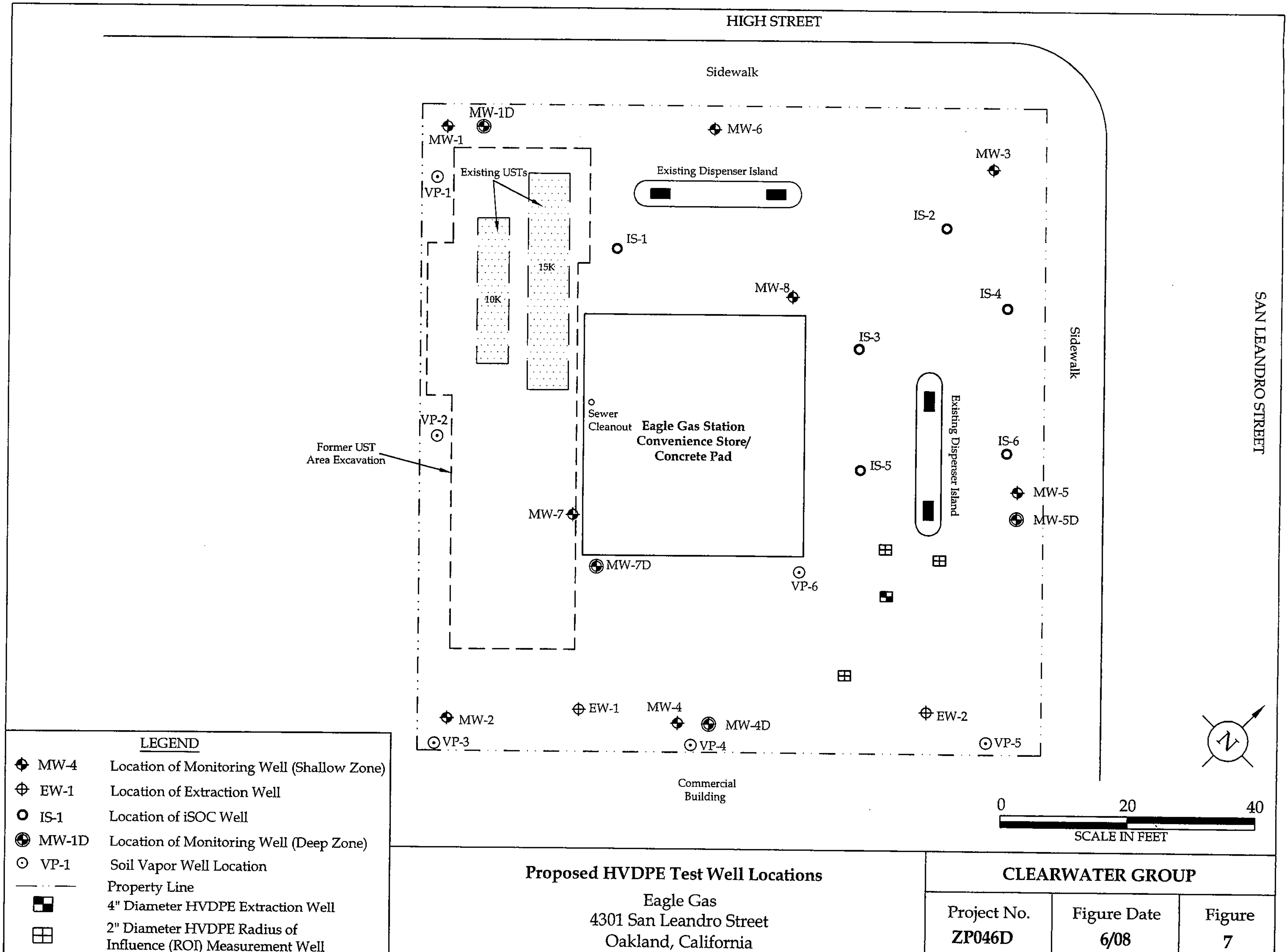
- X Proposed Shallow (Zone A) Groundwater Monitoring Well Location
- O Proposed Deep (Zones B) Groundwater Monitoring Well
- ● 2007 Soil Boring Location

Proposed Groundwater Monitoring Well Locations
Eagle Gas
4301 San Leandro Street
Oakland, California

CLEARWATER GROUP

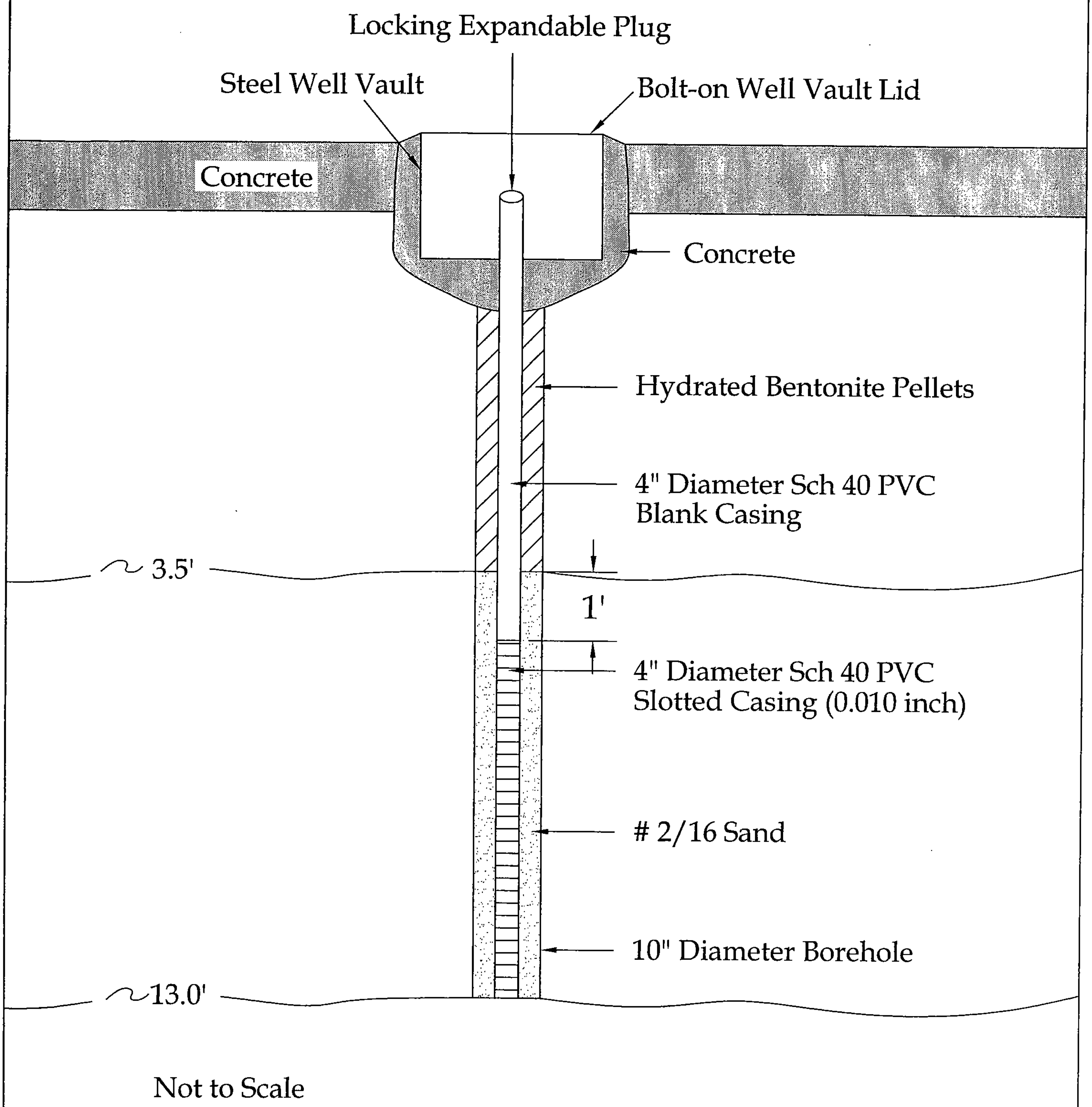
Project No.	Figure Date	Figure
ZP046D	**6/08**	**6**

\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\2008 Work Plan\Graphics\Fig 6 Proposed Groundwater Monitoring Well Locations



Proposed HVDPE Test Well Locations Eagle Gas 4301 San Leandro Street Oakland, California	**CLEARWATER GROUP**		
	Project No. **ZP046D**	Figure Date **6/08**	Figure **7**

\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\2008 Work Plan\Graphics\Fig 7 Proposed HVDPE Test Well Locations



Proposed HVDPE Test Extraction Well Eagle Gas 4301 San Leandro Street Oakland, California	**CLEARWATER GROUP**		
	Project No. **ZP046D**	Figure Date **6/08**	Figure **8**

\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\CAD\Remedial Investigation Report\2007 Soil and Groundwater investigation report\Figure\Fig 8 Proposed Soil Vapor Well Design for HVDPE Test

TABLES

TABLE 1
WELL CONSTRUCTION DATA
Eagle Gas
4301 San Leandro Street
Oakland, California
Clearwater Group Project No. ZP046

Well I.D.	Date Installed	Installed by	Borehole Diameter (inches)	Casing Diameter (inches)	Depth of Borehole (feet bgs)	Cement (feet bgs)	Bentonite Seal (feet bgs)	Filter Pack (feet bgs)	Filter Pack Material	Screened Interval (feet bgs)	Slot Size (inches)
MW-1	9/26/2000	Western Hazmat	8	2	25	0-5	5-7	7-25	#2/12 sand	10-25	0.01
MW-1D	10/4/2007	Gregg Drilling	8	2	45	0-31	31-33	33-45	#2/12 sand	35-45	0.01
MW-2	9/26/2000	Western Hazmat	8	2	25	0-5	5-7	7-25	#2/12 sand	10-25	0.01
MW-3	9/26/2000	Western Hazmat	8	2	25	0-5	5-7	7-25	#2/12 sand	10-25	0.01
MW-4	12/19/2005	HEW Drilling	8	2	25	0-5	5-8	8-25	#3 sand	10-25	0.02
MW-4D	12/19/2005	HEW Drilling	8	2	45	0-30	30-33	33-45	#3 sand	35-45	0.02
MW-5	12/15/2005	HEW Drilling	8	2	25	0-5	5-8	8-25	#3 sand	10-25	0.02
MW-5D	12/15/2005	HEW Drilling	8	2	45	0-30	30-33	33-45	#3 sand	35-45	0.02
MW-6	12/20/2005	HEW Drilling	8	2	25	0-5	5-8	8-25	#3 sand	10-25	0.02
MW-7	12/19/2005	HEW Drilling	8	2	25	0-5	5-8	8-25	#3 sand	10-25	0.02
MW-7D	10/4/2007	Gregg Drilling	8	2	45	0-31	31-33	33-45	#2/12 sand	35-45	0.01
MW-8	12/21/2005	HEW Drilling	8	2	25	0-5	5-8	8-25	#3 sand	10-25	0.02
IS-1	12/20/2005	HEW Drilling	8	2	25	0-3	3-6	6-25	#3 sand	10-25	0.02
IS-2	12/20/2005	HEW Drilling	8	2	25	0-3	3-6	6-25	#3 sand	10-25	0.02
IS-3	12/21/2005	HEW Drilling	8	2	25	0-3	3-6	6-25	#3 sand	10-25	0.02
IS-4	12/20/2005	HEW Drilling	8	2	25	0-3	3-6	6-25	#3 sand	10-25	0.02
IS-5	12/21/2005	HEW Drilling	8	2	25	0-3	3-6	6-25	#3 sand	10-25	0.02
IS-6	12/20/2005	HEW Drilling	8	2	25	0-3	3-6	6-25	#3 sand	10-25	0.02
EW-1	12/16/2005	HEW Drilling	8	4	25	0-3	3-6	6-25	#3 sand	10-25	0.02
EW-2	12/16/2005	HEW Drilling	8	4	25	0-3	3-6	6-25	#3 sand	10-25	0.02

Note: All depths and intervals are below ground surface (bgs)

TABLE 2
GROUNDWATER ELEVATIONS
Eagle Gas
4301 San Leandro Street
Oakland, California

Well Name	Measurement Date	TOC in feet AMSL	DTW in feet BTOC	GWE in feet AMSL
MW-1	10/3/2000	18.37	8.96	9.41
	10/27/2000	18.37	7.27	11.10
	1/26/2001	18.37	7.60	10.77
	5/8/2001	18.37	7.50	10.87
	8/3/2001	18.37	7.09	11.28
	7/1/2003	18.37	7.59	10.78
	10/1/2003	18.37	8.36	10.01
	2/13/2004	18.37	8.80	9.57
	5/17/2004	18.37	10.92	7.45
	8/6/2004	18.37	7.76	10.61
	11/12/2004	18.37	9.25	9.12
	2/15/2005	18.37	10.12	8.25
	5/9/2005	18.37	9.58	8.79
	8/8/2005**	20.08	10.09	9.99
	11/16/2005	20.08	9.81	10.27
	2/22/2006	20.08	9.58	10.50
	5/16/2006	20.08	6.89	13.19
	8/23/2006	20.08	9.21	10.87
	11/13/2006	20.08	8.55	11.53
	2/13/2007	20.08	7.11	12.97
	5/15/2007	20.08	6.63	13.45
	8/15/2007	20.08	9.61	10.47
	11/13/2007	20.08	13.63	6.45
	2/19/2008	20.08	6.13	13.95
MW-1D	11/13/2007	19.98	15.61	4.37
	11/27/2007	19.98	15.52	4.46
	2/19/2008	19.98	13.81	6.17
MW-2	10/3/2000	20.28	20.26	0.02
	10/27/2000	20.28	13.88	6.40
	1/26/2001	20.28	12.10	8.18
	5/8/2001	20.28	12.05	8.23

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GROUNDWATER ELEVATIONS
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MW-2 Continued	8/3/2001	20.28	13.30	6.98
	7/1/2003	20.28	14.98	5.30
	10/1/2003	20.28	15.99	4.29
	2/13/2004	20.28	13.88	6.40
	5/17/2004	20.38	14.68	5.70
	8/6/2004	20.38	15.36	5.02
	11/12/2004	20.38	15.49	4.89
	2/15/2005	20.38	14.16	6.22
	5/9/2005	20.38	13.62	6.76
	8/8/2005**	22.05	13.36	8.69
	11/16/2005	22.05	14.51	7.54
	2/22/2006	22.05	12.69	9.36
	5/16/2006	22.05	12.01	10.04
	8/23/2006	21.98	11.33	10.65
	11/13/2006	21.98	13.64	8.34
	2/13/2007	21.98	12.78	9.20
	5/16/2007	21.98	13.17	8.81
	8/16/2007	21.98	13.48	8.50
	11/16/2007	21.98	14.11	7.87
	2/19/2008	21.98	14.02	7.96
MW-3	10/3/2000	18.98	NA	NA
	10/27/2000	18.98	18.75	0.23
	1/26/2001	18.98	13.38	5.60
	5/8/2001	18.98	11.82	7.16
	8/3/2001	18.98	13.44	5.54
	7/1/2003	18.98	12.67	6.31
	10/1/2003	18.98	14.04	4.94
	2/13/2004	18.98	12.20	6.78
	5/17/2004	18.98	11.87	7.11
	8/6/2004	18.98	13.07	5.91
	11/12/2004	18.98	12.83	6.15

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Well Name	Measurement Date	TOC in feet AMSL	DTW in feet BTOC	GWE in feet AMSL
MW-3 Continued	2/15/2005	18.98	11.95	7.03
	5/9/2005	18.98	10.51	8.47
	8/8/2005**	20.73	10.98	9.75
	11/16/2005	20.73	12.89	7.84
	2/22/2006	20.73	10.31	10.42
	5/16/2006	20.73	9.03	11.70
	8/23/2006	20.68	10.81	9.87
	11/13/2006	20.68	12.29	8.39
	2/13/2007	20.68	11.23	9.45
	5/15/2007	20.68	10.39	10.29
	8/15/2007	20.68	11.81	8.87
	11/14/2007	20.68	12.26	8.42
	2/19/2008	20.68	10.72	9.96
MW-4	2/22/2006	21.63	7.87	13.76
	5/16/2006	21.63	8.04	13.59
	8/23/2006	21.53	9.77	11.76
	11/13/2006	21.53	8.78	12.75
	2/13/2007	21.53	7.56	13.97
	5/16/2007	21.53	7.97	13.56
	8/16/2007	21.53	9.03	12.50
	11/16/2007	21.53	8.52	13.01
	2/19/2008	21.53	7.51	14.02
MW-4D	2/21/2006	21.54	15.58	5.96
	5/16/2006	21.54	13.23	8.31
	8/23/2006	21.44	15.33	6.11
	11/13/2006	21.44	16.23	5.21
	2/13/2007	21.44	15.73	5.71
	5/15/2007	21.44	15.38	6.06
	8/15/2007	21.44	16.42	5.02
	11/13/2007	21.44	17.21	4.23
	11/27/2007	21.44	15.85	5.59

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GROUNDWATER ELEVATIONS
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Well Name	Measurement Date	TOC in feet AMSL	DTW in feet BTOC	GWE in feet AMSL
MW-4 Continued	2/29/2008	21.44	15.41	6.03
MW-5	2/21/2006	20.48	6.63	13.85
	5/16/2006	20.48	6.62	13.86
	8/23/2006	20.41	7.62	12.79
	11/13/2006	20.41	7.31	13.10
	2/13/2007	20.41	6.54	13.87
	5/16/2007	20.41	6.79	13.62
	8/16/2007	20.41	7.99	12.42
	11/16/2007	20.41	7.51	12.90
	2/19/2008	20.41	8.41	12.00
MW-5D	2/21/2006	20.32	13.68	6.64
	5/16/2006	20.32	12.72	7.60
	8/23/2006	20.22	14.48	5.74
	11/13/2006	20.22	14.98	5.24
	2/13/2007	20.22	14.48	5.74
	5/15/2007	20.22	14.13	6.09
	8/15/2007	20.22	15.21	5.01
	11/13/2007	20.22	15.94	4.28
	11/27/2007	20.22	15.85	4.37
	2/19/2008	20.22	14.17	6.05
MW-6	2/22/2006	20.45	9.88	10.57
	5/16/2006	20.45	9.35	11.10
	8/23/2006	20.47	10.48	9.99
	11/13/2006	20.47	10.86	9.61
	2/13/2007	20.47	10.31	10.16
	5/15/2007	20.47	10.35	10.12
	8/15/2007	20.47	10.74	9.73
	11/14/2007	20.47	10.91	9.56
	2/19/2008	20.47	9.82	10.65
MW-7	2/22/2006	21.13	11.72	9.41
	5/16/2006	21.13	8.72	12.41

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Well Name	Measurement Date	TOC in feet AMSL	DTW in feet BTOC	GWE in feet AMSL
MW-7 Continued	8/23/2006	21.14	11.34	9.80
	11/13/2006	21.14	12.53	8.61
	2/13/2007	21.14	11.83	9.31
	5/15/2007	21.14	10.99	10.15
	8/15/2007	21.14	12.41	8.73
	11/14/2007	21.14	13.41	7.73
	2/19/2008	21.14	9.51	11.63
MW-7D	11/13/2007	21.36	19.21	2.15
	11/27/2007	21.36	17.02	4.34
	2/19/2008	21.36	15.78	5.58
MW-8	2/22/2006	21.03	7.28	13.75
	5/16/2006	21.03	7.48	13.55
	8/23/2006	20.95	8.19	12.76
	11/13/2006	20.95	8.15	12.80
	2/13/2007	20.95	6.58	14.37
	5/16/2007	20.95	7.24	13.71
	8/16/2007	20.95	8.61	12.34
	11/16/2007	20.95	8.21	12.74
	2/19/2008	20.95	7.01	13.94
IS-1	2/22/2006	20.57	6.91	13.66
	5/16/2006	20.57	7.01	13.56
	8/23/2006	20.58	7.82	12.76
	11/13/2006	20.58	8.21	12.37
	2/13/2007	20.58	6.14	14.44
	5/15/2007	20.58	7.04	13.54
	8/15/2007	20.58	8.06	12.52
	11/13/2007	20.58	7.61	12.97
	2/19/2008	20.58	6.42	14.16
IS-2	2/22/2006	20.87	6.92	13.95
	5/16/2006	20.87	6.99	13.88
	8/23/2006	20.78	7.91	12.87

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Well Name	Measurement Date	TOC in feet AMSL	DTW in feet BTOC	GWE in feet AMSL
IS-2 Continued	11/13/2006	20.78	8.23	12.55
	2/13/2007	20.78	6.76	14.02
	5/15/2007	20.78	6.87	13.91
	8/15/2007	20.78	8.08	12.70
	11/14/2007	20.78	7.69	13.09
	2/19/2008	20.78	6.63	14.15
IS-3	2/22/2006	20.99	7.32	13.67
	5/16/2006	20.99	7.86	13.13
	8/23/2006	20.87	8.19	12.68
	11/13/2006	20.87	8.03	12.84
	2/13/2007	20.87	7.03	13.84
	5/16/2007	20.87	7.17	13.70
	8/15/2007	20.87	8.43	12.44
	11/14/2007	20.87	7.93	12.94
	2/19/2008	20.87	6.01	14.86
IS-4	2/22/2006	20.79	6.95	13.84
	5/16/2006	20.79	7.17	13.62
	8/23/2006	20.68	7.83	12.85
	11/13/2006	20.68	8.46	12.22
	2/13/2007	20.68	9.02	11.66
	5/15/2007	20.68	6.99	13.69
	8/15/2007	20.68	8.05	12.63
	11/14/2007	20.68	6.38	14.30
	2/19/2008	20.68	6.11	14.57
IS-5	2/22/2006	21.02	7.17	13.85
	5/16/2006	21.02	6.81	14.21
	8/23/2006	20.91	8.12	12.79
	11/13/2006	20.91	8.41	12.50
	2/13/2007	20.91	6.78	14.13
	5/16/2007	20.91	7.15	13.76
	8/15/2007	20.91	8.32	12.59

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Well Name	Measurement Date	TOC in feet AMSL	DTW in feet BTOC	GWE in feet AMSL
IS-5 Continued	11/16/2007	20.91	7.71	13.20
	2/19/2008	20.91	7.35	13.56
IS-6	2/22/2006	20.56	6.89	13.67
	5/16/2006	20.56	6.44	14.12
	8/23/2006	20.47	7.69	12.78
	11/13/2006	20.47	7.72	12.75
	2/13/2007	20.47	6.12	14.35
	5/16/2007	20.47	6.67	13.80
	8/15/2007	20.47	7.91	12.56
	11/14/2007	20.47	7.22	13.25
	2/19/2008	20.47	6.49	13.98
EW-1	2/22/2006	21.74	8.06	13.68
	5/16/2006	21.74	7.97	13.77
	8/23/2006	21.65	9.61	12.04
	11/13/2006	21.65	8.78	12.87
	2/13/2007	21.65	6.31	15.34
	5/16/2007	21.65	8.13	13.52
	8/16/2007	21.65	8.71	12.94
	11/16/2007	21.65	8.70	12.95
	2/19/2008	21.65	7.71	13.94
EW-2	2/22/2006	20.46	7.31	13.15
	5/16/2006	20.46	7.25	13.21
	8/23/2006	20.37	8.31	12.06
	11/13/2006	20.37	8.18	12.19
	2/13/2007	20.37	7.15	13.22
	5/16/2007	20.37	7.74	12.63
	8/16/2007	20.37	9.45	10.92
	11/16/2007	20.37	9.64	10.73
	2/19/2008	20.37	7.91	12.46

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GROUNDWATER ELEVATIONS
Eagle Gas
4301 San Leandro Street
Oakland, California

Well Name	Measurement Date	TOC in feet AMSL	DTW in feet BTOC	GWE in feet AMSL

Notes:

TOC	Top-of-well casing referenced to arbitrary datum prior to 3Q2005
DTW	Depth to water
AMSL	Above mean sea level
BTOC	Below top of casing
GWE	Groundwater elevation measured in feet above mean sea level
NA	Not Available
**	Wells re-surveyed on 3/28/2005.

ATTACHMENTS

ATTACHMENT A

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

January 10, 2008

Ms. Farah Naz c/o
Mr. Muhammad Jamil
40092 Davis Street
Fremont, CA 94538

Subject: Fuel Leak Case No. RO0000096 and Geotracker Global ID T0600143649, Eagle Gas, 4301 San Leandro Street, Oakland, CA

Dear Ms. Naz:

Alameda County Environmental Health (ACEH) staff has reviewed the fuel leak case file for the above-referenced site including the recently submitted document entitled, "2007 Soil and Groundwater Investigation Report," dated December 5, 2007. The 2007 Soil and Groundwater Investigation Report presents the results from both on-site and off-site soil borings and monitoring wells. Results from the off-site soil borings indicate that petroleum hydrocarbons and fuel oxygenates are present at elevated concentrations in soil, soil vapor, and groundwater on site. The extent of off-site contamination has not been determined but elevated concentrations of petroleum hydrocarbons and fuel oxygenates were detected south and southwest of the site at sampling locations as much as approximately 275 feet from the site. The 2007 Soil and Groundwater Investigation Report also includes recommendations for additional work.

We request that you address the following technical comments, perform the proposed work, and send us the reports described below.

TECHNICAL COMMENTS

1. **Proposed Passive Soil Vapor Sampling (Gore Sorber®) Survey.** We have no objection to using a passive soil vapor sampling survey to help locate future off-site soil borings and monitoring wells. We have no comments on the proposed sampling locations at this time. Please submit a Work Plan for the passive soil vapor sampling survey that describes the sampling and analytical parameters for the survey. Please present this information in the Work Plan requested below.

2. **Additional Soil Vapor Sampling and Wells.** Based on results from sampling of the shallow soil vapor probes, additional soil vapor sampling or installation of additional soil vapor probes is not requested at this time.

3. **Off-site and Deep Monitoring Wells.** We concur with the recommendation to install off-site groundwater monitoring wells following review of the passive soil vapor sampling results. Although the locations of the off-site wells may be adjusted based on the results of the passive soil vapor sampling survey, the proposed depths and construction details of the wells are to be presented in the Work Plan requested below.

4. **Groundwater Monitoring Program.** We have no objection to a proposal to conserve costs in the groundwater monitoring program. In order to conserve costs, please discontinue analyses for monitored natural attenuation parameters during quarterly sampling. In the Work Plan requested below, please submit a proposal for future groundwater monitoring.

5. **Dual-Phase Extraction Pilot Test.** We concur that the proposal to install one extraction well and three observation wells for the proposed dual-phase extraction (DPE) pilot test. The proposed extraction and observation well locations shown on Figure 37 of the 2007 Soil and Groundwater Investigation Report appear to be acceptable. However, it is not clear why the screen intervals for the wells are proposed as shallow as 3.5 feet bgs since the largest mass of contamination appears to be deeper than 3.5 feet bgs. Moving the top of the screen lower may focus the vapor extraction within more contaminated intervals and potentially prevent surface infiltration. Please provide further definition and rationale for the proposed construction of the DPE extraction and observation wells in the Work Plan requested below. Please also provide further details on the duration, operation, and monitoring of the proposed DPE pilot test in the Work Plan requested below.

6. **Sewer System Leaks.** As discussed in Appendix H of the 2007 Soil and Groundwater Investigation Report, two leaks were found in the sewer line from the station building. Please report on progress in repairing the leaks in the Work Plan requested below.

TECHNICAL REPORT REQUEST

Please submit technical reports to Alameda County Environmental Health (Attention: Jerry Wickham), according to the following schedule:

- **March 21, 2008** – Work Plan
- **45 days after the end of each quarter** – Quarterly Groundwater Monitoring Report

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

ELECTRONIC SUBMITTAL OF REPORTS

The Alameda County Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of all reports in electronic form to the county's ftp site. Paper copies of reports will no longer be accepted. The electronic copy replaces the paper copy and will be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program ftp site are provided on the attached "Electronic Report Upload (ftp) Instructions." Please do not submit reports as attachments to electronic mail.

Submission of reports to the Alameda County ftp site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) Geotracker website. Submission of reports to the Geotracker website does not fulfill the requirement to submit documents to the Alameda County ftp site. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitor wells, and other data to the Geotracker database over the Internet. Beginning July 1, 2005, electronic submittal of a complete copy of all necessary reports was required in Geotracker (in PDF format). Please visit the SWRCB website for more information on these requirements (http://www.swrcb.ca.gov/ust/cleanup/electronic_reporting).

PERJURY STATEMENT

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6735, 6835, and 7835.1) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately registered or certified professional. For your submittal to be considered a valid technical report, you are to present site specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this fuel leak case meet this requirement.

UNDERGROUND STORAGE TANK CLEANUP FUND

Please note that delays in investigation, later reports, or enforcement actions may result in your becoming ineligible to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse you for the cost of cleanup.

AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

If you have any questions, please call me at (510) 567-6791 or send me an electronic mail message at jerry.wickham@acgov.org.

Sincerely,

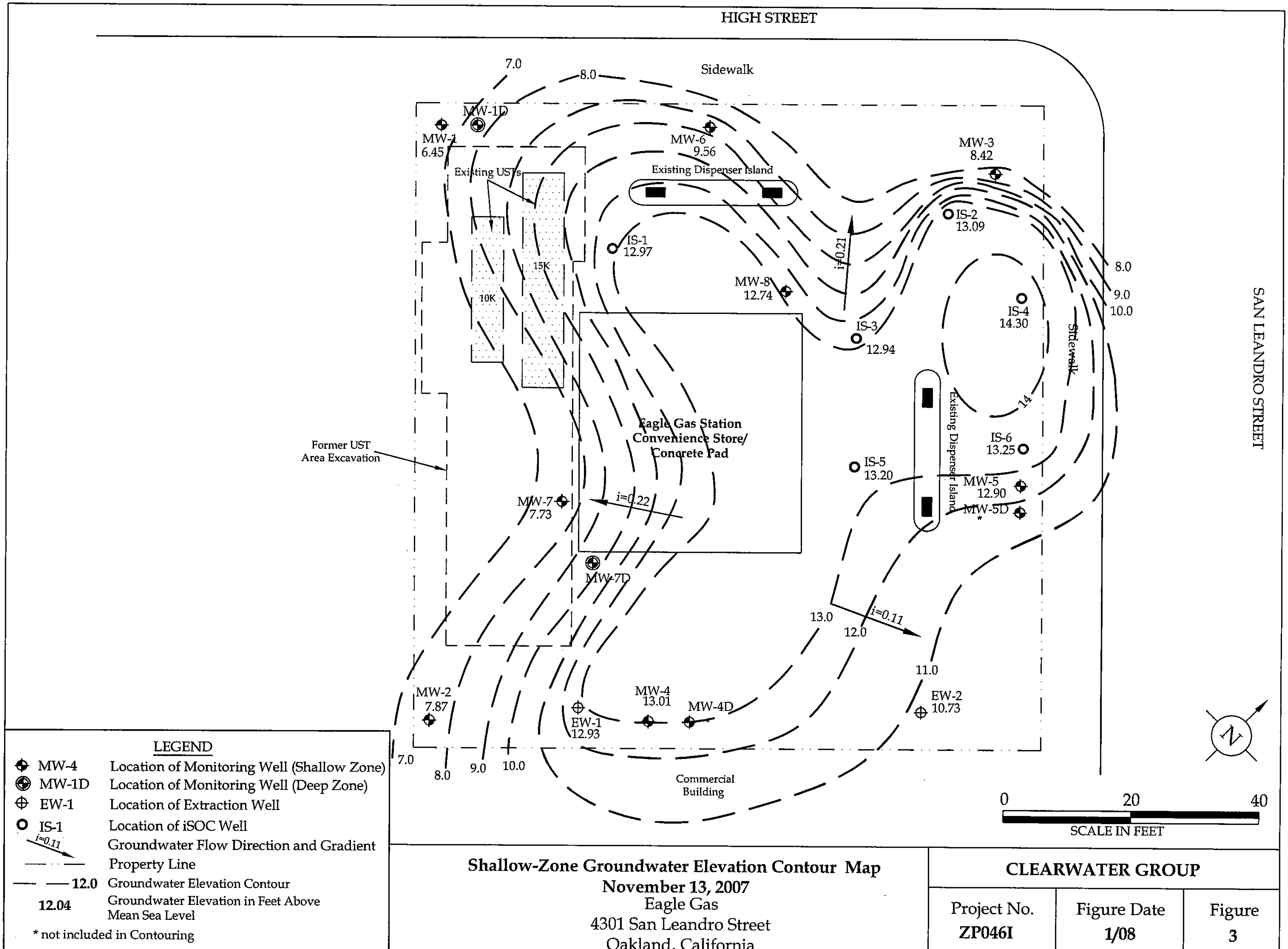
Jerry Wickham, California PG 3766, CEG 1177, and CHG 297
Hazardous Materials Specialist

Enclosure: ACEH Electronic Report Upload (ftp) Instructions

cc: Robert Nelson
Clearwater Group
229 Tewksbury Avenue
Point Richmond, CA 94801

Donna Drogos, ACEH
Jerry Wickham, ACEH
File

ATTACHMENT B

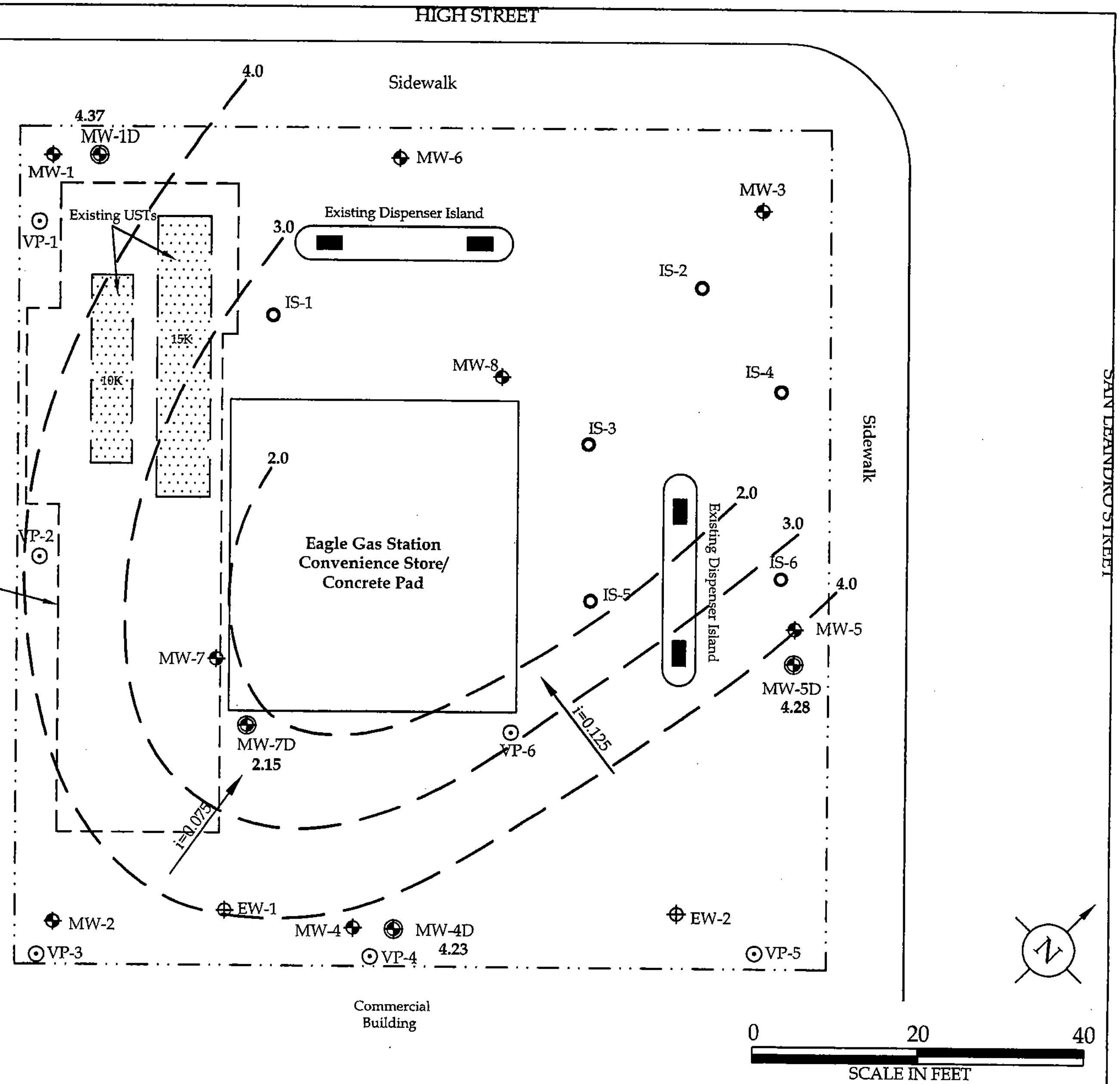


Shallow-Zone Groundwater Elevation Contour Map
November 13, 2007
Eagle Gas
4301 San Leandro Street
Oakland, California

CLEARWATER GROUP

Project No.	Figure Date	Figure
ZP046I	**1/08**	**3**

\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\Quarterly Reports\4Q07\Figures\Figure 3 Groundwater Contour Elevation Map



LEGEND

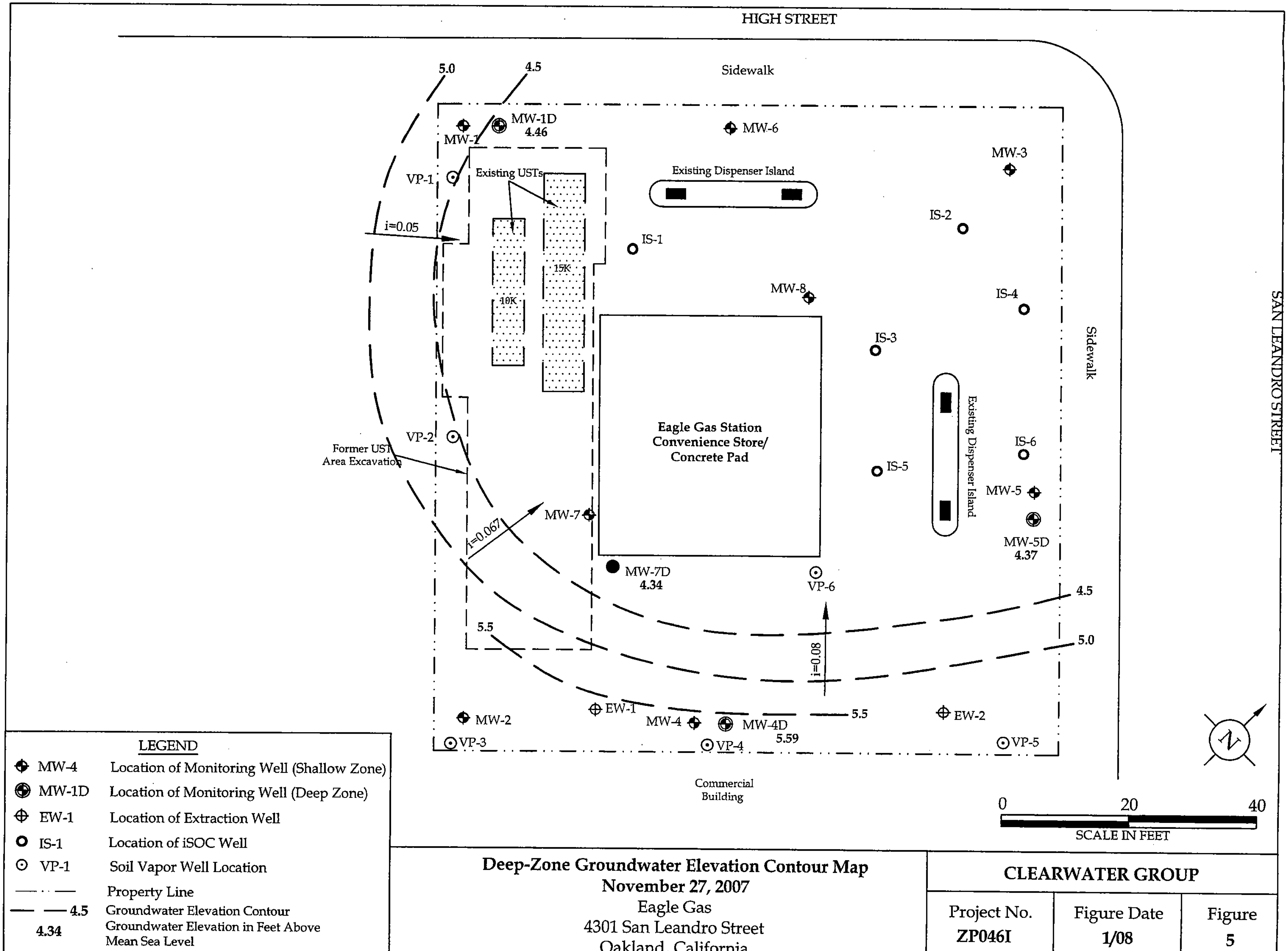
- MW-4 — Location of Monitoring Well (Shallow Zone)
- MW-1D — Location of Monitoring Well (Deep Zone)
- EW-1 — Location of Extraction Well
- IS-1 — Location of iSOC Well
- VP-1 — Soil Vapor Well Location
- Property Line
- 2.0 — Groundwater Elevation Contour
- 2.15 — Groundwater Elevation in Feet Above Mean Sea Level

Deep-Zone Groundwater Elevation Contour Map
November 13, 2007
Eagle Gas
4301 San Leandro Street
Oakland, California

CLEARWATER GROUP

Project No.	Figure Date	Figure
ZP046I	1/08	4

\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\Quarterly Reports\4Q07\Figures\Fig 4 Groundwater Elevation Contour



Deep-Zone Groundwater Elevation Contour Map November 27, 2007 Eagle Gas 4301 San Leandro Street Oakland, California	CLEARWATER GROUP		
	Project No. ZP046I	Figure Date 1/08	Figure 5

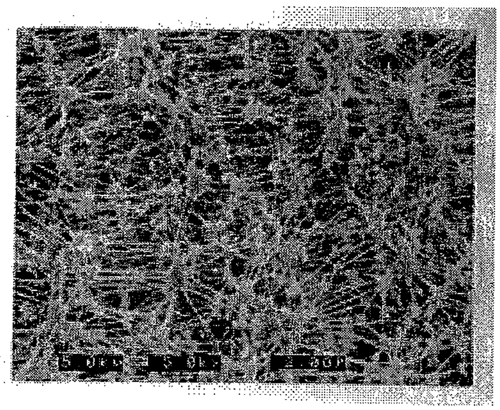
\\Tagi\Shares\Department\Jobs\ZP046 Eagle Gas\Quarterly Reports\4Q07\Figures\Fig 5 Groundwater Elevation Countour

ATTACHMENT C

STATEMENT OF PROCEDURES
Clearwater Group

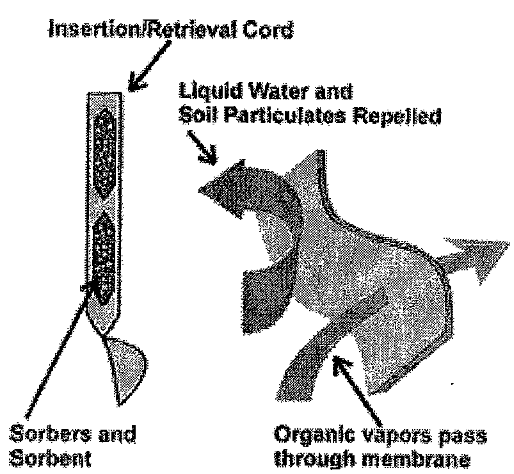
PASSIVE GORE-SORBER® SOIL GAS SURVEY

The GORE-SORBER® Module is a patented, passive soil gas sampler, is used to evaluate soil gas for contaminant source identification in environmental projects. The temporary survey process involves planting a dozen or more Gore-sorber modules in a sampling grid designed to meet the project objectives.



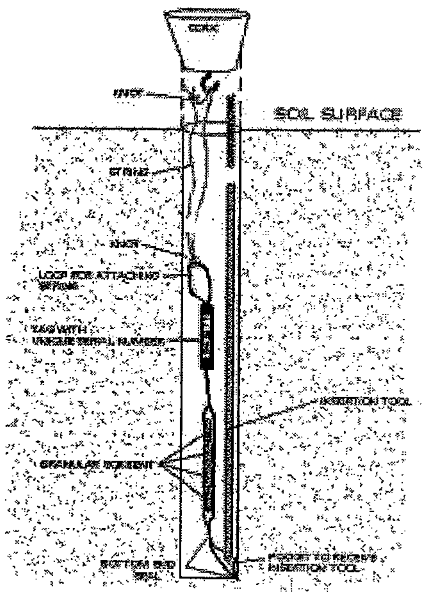
The module is constructed entirely of GORE-TEX® membrane. This membrane is an expanded polytetrafluoroethylene (ePTFE) which is a chemically inert, microporous (vapor permeable), and hydrophobic (waterproof). Much of the node and fibril structure is void space available for vapor transfer. Pore spaces are designed to be orders of magnitude smaller than a liquid drop of water.

The module is constructed of a hollow ePTFE insertion/retrieval cord that contains smaller ePTFE tubes (sorbers). The sorbers contain various polymeric and carbonaceous adsorbents selected for their affinity to a wide variety of volatile and semi-volatile organic compounds, while minimizing the uptake of water vapor.

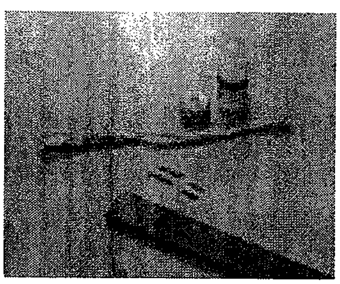


STATEMENT OF PROCEDURES

Clearwater Group



The membrane facilitates vapor transfer across the entire surface area while providing strength for retrieval from the subsurface. Organic vapors present in the soil gas migrate unimpeded through the membrane to the adsorbent housed in the sorbers. This design prevents soil particles and liquid water from impacting sample integrity.



The module itself is approximately one foot in length and contains enough sorbers for two samples. This allows for duplicate analyses, if required, or a back up analyses in the event of an instrument malfunction. Additional sorbers can be placed in the module if a greater number of samples are required. Each module is stored in individual containers and is uniquely numbered and tracked throughout the project.

STATEMENT OF PROCEDURES
Clearwater Group

Trip Blanks

Additional modules are provided with each project to document impact to the modules during transit, storage and installation/retrieval away from Gore's facility. Trip blanks are identical to the field-installed modules. The client selects which modules are to be trip blanks and leaves them unopened during all phases of the passive soil gas survey.

Module Installation for GORE-SORBER® Screening Surveys

In general, the installation and retrieval of the modules is simple. A narrow diameter hole (three-quarter inch) is drilled into the subsurface to a maximum depth of three feet, the recommended depth for soil gas sampling in environmental sampling applications (1, 2). The hole can be created using hand tools such as a slide hammer and tile probe, a Geoprobe-type or similar direct push probe rig or a rotary hammer drill with a 36-inch carbide-tipped drill bit attached. Once the hole is created, a length of cord is tied to the loop end of the module, and a cork is tied to the surface end of the cord. A stainless steel insertion rod (supplied by Gore) is placed in the pocket at the opposite end of the module, and the unit is inserted down the hole. The insertion rod is removed and the cork tamped flush into the ground at the surface. The site map is marked with the location of the module and its serial number, and the Chain of Custody undated. Global positioning systems (GPS) are now being used to record actual coordinate information in the field.

Following the recommended exposure period, each module is retrieved, the cord and cork discarded properly and the module is returned to its respective container. The serial number and location are verified, and the modules are returned to Gore's laboratory for analysis. The Chain of Custody is updated and returned with the modules.

DETAILS OF THE MODULE INSTALLATION

To facilitate the installation of the modules, it is recommended that the cord and corks be prepared prior to going to the field. For the installation of each module, cut a piece of the supplied polypropylene cord to a length of approximately 7.0 feet or 2.25 meters. Tie the ends of the cord together using a non-slip knot (square knot is suggested - see below). This loop should be long enough to allow for an installation of three feet (one meter) into the subsurface. Pass the looped cord through the eyelet in the cork and pull it back through itself. This will attach the cord to the cork. Wrap the remainder of the cord around the cork and secure the cord/cork combination with a rubber band. The cork and cord are now ready to attach to the module after the pilot hole is created at the installation location.

STATEMENT OF PROCEDURES

Clearwater Group

Square knot instructions (see Figure 1)

1. Take an end of the cord in each hand.
2. Pass the left-hand cord over the right-hand cord and wrap it around the right-hand cord.
3. Take the cord end that is now in your right hand, place it over the cord end in your left hand and wrap it around that cord.
4. Pull the cord carefully to tighten the knot.

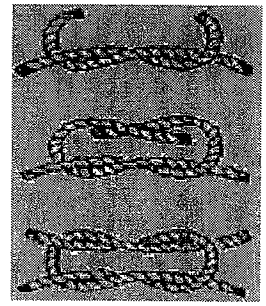


Figure 1.Square Knot

- Always obtain utility clearance before digging or probing.
- We do not recommend installation of modules within 15 feet of monitoring wells, utility trenches or other conduits, which may act as a preferential pathway for soil vapor migration.
- Drive/drill narrow pilot hole at desired pre-marked location. In sandy soils, occasionally the pilot hole will collapse after the drill or tile probe is removed. Adding deionized water to the sandy soil will temporarily compact the soil and keep the hole open for module insertion.
- Wearing clean surgical gloves, remove module from numbered container and re-seal the jar (this numbered container should correspond to the numbered module ID tag - please verify this).
- Attach the cord and cork to the module by passing the looped cord through the loop on the module and pull the cord/cork back through itself.
- Place insertion rod into the pre-cut pocket at the base of the module and lower it into the hole. If you encounter resistance remove the module and ream the hole and re-insert the module.
- Once deployed to the desired depth, press the insertion rod against the side of the hole and twist slightly to release the module. Remove the rod and push any excess cord into the pilot hole and plug it with the cork. (See Figure 2 for schematic of completed module installation.)
- Indicate the module number, date and time of installation and any pertinent comments on the installation/retrieval log. Write the module serial number on the site map adjacent to the appropriate map location.
- To minimize sample location errors, it is preferable to record the GORE-SORBER Module location on the field map. However, if another sample numbering system is used, information relating the sample number system to the GORE-SORBER Module serial numbers must be provided either on the Installation and Retrieval Log, or in a separate table.

- Clean the tile probes or drill bits and the insertion rod prior to use at the next location. Replace the surgical gloves as necessary before handling any modules.
- Following module installation, the modules selected as trip blanks should be kept in the sample box provided and stored as described above in "STORAGE" until sample retrieval.

DETAILS OF THE MODULE RETRIEVAL

- Following the module exposure period (usually 10 - 14 days) identify and check each module location in the field using the site map.
- Remove the cork with a penknife or corkscrew. Grasp the cord and pull the module from the ground; verify the module ID number. Cut off and discard the cork and cord. Place the entire module in its labeled container and tightly secure the lid.
- Use caution when screwing down the lid on the sample jars. Be sure the seal is tight and that no part of module or any dirt/ debris is pinched in the jar threads. Over-tightening may cause breakage.
- Replace the sample container in the box. Where possible, please attempt to keep modules in numbered sequence to expedite sample check-in and processing.
- Complete the module retrieval date/time on the installation/retrieval log.
- Do not use Styrofoam "peanuts" as packing material. Bubble packing is acceptable. Water ice can be added if desired, but cooling in general is not necessary. If shipping with ice, please take precautions to keep boxes dry (perhaps shipping in a cooler).
- Return the samples with insertion rod and paperwork (preferably by overnight courier) to:

Screening Modules Laboratory
W.L. Gore & Associates, Inc.
100 Chesapeake Blvd.
Elkton, MD 21921
Phone: (410) 392-7600

Attn: NOTIFY LAB IMMEDIATELY UPON DELIVERY!!

IMPORTANT: Samples should not be shipped for weekend or holiday delivery at GORE.

Module Installation for the GORE-SORBER® Exploration Surveys

Installation and retrieval of the module in this application is similar to the screening surveys. However, these surveys tend to be carried out in remote locations over large areas necessitating portable hand tools. A narrow diameter hole (1 cm) is created to depths of 24 inches (60cm) below grade by hammering a narrow steel tool, such as a long screwdriver, into the ground.

After the pilot hole is completed, modules are tied to a section of cord and inserted into the completed hole using the stainless steel insertion rod. The cord is secured at the surface by collapsing the hole. The location is marked on a map and location coordinates are secured where possible with a GPS having file download capabilities.

Module retrieval requires that field personnel locate the retrieval cord and manually pull the module from each location. The cord is separated from the module and discarded properly. The exposed modules are resealed in their respective containers and returned to Gore for analysis. The appropriate paperwork including the Chain of Custody is returned with the modules. Additional installation and retreival information can be found by clicking here.

Creating the Installation Hole

Narrow diameter, uncased installation holes are easily prepared using a slide hammer and long tile probe (left), a rotary hammer drill with a long carbide tipped bit (typically used to create the installation hole through impermeable layers such as asphalt; middle), or with a handheld hammer and steel rod (right).

Installing a Module

The photo at left illustrates a module, its container, and a length of string tied to the loop of the module. String is cut to the appropriate length in the field and attached to each module loop during the installation process. The insertion rod is placed in the pocket at the opposite end of the module, and a cork it tied to the string. The entire unit is slid down into the installation hole (middle photo). The insertion rod is pulled out of the hole, decontaminated, and is ready for use at the next sample location. A quick twist of the rod while in the hole, or placing the unit against the side of the hole while pulling the rod out of the ground, will cause the module to slip off of the insertion rod and remain at the required installation depth. The installation hole is plugged with a cork at the surface. The field map and installation notes are updated.

FIELD PHOTOS: Using the Gore-Sorber Modules

String, an insertion rod, and corks (as needed) are supplied by Gore.
NOTE: For the exploration surveys, corks are not required to seal the installation hole. The cord is secured at the surface by collapsing the hole.

INTERPRETATION

Soil Gas Data Interpretation

In general, the detection of VOCs and SVOCs in field-exposed modules indicates that potential sources (i.e. soil adsorbed-, dissolved- and separate-phase organics) of the detected compound(s) may exist in proximity to the module location. The module will adsorb migrating gases present in the adjacent media (soil or water). The processes that govern the movement of gases in the subsurface are complex, involving interactions between the soil, soil moisture, pore gasses, ground water, natural and human made barriers, and the volatile contaminant. Chemical and microbiological processes can further influence the presence of soil gases, by reacting with or metabolizing these compounds.

Vapor pressure, water solubility, molecular weight, and the Henry's Law partitioning coefficient, are important chemical parameters to consider when interpreting soil gas data. The Henry's Law coefficient reflects a compound's behavior when partitioned into air and water, which aids in understanding an organic chemical's likely state in the subsurface. An understanding of the site geology (geologic structure, geochemistry), hydrogeolology and operational history are also important when interpreting the distribution of soil gases.

A strong relative correlation is often observed between the soil gas mass levels and the compound concentrations in the subsurface.

Contour Maps

Graphic presentation of the data extracted from GORE-SORBER® Modules is normally presented by overlaying the contamination patterns detected during analysis onto CAD maps supplied by the customer. Either minimum surface curvature or kriging models are employed. Standard "B-sized" (11" x 17") color contour plots are included with each project, however up to "E-size" (24" x 36") plots are available, if requested. The site plan base map(s) provided by the customer must include a scaled drawing with relevant site features, and a layer containing the sample locations and module serial numbers for the survey.

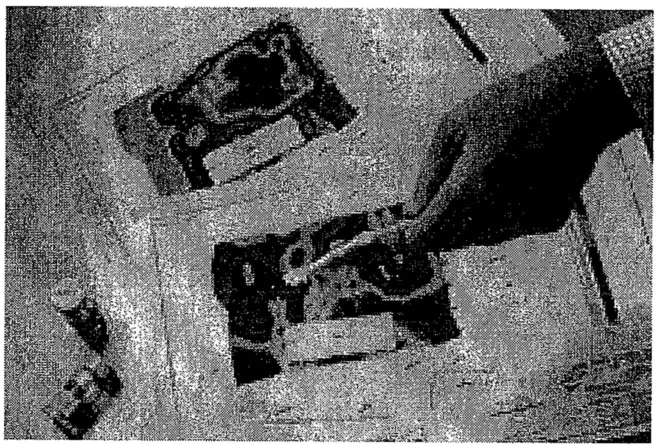
Tentatively Identified Compounds (TICs)

Some of the modules may contain non-target analytes (compounds not on GORE's target list). GORE can provide tentative identification of prominent non-target compound peaks

(TICs). These compounds can include non-target soil gas analytes, and contaminants introduced during sample transport and installation/retrieval activities.

Final Reporting

The results of the GORE-SORBER® Screening Survey will be summarized in a brief report, which will include the chain of custody, analytical data summary table, sample chromatograms, and color contour maps. A laboratory analytical data deliverables package incorporating results of samples, standards and blanks, and mass spectra compared to standards for all detects can be provided as an option.



References:

1 – Field Sampling Procedures Manual, ed. J.R. Schoenleber and P.S. Morton, New Jersey Department of Environmental Protection and Energy, 364pp., 1992

2 – Devitt, D. A., Evans, R.B., Jury, W. A., and Starks, T.H., Soil Gas Sensing for Detection and Mapping of Volatile Organics, National Groundwater Association, Dublin, OH

NOTES: This statement of procedures was compiled from materials provided by Gore. http://www.gore.com/surveys/

ATTACHMENT D

CLEARWATER GROUP

Direct-Push Drilling Investigation Procedures

The direct-push method of drilling soil borings has several advantages over hollow-stem auger drilling. The direct-push method produces no drill cuttings and is capable of 150 to 200 feet of soil boring or well installation work per day. Direct-push drilling can be used for soil gas surveys, soil sampling, groundwater sampling, and installation of small-diameter monitoring well and remediation system components such as air sparge points. The equipment required to perform direct-push work is varied, ranging from a roto-hammer and operator to a pickup truck-mounted rig capable of substantial static downward force combined with percussive force. This method allows subsurface investigation work to be performed in areas inaccessible to conventional drill rigs such as basements, beneath canopies, or below power lines. Direct-push equipment is ideal at sites with unconsolidated soil or overburden, and for sampling depths less than 30 feet. This method is not appropriate for boring through bedrock or gravelly soils.

Permitting and Site Preparation

Prior to direct-push drilling, Clearwater Group will obtain all necessary permits and locate all underground and above-ground utilities through Underground Service Alert and a thorough site inspection. All drilling equipment will be inspected daily and will be maintained in safe operating condition. All down-hole drilling equipment will be cleaned prior to arriving on-site. Working components of the rig near the borehole, as well as casing and sampling equipment, will be thoroughly decontaminated between each boring location by either steam cleaning or washing with an Alconox® solution. All drilling and sampling methods will be consistent with ASTM Method D-1452-80 and county, state, and federal regulations.

Boring Installation and Soil Sampling

Direct-push drilling uses a 1.5-inch outer barrel with an inner rod held in place during pushing. Soil samples are collected by penetrating to the desired depth, retracting the inner rod, and attaching a soil sampler. The sampler is then thrust beyond the outer barrel into native soil. Soil samples are recovered in brass, stainless steel, or acetate sample tubes held inside the sampler.

Soil removed from the upper tube section is used for lithologic descriptions, according to the Unified Soil Classification System. If organic vapors will be analyzed in the field, a portion of each soil sample will be placed in a plastic zip-lock bag. The bag will be sealed and warmed for approximately 10 minutes to allow soil vapors to be released from the sample and diffused into the head space of the bag. The bag is then pierced with the probe of a calibrated organic vapor detector and the detector readings recorded with the lithologic descriptions on the soil boring log. Soil samples selected for laboratory analysis will be covered on both ends with Teflon™ tape and plastic end caps. The samples will then be labeled, recorded on a chain-of-custody document, stored on ice in a cooler, and transported to a state-certified analytical laboratory.

Temporary Well Installation and Groundwater Sampling

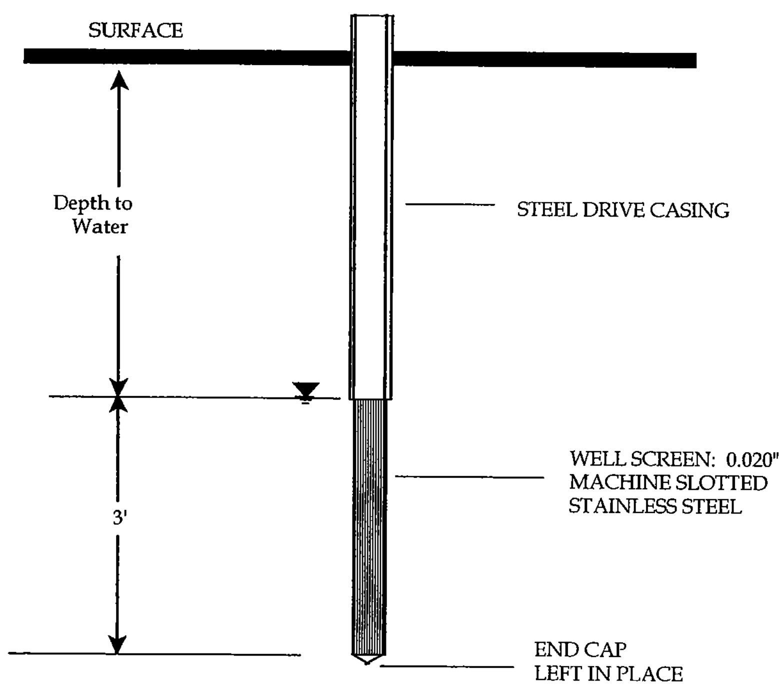


Figure 1

Grab Groundwater Sample Collection

Groundwater samples are collected by removing the inner rod and attaching a 4-foot stainless steel screen with a drive point at the end (**Figure 1**). The screen and rod are then inserted inside the outer barrel and driven to the desired depth, where the outer rod is retracted to expose the screen. If enough water for sampling is not produced through the stainless well screen, a 1-inch PVC screen can be installed in the boring and the outer rod retracted to leave a temporary well point for collecting groundwater samples, water level, or other parameters.

Monitoring Well Installation and Development

Permanent small-diameter monitoring wells are installed by driving a 2-inch diameter outer barrel and inner rod as described above. Upon reaching the desired depth, the system is removed, and 1-inch outside diameter (OD) (1/2-inch inside diameter [ID]) pre-packed PVC piping is installed. The well plug is created using granular bentonite. The well seal is constructed of cement and sealed at the surface with a conventional "Christy® Box" or similar vault. Monitoring wells are developed by surging the well with a small-diameter bailer and removing approximately 10 casing volumes of water, until the water is clear.

Groundwater Sample Collection and Water Level Measurement from Monitoring Wells

Before groundwater is collected from the wells, the water levels are measured in all wells using an electronic water-level gauge. Monitoring wells are prepared for sampling by purging three or more well volumes of water. Water is removed using small-diameter bailers, a peristaltic pump, or by manually pumping using tubing with a check valve at the bottom. During removal of each well volume of water, the temperature, pH, and conductivity are measured and recorded on the field sampling form. Successive well volumes are removed until the parameters have stabilized or the well has gone dry. Prior to sampling, the well is allowed to recover to within 90% of the stabilized water levels. The groundwater samples[1] are collected using small-diameter bailers.

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[1] Small-diameter wells often produce small sample quantities and are appropriate for analysis of volatile and aromatic compounds and dissolved metals analysis using VOA vials. Obtaining liter-size samples can be difficult and time consuming. Monitoring wells installed by the direct-push method are most effective at sites where the subsurface soils are more coarse than silt, gasoline components are the key contaminants of concern, and water levels are not more than 25 feet below ground surface.

The samples are decanted into laboratory-supplied containers, labeled, recorded on a chain-of-custody document, stored on ice in a cooler, and transported to a certified analytical laboratory for analysis.

CLEARWATER GROUP

Field Procedure for Soil Borehole Drilling and Groundwater Monitoring Well Installation and Development

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Drilling and Soil Sampling

Permits, Site Safety Plan, Utility Clearance

Clearwater Group (Clearwater) obtains all the required permits, unless otherwise contractually directed. Clearwater prepares a site-specific Site Safety Plan detailing site hazards, site safety and control, decontamination procedures, and emergency response procedures to be employed throughout the work or in the event of an accident. At least 48 hours prior to drilling, Underground Service Alert (USA) or an equivalent agency is notified of the planned work. Clearwater attempts to locate all underground and aboveground utilities by site inspection (in conjunction with its subcontractors and knowledgeable site managers, if available), and review of site as-built drawings. Clearwater may employ a private, professional utility locator to refine the site utility inspection.

Drilling Equipment

Soil borings are drilled using either a continuous core drill (Geoprobe®) or a hollow-stem auger drill rig, unless site conditions warrant a different drilling method. Subsurface conditions permitting, the first 5 feet of each boring is advanced using a hand-auger or post-hole digger. All drilling equipment is inspected daily and maintained in safe working condition by the operator. All down-hole drilling equipment is steam cleaned prior to arriving on site. Working components of the drill rig near the borehole, as well as augers and drill rods, are thoroughly steam cleaned between each boring location. All Clearwater drilling and sampling methods are consistent with American Society for Testing and Material Standards (ASTM) Method D 1452-80 and local, state, and federal regulations.

Soil Sampling and Lithologic Description

Whenever possible, the first boring to be drilled at a site is continuously cored to obtain a complete lithologic description using a Geoprobe®, or similar, continuous core soil probe drill rig.

Typically, groundwater monitoring wells are installed using a hollow-stem auger drill, and samples for lithologic characterization or environmental analysis are collected every 5 feet to the total depth explored. The samples are collected using brass tubes fitted inside a split spoon sampler. If copper or zinc contamination is the subject of the investigation, stainless steel liners are used instead of brass. Additional soil samples may be collected if there are significant changes in lithology or in areas of obvious soil contamination. The soil sampler and liners are cleaned with an Alconox® solution and rinsed with tap water prior to each sampling event. New liners are used whenever a soil sample may be retained for laboratory analysis.

During soil sample collection, the split spoon sampler is driven 18 to 24 inches past the lead auger by a 140-pound hammer falling 30 inches. The number of hammer blows necessary to drive the sampler every 6 inches ("Blow Count") and the amount of soil recovered are recorded on the Field Exploratory Soil Boring Log. It is necessary to record the type, diameter, and length of the split spoon sampler on the boring log, in order to be able to convert the blow counts to standard values.

The soil descriptions will be made according to ASTM Method D 2488-90, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). The soil colors will be described, by color name and numeric description, according to Munsell® Soil Color Charts.

Monitoring Well Installation

Construction of Well Casing, Screen, and Filter Pack

Groundwater monitoring wells are constructed with threaded, Schedule 40, polyvinyl chloride (PVC) casing unless site geochemistry or contamination necessitates an alternative material. The wells are constructed with factory-slotted screened casing and threaded end caps.

A graded sand filter pack is placed in the annular space across the screened interval and extended approximately 1 to 2 feet above the screened casing, as site conditions permit. The well screen slot size is the maximum size capable of retaining 90% of the filter pack. Typically, 0.010-inch diameter slotted screen is used where the formation is predominantly clay and/or silt or fine sand and 0.020-inch screen is used where the formation is predominantly medium to coarse sand and/or gravel.

The filter pack grade (mean grain size) is selected according to native sediment type as follows: a) for poorly graded fine sand or silt/clay - 4 times the 70% grain size of the formation (grain size where 30% of the grains are larger and 70% are smaller); b) for medium to coarse sand, gravel, or well graded sediments - 6 times the 70% grain size. Since grain size analysis is not always available, Clearwater often selects screen size and filter pack on the basis of the site stratigraphy, specifically the finest significantly thick layer of sediment to be screened. Commonly selected grades are Lone Star® 3, 2/12, or 2/16 (or equivalent) with 0.020-inch slotted screen and Lone Star® 1/20 with 0.010-inch slotted screen. To prevent sand bridging of the filter pack and help settle the filter pack sand, a surge block should be used to swab the inside of the screened casing, prior to placing the well seal.

Well Seal and Completion

A minimum 2-foot-thick seal of bentonite pellets is placed above the filter pack to prevent extension of the filter pack into an overlying water-bearing unit. The bentonite seal is hydrated by either formation water or potable water. Neat cement or a cement/bentonite grout mixture seals the remaining annular space to the surface. If bentonite is used in the grout mixture, it will not exceed 5% by weight. The grout is placed using a tremie pipe, if the top of the bentonite is more than 20 feet below grade, or if water is present in the boring above the bentonite seal. A watertight locking cap and protective traffic-rated vault box is installed to protect the top of each well. Well construction details are recorded on a Well Construction Log and the Field Exploratory Soil Boring Log Form. Following completion of a well, Clearwater completes and submits, or ensures that the driller has sufficient information to complete, sign, and submit, a California Department of Water Resources Well Completion Report (Form 188) for each well.

Well Development

Well development is performed 48 hours, or more, after well installation, in order to allow the grout seal to set. Well development removes most of the particles that are smaller than the slot openings from the filter pack, thereby increasing the porosity and hydraulic conductivity of the filter pack.

The total depth of the well (depth to bottom of well) is measured, then the well is pumped, or bailed, of several well volumes to remove turbid water and sediment from the bottom of the well and to draw sediment that is finer than the slot opening through the well screen. The well is surged with a surge block for approximately 10 minutes to further remove loose sediment and then pumped, or bailed, to remove the turbid water and sediment from the well. The surging and bailing procedure is performed at least twice, followed by additional purging until the purged water is observed to be clear. Typically, greater than ten well volumes of groundwater will be removed from a well during development. Finally, the total depth of the well and depth to water are remeasured.

Multiple, large diameter, and/or deep wells can be developed by a drilling or well-servicing contractor using a truck-mounted well development rig. The contractor may use alternative well development techniques, such as bailing, jetting, or air development procedures.

Soil Boring Abandonment

Soil borings which are not to be converted into monitoring wells are sealed to the ground surface using neat cement or sand-cement slurry, in accordance with federal, state, and local regulations. Native soil or road construction surfacing may be used to fill the top 2 to 3 feet to ensure a completed flush surface and for cosmetic purposes, as permitted.

ATTACHMENT E

June 18, 2007

Ms. Karel Detterman
Clearwater Group
229 Tewksbury Avenue
Richmond, CA 94801

Subject: Site Date Review and Design of HVDPE Pilot Test Plan
Eagle Gas Station
4301 San Leandro Street
Oakland, California

Dear Ms. Detterman:

CCA has prepared this review of reports for the Eagle Gas Station located at 4301 San Leandro Street, Oakland, California (Site) in accordance with the scope of work outlined in Clearwater Group Purchase Order 719 and following discussions at a site meeting held on May 24, 2007. The Site data review was performed to evaluate potential remedial strategies with the specific objective to design a HVDPE pilot test plan. The following Artesian/Clearwater Group reports were reviewed to assess site conditions and determine the applicability of HVDPE to site conditions:

- Underground Storage Tank Removal Report, dated May 24, 1999
- Notice of Interim Remediation Groundwater Treatment Pilot Test, dated November 1, 2005
- Bench Test for Using Advanced Oxidation – A summary Report, dated March 27, 2006
- Activated Carbon and Organoclay (EC300) Bench Test Report, dated May 9, 2006
- Soil and Groundwater Investigation Report, dated May 30, 2006
- Revised Work Plan, dated December 19, 2006

Petroleum hydrocarbons have been released to Site soil and groundwater, with MTBE and TBA being the main drivers for remediation. TPH-g, TPH-d and BTEX compounds are also present within Site soil and groundwater. This letter report provides a review of the Site Geology, Hydrogeology and Current Groundwater Monitoring Network, Petroleum Hydrocarbon Distribution, Review of Proposed Remediation Options, Design Parameters for HVDPE Pilot Test Plan, and Conclusions and Recommendations.

Site Geology

The site is located in the San Francisco Bay Plain and situated upon Holocene alluvial deposits (the flatland deposits of Helley and Lajoie, USGS Professional Paper 943, 1979). The alluvium encountered in the 21 site boreholes consists mostly of clayey gravel (GC), clayey sand (SC) and clay (CL) with lesser intervals of well graded gravel (GW), poorly graded gravel (GP), silty sand (SM), poorly graded sand (SP) and organic clay (CH) to the maximum depth explored of 48 feet below ground surface (bgs).

The site geology is consistent with a floodplain setting where fluvial channels have traversed the depositional landscape and during times of flooding deposited widespread fine grained floodplain deposits of mostly silt and clay. (The topographic slope and profile of the valley floor does not support the sometimes held view that these deposits are related to alluvial fans). Within the "mud" rich floodplain, stream channels tend to flow within the cohesive mud-rich banks, and changes course during flood events by cutting new pathways by avulsion through the stream banks. As such, lateral continuity between coarse grained channel deposits is variable.

Flood-related deposition of the coarse alluvium (i.e., GC and SC) is supported by the fact that the coarse grained deposits appear to contain significant amounts of fine grained material. This suggests that deposition occurred due to a rapid loss of transport energy, i.e., in the waning stage of a flood. Further during the flood-stage, overtopping of stream banks results in lobate overbank deposits of coarse grained material across the floodplain. During non-flood stages, winnowing of fines occurs within the stream channels and the mud-fraction is removed resulting in cleaner coarser grained residual deposits (GW or SW or SP). These deposits likely represent the more permeable sediments for the migration of fluids within the subsurface.

Unfortunately, the site boring logs have been prepared consistent with the USCS (the industry standard) and little geological detail is provided that would assist in refining the interpretation of the depositional environment and therefore the spatial relationship between sediment types and potential fluid migration pathways. Further, relative percentages of grain sizes for each sediment (soil) type described are not in the recorded boring logs; this information would be useful to assess relative permeability of soil types. It is recommended in future investigations that sieve/hydrometer analysis be performed to verify the interpretations of soil types and grain size ranges.

Site Hydrogeology and Current Groundwater Monitoring Network

The approximately ¼-acre site (100-feet by 100-feet) is populated with 8 shallow monitoring wells (MW-1 to MW-8), 6 intended oxygen delivery wells (IS-1 to IS-6) and two intended extraction wells (EW-1 and EW-2) and 2 deep monitoring wells (MW-4D and MW-5D).

Based on the site geology and groundwater elevation measurements two water bearing zones (WBZs) have been identified; the Shallow WBZ defined by the extent of clayey gravel and clayey sand deposits and ranging in depth from approximately 5-15 feet bgs (noting that the top and bottom of the coarse units are variable) and the Deep WBZ ranging in depth from approximately 30-45 feet bgs (noting that the top and bottom of the coarse units are variable). Depth to water beneath the site appears to vary seasonally; varying within the Shallow WBZ from about 5 to 14 feet bgs across the site, and varying within the Deep WBZ from about 13 to 16 feet bgs across the site. Vertical head data from well pairs MW-4/MW-4D and MW-5/MW-5D suggest that the two WBZs are hydraulically isolated as a consistent approximately 7.5-foot head difference is measured between the WBZs. However, the boring log from MW-5D would indicate that the two WBZs are possibly connected. The logging of this borehole should be verified with a less invasive technique such as CPT, as the current interpretation may be the result of sloughing during drilling activities. If the boring log for MW-5D is correct then a vertical pathway between the two WBZs likely exists.

The groundwater gradient within the Shallow WBZ is relatively steep at about 0.03 ft/ft and flow is multidirectional due to mounding created by water leakage from Site utilities. Given the position of the Site relative to the uplands and the bay, and if large pumping centers are not located nearby, it would be reasonable to assume that groundwater in the vicinity of the Site would naturally flow to the west or southwest, that is, towards the bay. The groundwater gradient between MW-5D and MW-4D within the Deep WBZ appears much flatter than the Shallow WBZ and based on the latest measurements, a gradient between the wells of 0.0005 ft/ft exists, flow is likely to the west.

The groundwater monitoring network within the Shallow WBZ is relatively dense for such a small site and should provide an accurate picture of groundwater conditions across the Site. However, it is noted that a large portion of many of the well screen intervals are situated within fine-grained sediments. Based on depth to water measurements many of the Shallow WBZ well screens are not screened across the water table interface between vadose soil and permanently saturated soil. Therefore, comparing groundwater elevation data from say wells MW-3 or IS-3 (which are completely screened in clay) with other wells may lead to a distorted view of groundwater flow patterns.

With regard to using existing monitoring wells as observation wells during the HVDPE pilot test, it would appear that large portions of the Shallow WBZ wells will require dewatering to expose the well screens to potential vacuum pressures. For the same reason, the use of existing monitoring wells as soil vapor extraction wells are not optimum choices. It is recommended that purpose-built soil vapor extraction well(s) be constructed for the HVDPE pilot test. Ideally the well should screen only the GC interval of the Shallow WBZ.

Petroleum Hydrocarbon Distribution

Soil data presented in Table 2 of the Soil and Groundwater Investigation Report indicate that TPH-d and TPH-g (and associated compounds) are relatively wide spread across the soil, and not surprisingly, highest in the vicinity of the former UST pit. The highest concentrations (generally > 1000 mg/kg TPH-d or TPH-g) are within vadose soil and at depths that correspond to the seasonal fluctuation of the water table between about 10 to 14 feet bgs. High concentrations of TPH-d or TPH-g are noted in vadose soil from boreholes SB-8, SB-i3, and Sb-i5 suggesting that releases) from the former dispenser island are contributing to soil and groundwater impacts. Also, high TPH concentrations are noted in saturated soil from boreholes SB-6D and SB-8. These data indicate that significant residual TPH impacts still exist at the Site.

TPH impacts to groundwater are observed in all Site groundwater monitoring wells, with MTBE and TBA being the highest. Data from wells MW-1, MW-2 and MW-3 (i.e., wells with a of history of monitoring) show declines in TPH-g and BTEX concentrations over time suggesting natural attenuation processes are active at the Site. Similarly, while MTBE concentrations are declining, TBA concentrations are increasing, again suggesting natural attenuation processes are active at the Site. While high concentrations of hydrocarbon compounds are observed across the Site, some of the highest concentrations are noted in area of wells IS-3 and IS-6, again suggesting that releases from each former dispenser island likely occurred.

Review of Proposed Remediation Options

Clearwater has proposed three remedial options for the Site; Bioremediation, HVDPE and Insitu Chemical Oxidation (ISCO). The following provides a brief discussion to the potential applicability of each technology to Site conditions.

<u>Bioremediation:</u> Site conditions appear very favorable for aerobic bioremediation, as indicated by the (surprisingly) high dissolved oxygen (DO) levels measured in monitoring wells. Noted also, is relatively high level of ferrous iron, suggesting anaerobic conditions exist (i.e. within the hydrocarbon plume); ferrous iron tends to oxidize readily in the presence of available oxygen. The presence of both high levels of DO and ferrous iron would suggest that an active biogeochemical environment exists. The identification of leaking sewer lines at the Site likely supply a source of nitrogen compounds to groundwater and further enhances microbial activity.

<u>HVDPE:</u> Site data with respect to soil porosity and permeability is limited and therefore it is difficult to accurately assess the applicability for HVDPE. The one reported incident of groundwater extraction testing (from well MW-2) indicates that groundwater extraction was limited and recharge rates were extremely low, suggesting low permeability soil in the area of well MW-2. Given that biological activity at the Site appears high, biofouling has likely occurred within this well's screen and filter pack causing a reduction in well efficiency. It is recommended that any proposed wells for the HVDPE pilot test be redeveloped and possibly treated with a biocide to improve efficiency prior to initiating the test. The application of a vacuum generally improves the

ability of a well to recover groundwater due to the steepened pressure gradient created by the low pressure created within the well casing.

ISCO: Chemical oxidation is a viable remediation technology; however, experience in the Bay Area has indicated that the method requires injection under pressure or pre-fracturing to obtain an effective area of influence. Further, an assessment of the aquifer's native (soil) oxygen demand should also be performed to accurately estimate oxidant dosage requirement and efficiency. The application of ISCO may be counter-productive to the benefit offered by natural attenuation processes currently active at the Site.

Design Parameters for HVDPE Pilot Test Plan

A HVDPE test can serve two purposes; to the evaluate potential for soil vapor extraction (SVE) and evaluate the potential groundwater extraction (GWE). The SVE portion of the HVDPE pilot test can provide the following benefits and design information: (1) remove free product, (2) evaluate the effectiveness of soil vapor extraction to remove contaminants from vadose soil, (3) develop preliminary design parameters for potential full-scale operation; and (4) provide site-specific data.

Site specific parameters to be evaluated during the HVDPE pilot test are as follows:

- Determine the effectiveness of SVE to remove hydrocarbon compounds from the vadose zone.
- Determine radius of influence as measured from surrounding groundwater monitoring wells. An effective radius of influence (ROI_{SVE}) is typically taken to be the radial distance at which an induced vacuum of 0.10 in. H_2O can be measured (*USEPA, 2004*).
- Determine air flow rates versus applied vacuum at the test well.
- Determine hydrocarbon concentrations in extracted soil vapor using a photo-ionization detector (PID) and laboratory analyses.
- Determine the likelihood of volatilization of free product.
- Estimate hydrocarbon mass removal rates.

A portable high vacuum SVE unit with an attached thermal oxidizer will be used to conduct the pilot test. The vacuum will be applied to each HVDPE pilot test extraction well to draw in soil vapor from the area surrounding the well screen. To avoid upconing groundwater during the HVDPE pilot test, the stringer method will be used. In the stinger method, the vacuum is applied via a 1 or 2-inch stinger tube inserted inside the main 2 or 4-inch diameter extraction well casing. The stinger tube is used to remove both soil vapor and (slurp) groundwater from the area surrounding the extraction well screen. Using this method, an evaluation of both soil vapor flow rates and groundwater extraction rates can be obtained. A portion of the applied vacuum will be utilized to lift groundwater (1-inch mercury (Hg) is required to 1.13 lift feet of water), while the remaining vacuum will draw in soil vapor to the well.

The portable SVE unit will consist of a trailer-mounted, thermal oxidizer and vacuum pump (blower) capable of generating a vacuum up to 29"Hg at 450 cubic feet per minute (cfm) flow rate. The SVE/Treatment unit will be powered with on-site electricity or a portable generator. The HVDPE extraction well will be connected to the SVE/Treatment unit using flexible hosing. Each observation well head will be fitted with a magnehelic gauge to observe changes in subsurface pressure.

Magnehelic gauges fitted to each individual wellhead will measure the induced vacuum at the wellhead. Air-flow will be measured with a portable anemometer. PID readings and vapor samples for laboratory testing will be collected throughout the test period. Data collected during the HVDPE test will include wellhead flow rates, applied wellhead vacuums, petroleum hydrocarbon concentrations in extracted soil vapors, and induced vacuum in nearby observation wells. Each HVDPE pilot test will be performed for approximately 6-hours.

Soil vapor extracted from each HVDPE well will be collected for laboratory analysis. Soil vapor samples will be collected using 1-liter SUMMA® canisters and submitted for analyses to a State of California certified laboratory. The submitted vapor samples will be analyzed for the following using the indicated test method:

- EPA TO-3/15 for TPH-g/BTEX/MTBE/TBA

Site wells have not been constructed in a fashion that readily lends their use in a HVDPE pilot test. To perform an optimum HVDPE pilot test, construction of extraction wells and observation wells across the GC-soils of the Shallow WBZ would be ideal. Groundwater elevations depicted on geological cross-sections indicate that, in most instances, at least 3 to 4 feet of groundwater overlie the top of well screens; thus, for any existing well to be used as an effective observation point in a HVDPE pilot test, the well screen will need to be exposed. The planned 6-hour pilot test duration may not be sufficient to create an effective cone of depression around each extraction well point. The pilot test should be planned for a period of seasonal low water levels, thereby reducing the required amount of dewatering to expose the well screens.

While it can be expected that water levels will drop significantly in the extraction well; the shape of the propagating cone of depression will be dependent on the surrounding formation permeabilities. If sediment is permeable, then a flat-broad cone of depression will develop; with the disadvantage that it will take some time to dewater over the broad area. However, if sediment is tight, then a steep-narrow cone of depression will develop, with the disadvantage that it will take some-time to propagate away from the extraction well, and is the like scenario for this site.

However, based on the site well construction details and encountered geology, the following rationale for the HVDPE pilot test layouts are provided:

Extraction Well	Observation Wells	Comment
MW-5 Screen 10-25 ft bgs	IS-6 Screen 10-25 ft bgs	Well MW-5 is screened across coarse grained material and has the best chance to dewater, and allow the applied vacuum to radiate. Observation well IS-6 is located 8-feet from MW-5 and has 5-feet of screen in GC.
	IS-5 Screen 10-25 ft bgs	Located 25 ft from extraction well and an area of high TPH concentrations. Only has 2-feet of screen in GC.
	IS-4 Screen 10-25 ft bgs	Located 33 ft from extraction well and an area of high TPH concentrations. Only has 4-feet of screen in GC.
EW-1 Screen 10-25 ft bgs	MW-4 Screen 10-25 ft bgs	Well EW-1 is 4-inch well and will have better well efficiency than 2-inch wells to dewater, and allow the applied vacuum to radiate. Only has 3-feet of screen in GC. Observation well MW-4 is 16 ft from extraction well and location of high TPH concentrations. Only has 3-feet of screen in GC.
	Purpose built vapor monitoring well near MW-2 Screen not determined	Located 5 ft from extraction well. Monitoring ports to be install into GC
	MW-7 Screen 10-25 ft bgs	Located 30 ft from extraction well. Has 12-feet of screen in GW, may not dewater sufficiently allow for vacuum readings.
MW-1 Screen 10-25 ft bgs	IS-1 Screen 10-25 ft bgs	Well MW-1 is surrounded by coarse grained material including former the UST pit, and should dewater readily and allow vacuum to radiate; coarse material in the area of the well is located near ground surface, which may allow short-circuiting of vacuum pressures. Well IS-1 located 35 ft from extraction well. Only has 3-feet of screen in GC.
	Purpose built vapor monitoring well near MW-1 Screen not determined	Located 8 ft from extraction well. Monitoring ports to be install into GC
	MW-6 Screen 10-25 ft bgs	Located 45 ft from extraction well. Lower GW elevation requiring less dewatering to expose screen.

Conclusions and Recommendations

Soil and groundwater across the site are impacted with significant concentrations of TPH and related compounds. Two WBZs are recognized to exist, with the Shallow WBZ and overlying vadose soil containing the majority of hydrocarbon mass. Natural attenuation processes appear to be active at the Site, and are evidenced by reduced concentrations of hydrocarbons, including MTBE, over time. However, degradation of MTBE has lead to a significant build up of TBA which is more recalcitrant to aerobic biodegradation.

Due to the high clay content of WBZs many remedial technologies have been demonstrated to have restricted value at similar site conditions. HVDPE does offer a proven remedial technology for apparent low permeability Site conditions. Hydrocarbon compounds BTEX, MTBE and TBA are volatile compounds and readily amenable to HVDPE remediation. Current onsite monitoring wells are not ideally suited to perform a HVDPE pilot test as many of the wells are screened across fine-grained sediments and the tops of many well screens are below year-round water levels. However, HVDPE offers many benefits for the site remediation and purpose-built extraction wells should be constructed if full scale implementation is to be initiated.

The proposed design using current site wells, while not optimum, should provide relevant and valuable data to contrast against the proposed ISCO bench scale test. Mass removal will be more readily quantified using HVDPE than other methods. It is recommended that proposed wells for the HVDPE pilot test be redeveloped to remove any buildup of bio-matter from within the well screens and filter packs to improve the efficiency of the wells. Further the pilot test should be conducted during a period of low water levels (likely late summer) to limit the amount of dewatering required to expose observation well screens to improve the potential value of the HVDPE pilot test.

If you have any questions or comments, please call me at 650-270-8741 or email at warrentas@aol.com.

Sincerely,

Warren B. Chamberlain, P.G., C.HG., P.E.