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Alameda County
Environmental Health

29 June 2007

Mr. Barney M. Chan
Hazardous Materials Specialist
Alameda County Health Care Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Subject: Fuel Leak Case No. RO#0000079:
Oakland National Engravers (ONE),
1001 42nd Street, Oakland, CA 94608

Dear Mr. Chan:

Enclosed is a proposed draft Corrective Action Plan (CAP) that includes a remediation plan for the contamination beneath the above referenced property. As you know, we are working in collaboration with the developers of the Dunne Quality Paints aka Green City property on a joint response to the off-site contamination issues.

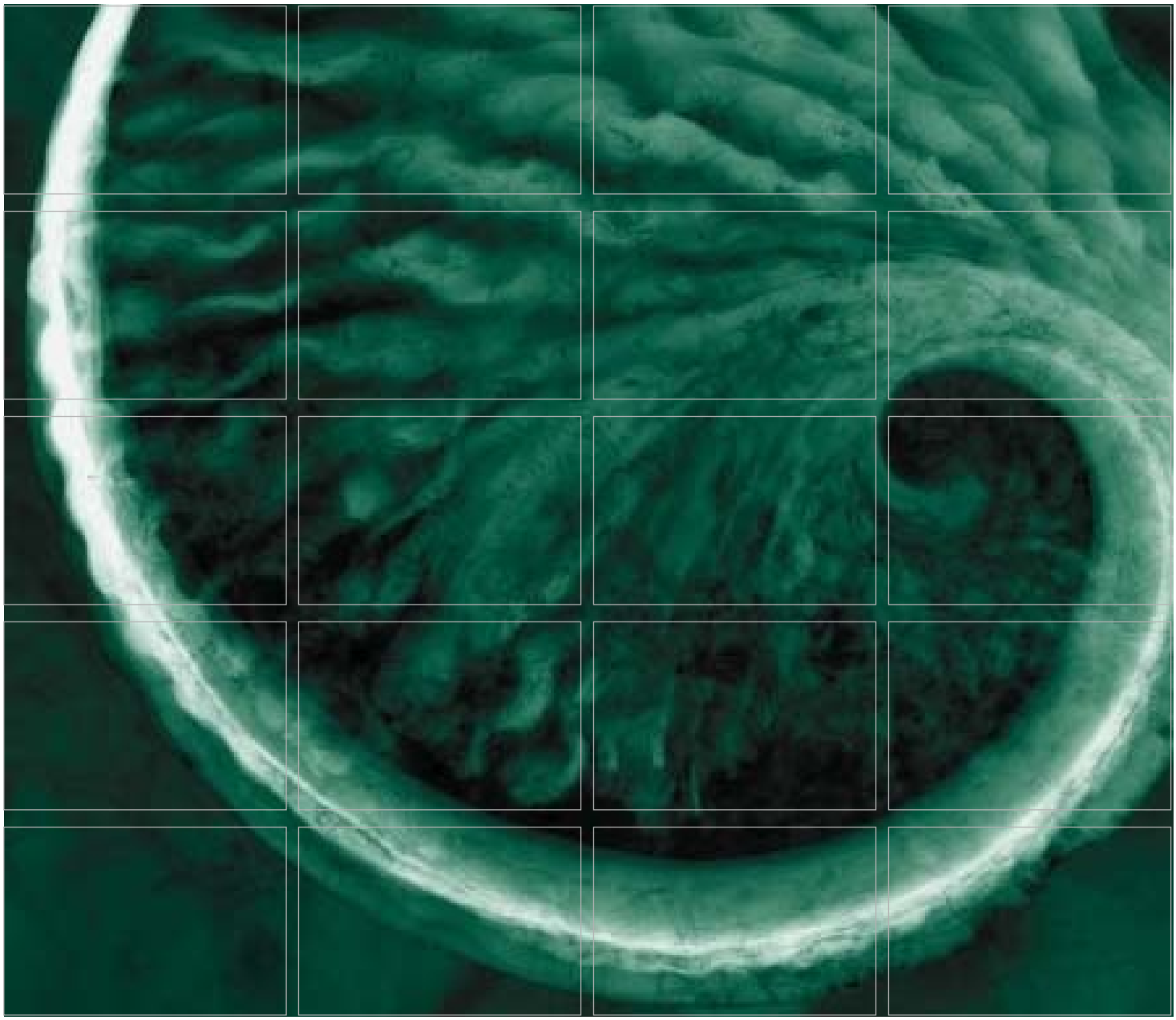
I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge.

Sincerely,

Deborah M. Castles
Vice President

JOC/JAQ/lhm/0051024
enclosures

cc: Donna Drogos
Catherine Johnson
John Cavanaugh
Matt Oliver
Brian Haughton



Corrective Action Plan

1001 42nd Street Property
Emeryville/Oakland, California

Prepared for:
1001 42nd Street, LLC

June 2007

www.erm.com

ERM

Delivering sustainable solutions in a more competitive world

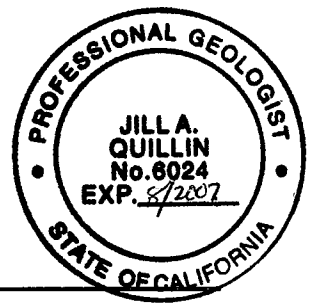
1001 42nd Street, LLC

Corrective Action Plan

1001 42nd Street Property
Emeryville/Oakland, California

June 2007

Project No. 0051024



Jill A. Quillin, P.G.
Program Director

John O. Cavanaugh, P.G.
Principal in Charge

ERM-West, Inc.
1777 Botelho Drive, Suite 260
Walnut Creek, California 94596
T: 925-946-0455
F: 925-946-9968

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LIST OF ACRONYMNS

ACHCSA	Alameda County Health Care Services Agency
ACPWA	Alameda County Public Works Association
ARARs	Applicable or Relevant and Appropriate Requirements
ASE	Aqua Science Engineers
ASTs	Aboveground storage tanks
BAAQMD	Bay Area Air Quality Management District
CAP	Corrective Action Plan
CCR	California Code of Regulations
CHHSLs	California Human Health Screening Levels
DO	Dissolved oxygen
ERM	ERM-West, Inc.
ESLs	Environmental Screening Levels
HSP	Health and Safety Plan
ISCO	In-situ chemical oxidation
LNAPL	Light nonaqueous phase liquid
NCP	National Contingency Plan
ONE	Oakland National Engravers/ ONE Color Communications, Inc.
O&M	Operation and maintenance
PRGs	Preliminary Remediation Goals
TCE	Trichloroethylene
TMV	Toxicity, mobility, or volume
USA	Underground Services Alert
USTs	Underground Storage Tanks

This Corrective Action Plan (CAP) was prepared by ERM-West, Inc. (ERM) for 1001 42nd Street, LLC, to address remedial options for the property located at 1001 42nd Street in the cities of Emeryville and Oakland, in Alameda County, California. The selected remedies are designed to minimize potential exposure by future site users to substances that could pose an unacceptable risk to human health and the environment. This CAP is being submitted to the Alameda County Health Care Services Agency (ACHCSA) for review and approval at their request. This Corrective Action Plan also meets the requirements of California Code of Regulations (CCR) Title 23, Division 3, Chapter 16 *Underground Tank Regulations*, Section 2725 *Soil and Water Investigation Phase,* which specifies that a Corrective Action Plan include: 1) an assessment of the impacts; 2) a feasibility study; and 3) applicable cleanup levels.

Subsurface investigations have evaluated soil and ground water conditions across the site. A free phase mineral spirits plume has been identified in ground water beneath and immediately proximate to the site (i.e., beneath the sidewalk and 41st Street in the block between Adeline Street and Linden Street), and mineral spirits has been detected in nearby soil borings. This CAP addresses remedial alternatives for addressing TPH-mineral spirits in these media.

This CAP summarizes site background and the results of historical soil and ground water investigations, presents information regarding potential human health and environmental effects from chemical constituents in soil and/or ground water at the site, identifies target cleanup goals, describes and evaluates candidate remedial alternatives for the site, and presents the preferred remedial alternative. Based on the current site configuration, the relatively low chemical detections in site soils and ground water, and a comparison of these concentrations to conservative screening levels established by the United States Environmental Protection Agency, the California Department of Toxic Substances Control, and the California Regional Water Quality Control Board, chemicals at the site are not likely to pose a risk to current and potential future site users. Therefore, the remediation approach was primarily designed to provide protection of ground water quality.

The remedial alternatives developed for soil and ground water ranged from a "no action" scenario to excavation of impacted soils, open pit dewatering, and off-site removal of impacted soil and ground water.

Conceptual designs for each alternative were developed, followed by an evaluation of each alternative based on its effectiveness, implementability, and cost.

Based on the results of this evaluation, Alternative 2B (vacuum enhanced skimming) emerged as the recommended remedial alternative for the impacted soil and ground water at the site. Under this alternative, active free-product skimmers are used with the addition of a low vacuum, which increases the rate of free-product removal from the ground water surface. Volatile constituents are removed in the vapor phase, which will reduce the mass of hydrocarbons in soil. In addition, the increased airflow in the subsurface created by the vacuum would provide additional oxygen to enhance biodegradation of organic constituents in the subsurface. Selection of this alternative is based primarily on its demonstrated effectiveness, consistency with future land use, cost-effectiveness, and ease and speed of implementation. This alternative meets the proposed target cleanup goals for the site.

The CAP concludes with a detailed description of the remediation procedures, reporting activities to be implemented as part of the remediation process, and the planned remediation schedule.

1.0 INTRODUCTION

This Corrective Action Plan (CAP) was prepared by ERM-West, Inc. (ERM) for 1001 42nd Street, LLC, to address remedial options for the property located at 1001 42nd Street in the cities of Emeryville and Oakland in Alameda County, California (Figure 1); referred hereinafter as "Site"). The selected remedies are designed to minimize potential exposure by future site users to substances that could pose an unacceptable risk to human health and the environment. This CAP is being submitted to Alameda County Health Care Services Agency (ACHCSA) for review and approval in response to their request. This Corrective Action Plan also meets the requirements of California Code of Regulations (CCR) Title 23, Division 3, Chapter 16 *Underground Tank Regulations*, Section 2725 *Soil and Water Investigation Phase,* which specifies that a Corrective Action Plan include 1) an assessment of the impacts; 2) a feasibility study; and 3) applicable cleanup levels.

The remainder of Section 1 describes the Site location and historical Site uses, the project history, the specific objectives of this CAP, and document organization.

1.1 SITE LOCATION, HISTORY, AND DESCRIPTION

The Site, located at 1001 42nd Street, is primarily situated in Oakland with a portion of the property in Emeryville, California (Figure 1). The site is bounded by 42nd Street to the north, 41st Street to the south, Linden Street to the east, and various residential properties to the west. The Site is located approximately one mile from the western shores of the San Francisco Bay.

The Site is currently vacant. Most recently, Site activities included operations by Oakland National Engravers/ ONE Color Communications, Inc. (ONE) and Rockridge Antiques (Rockridge). Previously, the Site was owned by Boysen Paint Company. Phase I investigations performed in 1998 and 2004 provided a description of the site features at the time of the Phase I investigations, and the site history. The findings of these investigations were presented in the following reports:

- *Phase I Environmental Site Assessment – ONE Color Communications, Inc., 1001 42nd Street, Oakland, California 94608* (National Assessment Corporation, 19 March 1998); and

- *Phase I Environmental Site Assessment –1001 42nd Street, Oakland, California 94608, A.P.N. 012-1023-001-01 & 049-1023-0005-02* (Aqua Science Engineers, Inc., 18 January 2004).

According to the 1998 Phase I report, "small commercial or residential buildings" were present on site in 1930; however, the configuration of those buildings did not resemble the 1998 configuration. The 2004 Phase I report stated that the early site use (i.e., approximately 1903 until the 1930s) was as a carpenter shop/yard on the east, and single-family homes on the west. The Phase I reports indicate that the buildings currently present on site appear to date from the 1940s.

The site was reportedly used by Boysen Paint Company as a paint and varnish manufacturing company, from the mid 1930s until approximately 1990, at which point Oakland National Engraving Company (later ONE Color Communications, Inc.) acquired the site and began operations. According to the 2004 Phase I report, at the time that investigation was conducted, full-scale printing production was not occurring onsite as part of ONE Color Communications, Inc., site operations. ONE continued operations on the Site until 2005. According to the 2004 Phase I report, Rockridge Antiques occupied the former Etching Room from 1980 until 1993; site activities consisted of furniture refinishing.

A map of the Site and its features is provided in Figure 2. As seen in that figure, three main structures are present onsite:

- The two-floor Office and Printing Building (approximate 20,000-square foot footprint) comprising approximately one-third of the property along the eastern boundary;
- The former Rockridge Furniture Refinishing Building/Etching Room in the southwestern corner; and
- The Maintenance Shop in the northwestern corner.

The central portion of the Site consists of a paved parking area, loading docks, and overhangs associated with the buildings.

Figure 2 also depicts the approximate former locations of three Underground Storage Tanks (USTs) identified during the various Phase I investigations:

- UST #1, a 10,000-gallon tank used for mineral spirits storage, was removed from the property in 1987. Total Petroleum Hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and/or xylenes (BTEX compounds) were detected in the underlying soils.

- UST#2, an 8,000-gallon tank also used for storage of mineral spirits, was closed in place in 1993 in the 41st Street sidewalk along the southern property boundary. TPH and BTEX compounds were detected in soil and ground water samples collected from beneath the UST.
- The third UST (UST#3), which was located in the neutralization room of the Office and Printing Building, was reportedly 300 gallons in size, and was closed in place with a No Further Action letter issued by ACHCSA in April 1996.

The Phase I investigations identified the following additional historical site features associated with chemical storage and/or waste disposal:

- A former drum storage area was located in the northwest corner of the Site, adjacent to the Maintenance Shop, where waste chemicals or materials intended for recycling were stored pending disposal. The 1998 Phase I report described the storage area as having a concrete floor and being sloped for secondary containment; one corner was observed to contain a drain/sump. Soil and ground water samples collected from the vicinity of the former drum storage area during subsequent investigations did not contain detectable concentrations of TPH or VOCs.
- Ten ASTs (size unknown) were formerly used for storage of "paint formulations." Based on aerial photograph evidence, it appears that these ASTs were located in the southwest corner of the Site outside the former Etching Room, and that they were removed from the site prior to 1990. No evidence of releases from these ASTs was identified in the Phase I reports, and the ground surface in that area is paved, lessening the possibility of potential impacts to the environment.
- Two steel-lined sumps outside the former Etching Room were apparently used in support of Rockridge's furniture stripping process. The two sumps were abandoned in November 1995. The closure report indicated that ACEHD staffs were present on site and "granted permission for closure after inspecting the open sump." The details of the closure were unclear, but involved a plug/concrete placement in the larger sump excavation, backfill of the excavation with clean fill, and capping with approximately 4 inches of concrete.

1.2 PROJECT HISTORY

The primary field investigations associated with the Site are as follows:

Investigation Event	Scope of Work
1987/1988 UST Investigation	UST#1 removed from the Site in 1987; soil samples collected beneath the former UST location, and monitoring well MW-LD4 installed (no construction details available, speculated that location within excavation pit)
	Additional sampling in UST#2 vicinity; UST not removed due to presence of nearby utility lines; temporary well installed and sampled
May 1990 UST Investigation	Monitoring well MW-B1 installed on west side of UST#2
September 1991 Ground Water Sampling	Ground water samples collected from wells MW-B1 and MW-LD4
May 1993 UST Closure	UST#2 closed in place; tank passed pressure test, but piping did not; UST void filled with cement slurry
	During excavation, liquid observed to be emanating from adjacent Rockridge Furniture Refinishing Building into the pit; this liquid was sampled, and a soil sample was collected from the sump area.
1993 Monitoring Well Installation	Monitoring wells MW-B2, MW-B3, MW-B4 installed in 41st Street in May; wells sampled in June and September 1993
1993/1994 Sump Investigation	Sludge in bottom of sump associated with Rockridge Furniture Refinishing sampled in May 1993; well BES-1 installed adjacent to sump in 1994; soil and ground water samples collected
1994/1995 UST Closure	UST #3 closed in place by backfilling with concrete; liquid contents of tank and underlying soils sampled; ACHCSA issued No Further Action letter in April 1996
Periodic On-site Ground Water Sampling	On-site wells sampled periodically, from the date of their installation through 2005
	At an undetermined date prior to September 2004, well MW-LD4 found to be abandoned; no details available regarding the abandonment activities.
2004 Soil and Ground Water Investigation	Between October and December 2004, 30 borings (BH-A through BH-DD) installed in on- and off-site locations; soil and ground water samples collected from temporary wells set in borings

Investigation Event	Scope of Work
2005 Soil and Ground Water Investigation	In August 2005, ten soil borings (BH-EE through BH-NN) installed in on- and off-site locations; soil samples collected from borings; ground water samples collected from temporary wells set in borings
2006 soil and ground water sampling event	Five soil borings (B-1 through B-5) drilled near the western property boundary in May 2006 to evaluate soil and ground water quality at the western edge of the site and adjacent residential properties; soil and ground water samples collected from borings
August 2006 soil gas sampling	One temporary soil gas probe (SVP-1) installed; soil gas sample collected from 6 feet bgs
March 2007 soil and soil gas sampling	Four temporary soil gas probes (SVP-2 through SVP-5) installed within the former etching room and office and printing building; soil gas samples collected from 6 feet bgs; soil samples collected from one soil boring installed at SVP-5

Sampling locations associated with these investigations are depicted in Figure 3.

1.3 DOCUMENT PURPOSE AND ORGANIZATION

Based on the results of previous investigations at the site, portions of the Site are known to have been impacted with TPH and certain VOCs (see Section 2). This CAP has been prepared to 1) summarize the remedial alternative evaluation process; 2) identify the selected approach for addressing these areas of concern; and 3) provide a detailed set of procedures for implementing the selected remedial alternative. This CAP is organized as follows:

- Section 2 summarizes the findings of historical soil and ground water investigations for the site and immediate vicinity, including the hydrogeologic site conditions, and the nature and extent of chemical occurrence in soils, ground water, and soil gas.
- Section 3 summarizes information regarding potential human health and environmental effects from exposure to the chemical constituents in soil, ground water, and soil gas at the site, specifically, petroleum hydrocarbons.
- Section 4 summarizes the development of target cleanup goals.

- Section 5 describes process undertaken to develop and screen remedial alternatives for evaluation of their ability to meet the target cleanup goals, and identifies the preferred remedial alternative.
- Section 6 presents a detailed description of the procedures that will be undertaken as part of the preferred remedial approach.
- Section 7 describes the reporting, documentation, and public participation activities that will be performed.
- Section 8 presents a schedule for implementation of the preferred alternative.
- Section 9 presents references cited or reviewed in preparation of the CAP.

The main text is followed by figures, tables, and appendices containing supporting information.

2.0 SUMMARY OF CURRENT ENVIRONMENTAL CONDITIONS

This section summarizes the findings of the historical investigations listed in Section 1.2 that were conducted within the Site, as they pertain to the current environmental conditions. These findings include subsurface stratigraphy, ground water depth and flow direction, and chemical occurrence patterns in site soils, ground water and soil gas.

2.1 HYDROGEOLOGY

The majority of the borings drilled at the Site terminated within the uppermost 30 feet bgs. Therefore, the subsurface stratigraphy description presented in this section focuses on the soil within that interval. As summarized below, the sediments across much of the site within the uppermost 30 feet bgs tended to be relatively low permeability sediments (i.e., clayey silt and silty clay).

In general, soils encountered onsite within the first 3 to 8 feet from ground surface (beneath asphalt paving or concrete) were generally dark brown sandy silts (ML), with variable sand content and occasional areas of increased clay content. Beneath this uppermost fill layer, clay (CH/CL) was typically encountered, with variable sand and silt content, and occasional stringers (layers less than 2 feet thick) of clayey gravels and silty sand. However, in the southeast corner of the property, thicker intervals of coarser-grained sediments were encountered, including gravelly sand (SW), clayey sand (SC), and silty sand (SM). The former USTs appear to have been located within the footprint of these coarser-grained sediments in the southeast corner of the site.

This coarse-grained sediments observed on site are consistent in trend and location with a paleo-channel previously identified as part of a separate investigation for the Oak Walk property, as presented in *Corrective Action Plan – Oak Walk Redevelopment Site – Emeryville, California* (The San Joaquin Company, Inc., July 2006) (report hereinafter referred to as the "Oak Walk CAP" that was prepared for the Oak Walk property located southwest of the Site). Appendix A includes a figure reproduced from that report, in which the presence of a paleo-channel is interpreted as trending northeast-southwest across the Oak Walk property and beyond. That figure does not include stratigraphic data associated with the Site.

Alluvial deposits are typically discontinuous by nature, and the existing level of characterization is not sufficient to determine whether the coarse-grained sediments beneath the site are connected with the presumed paleo-channel system described in the Oak Walk CAP. However, determining whether or not such a connection exists is unnecessary for the purpose of this report. As presented later in this section, the nature and extent of contamination is known, and the subsurface characteristics that would affect remediation implementation and effectiveness are adequately understood such that an appropriate remedial approach can be selected.

Three borings extended to depths beyond 30 feet bgs: BH-II, the deepest of the three, terminated at 50 feet bgs; BH-F and BH-FF each terminated at 32 feet bgs. These deeper borings encountered alluvial sediments similar in nature to those in the shallower intervals (i.e., 3 to 5-foot intervals of sands, silts and clays).

Cross-sections depicting the subsurface stratigraphy prepared by a prior consultant investigating the Site (Aqua Science Engineers, Inc.; hereinafter "ASE") have been reproduced from *Report of Soil and Groundwater Assessment ASE Job No. 3976 at Kozel Property, 1001 42nd Street, Oakland, California* (ASE, January 2005), and are provided in Appendix A to this report. These cross-sections depict soils by general permeability classification (i.e., low, medium, and high permeability).

Table 1 presents historical water level measurements associated with ground water wells at the site and in the immediate site vicinity. As seen in that table, ground water is typically encountered from 6 to 9 feet below grade. Calculated elevations based on a recent representative round of ground water monitoring (June 2005) are posted and contoured on Figure 4; the interpreted ground water flow direction is west. This flow direction is consistent with the regional flow direction toward the San Francisco Bay, as noted in the Oak Walk CAP (The San Joaquin Company, Inc., July 2006). The flow direction is also consistent with the general westward sloping of sediments at the site (see Appendix A cross-sections).

2.2 *CHEMICAL OCCURRENCE IN SITE SOILS*

During the field investigations summarized in Section 1.2, approximately 60 soil samples were collected and submitted for analysis for TPH (various fractions, primarily mineral spirits range) and/or VOCs. The results of these analyses are summarized in Table 2, and TPH detections (mineral spirits range; hereinafter "TPH-ms") are posted on Figure 5.

When a given sample was analyzed for VOCs, the full suite analysis by US EPA Method 8260B was performed. The specific analytes included in this analysis varies somewhat between laboratories, but most laboratories report a list of more than 60 common VOCs. The majority of these analytes were not detected in soil samples collected from the site. Therefore, for ease of presentation, this data table omits the results for most of the non-detected analytes. However, the results are included for all constituents detected in at least one soil sample, and for selected additional constituents that were not detected in soils but were detected in samples from other media.

For the soil sampling results associated with all reported analytes (including all non-detected), the reader is referred to the following investigation summary reports, which contain the full laboratory reports:

- Aqua Science Engineers, Inc., 2005. *Report of Soil and Groundwater Assessment - ASE Job No. 3976 - at Kozel Property, 1001 42nd Street, Oakland, California*, January 19.
- Aqua Science Engineers, Inc., 2005. *Report of Additional Soil and Groundwater Assessment - ASE Job No. 3976 - at Kozel Property, 1001 42nd Street, Oakland, California*, October 28.
- ERM, 2006, *Limited Soil and Groundwater Investigation Report - Kozel Property, 1001 42nd Street, Oakland, California*, June.

For comparison purposes Environmental Screening Levels (ESLs) for soils are included on Table 2. The ESLs are screening levels that were developed by the San Francisco Regional Water Quality Control Board to accelerate the preparation of environmental risk assessments at sites where soil and ground water impacts are present. The specific ESLs presented in Table 2 were developed for assessment of shallow soils (i.e., < 3 meters bgs) at locations where ground water is not a source of drinking water, under a residential use scenario[1]. ESLs are not cleanup goals, do not establish policy or regulation, and are not intended to be used as a stand-alone tool for decision making. Detections lower than the ESLs are presumed not likely to pose a threat to human health or the environment. As stated in the ESL documentation, the presence of a chemical above an ESL does not necessarily indicate that adverse impacts to human health or the environment are occurring. In cases where an ESL

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1 These residential ESLs were used in the interest of providing a conservative screening of the soil data, to evaluate against a wider range of land uses than currently exists.

has not been developed for a given constituent, where available, Preliminary Remediation Goals (PRGs) are included for comparison purposes (as above, assuming a residential land use). The PRGs were developed by US EPA Region IX for purposes similar to those of the ESLs.

The majority of the chemical detections in soil are lower than the ESLs/PRGs and do not warrant further attention[2]. Only TPH was detected at concentrations in excess of its screening level. TPH-ms results exceeded the ESL in six soil samples, and TPH-gasoline results exceeded the ESL in three soil samples. These exceedances were associated with fewer than ten percent of the samples. The six samples with TPH-ms detections higher than the ESL are highlighted in Figure 5. The maximum TPH detection was 1,100 mg/kg (location BH-AA, in the extreme southeast corner of the Site, beneath the building).

It should be noted that TPH ranges other than mineral spirits were not widely analyzed in soil samples collected as part of the investigations discussed above, because mineral spirits was known to have been associated with historical site activities, and its presence had been confirmed in site soils and ground water. Regardless, for completeness, a broader range of TPH was included in analyses within samples collected from five locations (B-1 through B-5). Gasoline range detections greater than the ESL were associated with samples collected from two of these locations (B-1 and B-2, off-site and adjacent to the 1020 41st Street property).

2.3 CHEMICAL OCCURRENCE IN GROUND WATER

During the field investigations summarized in Section 1.2 and other investigations conducted at nearby off-site locations, ground water samples were collected from eleven wells in the Site vicinity[3]. In addition, grab ground water samples were collected from 37 soil borings. These samples were submitted for analysis for TPH (various fractions, primarily mineral spirits range) and/or VOCs. The results of these analyses are summarized in Table 3.

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2 Neither an ESL nor a PRG have been established for p-isopropyltoluene.

3 As part of the environmental conditions summary, this report includes data associated with wells CW-1 through -3, which are located in Adeline Street southwest of the subject property, and MW-D1 and -D2, which are located in the block adjacent to the subject property and south of 41st Street.

As for the soil samples, the full suite US EPA Method 8260 analysis was performed for most ground water samples; however, for a subset, volatile analyses were restricted to BTEX compounds. For ease of presentation, as for the soil results, Table 3 omits the results for most of the non-detected analytes. However, the results are included for all constituents detected in at least one water sample, and for selected additional constituents that were not detected in water but were detected in samples from other media As seen in Table 3, with the exception of TPH-ms and butyl benzene, none of these constituents have been routinely detected in recent ground water samples (i.e., samples collected in 2004 or later).

For the water sampling results associated with all reported analytes (including all non-detected), the reader is referred to the following investigation summary reports, which contain the full laboratory reports for the most recent ground water sampling events:

- Aqua Science Engineers, Inc., 2005. *Report of Soil and Groundwater Assessment - ASE Job No. 3976 - at Kozel Property, 1001 42nd Street, Oakland, California*, January 19.
- Aqua Science Engineers, Inc., 2005. *Report of Additional Soil and Groundwater Assessment - ASE Job No. 3976 - at Kozel Property, 1001 42nd Street, Oakland, California*, October 28.
- Aqua Science Engineers, Inc., 2006. *Semi-Annual Groundwater Monitoring Report – March 2006 Groundwater Sampling at Kozel Property, 1001 42nd Street, Oakland, California*, May 7.
- ERM, 2006, *Limited Soil and Groundwater Investigation Report - Kozel Property, 1001 42nd Street, Oakland, California*, June.

In addition, the TPH-ms results are posted on Figure 6, including notations of the two monitoring wells with measurable free product (BES-1 and MW-B1). In the interest of thorough lateral coverage, this figure contains data associated with:

1) Grab ground water samples collected from borings during the December 2004, August 2005, and May/June 2006 sampling events; and
2) Samples collected during the last reported monitoring event for each monitoring well (representing a range of dates from 2003 to 2006).

Because the posted data were collected over a 4-year period, the results cannot be meaningfully contoured to represent a one-time depiction of TPH occurrence. Instead, the data were used to outline an outermost extent of impacts, which is the presumed Area of Concern for remediation purposes.

As described above for soils, ESLs are provided on Table 3 for comparison purposes[4]. In cases where an ESL has not been developed for a given constituent, where available, Maximum Contaminant Levels (MCLs) are included for comparison purposes[5].

Most of the chemical detections were well below screening levels, and do not warrant further attention. The detections that exceeded screening levels are summarized below.

2.3.1 TPH

TPH detections in ground water samples were higher than the screening levels at several locations (soil borings and wells). The highest TPH-ms concentrations were associated with water samples collected from soil borings (maximum detection 2,000 mg/L at location BH-AA) and may represent effects of incorporation of impacted soil particles rather than actual ground water conditions. Detections in samples collected from wells were considerably lower (maximum detection of 630 mg/L at MW-LD4).

As seen in Figure 6, the highest TPH-ms concentrations are associated with locations along the southern boundary of the Site (both on and off-site). As noted above for soils, other TPH ranges were not widely analyzed for in ground water samples, but they were routinely detected in the analyses performed. In the few samples in which other TPH ranges were analyzed, detections were reported for those ranges. Most of those detections were higher than the ESLs. These ESL exceedences are within the footprint of the overall TPH-ms footprint (Figure 6).

2.3.2 Butyl Benzenes

Butyl benzenes were typically detected in ground water samples with elevated TPH detections. The butyl benzene detections were low relative to the TPH detections (maximum detection 0.056 mg/L), and were within

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4 For this purpose, consistent with the approach for assessment of the soil data, ERM used ESLs developed for assessment of shallow soils (i.e., < 3 meters bgs) at locations where ground water is not a source of drinking water, under a residential use scenario.

5 The lower of either 1) the US EPA primary MCL, or 2) the California Department of Health Services (DHS) primary MCL is posted in the table and was used for the screening level comparison.

the footprint of TPH occurrence. ESLs have not been established for butyl benzenes, but based on their relatively high soil PRGs, they do not appear to have low health threshold criteria, and these detections are not expected to pose a threat to human health.

2.3.3 Other VOCs

As seen in Table 3, certain other VOC were reported as detections during various sampling events. These VOCs are not commonly detected in water samples and do not suggest the presence of a sustained VOC plume. Samples collected from Well BES-1, which is located between the former locations of UST#1 and #2 (last sampled in 2003), are generally associated with the widest variety and highest concentrations of these VOCs.

Most of the VOC detections were lower than the applicable screening levels. However, xylenes, naphthalene, and vinyl chloride were detected sporadically at concentrations in excess of the screening levels, as summarized below:

Xylenes	One detection in excess of ESL in sample collected during initial sampling round at MW-B1. This constituent was not detected during subsequent sampling rounds, and is presumed to be non-representative of actual ground water conditions.
Naphthalene	One detection in excess of ESL in sample collected from BH-Y. This constituent was not routinely detected; the only other detection (lower then ESL) was associated with BH-W.
Vinyl chloride	Two detections in excess of ESL, both associated with samples collected from BES-1. This constituent was not routinely detected; the only other detections (lower then ESL) were associated with BH-C and MW-B4. All of these sampling locations are within the same general area in the southwest corner of the Site. This localized area is also associated with the sole detections of certain other VOCs (DCA and DCE).

2.4 CHEMICAL OCCURRENCE IN SOIL GAS

As noted above, in August 2006, one soil gas sample was collected from a temporary soil gas probe set at location SVP-1 and in March 2007; four soil gas samples were collected from locations SVP-2 through SVP-5 (see

Figure 3). Analytical results for VOCs and TPH-ms in soil gas are summarized on Table 4.

For comparison purposes the ESLs and California Human Health Screening Levels (CHHSLs) for soil gas are included on Table 4. The CHHSLs were developed by the Department of Toxic Substances Control (DTSC) for purposes similar to the ESLs (refer to discussion in Section 2.2). None of the detections exceeded the ESLs or CHHSLs.

2.5 SUMMARY OF CHEMICAL OCCURRENCE IN ALL MEDIA

Detections of individual chemicals in soil, ground water, and soil gas were compared to determine the relationships and potential migration pathways of chemicals within and between those media. The results of this evaluation are presented in Table 5.

As presented in that table, TPH-ms is the primary chemical of potential concern. It was known to have been stored in large quantities on site during historical site operations, and releases have been documented from onsite USTs. Free product has been encountered in ground water in a localized area, and soil samples collected from immediately above the water table contain elevated TPH-ms concentrations. TPH-ms is the constituent most commonly detected and at the highest concentrations in soil and ground water samples, and several of the detections are greater than applicable screening levels. These exceedances are associated with samples collected from along the southern boundary of the property (on and off-site).

No other site-related compounds appear to have impacted site media to this extent; however, certain VOCs have been sporadically detected in ground water samples (i.e., xylenes, naphthalene, and vinyl chloride) at levels above their respective screening levels. These VOCs are not considered chemicals of potential concern associated with historical site operations, for the reasons listed below.

1) Naphthalene has not been detected in samples collected from wells; it was only reported in the results for a few grab ground water samples collected from soil borings.
2) Xylenes were detected at a concentration above the screening levels during a single monitoring event, the initial sampling round at MW-B1. This constituent was not detected during subsequent sampling rounds, and is presumed to be non-representative of actual ground water conditions.

3) Vinyl chloride detections have been reported in repeated ground water sampling events and appear to be representative of actual ground water conditions. However, the occurrence of this constituent is limited to a localized area within the boundaries of the overall TPH-ms impacts.

As summarized above, the detections of these three constituents do not appear to represent a sustained VOC plume, and the screening level exceedances fall within the footprint of the TPH impacts. Constituents recently reported as being present in soil or ground water at concentrations above screening levels have not been detected in soil gas samples, indicating that upward migration from soil or ground water through the soil column is not an issue.

Based on site ground water monitoring data, the extent of the dissolved phase TPH-ms plume is similar to that of the free phase impacts. Concentrations of TPH and VOCs in site ground water appear to be stable or decreasing, although a study specifically documenting plume stability has not been performed.

2.6 ESTIMATE OF FREE PRODUCT VOLUME

Scientific literature characterizes mineral spirits as insoluble and as lighter than water (Genium, 1999); as such, it forms a light nonaqueous phase liquid (LNAPL) layer in the subsurface, separate from and floating upon ground water. LNAPL tends to not migrate as quickly and extensively as soluble chemicals that migrate with ground water flow.

The measured LNAPL thickness and estimated plume size can be used to develop a rough but conservative estimate of the volume of LNAPL present. It is well documented that LNAPL thicknesses observed in monitoring wells is not a true representation of LNAPL thicknesses likely present in the formations (Hampton and Miller, 1988; Ballestero et al, 1994). Measured LNAPL thickness in wells is typically 2 to 10 times greater than the corresponding LNAPL-saturated formation thickness (Mercer and Cohen, 1990). Several methods have been developed that attempt to estimate the apparent LNAPL thickness from the measured thickness in wells (Ballestero et al, 1994).

Six monitoring wells have been installed at the former ONE Facility and an additional five wells were installed across 41st Street at the former Dunne Paints facility. LNAPL has been consistently recorded in two of the monitoring wells (BES-1 and MW-B1), over a 12-month monitoring

period between March 2004 to June 2005. In addition, a sheen was detected in a third well (MW-B4) during a single sampling event in June 2004. In June 2005, free product was observed in monitoring well BES-1 with a thickness of 0.02 feet. MW-B1 was not sampled in June because it had been covered by a new concrete sidewalk. During the preceding monitoring event in March 2005, 0.04 feet and 0.03 feet of free-product were observed in monitoring wells MW-B1 and BES-1, respectively.

According to Mercer and Cohen (1990) the ratio of measured thickness to actual thickness increase with decreasing formation grain size, increasing capillary fringe height, and increasing LNAPL density. De Pastrovich et al (1979) suggest using the following equation to estimate this ratio:

$$h_w / h_f \approx \rho_n / (\rho_w - \rho_n)$$

Where:
h_w = measured LNAPL thickness
h_f = actual LNAPL thickness
ρ_n = LNAPL density [0.793 g/mL (NPS, 1997)]
ρ_w = water density

Table 6 shows the estimated in-situ thicknesses calculated using the seven methods reviewed in Ballestero et al (1994). Using the measured free-product thickness for BES-1 in June 2005 (0.02 feet), this equation estimates an actual thickness of 0.005 feet. Based on the June 2005 soil and ground water analytical data, and assuming that recoverable LNAPL exists in areas exceeding 1,000 mg/L TPH in ground water, the plume area is estimated to be 12,000 ft^2. The LNAPL occurrence is assumed to be uniform throughout this area. Because free-product has not been observed in other monitoring wells within the estimated plume boundary, this assumption is considered to be conservative. Assuming a uniform porosity of 0.34, the volume of the LNAPL is thus estimated to be roughly 450 gallons.

It should be noted that only a fraction of the estimated free-product in the subsurface is recoverable, and, once removed, would leave behind residual TPH concentrations. In most cases, residual saturations are not known or measured, but are developed as estimates from theoretical equations and information on hydrogeologic conditions. Mercer and Cohen (1990) have compiled data for several liquids in various media. Typically, residual saturation fractions range from 0.1 to 0.2 in the vadose zone and from 0.15 to 0.50 in saturated soils. Mercer and Cohen (1990) report a residual saturation of 0.52 L/m^3 for paraffin oil in fine sediments

in the vadose zone, which corresponds roughly to 30,000 ppm. Therefore, we do not expect to be able to recover the full estimated 450 gallons of TPH. As such, there exists a risk of impacted soil acting as a significant potential source to ground water contamination in the future. Thus, a remediation alternative that addresses both the free product and the impacted soil should be considered.

3.0 ASSESSMENT OF RISKS ASSOCIATED WITH SITE CONDITIONS

This section identifies the chemicals of potential concern at the site based on the information provided in Section 2 and assesses the associated risks posed to human health and the environment. The discussion includes a description of the physical and chemical characteristics of the chemicals of potential concern, their toxicity, and their potential for migration.

3.1 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

The chemicals of potential concern at the site have been identified based on comparison of detections in soil, ground water, and soil gas samples to established risk-based screening levels (i.e., the ESLs, CHHSLs, and/or PRGs). As discussed in Section 2, the only constituents ever reported at concentrations in excess of these screening levels were TPH, xylenes, naphthalene, and vinyl chloride. Of these, because of the number and level of exceedances, TPH-ms is considered the primary chemical of potential concern, and is the focus of the remedial alternative evaluation process summarized in this report. The physical characteristics and potential for migration of TPH-ms are evaluated below.

3.2 TPH-MS

TPH-ms is a refined petroleum solvent that is a complex mixture of hydrocarbons distilled from crude oil. It is typically defined by a 150 to 220°C boiling range. The primary chemical constituents are alkanes (30 to 50 percent of total mixture), cycloaliphatics (30 to 40 percent), and aromatics (10 to 20 percent). The specific compounds and their percentages vary depending on the specific solvent in question, and change over time with degradation (ATSDR, June 1995).

3.2.1 Migration Potential

Environmental fate of mineral spirits is a function of the physical-chemical properties of the mixture, as well as the nature of the release and subsurface conditions (e.g., the soil types, the depth to ground water, and other factors). If a mineral spirits release is sufficiently large, the capacity of the soil into which it is released can be exceeded, and the hydrocarbons will migrate downward to the water table. Upon encountering ground water, the hydrocarbons will collect and spread laterally on the ground

water surface as a separate phase (Light Non-Aqueous Phase, or LNAPL). Being less dense than water, this LNAPL layer will float on the water surface. Most of the constituents in mineral spirits tend to have low solubility in water; however, over time, a portion of the LNAPL (e.g., aromatic constituents) may slowly dissolve into ground water. Migration of the LNAPL (and any portion solubilized into ground water) would then be consistent with ground water flow directions. Soluble constituents would tend to migrate further and more rapidly than the LNAPL. However, any soluble fractions would constitute a minor component of associated ground water impacts, and the relative solubility of TPH-ms is low.

Because unconfined ground water tends to fluctuate in elevation, the presence of an LNAPL layer often creates a "smear zone" in the depth intervals proximate to the water table, in which the LNAPL is retained in the overlying soils. The presence of this smear zone can serve as a future source of continued ground water impacts.

As a mixture, mineral spirits is not highly volatile; however, the lighter constituents can volatilize and migrate upward through the soil column.

Consistent with the migration mechanisms noted above, over time, the percentage of lighter constituents will decrease, and the heavier constituents (i.e., the aliphatic compounds) will represent a higher percentage of the mineral spirits residues remaining in the subsurface.

3.2.2 Toxicity

Because the chemical composition of mineral spirits varies widely, only certain preparations of mineral spirits (e.g., Stoddard solvent) have been well-studied in regards to toxicological characteristics. The toxicology database is much more extensive on some of the individual chemicals in mineral spirits. Based on evidence derived from both humans and laboratory animals, it is clear that mineral spirits constituents are readily absorbed in the primary three routes of entry (i.e., gastrointestinal tract, lungs, skin). Chronic toxicity and toxic effects vary among different chemical constituents. The most frequently observed chronic effects in humans include headaches; irritation of the eyes, nose, and throat; and fatigue. The organ systems most likely to be affected in laboratory animals following chronic exposure to mineral spirits are the liver, lungs, and kidneys. There is no evidence that either mineral spirits or any of the individual chemicals in mineral spirits are carcinogenic (ATSDR, June 1995).

3.4 EVALUATION OF POTENTIAL THREAT TO HUMAN HEALTH AND THE ENVIRONMENT

Theoretically, if chemical constituents were present in the various site media at levels of concern, exposures to impacted soil or water, volatile emissions, or dusts generated from soil could represent a potentially unacceptable health risk to human receptors 1) on the subject property; 2) immediately off-site in the area beneath the sidewalk and 41st Street in the block between Adeline Street and Linden Street; and/or 3) the residences along 41st Street that are immediately adjacent to the subject property. Evaluation of chemical occurrence patterns and the land uses suggest that this is not a concern.

3.4.1 Subject Property

As discussed in Section 1, the subject property currently is designed for commercial/industrial use rather than residential use. No residential properties are within the subject property. Three main buildings are present on site, and pavement covers the remainder of the property. Therefore, no soils are exposed at the site or immediate vicinity, and there is no potential for direct contact with soils and the chemicals within them under the current land use. Furthermore, even if direct contact were possible, the chemical detections in site soils are lower than risk-based screening levels at most locations (Section 2.2); thus negligible risks would be posed by these exposures. The highest detection in site soils for TPH-ms[6] is 1,100 mg/kg (boring BH-AA). This detection is associated with a location beneath the main building, where direct contact is exceedingly unlikely.

It must be emphasized that the 100 mg/kg soil ESL for TPH incorporates conservative assumptions, and exceedances of the ESL do not necessarily indicate that a health risk is posed. For example, the ESLs for TPH are conservatively based on a target hazard quotient of 0.5, as compared to a hazard quotient of 1.0 that indicates an estimated exposure potential approaching the regulatory limit. Furthermore, the ESLs used in this screening level evaluation were not established solely for protection of human health; the 100 mg/kg TPH ESL also considers protection of ground water quality. As presented in the ESL documentation, risk-based screening levels for soil developed using the ESL procedures, but solely

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6 As presented in Section 2 and Table 2, TPH is the only chemical constituent detected above risk-based screening levels in soil samples.

considering direct exposures to humans under residential and commercial/industrial land uses are 400 mg/kg (Table K-1 of ESL documentation; CRWQCB, February 2005) and 750 mg/kg (Table K-2; CRWQCB, February 2005), respectively. Of all detections in onsite soils, only one (the above-mentioned 1,100 mg/kg detection) falls above this range. If one applies a 1.0 hazard quotient, such as would be appropriate when no other chemicals of potential concern were present, the 1,100 mg/kg falls at the lower end of the range of applicable screening levels (800 to 3,700 mg/kg, for residential and commercial/industrial, respectively).

It is important to note that point-by-point comparisons of sampling data to risk-based criteria are a conservative approach for identifying areas with potential health risk. It is more appropriate to evaluate potential exposures and risks using the 95 percent upper confidence limit (UCL) concentration of the combined data set, rather than individual sample results, for the following reasons:

- Any risk-based screening levels are derived using toxicity criteria that are based on lifetime average exposures; and
- The 95 percent UCL concentration is more representative of the concentration that would be contacted at the site over time. That is, a person would not expect to be exposed to soil at a single point on the site; rather, they would be exposed to soil over an area of the site.

In addition, the screening levels used for comparison to site concentrations are generic values that have been developed to be a conservative screen for a wide-variety of environmental conditions. Site-specific screening levels, which would account for site-specific environmental and exposure conditions, would likely be higher. Therefore, chemicals in soils in this area are not likely to pose a threat to human health under a direct exposure situation.

Chemical detections in ground water are also unlikely to pose a threat to the health of site users. No water supply wells are currently present on the subject property, and a site user is not likely to come into direct contact with ground water.

Emission of volatile constituents from soil and ground water into the overlying soil column is a potential migration pathway. However, the soil gas data indicate that volatile compounds are not present at appreciable concentrations in soil gas, and none of the detections exceed the ESLs and CHHSLs (Table 4, Section 2.4). Therefore, this exposure pathway does not appear to represent a threat to current or future site users.

3.4.2 Adjacent Property – Sidewalk and Street

As previously noted, a free phase mineral spirits plume has been identified in ground water beneath and immediately proximate to the site (i.e., beneath the sidewalk and 41st Street in the block between Adeline Street and Linden Street), and TPH has been reported in soil in this area at depths near the water table. Therefore, the potential for adverse health effects to street workers was also evaluated. Because the ground surface is covered with sidewalk and road, direct contact to underlying soils is not possible under current conditions.

If sidewalk or roadway repair were to be performed, there would be the potential for direct contact by those repair workers to impacted soils. Most of the chemical detections in soils immediately adjacent to the subject property are lower than the ESLs, and as such would not pose a threat to human health even under a direct exposure situation. As seen in Table 2 and noted in Section 2.2, only one soil sample collected in 41st Street was slightly higher than the ESL applicable to TPH-ms (140 mg/kg as compared to the 100 mg/kg ESL); other TPH detections in soils within the road are well below the ESL. As discussed above, the 100 mg/kg screening level is considered conservative; the ESL documentation indicates that an appropriate TPH-ms screening level for construction/trench workers based on direct exposure alone is 6,000 mg/kg (Table K-3, CRWQCB, February 2005). All of the TPH-ms detections are well below this screening level. It should also be noted that the screening levels are based on long-term chronic exposures. Any sidewalk or roadway repairs would likely be short-term. Therefore, direct exposures to soils within the sidewalk/street areas should not pose an unacceptable risk to human health.

Ground water is encountered below the depths in which workers involved in road construction or utility maintenance would typically be working, and dewatering would typically not be required. Under those circumstances, direct exposures to ground water would not be anticipated. However, for certain types of utilities, in particular deeper sewers, ground water could be encountered. Given the short duration of such activities, direct exposures to ground water with chemical concentrations comparable to those recently detected should not pose an unacceptable risk to human health.

As discussed above, based on the relatively low chemical detections in soil gas compared to applicable screening levels (Section 2.4, Table 4), emission of volatile constituents from soil or ground water does not appear to represent a threat to off-site maintenance workers.

3.4.3 Adjacent Property – 4102 Adeline Street/1020 41st Street

These properties are in the immediate vicinity of the free phase mineral spirits plume, and TPH detections been reported in soil and ground water in this area. Therefore, the potential for adverse health effects to residents at these properties was also evaluated.

As presented in Table 2 and Section 2.2, most of the chemical detections in soils in the residential area immediately adjacent to the subject property are lower than the ESLs, and as such would not pose a threat to human health under a direct exposure situation. One soil sample (boring B-1 at 14 feet below grade) was slightly higher than the ESL applicable to TPH-ms (110 mg/kg as compared to the 100 mg/kg ESL); other TPH-ms detections in soils near the offsite residences are well below the ESL. Samples at location B-1 and B-2 also exceed the ESL for TPH-gasoline range (also 100 mg/kg); the highest detection is 620 mg/kg. As described above, a more applicable screening level for residential land use is 800 mg/kg (assuming a 1.0 hazard quotient); all off-site TPH detections (including both gasoline and mineral spirits ranges) are below that level. Therefore, chemicals in soils in this area are not likely to pose a threat to human health under a direct exposure situation.

As noted above, the use of (1) individual sampling results rather than the 95 percent UCL concentration, and (2) generic screening levels (i.e., rather than site-specific screening levels that would account for site-specific environmental and exposure conditions) provide a conservative approach to evaluating risk. With this in mind, chemicals in soils in this area are not likely to pose a threat to human health under a direct exposure situation.

Chemical detections in ground water are also unlikely to pose a threat to the health of site users. Unless water supply wells are present at the off-site residences, the residents are not likely to come into direct contact with ground water.

As discussed above, chemical detections in soil gas are relatively low, and none exceed the screening levels (Table 4, Section 2.4). Therefore, emission of volatile constituents from soil or ground water does not appear to represent a threat to off-site residents.

4.0 DEVELOPMENT OF CLEANUP GOALS

This section presents the target cleanup goals developed for the site, including a summary of the beneficial property uses.

4.1 BENEFICIAL USES SUMMARY

Site ground water is not currently in use; however, the current *San Francisco Bay RWQCB Basin Plan* identifies potential beneficial uses for this ground water including municipal and domestic water supply, agricultural supply, industrial service supply, and industrial process supply. There are no known residential-use wells or irrigation wells in the area around the site.

Although there is no planned future use for ground water in the vicinity of the remediation area, potential future beneficial uses identified for the ground water in the vicinity of the remediation area include municipal and domestic water supply, agricultural supply, industrial service supply, and industrial process supply.

4.2 TARGET CLEANUP GOALS

Two types of cleanup goals are typically established for impacted sites: target cleanup goals for protection of 1) human health and 2) protection of ground water. As discussed in Section 3, based on the current land use and chemical concentrations in soil and ground water at and adjacent to the site, site conditions do not pose a likely threat to human health under current and future anticipated land uses; therefore, remediation is not needed to address these issues.

The following target cleanup goals have been developed for protection of ground water quality:

- To minimize the potential growth of the TPH-ms plume and accelerate natural attenuation, remove free-product to the extent practicable[7]; and

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7 For remedial alternatives involving free product pumping, the practical extent is defined as less than two gallons of free product recovered per month.

- Achieve site conditions such that soils are protective of ground water quality and do not represent an on-going source of potential ground water impacts. With ACHCSA concurrence, a cleanup goal of 5,000 mg/kg (a value corresponding roughly to the residual saturation of TPH-ms) was recently established for the nearby former Dunne Paints facility as being protective of ground water quality. Assuming conditions at the subject site are similar to those at the former Dunne Paint facility, we request that the ACHCSA adopt a target cleanup goal of 5,000 mg/kg for this release, with the need for remediation of exceedances, if any are encountered in the future, to be determined based on the specific conditions (e.g., the magnitude of the exceedance, the lateral and vertical extent of concentrations greater than the target cleanup goal, and the overall likelihood for adverse impacts to site users and/or ground water quality).

5.0 SELECTION OF REMEDIAL ACTION ALTERNATIVE

ERM has developed remedial action alternatives potentially capable of meeting the target cleanup goals for the remediation of impacted soil and ground water. This section describes the development process for the remedial action alternatives, the methodology used to evaluate each alternative, and an evaluation of each alternative against standard screening criteria.

5.1 TECHNOLOGY SCREENING

Various remedial technologies and process options were screened to identify those that have the potential to meet the target cleanup goals for the chemical constituents identified at the site. The screenings of technology process options for various environmental media are summarized in Table 7. Many remediation technologies volatilize the sorbed, dissolved, or free-product chemicals, producing an impacted vapor. An off-gas treatment system may be required depending on the concentration of constituents in these emissions and the rate at which they are discharged. Based on the screening, those technology process options least suitable for addressing impacted media and achieving target cleanup goals were eliminated. Those technology process options considered technically effective, implementable given current knowledge of the site, and cost-effective relative to competing options were retained and evaluated to develop remedial alternatives for impacted soil/fill materials and ground water.

5.2 REMEDIAL ALTERNATIVE DEVELOPMENT

The following four remedial action alternatives for the remediation of impacted soil and/or ground water have been developed:

- **Alternative 1 –** No Action;
- **Alternative 2 –** Skimming (Option A – Standard Skimming Process, Option B – Vacuum Enhanced Skimming);
- **Alternative 3 –** Ozone Sparging; and
- **Alternative 4 –** Open Pit Dewatering/Soil Source Removal.

The following subsections present a conceptual description of each alternative in sufficient detail for evaluation and comparison of the alternatives later in this document.

5.3 REMEDIAL ALTERNATIVE EVALUATION

This section provides detailed descriptions and a comparative analysis of the remedial alternatives presented in Section 5.2. The description of each alternative provides a summary of the remedial activities to be performed and the equipment to be used during implementation. The comparative analysis evaluates the relative advantages and disadvantages of each of the alternatives with respect to effectiveness, implementability, and cost (described below).

The ability of a remediation strategy to achieve cleanup goals is somewhat dependent on the starting conditions, especially in regard to the time needed to achieve these goals. Several soil and ground water sampling events have occurred between 1993 and the present. These studies have helped to characterize the extent of the subsurface impacts, as described in Section 2.

5.3.1 Evaluation Criteria

The three criteria that were used in evaluating the candidate alternatives are defined below.

- **Effectiveness.** This criterion measures how well the alternative meets the target cleanup goals, and the time required to achieve them. Effectiveness also measures the long-term reliability of the alternative, including any uncertainties that may be associated with the alternative, the magnitude of residual risk posed by the presence of untreated waste or treatment residuals, and the adequacy of institutional actions or containment measures needed to manage residual risk. Finally, this criterion assesses the potential impact on the environment during remediation and the effectiveness of the proposed remedial measures.
- **Implementability**. This criterion measures the ease or difficulty of conducting the proposed remedial action. Included in this criterion are the technical feasibility of the alternative, the ease of undertaking additional actions, and the ability to monitor the effectiveness of the action. Additionally, it assesses the availability of the required equipment, materials, and services, as well as site-specific constraints. This criterion also measures the administrative feasibility (i.e., permit availability and regulatory acceptance) of the action and the likelihood

of public acceptance of the action. This criterion favors proven technologies that are widely available and simple to implement or construct and operate.

- **Cost**. The cost criterion assesses the financial burden associated with implementing the remedial action alternative. The factors that are addressed include direct and indirect capital costs, and operation, monitoring, and maintenance costs, if applicable. Direct capital costs include construction costs or expenditures for labor, materials, equipment, and subcontractors associated with the remedial action. Indirect capital costs include expenditures for engineering, permitting, construction management, and other services necessary to carry out the remedial action. O&M costs include operational labor and maintenance materials associated with the extended O&M and reporting for each alternative. Costs are evaluated in terms of present worth.

The components of the remedial alternatives are summarized later in this section. A detailed analysis was performed for each alternative relative to the evaluation criteria, the results of which are comparatively presented in Section 5.4 and summarized in Table 8.

5.3.2 Alternative 1 – No Action

The "no action" alternative includes no active remediation and relies on the natural abilities of the subsurface to reduce the mass, toxicity, mobility, volume or concentration of the chemicals of potential concern to achieve site-specific cleanup goals. Several processes contribute to natural attenuation of chemicals, including:

- Biodegradation;
- Dispersion;
- Dilution;
- Sorption;
- Volatilization; and
- Chemical or biological stabilization, transformation, or destruction.

The capabilities of natural attenuation depend on geologic and hydrogeologic characteristics of the aquifer, the physical and chemical properties of the soil, and the metabolic capabilities of the native microbes. Natural attenuation can prove to be a viable remediation alternative under favorable conditions. TPH-ms, the predominant chemical present at and near the site, and some VOCs are amenable to

natural attenuation provided the indigenous microorganisms have an adequate supply of nutrients and electron acceptors, and biological activity is not inhibited by substances toxic to the organisms. Where site data shows contaminant plume stability and decreasing concentrations at rates acceptable for human health risk concerns, natural attenuation may be used to achieve cleanup goals without the assistance of active remediation. Based on site ground water monitoring data, the extent of the dissolved phase TPH-ms plume is similar to that of the free phase impacts. Concentrations of TPH-ms and VOCs in site ground water appear to be stable or decreasing, although a study specifically documenting plume stability has not been performed.

No monitoring would be performed under this "no action" alternative to document the occurrence of natural attenuation.

5.3.3 Alternative 2 – Skimming (Option A – Standard Skimming Process, Option B – Vacuum Enhanced Skimming)

During standard skimming (Option 2A), passive free-product skimmers are inserted into new 6-inch product recovery wells within the area of free-product impact to a depth near the water-product interface. The free-product is collected through a hydrophobic filter that allows only product into the skimmer reservoir. The reservoir is periodically removed and emptied into temporary storage, which is sent off site for oil recycling. Passive skimming relies on gravity, which causes the free product to migrate through a filter into the reservoir. Because the equipment does not have any moving parts, this option requires little maintenance other than periodically emptying the reservoir. Skimming is advantageous in that little ground water waste is generated.

Vacuum-enhanced skimming (Option 2B) is an enhancement of the technology described above. Option B uses active free-product skimmers with the addition of a low vacuum, which reduces air pressure in the formation, which may mobilize trapped product to drop out of the vadose zone. This vacuum also creates a gradient toward the wells, which increases the rate of free-product removal. Under this option, the free-product skimmers would be used with pneumatic pumps connected to an air compressor. The air compressor is used to transfer the free-product from the skimmer reservoir through underground tubing to temporary storage, which would be sent off site for oil recycling. As a side benefit, the increased airflow in the subsurface created by the vacuum provides additional oxygen to promote biodegradation of TPH and VOCs in the subsurface.

This option would include active skimmers with pumps and airtight seals on each recovery well, an air compressor, and a blower to supply a vacuum to each well. The vapor discharge from the blower would be connected to a vapor-phase granular activated carbon (GAC) unit to treat the extracted air prior to discharge to the atmosphere. Because vacuum enhanced skimming uses low vacuum and hydrophobic filters, little ground water waste is generated.

Either of these two skimming options would be followed by a monitored natural attenuation program to document the occurrence of natural attenuation. This program would require a period of ground water monitoring until and for a short time following the achievement of cleanup goals and would likely require a monitoring well network to confirm plume stability. These options would also include ground water monitoring to evaluate the impacts from impacted soil on ground water quality.

5.3.4 Alternative 3 – Ozone Sparging

In-situ chemical oxidation (ISCO) using ozone is one of the presumptive methods to remediate hydrocarbons. Ozone is a strong oxidizer that will, upon contact, oxidize, or destroy, any hydrocarbons. Unlike many other chemical oxidizers, ozone is a gas, which enables it to migrate more easily through fine-grained soils. To maximize mass transfer to ground water, ozone is commonly injected into sparge wells where small fine bubbles of ozone are generated and dispersed through the subsurface. Also, as an ancillary benefit, upon decomposition, ozone provides oxygen to the microbial community, which can aid in bioremediation of TPH and VOCs due to increased dissolved oxygen (DO) concentrations in ground water beneath the site.

Under this alternative, 2-inch sparge wells screened in the saturated zone beneath the LNAPL would be installed in the area of interest. Using a plasma arc connected to an air compressor, ozone would be created from air and injected through underground piping into the sparge wells. Each wellhead would be fitted with an airtight seal. In addition, a vapor extraction system would be implemented to capture any residual ozone.

Long term feasibility testing would be required to determine ISCO's remedial effectiveness; therefore, the majority of the infrastructure (sparge wells, underground piping, and power drop, etc.) would need to be installed even for the multi-month feasibility test.

The effectiveness of ISCO may be limited due to low permeability subsurface conditions and may require extended periods of implementation.

Following ozone sparging, a monitored natural attenuation program would be implemented to document the occurrence of natural attenuation. This program would require a period of ground water monitoring until and for a short time following the achievement of cleanup goals and would likely require the installation of down-gradient monitoring wells to confirm plume stability. This option would also include ground water monitoring to evaluate the impacts from impacted soil on ground water quality.

5.3.5 Alternative 4 – Open Pit Dewatering/Soil Source Removal

Excavation is often the quickest method to remediate hydrocarbons in soil and can be used to remove saturated sediments containing petroleum hydrocarbons, if conditions are appropriate. With this method, impacted soil is excavated, hauled offsite for disposal, and replaced with clean back fill material.

Excavation dewatering would be performed using a trash pump placed in the excavation. The pump would be connected by hoses to a sedimentation tank to remove solids, followed by GAC to remove organics. The treated water would be discharged to the sanitary sewer and conveyed to the publicly owned treatment works (POTW).

Following soil excavation, a monitored natural attenuation program would be implemented to document the ability of natural attenuation to decrease dissolved phase concentrations. This program would require a period of ground water monitoring until and for a short time following the achievement of cleanup goals and would likely require the installation of down-gradient monitoring wells to confirm plume stability.

5.4 COMPARATIVE ANALYSIS OF ALTERNATIVES

The four remedial action options summarized above were evaluated with respect to the evaluation criteria. The findings of this analysis are listed in Table 8, and summarized below.

5.4.1 Effectiveness

Of the four alternatives being considered, Alternative 4 offers the greatest effectiveness. Alternative 4 includes the removal of all impacted soil and LNAPL from the site, as well as impacted ground water. Under this alternative, excavated soil would be disposed off site in a landfill and the LNAPL and impacted ground water would be removed by pumping and treated prior to disposal at the POTW. Because the soil source and LNAPL would be removed under this alternative, the residual risk would be minimal to human health, the environment, and the beneficial uses of ground water. In addition, natural attenuation of the dissolved phase impacts remaining after source removal would permanently reduce risk to the beneficial uses of ground water. This alternative would achieve cleanup goals the most quickly, in an estimated 6 months, depending upon schedule and timing of the work activities. However, this option could pose a greater short-term risk to workers and the community due to direct contact with impacted soils, ground water, and LNAPL. Volatilization of chemicals during soil excavation activities could also pose a short-term risk.

Alternatives 2A, 2B, and 3 are adequate and reliable methods to remove the LNAPL in order to achieve the cleanup goals. Alternatives 2B and 3 offer ancillary benefits of bioremediating the soil while addressing the LNAPL issue, which would adequately address risk to the beneficial uses of ground water posed by residual soil impacts. In addition, natural attenuation of the dissolved phase impacts remaining after source removal would permanently reduce risk to the beneficial uses of ground water. The duration required for Alternatives 2B and 3 to achieve cleanup goals depends on several factors, including the radius of influence of each well, pump rates, and bioremediation rates. As mentioned above, the off-gas resulting from implementation of Alternatives 2B and 3 would need to be monitored and possibly treated prior to discharge. Alternatives 2B and 3 offer the possibility of achieving cleanup goals as quickly as 2 to 4 years respectively. Because the standard skimming option relies on gravity alone to remove LNAPL from the ground water surface, Alternative 2A would take longer (approximately 7 years) to achieve cleanup goals than Alternatives 2B, 3, and 4, but would not create off-gas during the process. Potential additional short-term risks for all these active remediation options include those associated with exposure to ground water during sampling events.

LNAPL, sorbed constituents, and dissolved constituents will also degrade under Alternative 1, but monitoring will not be performed to confirm that the process is adequately reducing chemical concentrations. This "no

action" option would not produce short-term risk to the community or workers because no remedial activities would be performed; however, the time to achieve cleanup goals would likely be decades, although no monitoring would be performed to confirm this.

5.4.2 Implementability

Alternative 1 is the easiest to implement, as no actions are required.

Alternatives 2 and 3 present similar implementability. Both alternatives will require the installation of product recovery or sparge wells, as well as additional monitoring wells to monitor bioremediation rates and effectiveness. Alternative 2A is more easily implementable because only the installation of wells and skimmers are required, and on-going maintenance would be limited. Alternatives 2B and 3 involve minimal above ground equipment and require a low to moderate amount of equipment maintenance. Depending on concentrations and emissions rates, ozone sparging and vacuum enhanced skimming (Alternatives 3 and 2B, respectively) may require one or more off-gas treatment units on the surface. Each of these alternatives would require regular operation and maintenance visits to the site.

Due to the existing infrastructure above the plume, the Open Pit Dewatering/Soil Source Removal is the least implementable option being considered. A fair portion of the LNAPL plume lies directly beneath the office and printing building, as well as 41st Street. In addition, several utilities pass through the footprint of the LNAPL plume, including a sewer line.

Skimming and soil excavation are proven technologies that reliably remove chemicals from the subsurface. Ozone sparging is an emerging technology that would require considerable time and effort to optimize delivery rates.

5.4.3 Cost

Alternative 1, the "no action" alternative, would not cost anything to implement.

Of the remaining three alternatives, Alternative 2A ($344,000) is the least expensive and Alternative 4 ($1,224,000) is the most expensive to implement. The cost provided for Alternative 4 does not include the additional costs associated with demolition of the building to provide access for excavation. A summary of the estimated costs is listed in Table

9, and a detailed breakdown of costs is included for Alternatives 2A through 4 in Tables 10 through 13, respectively.

The cost breakdowns consider the additional work required to implement each alternative as well as O&M costs and long term monitoring.

5.5 SELECTED ALTERNATIVE

Based on the implementability, cost, and the estimated duration to achieve remedial goals, ERM recommends vacuum enhanced skimming (Alternative 2B) as the selected remedial alternative.

6.0 SELECTED REMEDIAL ALTERNATIVE IMPLEMENTATION

This section describes the elements and procedures associated with implementation of the selected remedial alternative, which include installing several extraction wells, installing and operating several pneumatic skimmer pumps, installing and operating a low-vacuum blower, and trenching for associated piping. This system will be operated until the cleanup goals have been achieved, as described in Section 4.4.

6.1 PRELIMINARY ACTIVITIES

All field activities will be performed in accordance with the health and safety, permitting, and utility clearance procedures described below.

6.1.1 Health and Safety Plan

ERM will prepare a site specific Health and Safety Plan (HSP) prior to beginning field work. The HSP will include information about the chemicals of potential concern at the site as well as the appropriate personal protective equipment to be used during all phases of work. Additionally, the HSP will document any hazards associated with the equipment and materials to be used as part of the remedial action. All ERM employees, subcontractors, and other site visitors will be required to review and comply with the HSP prior to entering the work zone. Additionally, ERM will conduct daily "tailgate" health and safety meetings to address planned activities prior to implementing daily site work.

6.1.2 Permitting

Prior to beginning any field work, the following permits will be obtained:

- Well installation permits will be procured from the Alameda County Public Works Association (ACPWA).
- Encroachment permits will be obtained from the Cities of Oakland and Emeryville to conduct work within the city streets.
- An air permit will be obtained from the Bay Area Air Quality Management District (BAAQMD). BAAQMD will issue an Authority to Construct, which will allow for construction and startup testing of the system. Following startup testing, and prior to regular system operation, BAAQMD will be notified of the results and the system's

capacity to maintain acceptable emissions, and they will issue a Permit to Operate.

6.1.3 Utility Clearance

All proposed well and underground piping locations will be cleared for utilities prior to trenching, concrete coring, drilling or other invasive activity. Underground Services Alert (USA) will be notified at least 48 hours prior to beginning work. A private utility locator will be retained to provide utility clearance at each location. The utility locator will identify the locations of water, gas, fuel, electrical, communication, storm sewer, and sanitary sewer lines. Invasive work will not be initiated until all stages of utility clearance described above are completed. In addition, the upper five feet of all borings will be hand augered or air vacuumed prior to drilling.

6.1.4 Site Security

All wells and piping will be located underground and will not present any security risks. However, all above ground equipment will be secured within a lockable box container located within a locked security fence compound.

6.2 CONSTRUCTION OF REMEDIAL INFRASTRUCTURE

The following sections describe the components of the proposed infrastructure to be installed. A process flow diagram is provided as Figure 7.

6.2.1 Well Installation

Five extraction wells will be installed in the source area of the site. The locations of the proposed wells are shown on Figure 8. The wells will be constructed of 4 to 6-inch PVC and screen, and will be installed to a depth of 12 to 15 feet below ground surface with the screens extending above the vadose zone. The well screen will be slot size 50 and the backfill in the screen area will be pea gravel to facilitate free product mobilization into the extraction well. The wells will be installed using hollow-stem auger construction. Drill cuttings from the well installation will be characterized and disposed of in accordance with federal, state and local requirements; ERM anticipates that the cuttings will be disposed of off-site as non-hazardous waste.

After the wells have been installed and the grout has been allowed to set at least 24 hours, the wells will be developed until the discharged water is clear and free of sediment. Approximately ten casing volumes of water will be extracted and containerized during purging. Purge water will be characterized and disposed of in accordance with federal, state and local requirements; ERM anticipates that the purge water will be disposed of off-site as non-hazardous waste.

The well heads will be constructed with an air-tight cap with openings that allow the tubing for the skimmer pump to pass through. The well head will also have a 2-inch diameter PVC union connection to facilitate connection to the low-vacuum piping. A valved sample port will be installed into the well cap for monitoring purposes.

6.2.2 Trenching and Conveyance Pipe Installation

Subsurface trenches will connect each well location to the equipment staging location. The low-vacuum piping will consist of 4-inch PVC trunk lines and 2-inch PVC branches connecting to the wells. The vacuum pipe will also serve as a conductor for the skimmer pump tubing, which consists of a ¼-inch air supply from the compressor and a ¾-inch product return line. The pipes will be buried approximately 18-inches in a 6-inch wide trench, backfilled with sand or pea gravel, and the surface will be completed to match the existing surface.

6.2.3 Low-Vacuum and Skimmer Pump Setup

The low-vacuum and skimmer pump setup will consist of the following:

- A 100 cubic foot per minute (cfm) vacuum blower capable of producing approximately 20 to 30 inches of water column vacuum;
- Five 2-inch Xitech, or equivalent, pneumatic skimmer pumps with hydrophobic inlets;
- An air compressor capable of providing at least 0.5 cfm per minute to cycle the skimmer pumps; the compressor will also contain a dryer and oil filter to provide clean air to the skimmer pumps; and
- A 55-gallon drum to contain free-phase product as it is removed from the ground water by the skimmer pumps; the drum will be stored under cover on a secondary containment pallet.

All the equipment will be powered by an on-site 110 Volt power source.

6.2.4 Granular Activated Carbon

Exhaust vapors from the vacuum blower will be diverted through two 55-gallon drum Vapor Phase Granular Activated Carbon canisters before being discharged into the atmosphere.

6.3 SYSTEM STARTUP AND TESTING

Upon completing system installation, ERM will conduct various testing associated with system startup in support of obtaining the Permit to Operate from BAAQMD, to document pre-startup conditions, and to obtain data for system optimization, as summarized below. Upon completing these tests, ERM will initiate system operations.

6.3.1 Pre-Startup Fluid Level Measurements

Prior to inserting and activating the skimmer pumps, fluid level measurements will be recorded to serve as a baseline for comparison against future readings. Free phase product thicknesses will be recorded, if any, and used to set the skimmer pumps to the correct depth in the extraction wells.

6.3.2 Pre-Startup Biological Parameters Measurements

Baseline biological parameters will be collected and evaluated to determine compliance with the BAAQMD permit, estimate mass removal rates, GAC loading, and calibrate equipment. Parameters recorded will be VOCs, carbon dioxide, and oxygen, which are the primary constituents used to determine biodegradation.

A baseline vapor sample will be collected and submitted to a California-certified laboratory for analysis by USEPA Method TO-14.

6.3.3 System Respiration Testing

A soil-air permeability test will be performed to estimate the permeability of the unsaturated zone by measuring the rate of vacuum change with time for a representative extraction well.

6.3.4 System Step Testing

The vacuum blower will be tested at vacuum pressures ranging from 0 to 30-inches of water column pressure and the corresponding extraction flow

rates will be recorded. This test will aid in determining the optimal blower operating conditions.

6.4 SYSTEM OPERATIONS AND MAINTENANCE (O&M)

The following O&M activities will be performed during system operation:

- Weekly site visits to obtain operational data such as system vapor concentrations, bioremediation parameters (i.e., carbon dioxide and oxygen), and system vacuum and air flow measurements. ERM will use portable equipment such as a photo ionization detector, an oxygen/carbon dioxide meter, and vacuum gauges to collect field parameters.
- Liquid level monitoring in each extraction well performed weekly to evaluate the effectiveness of the system at removing product from the ground water. The measurements will also be used to determine if any adjustments to the skimmer pumps are necessary to maintain optimum operating capacity.
- Weekly monitoring of the collected product and coordinating additional storage drums or removal of product as needed.
- System mass removal estimate (concentration as well as biological-based) and system optimization on a weekly basis. The estimate of mass removal via bioremediation will be based on the following stoichiometric equation for aerobic bioremediation, using dodecane as a proxy chemical to represent site-specific petroleum hydrocarbons:

  $C_{12}H_{26} + 18.5O_2 \rightarrow 12CO_2 + 13H_2O$

- Each mole of dodecane needs 18.5 moles of oxygen for aerobic bioremediation. Equivalently, each pound of dodecane produces 3.1 pounds of carbon dioxide via aerobic bioremediation. Monitoring oxygen and carbon dioxide concentrations and extraction flow rates from the vacuum process will allow for an estimate of aerobic bioremediation induced by the remedial program.
- GAC breakthrough by sampling the effluent of the first canister in series using a PID (BAAQMD requirements dictate GAC changeout when effluent concentrations exceed 10 percent of influent concentrations).
- System air progress reporting to BAAQMD and ACHSC as needed.
- System maintenance evaluation and providing for GAC and vacuum blower oil changeouts, if necessary.

The system will operate for approximately 2 years, or until the system has reached a point of diminishing returns. Diminishing returns are considered the point where measureable free-product is not observed in the extraction wells, and the biodegradation removal rate has dropped to near zero.

6.5 SYSTEM MONITORING PROGRAM

The effectiveness of the system will be evaluated by monitoring the following parameters:

- Rate of overall system removal due to volatilization and biodegradation;
- Rate of product removal via free-phase recovery from the extraction wells; and
- Product thickness as measured in the extraction wells.

The rates of product removal and product thickness data will provide information on remedial progress and provide for system optimization. As appropriate, this information will be used to evaluate when a point of diminishing returns has been attained.

6.6 MONITORING TO ASSESS NATURAL ATTENUATION

The monitored natural attenuation program would entail quarterly monitoring for TPH, VOCs, and geochemical indicators from selected wells upgradient, within, and downgradient of the TPH- and VOC-impacted areas. The geochemical indicators that will be analyzed include:

- Dissolved oxygen (field meter);
- Nitrate (USEPA Method 300.0);
- Sulfate (USEPA Method 300.0);
- Dissolved methane (RSK-175);
- Dissolved manganese (USEPA Method 6010);
- Dissolved iron (USEPA Method 6010)
- Reduction/oxidation (redox) potential (field meter);
- Total alkalinity (USEPA Method 310.1);
- Chloride (USEPA Method 300.0);

- Ethene (RSK-175); and
- Ethane (RSK-175).

The distribution of indicators relative to the dissolved-phase TPH and VOCs impacts can be used to assess whether natural attenuation is occurring. The concentration of electron acceptors (dissolved oxygen, nitrates, sulfates) will decrease within and downgradient of the plume if natural attenuation is occurring. Likewise, the metabolic byproducts (methane, manganese (II), iron (II), and CO_2) will increase within and downgradient of the plume, and redox potential will be more electronegative as compared to background conditions. For chlorinated VOCs, ethene and ethane detections provide evidence of natural attenuation through reductive dehalogenation, or use of a chlorinated compound as an electron acceptor. As chlorinated compounds are biodegraded into less chlorinated compounds or to carbon dioxide, chloride, and water, chloride ions are released to ground water, although the effect may be masked in areas of high background chloride concentrations. Decreasing concentrations of TPH and VOCs provide primary evidence of natural attenuation occurrence.

7.0 REPORTING, DOCUMENTATION, AND PUBLIC PRESENTATION ACTIVITIES

This section outlines the reporting that will be performed as part of the remediation program for the Site. The report scope and submittal dates will be in accordance with applicable permit requirements, and are expected to be as summarized below.

7.1 SOURCE TEST REPORT

As described in Section 6, as soon as possible after remediation system installation, source testing will be performed, and a report of the testing results will be submitted to BAAQMD. This report will document the installation procedures, including surveyed coordinates and a map of the primary remediation features, well construction diagrams, a description of the source test procedures and the testing results. Assuming that the source testing results are consistent with the design assumptions, this report will be the basis for the Permit to Operate that will be granted by BAAQMD.

7.2 MONTHLY EMISSIONS REPORTING

ERM anticipates that the Permit to Operate will include a requirement for submittal to BAAQMD of monthly emission reports. Such reports typically include emission-sampling data, summaries of system operation throughout the month, and evaluations of emissions data as compared to allowable criteria established in the permit.

7.3 QUARTERLY MONITORING AND O&M REPORTING

As described in Section 5, ongoing system maintenance will be performed during the operation period, including the sampling of monitoring wells to monitor the effectiveness of the remediation system. A summary of the operational status, as well as the results of the quarterly sampling will be documented in reports submitted to ACHCSA, as agreed in advance with ACHCSA. ERM anticipates that these reports will initially be submitted quarterly (frequency to be reduced with agency concurrence after the first year of monitoring) and that they will include the following:

- Quarterly water level and free-product thickness measurements presented in a summary table;
- A potentiometric surface map generated using the water level data collected during that quarter;
- Water sampling forms;
- Summaries of chemical detections associated with the quarterly samples, presented in location- and compound-specific data tables;
- Graphical presentations of chemical distribution and/or free-product occurrence as appropriate (i.e., time series plots or isocontour maps);
- Copies of the associated laboratory reports;
- A summary of the QA/QC review performed by the project chemist indicating whether the data can be relied upon for decision-making purposes; and
- Summaries of system operation over the quarter, making note of any down time or system repairs/modifications and the volumes of free product removed.

7.4 ANNUAL MONITORING REPORTS

The report associated with the final quarter of the year will serve as the annual report for the remedial system. This report will be expanded from the standard quarterly report to include:

- Water level and chemical data collected from the monitoring wells as of project startup;
- Descriptions of any major repairs or modifications to the system and shut-down periods that occurred during the year; and
- Discussions of water flow directions, chemical occurrence trends and remediation efficiency observed throughout the year.

8.0 SCHEDULE

A detailed schedule for implementation of the proposed remedy will be coordinated between 1001 42nd Street, LLC, and the ACHCSA. A tentative schedule for implementation of the remedy following formal ACHCSA approval of this CAP is summarized in the following table.

Activity	Estimated Duration
Permitting/Mobilization	1 month
System Installation	2 months
System Operation/Monitoring	2 years

As noted in Section 7, a report detailing the system installation will be generated and submitted to ACHCSA after completion of field activities associated with system installation. In addition, reports discussing the on-going monitoring results and system operation will be routinely generated and submitted to ACHCSA and BAAQMD throughout the monitoring period.

9.0 REFERENCES

Agency for Toxic Substances and Disease Registry, US Department of Health and Human Services (ATSDR), 1995. *Toxicological Profile for Stoddard Solvent*, June.

ATSDR), 2006. *Toxicological Profile for Vinyl Chloride*, July.

Aqua Science Engineers, Inc., 2004. *Phase I Environmental Site Assessment – 1001 42nd Street, Oakland, California 94608, A.P.N. 012-1023-001-01 & 049-1023-0005-02*, 18 January.

Aqua Science Engineers, Inc., 2005. *Report of Soil and Groundwater Assessment - ASE Job No. 3976 - at Kozel Property, 1001 42nd Street, Oakland, California*, 19 January.

Aqua Science Engineers, Inc., 2005. *Report of Additional Soil and Groundwater Assessment - ASE Job No. 3976 - at Kozel Property, 1001 42nd Street, Oakland, California*, 28 October.

Aqua Science Engineers, Inc., 2006. *Semi-Annual Groundwater Monitoring Report – March 2006 Groundwater Sampling at Kozel Property, 1001 42nd Street, Oakland, California*, 7 May.

Ballestero, T.P., F.R. Fiedler and N.E. Kinner, 1994. An investigation of the relationship between actual and apparent gasoline thickness in a uniform sand aquifer, *Ground Water*, 32(5): 708-718.

Blake, S.B. and R.A. Hall, 1984. Monitoring petroleum spills with wells: someproblems and solutions, *Proceedings, Fourth National Symposium on Aquifer Restoration and Groundwater Monitoring*, National Water Well Association, Columbus, OH, pp. 305-310.

California Regional Water Quality Control Board (CRWQCB), San Francisco Bay Region, 2005. *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Interim Final*, February.

de Pastrovich, T.L., Y. Baradat, R. Barthel, A. Chiarelli, and D.R. Fussell, 1979. *Protection of ground water from oil pollution*, CONCAWE, The Hague, Netherlands.

ERM, 2006, *Limited Soil and Groundwater Investigation Report - Kozel Property, 1001 42nd Street, Oakland, California*, June.

Farr, A.M., R.J. Houghtalen, and D.B. McWhorter, 1990. Volume estimation of light nonaquous phase liquids in porous media, *Ground Water*, 28(1):48-56.

Genium Publishing Corporation, 1999. *Genium's Handbook of Safety, Health, and Environmental Data for Common Hazardous Substances*, Volume II. McGraw-Hill, New York, pp. 2445-2446.

Hall, R.A., S.B. Blake, and S.C. Champlin, Jr., 1984. Determination of hydrocarbon thickness in sediments using borehole data, *Proceedings, Fourth National Symposium on Aquifer Restoration and Groundwater Monitoring*, National Water Well Association, Columbus, OH, pp.300-304.

Hampton, D.R. and Miller, P.D.G., 1988. Laboratory Investigation of the Relationship Between Actual and Apparent Product Thickness in Sands: In: Proceedings of the Conference on Petroleum Hydrocarbons and Organic Chemicals in Ground Water: Prevention Detection and Restoration. National Water Well Association, Dublin, Ohio, pp. 157-181.

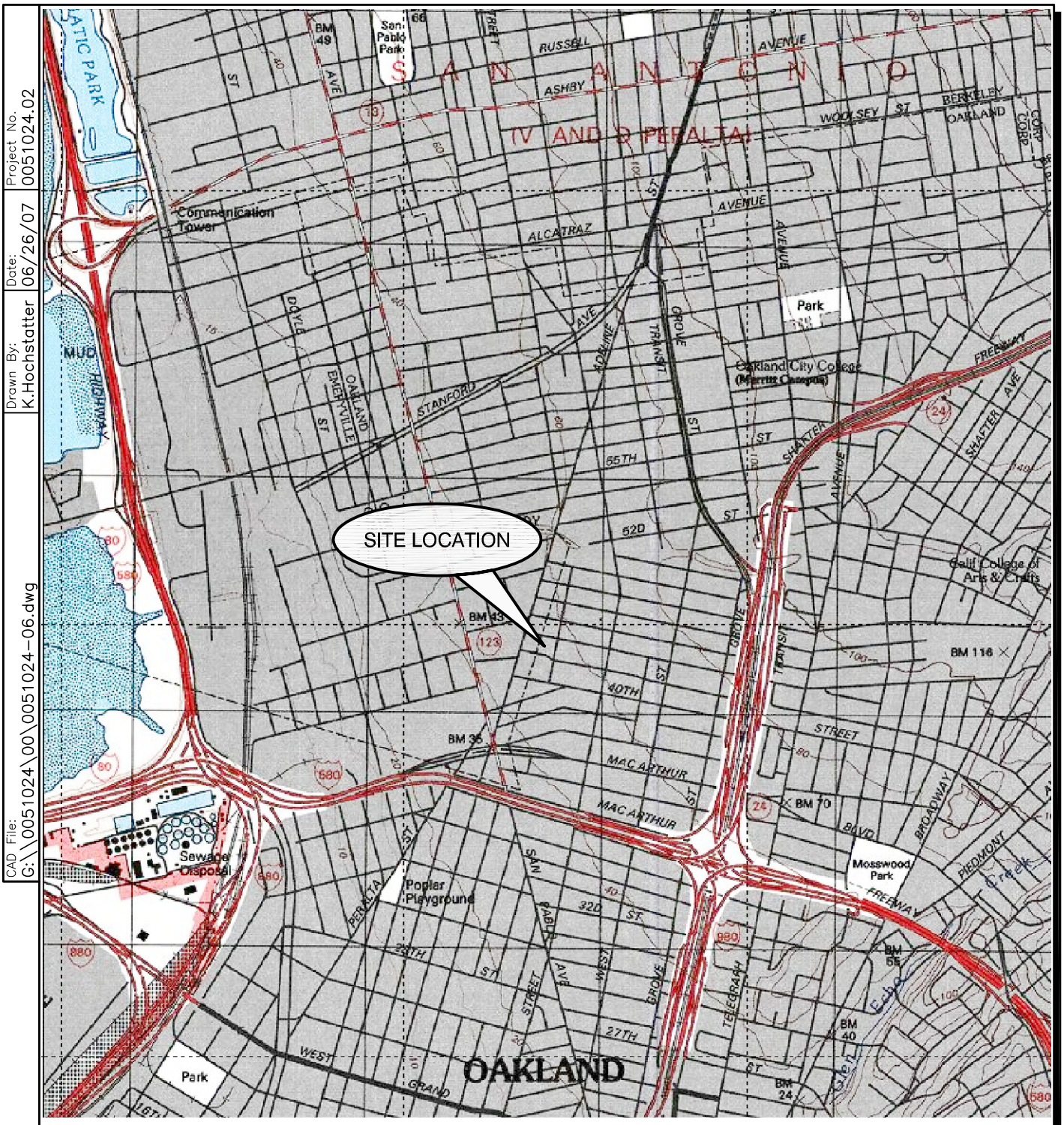
Lenhard, R.J. and J.C. Parker, 1990. Estimation of free hydrocarbon volume from fluid levels in monitoring wells, *Ground Water*, 28(1):57-67.

Mercer, J.W. and Cohen, R.M., 1990. *A Review of Immiscible Fluids in the Subsurface: Properties, Models, Characteristics and Remediation.* Journal of Contaminant Hydrology, Volume 6, pp. 107-163.

National Assessment Corporation, 1998. *Phase I Environmental Site Assessment – ONE Color Communications, Inc., 1001 42nd Street, Oakland, California 94608*, 19 March.

Schiegg, H.O., 1985. Considerations on water, oil, and air in porous media, *Water Science and Technology*, 17:467-476.

Figures



References:
TOPO!® Software
U.S.G.S. 7.5 Minute Series (Topographic) Quadrangle,
Oakland West, California
Map Version: 1997

Figure 1
Site Location Map
1001 42nd Street Property
Emeryville/Oakland, California

ERM 06/07

Project No. 0051024.00
Date: 06/26/07
Drawn By: R. Olson
CAD File: G:\0051024\00\005102400-05.dwg

LEGEND

FORMER UST

PROPERTY BOUNDARY

AERIAL IMAGE SOURCE:
© 2007 GOOGLE EARTH PRO, VER 4.0.2737

N

0 20 40
FEET

Figure 2
Site Detail Map
1001 42nd Street Property
Emeryville/Oakland, California

ERM 06/07

Project No. 0051024.00
Date: 06/26/07
Drawn By: R. Olson
CAD File: G:\0051024\00\005102400-07.dwg

42nd STREET
CITY LIMITS EMERYVILLE
CITY LIMITS OAKLAND
SIDEWALK
SITE ACCESS
ENTRANCE
ADELINE STREET
LINDEN STREET
41st STREET
1086/1087 42nd STREET
4114–4120 ADELINE STREET
4112 ADELINE STREET
4106 ADELINE STREET
4102 ADELINE STREET
1020 41st STREET
MAINTENANCE SHOP
FORMER DRUM STORAGE
FORMER ROCKRIDGE FURNITURE REFINISHING BUILDING
FORMER ETCHING ROOM
OVERHANG
LOADING DOCK
ASPHALT PARKING AREA
OFFICE AND PRINTING BUILDING
FENCE
UST #1
UST #2
UST #3

B-1
B-2
B-3
B-4
B-5
BH-A
BH-B
BH-C
BH-D
BH-E
BH-F
BH-G
BH-H
BH-I
BH-J
BH-K
BH-L
BH-M
BH-N
BH-O
BH-P
BH-Q
BH-R
BH-S
BH-T
BH-U
BH-V
BH-W
BH-X
BH-Y
BH-Z
BH-AA
BH-BB
BH-CC
BH-DD
BH-EE
BH-FF
BH-GG
BH-HH
BH-II
BH-JJ
BH-KK
BH-LL
BH-MM
BH-NN
SVP-1
SVP-2
SVP-3
SVP-4
SVP-5
AMBIENT AIR 01
AMBIENT AIR 02
IA-1
IA-2
IA-3
IA-4
IA-5
BES-1
MW-B1
MW-B2
MW-B3
MW-B4
MW-D1
MW-D2
CW-1
CW-2

LEGEND
- FORMER UST
- PROPERTY BOUNDARY
- GEOPROBE BORING LOCATION
- MONITORING WELL–FORMER KOZEL PROPERTY
- MONITORING WELL–DUNNE PAINTS
- AIR SAMPLING LOCATION
- SOIL GAS SAMPLING LOCATION

NOTES:
RESIDENTIAL PROPERTIES ARE APPROXIMATED.

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0 25 50
FEET

Figure 3
Historical Sampling Location Map
1001 42nd Street Property
Emeryville/Oakland, California
ERM 06/07

Drawn By: R. Olson | Date: 06/26/07 | Project No. 0051024.00

CAD File: G:\0051024\00\0051024400-09.dwg

42nd STREET

CITY LIMITS EMERYVILLE

CITY LIMITS OAKLAND

SIDEWALK

SITE ACCESS

ADELINE STREET

SIDEWALK

1086/1087 42nd STREET

MAINTENANCE SHOP

B-3

FORMER DRUM STORAGE

B-4

BH-O

4114-4120 ADELINE STREET

4112 ADELINE STREET

4106 ADELINE STREET

4102 ADELINE STREET

1020 41st STREET

FORMER ROCKRIDGE FURNITURE REFINISHIING BUILDING

FORMER ETCHING ROOM

OVERHANG

ASPHALT PARKING AREA

ENTRANCE

OFFICE AND PRINTING BUILDING

LOADING DOCK

FENCE

SIDEWALK

LINDEN STREET

SIDEWALK

SIDEWALK

41st STREET

BH-EE

BH-FF

BH-A

BH-GG

BH-CC

BH-HH

UST #3

BH-M

BH-L

BH-KK

BH-K

B-1

B-5

BH-V

BH-T

BH-E

BH-G

BH-D

BH-F

BH-X

BH-W

BES-1 45.186*

BH-Y

BH-BB

BH-LL

BH-J

B-2

BH-C

BH-B

BH-U

UST #1

BH-II

BH-I

BH-H

BH-Z

BH-DD

BH-S

BH-MM

BH-NN

BH-R

MW-B1 NA

UST #2

MW-B4 44.50

MW-B3 44.11

MW-B2 44.78

BH-Q

BH-P

BH-N

BH-AA

BH-JJ

MW-D1

MW-D2

CW-1

CW-2

44.20

44.30

44.40

44.50

44.60

44.70

LEGEND

- FORMER UST
- PROPERTY BOUNDARY
- GEOPROBE BORING LOCATION
- MONITORING WELL–FORMER KOZEL PROPERTY
- MONITORING WELL–DUNNE PAINTS

NOTES:

RESIDENTIAL PROPERTIES ARE APPROXIMATED.

44.50 — LINE OF EQUAL GROUND WATER ELEVATION (ft msl)

44.50 — GROUND WATER ELEVATION (ft msl); WATER LEVELS MEASURED ON 06/27/05

* — ANOMALOUS VALUE, NO USED IN CONTOURING; MEASUREMENT REFLECTS A CALCULATED VALUE ADJUSTED FOR FREE-FLOATING HYDROCARBONS

N

0 25 50

FEET

Figure 4

Potentiometric Surface Map

1001 42nd Street Property

Emeryville/Oakland, California

ERM 06/07

Project No. 0051024.00
Date: 05/24/07
Drawn By: R. Olson
CAD File: G:\0051024\00\0051024400-10.dwg

42nd STREET
CITY LIMITS EMERYVILLE
CITY LIMITS OAKLAND
ADELINE STREET
SIDEWALK
1086/1087 42nd STREET
MAINTENANCE SHOP
SITE ACCESS
ENTRANCE
OFFICE AND PRINTING BUILDING
FORMER DRUM STORAGE
4114–4120 ADELINE STREET
4112 ADELINE STREET
4106 ADELINE STREET
4102 ADELINE STREET
1020 41st
ASPHALT PARKING AREA
FORMER ROCKRIDGE FURNITURE REFINISHING BUILDING
FENCE
STRIPPING ROOM
LINDEN STREET
UST #1
UST #2
UST #3
41st
MW-B1
MW-B2
MW-B3
MW-B4
MW-D1
MW-D2
CW-1
CW-2
SVP-5
B-1 11.5' 55 / 14.0' 110
B-2 7.0' <2.5 / 15.0' 0.1
B-3 7.0' <2.5
B-4 7.0' <2.5
BES-1
BH-A 15.5' 8.3
BH-B 11.5' 130
BH-C 14.5' 13
BH-D 15.5' 5.4
BH-E 15.5' 2.0
BH-F 19.5' <1.0
BH-G 19.5' <10
BH-H 7.5' 14
BH-I 14.5' 19 / 24.5' <1.0 / 34.5' <1.0
BH-J 11.5' 2.3
BH-K 15.5' <1.0
BH-L 19.5' 1.2
BH-M 11.5' <1.0
BH-N 11.5' <1.0
BH-O 20.5' <1.0
BH-P 7.5' 140
BH-Q 7.5' 27
BH-R 11.5' 14
BH-S 11.5' 42
BH-T 11.5' 6.6
BH-U 7.5' <1.0
BH-V 11.5' 12 / 25.5' 3.3
BH-W 7.5' 24
BH-X 11.5' 5.8
BH-Y 8.5' 44
BH-Z 11.5' 51
BH-AA 11.5' 1,100
BH-BB 11.5' 320
BH-CC 11.5' 31 / 19.5' <1.0
BH-DD 11.5' <1.0
BH-EE 3.5' <1.0 / 23.5' <1.0
BH-FF 3.5' <1.0 / 27.5' <1.0
BH-GG 2.5' <1.0 / 19.5' <1.0
BH-HH 5.5' <1.0 / 11.5' 7.1
BH-II 11.5' 55 / 15.5' <1.0
BH-JJ 11.5' <1.0 / 15.5' <1.0
BH-KK 11.5' <1.0 / 23.5' <1.0
BH-LL 11.5' <1.0 / 23.5' <1.0
BH-MM 11.5' 56 / 15.5' <1.0
BH-NN 11.5' 15 / 15.5' <1.0
SVP-5 12.5' <2.5 / 14.0' 130

N
0 25 50
FEET

LEGEND
- FORMER UST
- PROPERTY BOUNDARY
- GEOPROBE BORING LOCATION
- MONITORING WELL–FORMER KOZEL PROPERTY
- MONITORING WELL–DUNNE PAINTS
- SOIL GAS SAMPLING LOCATION

NOTES:
RESIDENTIAL PROPERTIES ARE APPROXIMATED.

BH-Z
11.5' 51
- SAMPLE LOCATION IDENTIFER
- TPH CHEMICAL CONCENTRATION (mg/kg)
- DEPTH OF SOIL SAMPLE

DETECTION >100 mg/kg ESL

Figure 5
Detections of TPH (Mineral Spirits Range) in Soil Samples
1001 42nd Street Property
Emeryville/Oakland, California
ERM 05/07

Project No. 0051024.00
Date: 06/26/07
Drawn By: R. Olson
CAD File: G:\0051024\00\0051024400-11.dwg

42nd STREET
CITY LIMITS EMERYVILLE
CITY LIMITS OAKLAND
SIDEWALK
SITE ACCESS
ADELINE STREET
SIDEWALK
1086/1087 42nd STREET
MAINTENANCE SHOP
4114–4120 ADELINE STREET
4112 ADELINE STREET
4106 ADELINE STREET
4102 ADELINE STREET
1020 41st STREET
FORMER ETCHING ROOM
FORMER DRUM STORAGE
ASPHALT PARKING AREA
FORMER ROCKRIDGE FURNITURE REFINISHING BUILDING
OFFICE AND PRINTING BUILDING
ENTRANCE
SIDEWALK
LINDEN STREET
FENCE
OVERHANG
SLOPE
LOADING DOCK
SLOPE
ACCESS
UST #2
UST #3
41st STREET
SIDEWALK

BH–M 0.072
BH–L <0.05
BH–KK <0.05
BH–K 1.3
BH–LL <0.05
BH–J 1,600
BH–S 0.52
BH–MM 3.5
BH–NN <0.05
B–1 <0.11
B–2 NA
BH–V IW
BH–E 3.6
BH–T 11
BH–F IW
BH–C 0.23
BES–1 120
BH–I 57
BH–G IW
BH–D NA
BH–U 1.6
BH–W 870
BH–H 1,200
BH–R 880
MW–B1 26
MW–B4 2.3
MW–B2 9.2
MW–B3 <0.05
MW–D1 <0.05
BH–Q 110
MW–D2 <0.05
BH–P 0.69
BH–N <0.05
BH–B 1,700
BH–A 0.054
BH–CC NA
BH–X <0.05
BH–Y 1,400
BH–Z 59
BH–EE <0.05
BH–FF <0.05
BH–O <0.05
B–3 NA
B–4 NA
B–5 NA
BH–GG NA
BH–HH NA
BH–BB 1,100
BH–DD 0.97
BH–AA 2,000
BH–JJ 0.52
CW–1 <0.05
CW–2 <0.05

16–20'	0.16
23–27'	0.056
46–50'	0.068

LEGEND

- FORMER UST
- PROPERTY BOUNDARY
- GEOPROBE BORING LOCATION
- MONITORING WELL–FORMER KOZEL PROPERTY
- MONITORING WELL–DUNNE PAINTS

NOTE:
RESIDENTIAL PROPERTIES ARE APPROXIMATED.

0.97 SAMPLE LOCATION REPORTED RESULT, UNITS MILLIGRAMS PER LITER, VARIOUS DATES

ISOCONTOUR LINE REPRESENTING ESTIMATED VALUE OF 0.5 mg/L, CORRESPONDING TO THE ESL FOR TPH–MINERAL SPIRITS, DASHED WHERE INFERRED

IW INSUFFICIENT WATER

NA NOT ANALYZED

MEASURABLE FREE PRODUCT

N

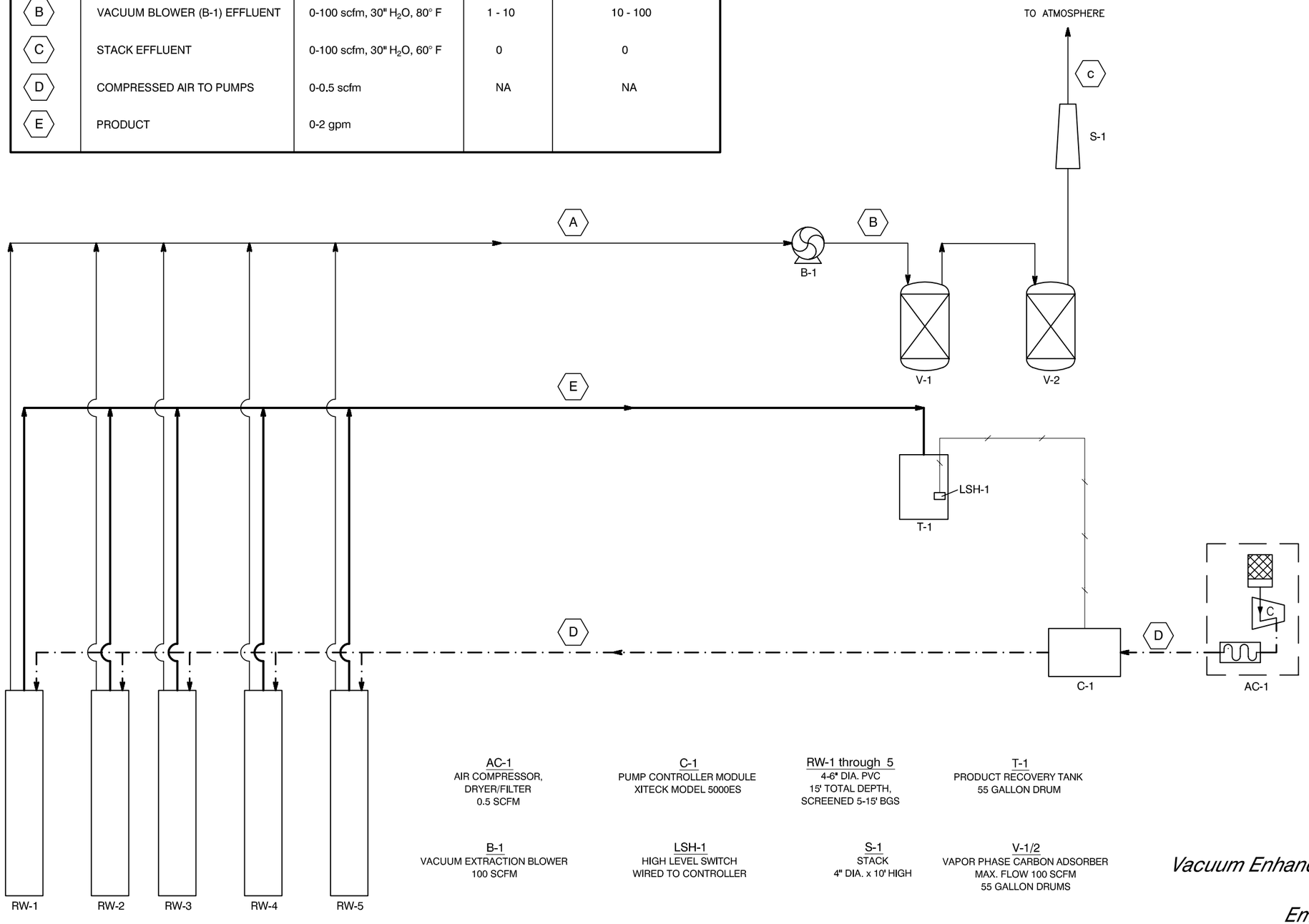
0 25 50
FEET

Figure 6
Detections of TPH (Mineral Spirits Range) in Ground Water Samples
1001 42nd Street Property
Emeryville/Oakland, California

ERM 06/07

Project No. 0051024.00
Date: 06/26/07
Drawn By: J. Estrada
CAD File: G:\0051024\00\005102400-12.dwg

STREAM	DESCRIPTION	FLOW CONDITIONS	MAXIMUM CONCENTRATION (ppmv)	
			XYLENES	TOTAL VOC/TPH
A	EXTRACTION WELL EFFLUENT	0-100 scfm, 30" H_2O, 60° F	1 - 10	10 - 100
B	VACUUM BLOWER (B-1) EFFLUENT	0-100 scfm, 30" H_2O, 80° F	1 - 10	10 - 100
C	STACK EFFLUENT	0-100 scfm, 30" H_2O, 60° F	0	0
D	COMPRESSED AIR TO PUMPS	0-0.5 scfm	NA	NA
E	PRODUCT	0-2 gpm		



AC-1
AIR COMPRESSOR, DRYER/FILTER
0.5 SCFM

C-1
PUMP CONTROLLER MODULE
XITECK MODEL 5000ES

RW-1 through 5
4-6" DIA. PVC
15' TOTAL DEPTH,
SCREENED 5-15' BGS

T-1
PRODUCT RECOVERY TANK
55 GALLON DRUM

B-1
VACUUM EXTRACTION BLOWER
100 SCFM

LSH-1
HIGH LEVEL SWITCH
WIRED TO CONTROLLER

S-1
STACK
4" DIA. x 10' HIGH

V-1/2
VAPOR PHASE CARBON ADSORBER
MAX. FLOW 100 SCFM
55 GALLON DRUMS

Figure 7
Process Flow Diagram
Vacuum Enhanced Skimmer Pump System
1001 42nd Street Property
Emeryville/Oakland, California

ERM 06/07

Drawn By: J. Estrada | Date: 06/26/07 | Project No. 0051024.00

CAD File: G:\0051024\00\0051024002-13.dwg

42nd STREET

CITY LIMITS EMERYVILLE

CITY LIMITS OAKLAND

SIDEWALK

SITE ACCESS

ENTRANCE

ADELINE STREET

SIDEWALK

1086/1087 42nd STREET

MAINTENANCE SHOP

FORMER DRUM STORAGE

4114–4120 ADELINE STREET

4112 ADELINE STREET

4106 ADELINE STREET

4102 ADELINE STREET

1020 41st STREET

ASPHALT PARKING AREA

FORMER ROCKRIDGE FURNITURE REFINISHIING BUILDING

FORMER ETCHING ROOM

OVERHANG

OFFICE AND PRINTING BUILDING

UST #3

SIDEWALK

LINDEN STREET

FENCE

BES-1

RW-1

RW-2

RW-3

RW-4

RW-5

UST #2

UST #1

LOADING DOCK

SITE ACCESS

SITE ACCESS

MW-B4

MW-B2

MW-B3

MW-D1

MW-D2

41st STREET

SIDEWALK

CW-1

CW-2

LEGEND

- FORMER UST
- PROPERTY BOUNDARY
- MONITORING WELL–FORMER KOZEL PROPERTY
- MONITORING WELL–DUNNE PAINTS
- ISOCONTOUR LINE REPRESENTING ESTIMATED VALUE OF 0.5 mg/L, CORRESPONDING TO THE ESL FOR TPH–MINERAL SPIRITS
- PROPOSED RECOVERY WELLS
- PROPOSED MONITORING WELLS

NOTE:
RESIDENTIAL PROPERTIES ARE APPROXIMATED.

N

0 25 50
FEET

Figure 8
Proposed Recovery and Monitoring Well Locations
1001 42nd Street Property
Emeryville/Oakland, California

ERM 06/07

Tables

Table 1
Historical Ground Water Elevation Data
1001 42nd Street Property
Emeryville/Oakland, California

Well ID	Date of Measurement	Top of Casing Elevation (msl)	Depth to Water (feet)	Depth to Product (feet)	Ground Water Elevation (msl)
BES-1	12/10/1998	Not surveyed	10.18	-	-
	12/14/1999	-	10.98	-	-
	6/15/2004	-	9.95	9.94	-
	9/14/2004	-	10.28	10.21	-
	12/16/2004	54.27	7.94	7.92	46.35*
	3/30/2005	-	7.15	7.12	47.14*
	6/27/2005	-	9.1	9.12	45.186*
CW-1	11/12/2003	47.55	8.93	-	38.62
	3/12/2003	-	-	-	40.70
	6/15/2004	-	-	-	39.70
	9/14/2004	-	-	-	39.17
CW-2	11/12/2003	47.59	9.25	-	38.34
	3/12/2003	-	7.22	-	40.37
	6/15/2004	-	8.40	-	39.19
	9/14/2004	-	8.98	-	38.61
CW-3	11/12/2003	46.39	8.30	-	38.09
	3/12/2003		6.04	-	40.35
	6/15/2004		7.74	-	38.65
	9/14/2004		8.65	-	37.74
MW-B1	6/10/1993	49.92	6.14		43.78
	7/8/1993		6.64		43.28
	8/24/1993		6.69		43.23
	9/29/1993		8.46		41.46
	10/20/1993		6.69		43.23
	11/23/1993		6.65		43.27
	12/10/1998		-		-
	12/14/1999		-		-
	6/15/2004		6.00	5.85	44.04*
	9/14/2004		6.18	6.14	43.77*
	12/16/2004		5.14	5.12	44.80*
	3/30/2005		3.54	3.50	46.41*
	6/27/2005		Well covered with new concrete sidewalk		
MW-B2	6/10/1993	50.77	6.75		44.02
	7/8/1993		6.91		43.86
	8/24/1993		7.22		43.55
	9/29/1993		8.80		41.97
	10/20/1993		7.25		43.52
	11/23/1993		7.26		43.51
	12/10/1998		6.43		44.34
	12/14/1999		6.50		44.27
	6/15/2004		6.40		44.37
	9/14/2004		6.56		44.21
	12/16/2004		5.88		44.89
	3/30/2005		5.27		45.50
	6/27/2005		5.99		44.78
MW-B3	6/10/1993	49.02	6.85		42.17
	7/8/1993		6.05		42.97
	8/24/1993		6.21		42.81
	9/29/1993		7.74		41.28
	10/20/1993		6.24		42.78
	11/23/1993		6.18		42.84
	12/10/1998		4.94		44.08
	12/14/1999		5.08		43.94
	6/15/2004		5.43		43.59
	9/14/2004		5.63		43.59
	12/16/2004		4.67		44.35
	3/30/2005		3.92		45.10
	6/27/2005		4.91		44.11

Table 1
Historical Ground Water Elevation Data
1001 42nd Street Property
Emeryville/Oakland, California

Well ID	Date of Measurement	Top of Casing Elevation (msl)	Depth to Water (feet)	Depth to Product (feet)	Ground Water Elevation (msl)
MW-B4	6/10/1993	49.74	6.00		43.74
	7/8/1993		6.14		43.60
	8/24/1993		6.34		43.40
	9/29/1993		7.97		41.77
	10/20/1993		6.11		43.63
	11/23/1993		6.38		43.36
	12/10/1998		6.20		43.54
	12/14/1999		6.05		43.69
	6/15/2004		5.58	sheen	44.16
	9/14/2004		5.95		43.79
	12/16/2004		5.24		44.50
	3/30/2005		4.42		45.32
	6/27/2005		5.24		44.50
MW-D1	6/10/1993	50.56	5.29		45.27
	7/8/1993		5.67		44.89
	8/24/1993		6.01		44.55
	9/29/1993		7.69		42.87
	10/20/1993		6.20		44.36
	11/23/1993		6.08		44.48
	12/14/1999		4.60		45.96
	11/12/2003	49.32	5.98		43.34
	3/12/2003		5.97		43.35
	6/15/2004		6.07		43.25
	9/14/2004		5.86		43.46
MW-D2	6/10/1993	50.56	6.25		44.31
	7/8/1993		6.37		44.19
	8/24/1993		6.47		44.09
	9/29/1993		7.96		42.60
	10/20/1993		6.48		44.08
	11/23/1993		6.44		44.12
	12/10/1998		5.68		44.88
	12/14/1999		5.80		44.76
	11/12/2003	50.52	9.52		41.00
	3/12/2003		8.94		41.58
	6/15/2004		5.89		44.63
	9/14/2004		6.01		44.51
MW-LD4	6/10/1993	51.51	6.98		44.53
	7/8/1993		7.18		44.33
	8/24/1993		7.31		44.20
	9/29/1993		7.43		44.08
	10/20/1993		7.37		44.14
	11/23/1993		7.32		44.19
	12/10/1998		6.14		45.37
	12/14/1999		6.52		44.99
	6/15/2004		Well abandoned		

Notes: * = Ground water elevation adjusted for free-floating hydrocarbons by the equation:
Adjusted ground water elevation = Top of casing elevation - depth to groundwater
+ (0.8 x free-floating hydrocarbon thickness)
Reproduced from "Report of Additional Soil and Groundwater Assessment ASE
Job No. 3976 at Kozel Property, 1001 42nd Street, Oakland, California"
(Aqua Science Engineers, Inc., October 2005)

Table 2
Summary of Analytical Results for Soil Samples
1001 42nd Street Property
Emeryville/Oakland, California

Boring ID	Sample Depth (feet)	Date Sampled	TPH Diesel[1] (mg/kg)	TPH Gasoline[2] (mg/kg)	TPH Motor Oil[3] (mg/kg)	TPH Mineral Spirits[2] (mg/kg)	Benzene (µg/kg)	Toluene (µg/kg)	Ethyl Benzene (µg/kg)	Total Xylenes (µg/kg)	Acetone (µg/kg)	n-Butyl Benzene (µg/kg)	sec-Butyl Benzene (µg/kg)	tert-Butyl Benzene (µg/kg)	1,1-DCA (µg/kg)	cis-1,2-DCE (µg/kg)	trans-1,2-DCE (µg/kg)	p-Isopropyl-toluene (µg/kg)	MEK (µg/kg)	Naphthalene (µg/kg)	n-Propyl-benzene (µg/kg)	1,1,1-TCA (µg/kg)	TCE (µg/kg)	1,2,4-TMB (µg/kg)	Vinyl Chloride (µg/kg)
ESL			100	100	500	100	180	9300	32000	11000	500	240000 (PRG)	220000 (PRG)	390000 (PRG)	320	1600	3100	NE	13000	460	240000 (PRG)	7800	260	52000 (PRG)	6.7
BH-A	15.5	10/18/2004	na	na	na	**8.3**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-B	11.5	10/18/2004	na	na	na	**130**	< 5	< 5	< 5	< 5	**86**	< 5	< 5	**27**	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-C	14.5	10/18/2004	na	na	na	**13**	< 5	< 5	< 5	< 5	**52**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-D	15.5	10/18/2004	na	na	na	**5.4**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-E	15.5	10/19/2004	na	na	na	**2**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-F	19.5	10/19/2004	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-G	19.5	10/19/2004	na	na	na	< 10	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-H	7.5	10/20/2004	na	na	na	**14**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-I	1	10/20/2004	na	na	na	**6.6**	< 5	< 5	< 5	< 5	< 5	< 5	**40**	**15**	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-J	11.5	10/20/2004	na	na	na	**2.3**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-K	15.5	10/20/2004	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-L	19.5	10/20/2004	na	na	na	**1.2**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-M	11.5	10/20/2004	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-N	11.5	10/21/2004	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-O	20.5	10/21/2004	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-P	7.5	10/21/2004	na	na	na	**140**	< 5	< 5	< 5	< 5	**85**	< 5	< 5	**7.4**	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-Q	7.5	10/21/2004	na	na	na	**27**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-R	11.5	10/21/2004	na	na	na	**14**	< 5	< 5	< 5	< 5	**130**	< 5	< 5	**10**	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-S	11.5	10/21/2004	na	na	na	**42**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	**5.6**	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-T	11.5	10/21/2004	na	na	na	**6.6**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-U	7.5	10/21/2004	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-V	11.5	10/21/2004	na	na	na	**12**	< 13	< 13	< 13	< 13	< 130	< 13	< 13	< 13	< 13	< 13	< 13	< 13	< 130	< 25	< 13	< 13	< 13	< 13	< 13
	25.5	10/22/2004	na	na	na	**3.3**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-W	7.5	10/22/2004	na	na	na	**24**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-X	11.5	11/9/2004	na	na	na	**5.8**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-Y	8.5	11/9/2004	na	na	na	**44**	< 5	< 5	< 5	< 5	**67**	< 5	< 5	**17**	< 5	< 5	< 5	**36**	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-Z	11.5	11/9/2004	na	na	na	**51**	< 5	< 5	< 5	< 5	**100**	< 5	< 5	**12**	< 5	< 5	< 5	**26**	< 5	**28**	< 5	< 5	< 5	< 5	< 5
BH-AA	11.5	12/14/2004	na	na	na	**1,100**	< 19	< 19	< 19	< 19	< 190	< 19	< 19	< 19	< 19	< 19	< 19	**58**	< 190	< 38	< 19	< 19	< 19	< 19	< 19
BH-BB	11.5	12/14/2004	na	na	na	**320**	< 17	< 17	< 17	< 17	< 170	< 17	< 17	< 17	< 17	< 17	< 17	**17**	< 170	< 34	< 17	< 17	< 17	< 17	< 17
BH-CC	11.5	12/14/2004	na	na	na	**31**	< 20	< 20	< 20	< 20	< 200	< 20	< 20	< 20	< 20	< 20	< 20	**32**	< 200	< 39	< 20	< 20	< 20	< 20	< 20
	19.5	12/14/2004	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 10	< 5	< 5	< 5	< 5	< 5
BH-DD	11.5	12/14/2004	na	na	na	< 1	< 20	< 20	< 20	< 20	< 200	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 200	< 41	< 20	< 20	< 20	< 20	< 20
BH-EE	3.5	8/15/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	23.5	8/15/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
BH-FF	3.5	8/15/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	27.5	8/15/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
BH-GG	2.5	8/16/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	19.5	8/16/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
BH-HH	5.5	8/16/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	11.5	8/16/2005	na	na	na	**7.1**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
BH-II	14.5	8/16/2005	na	na	na	**19**	< 5	< 5	< 5	< 5	**56**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	24.5	8/16/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	34.5	8/16/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
BH-JJ	11.5	8/16/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	15.5	8/16/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5

Table 2
Summary of Analytical Results for Soil Samples
1001 42nd Street Property
Emeryville/Oakland, California

Boring ID	Sample Depth (feet)	Date Sampled	TPH Diesel[1] (mg/kg)	TPH Gasoline[2] (mg/kg)	TPH Motor Oil[3] (mg/kg)	TPH Mineral Spirits[2] (mg/kg)	Benzene (µg/kg)	Toluene (µg/kg)	Ethyl Benzene (µg/kg)	Total Xylenes (µg/kg)	Acetone (µg/kg)	n-Butyl Benzene (µg/kg)	sec-Butyl Benzene (µg/kg)	tert-Butyl Benzene (µg/kg)	1,1-DCA (µg/kg)	cis-1,2-DCE (µg/kg)	trans-1,2-DCE (µg/kg)	p-Isopropyl-toluene (µg/kg)	MEK (µg/kg)	Naphthalene (µg/kg)	n-Propyl-benzene (µg/kg)	1,1,1-TCA (µg/kg)	TCE (µg/kg)	1,2,4-TMB (µg/kg)	Vinyl Chloride (µg/kg)
ESL			100	100	500	100	180	9300	32000	11000	500	240000 (PRG)	220000 (PRG)	390000 (PRG)	320	1600	3100	NE	13000	460	240000 (PRG)	7800	260	52000 (PRG)	6.7
BH-KK	11.5	8/17/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	23.5	8/17/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
BH-LL	11.5	8/17/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
	23.5	8/17/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
BH-MM	11.5	8/17/2005	na	na	na	**56**	< 250	< 250	< 250	< 500	< 25000	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 25000	< 250	< 250	< 250	< 250	< 250	< 250
	15.5	8/17/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
BH-NN	11.5	8/17/2005	na	na	na	**15**	< 250	< 250	< 250	< 500	< 25000	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 25000	< 250	< 250	< 250	< 250	< 250	< 250
	15.5	8/17/2005	na	na	na	< 1	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 50	< 10	< 5	< 5	< 5	< 5	< 5
B-1	11.5	5/30/2006	< 2.5	**390**	< 10	**55**	< 5000	< 5000	< 5000	< 10000	< 100000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 40000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
	14	5/30/2006	< 5	**480**	< 20	**110**	< 5000	< 5000	< 5000	< 10000	< 100000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 40000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
B-2	7	5/30/2006	< 2.5	**620**	< 10	< 2.5	< 5000	< 5000	< 5000	< 10000	< 100000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000	< 40000	< 5000	< 5000	< 5000	< 5000	< 5000	< 5000
	15	5/30/2006	< 0.05	**0.12**	< 0.2	< 0.05	< 0.5	**0.52**	< 0.5	< 0.5	**20**	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5	< 5	< 20	< 5	< 5	< 0.5	< 0.5	< 5	< 0.5
B-3	7	5/30/2006	< 2.5	0.6	< 10	< 2.5	< 5	< 5	< 5	< 10	< 100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 40	< 5	< 5	< 5	< 5	< 5	< 5
B-4	7	5/30/2006	< 2.5	< 0.1	< 10	< 2.5	< 5	< 5	< 5	< 10	< 100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 40	< 5	< 5	< 5	< 5	< 5	< 5
B-5	7	5/30/2006	< 2.5	< 0.1	< 10	< 2.5	< 5	< 5	< 5	< 10	< 100	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 40	< 5	< 5	< 5	< 5	< 5	< 5
SVP-5	12.5	3/28/2007	na	na	na	< 2.5	na	na	na	na	na	na	na	na	< 5	< 5	< 5	na	na	na	na	< 5	< 5	na	< 5
	14	3/28/2007	na	na	na	**130**	na	na	na	na	na	na	na	na	< 5	< 5	< 5	na	na	na	na	< 5	< 5	na	< 5

Notes:
This table includes results for only those compounds detected in at least one soil sample, and additional selected compounds detected in ground water and/or soil gas samples.
Analysis for VOCs was performed by EPA Method 8260B.
Analysis for TPH was performed by EPA Method 8015M with silica gel cleanup (2004, 2005), EPA 8015B (2006), and EPA 8015B(M) (2007).
Non-detections noted by the less than sign (<) followed by the laboratory reporting limit.
"na" = not analyzed.
ESL = the Environmental Screening Level for residential soil in areas where groundwater is not a current or potential source of drinking water established by the California Regional Water Quality Control, San Francisco Bay Region as presented in the "Screening for Environmental Concerns at Sites with Contamined Soil and Groundwater" document dated February 2005. TPH ESL categorization based on carbon ranges.
PRG = The United States Environmental Protection Agency IX Preliminary Remediation Goal for residential soil; presented for compounds where an ESL has not been established.
NE = Not Established (ESL or PRG)
[1] TPH (middle distillates) ESL value
[2] TPH (gasolines) ESL value
[3] TPH (residual fuels) ESL value

Chemicals:
DCA = Dichloroethane
DCE = Dichloroethene
MEK = Methyl Ethyl Ketone
TCA = Trichloroethane
TCE = Trichloroethylene
TMB = Trimethylbenzene
TPH = Total Petroleum Hydrocarbons

Table 3
Summary of Analytical Results for Ground Water Samples
1001 42nd Street Property
Emeryville/Oakland, California

Boring or Well ID	Date Sampled	TPH Diesel (mg/L)	TPH Gasoline (mg/L)	TPH Motor Oil (mg/L)	TPH Mineral Spirits (mg/L)	TEPH (Non-Diesel) (mg/L)	TPPH (Non-Gasoline) (mg/L)	Kerosene (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Total Xylenes (µg/L)	Acetone (µg/L)	n-Butyl Benzene (µg/L)	sec-Butyl Benzene (µg/L)	tert-Butyl Benzene (µg/L)	1,1-DCA (µg/L)	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	p-Isopropyl toluene (µg/L)	MEK (µg/L)	Naphthalene (µg/L)	n-Propyl benzene (µg/L)	1,1,1-TCA (µg/L)	TCE (µg/L)	1,2,4-TMB (µg/L)	Vinyl Chloride (µg/L)
ESL		0.64[a]	0.5[b]	0.64[c]	0.5[b]	0.64[c]	0.64[c]	0.64[a]	46	130	290	100	1500	NE	NE	NE	47	590	590	NE	14000	24	NE	62	360	NE	3.8
SOIL BORINGS																											
B-1	5/31/2006	< 0.11	**0.46**	< 0.44	< 0.11	na	na	na	< 0.5	**0.65**	< 0.5	**2.7**	**47**	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5	< 5	< 20	< 5	< 5	< 0.5	< 0.5	< 5	< 0.5
B-4	6/7/2006	na	na	na	na	na	na	na	< 0.5	< 0.5	< 0.5	< 0.5	< 20	< 5	< 5	< 5	< 0.5	< 0.5	< 0.5	< 5	< 20	< 5	< 5	< 0.5	< 0.5	< 5	< 0.5
BH-A	10/18/2004	na	na	na	**0.054**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-B	10/18/2004	na	na	na	**1700**	na	na	na	< 2	< 2	< 2	< 4	< 200	**9**	< 4	**7.9**	< 2	< 2	< 2	< 4	< 200	< 4	< 4	< 2	< 2	< 2	< 2
BH-C	10/19/2004	na	na	na	**0.23**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	**2.2**	**3.1**	< 0.5	**4.7**	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	**0.51**
BH-E	10/19/2004	na	na	na	**3.6**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	**1.3**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-F	10/19/2004	na	na	na	IW	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-G	10/19/2004	na	na	na	IW	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	**0.57**	< 0.5	< 0.5
BH-H	10/20/2004	na	na	na	**1200**	na	na	na	< 2	< 2	< 2	< 4	< 200	< 4	**56**	**48**	< 2	< 2	< 2	< 4	< 200	< 4	< 4	< 2	< 2	< 2	< 2
BH-I	10/20/2004	na	na	na	**57**	na	na	na	< 2	< 2	< 2	< 4	< 200	< 4	**35**	**13**	< 2	< 2	< 2	< 4	< 200	< 4	**20**	< 2	< 2	< 2	< 2
BH-J	10/20/2004	na	na	na	**1600**	na	na	na	< 2	< 2	< 2	< 4	< 200	< 4	< 4	**20**	< 2	< 2	< 2	< 4	< 200	< 4	< 4	< 2	< 2	< 2	< 2
BH-K	10/20/2004	na	na	na	**1.3**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-L	10/20/2004	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-M	10/20/2004	na	na	na	**0.072**	na	na	na	< 0.5	**0.64**	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-N	10/21/2004	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-O	10/21/2004	na	na	na	< 0.05	na	na	na	**1.6**	**26**	**2.4**	**13**	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-P	10/21/2004	na	na	na	**0.69**	na	na	na	< 0.5	**0.57**	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-Q	10/21/2004	na	na	na	**110**	na	na	na	< 2	< 2	< 2	< 4	< 200	< 4	< 4	**6.1**	< 2	< 2	< 2	< 4	< 200	< 4	< 4	< 2	< 2	< 2	< 2
BH-R	10/21/2004	na	na	na	**880**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	**4.9**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-S	10/21/2004	na	na	na	**0.52**	na	na	na	< 0.5	**0.64**	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-T	10/21/2004	na	na	na	**11**	na	na	na	**0.7**	**12**	**1.2**	**6.8**	< 50	< 1	< 1	**2**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	**0.9**	< 0.5
BH-U	10/21/2004	na	na	na	**1.6**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	**1**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-W	10/21/2004	na	na	na	**870**	na	na	na	< 1	< 1	< 1	< 2	< 100	< 2	< 2	**26**	< 1	< 1	< 1	< 2	< 100	**2.6**	< 2	< 1	< 1	**4**	< 1
BH-X	11/9/2004	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-Y	11/9/2004	na	na	na	**1400**	na	na	na	< 5	**12**	< 5	**12**	< 500	< 10	< 10	**46**	< 5	< 5	< 5	< 10	< 500	**41**	< 10	< 5	< 5	< 5	< 5
BH-Z	11/9/2004	na	na	na	**59**	na	na	na	< 1	**11**	< 0.5	**7.3**	< 100	< 2	< 2	< 2	< 1	< 1	< 1	< 2	< 100	< 2	< 2	< 1	< 1	< 1	< 1
BH-AA	12/14/2004	na	na	na	**2000**	na	na	na	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 10	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 5	< 5	< 5	< 5
BH-BB	12/14/2004	na	na	na	**1100**	na	na	na	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 10	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 5	< 5	< 5	< 5
BH-DD	12/14/2004	na	na	na	**0.97**	na	na	na	< 0.5	**2.9**	**0.58**	**3.8**	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	**0.8**	< 0.5
BH-EE	8/15/2005	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-FF	8/16/2005	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-II 16-20'	8/16/2005	na	na	na	**0.16**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-II 23-27'	8/16/2005	na	na	na	**0.056**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-II 46-50'	8/16/2005	na	na	na	**0.068**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-JJ	8/16/2005	na	na	na	**0.52**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-KK	8/17/2005	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-LL	8/17/2005	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-MM	8/17/2005	na	na	na	**3.5**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
BH-NN	8/17/2005	na	na	na	< 0.05	na	na	na	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW	IW
MONITORING WELLS																											
BES-1	4/21/1994	**18**	na	na	**12**	na	na	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	12/10/1998	< 1	na	na	**78**	na	na	< 1	< 100	< 100	< 100	< 100	< 2500	na	na	na	< 100	na	na	na	< 5000	na	na	< 100	< 100	na	< 250
	12/14/1999	na	na	na	**72**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	5/28/2003	**19**	**84**	na	**60**	na	na	na	DU	< 0.5	< 0.5	< 0.5	DU	< 0.5	< 0.5	**4.4**	**1.5**	**17**	**2.1**	DU	DU	DU	DU	DU	DU	DU	**20**
	6/18/2003	DU	DU	DU	**120**	DU	DU	na	DU	< 0.5	< 0.5	< 0.5	DU	< 0.5	< 0.5	< 0.5	< 0.5	**14**	< 0.5	DU	DU	DU	DU	DU	DU	DU	**18**
	6/15/2004	Not Sampled Due to Free Product																									
	9/14/2004	Not Sampled Due to Free Product																									
	12/16/2004	Not Sampled Due to Free Product																									
	3/30/2005	Not Sampled Due to Free Product (0.03-feet)																									

Table 3
Summary of Analytical Results for Ground Water Samples
1001 42nd Street Property
Emeryville/Oakland, California

Boring or Well ID	Date Sampled	TPH Diesel (mg/L)	TPH Gasoline (mg/L)	TPH Motor Oil (mg/L)	TPH Mineral Spirits (mg/L)	TEPH (Non-Diesel) (mg/L)	TPPH (Non-Gasoline) (mg/L)	Kerosene (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Total Xylenes (µg/L)	Acetone (µg/L)	n-Butyl Benzene (µg/L)	sec-Butyl Benzene (µg/L)	tert-Butyl Benzene (µg/L)	1,1-DCA (µg/L)	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	p-Isopropyl toluene (µg/L)	MEK (µg/L)	Naphthalene (µg/L)	n-Propyl benzene (µg/L)	1,1,1-TCA (µg/L)	TCE (µg/L)	1,2,4-TMB (µg/L)	Vinyl Chloride (µg/L)
ESL		0.64[a]	0.5[b]	0.64[c]	0.5[b]	0.64[c]	0.64[c]	0.64[a]	46	130	290	100	1500	NE	NE	NE	47	590	590	NE	14000	24	NE	62	360	NE	3.8
	6/27/2005	Not Sampled Due to Free Product (0.02-feet)																									
CW-1	11/12/2003	na	na	na	**0.085**	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	3/12/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	6/15/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	9/14/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 10	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 0.05
CW-2	11/12/2003	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	3/12/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	6/15/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	9/14/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 10	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 0.05
CW-3	11/12/2003	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	**5.1**	DU	< 10
	3/12/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	6/17/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	9/14/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 10	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 0.05
MW-B1	9/30/1991	< 0.05	**18**	na	na	na	na	**29**	**5**	**6**	**250**	**980**	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	6/10/1993	na	na	na	na	**27**	**57**	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	9/29/1993	na	na	na	**43**	na	na	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	5/28/2003	**1100**	**37**	na	**26**	na	na	na	DU	< 2.5	< 2.5	< 2.5	DU	< 2.5	< 2.5	**23**	< 2.5	< 2.5	na	DU	DU	DU	DU	DU	DU	DU	< 2.5
	6/15/2004	Not Sampled Due to Free Product																									
	9/14/2004	Not Sampled Due to Free Product																									
	12/16/2004	Not Sampled Due to Free Product																									
	3/30/2005	Not Sampled Due to Free Product (0.04-feet)																									
	6/27/2005	ıled Due to New Concrete Sidewalk Poured Over Well																									
MW-B2	6/10/1993	na	na	na	na	**3.8**	**1.4**	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	9/29/1993	na	na	na	**290**	na	na	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	12/10/1998	< 1	< 0.05	na	**150**	na	**2.4**	< 1	< 100	< 100	< 100	< 100	< 2500	na	na	na	< 100	na	na	na	< 5000	na	na	< 100	< 100	na	< 250
	12/14/1999	na	na	na	**0.63**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	5/28/2003	**22**	**1.6**	na	**1.1**	na	na	na	DU	< 0.5	< 0.5	< 0.5	DU	< 0.5	**3.2**	**3.2**	< 0.5	< 0.5	na	DU	DU	DU	DU	DU	DU	DU	< 0.5
	6/15/2004	na	na	na	**3**	na	na	na	< 5	< 5	< 5	< 10	< 500	**33**	< 10	< 10	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 5	< 5	< 5	< 5
	9/14/2004	na	na	na	**0.41**	na	na	na	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 10	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 5	< 5	< 5	< 5
	12/16/2004	na	na	na	**0.48**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	**1.4**	**1.8**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
	3/30/2005	na	na	na	**14**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	**4.1**	**5.8**	< 0.5	**0.57**	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	**2.2**
	6/27/2005	na	na	na	**4.3**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	**4.7**	**5.9**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	**2.2**
	3/2/2006	na	na	na	**9.2**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	**1.8**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
MW-B3	6/10/1993	na	na	na	na	**1.7**	**0.51**	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	9/29/1993	na	na	na	**2.4**	na	na	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	12/10/1998	< 0.05	< 0.05	na	**0.12**	na	**0.83**	< 0.05	< 2.0	< 2.0	< 2.0	< 2.0	< 50.0	na	na	na	< 2.0	na	na	na	< 100.0	na	na	< 2.0	< 2.0	na	< 5.0
	12/14/1999	na	na	na	< 0.05	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	5/28/2003	na	na	na	ND	na	na	na	DU	< 0.5	< 0.5	< 0.5	DU	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	na	DU	DU	DU	DU	DU	DU	DU	< 0.5
	6/15/2004	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
	9/14/2004	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
	12/16/2004	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
	3/30/2005	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5
	6/27/2005	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	**0.5**	**3.4**	< 0.5	< 0.5
	3/2/2006	na	na	na	< 0.05	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 1	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.5

Table 3
Summary of Analytical Results for Ground Water Samples
1001 42nd Street Property
Emeryville/Oakland, California

Boring or Well ID	Date Sampled	TPH Diesel (mg/L)	TPH Gasoline (mg/L)	TPH Motor Oil (mg/L)	TPH Mineral Spirits (mg/L)	TEPH (Non-Diesel) (mg/L)	TPPH (Non-Gasoline) (mg/L)	Kerosene (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Total Xylenes (µg/L)	Acetone (µg/L)	n-Butyl Benzene (µg/L)	sec-Butyl Benzene (µg/L)	tert-Butyl Benzene (µg/L)	1,1-DCA (µg/L)	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	p-Isopropyl toluene (µg/L)	MEK (µg/L)	Naphthalene (µg/L)	n-Propyl benzene (µg/L)	1,1,1-TCA (µg/L)	TCE (µg/L)	1,2,4-TMB (µg/L)	Vinyl Chloride (µg/L)
ESL		0.64[a]	0.5[b]	0.64[c]	0.5[b]	0.64[c]	0.64[c]	0.64[a]	46	130	290	100	1500	NE	NE	NE	47	590	590	NE	14000	24	NE	62	360	NE	3.8
MW-B4	6/10/1993	na	na	na	na	**36**	**36**	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	9/29/1993	na	na	na	**1.4**	na	na	na	ND	ND	ND	ND	DU	ND	ND	ND	ND	ND	ND	DU	DU	DU	DU	ND	ND	DU	ND
	12/10/1998	**1**	< 0.05	na	**7.5**	na	**2.7**	< 0.05	< 20	< 20	< 20	< 20	< 500	na	na	na	< 20	DU	DU	DU	< 1000	DU	DU	< 20	< 20	DU	< 50
	12/14/1999	na	na	na	**5.1**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	5/28/2003	**7**	**14**	DU	**0.99**	na	na	na	DU	< 0.5	< 0.5	< 0.5	DU	< 0.5	< 0.5	**2.8**	< 0.5	< 0.5	na	DU	DU	DU	DU	DU	DU	DU	**1.8**
	6/15/2004	na	na	na	**1.3**	na	na	na	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 10	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 5	< 5	< 5	< 5
	9/14/2004	na	na	na	**0.4**	na	na	na	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 10	< 5	< 5	< 5	< 10	< 500	< 10	< 10	< 5	< 5	< 5	< 5
	12/16/2004	na	na	na	**0.45**	na	na	na	< 1	< 1	< 1	< 2	< 100	< 2	< 2	**4.6**	< 1	< 1	< 1	< 2	< 100	< 2	< 2	< 1	< 1	< 1	< 1
	3/30/2005	na	na	na	**3**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	**2**	**6.5**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	**1.3**
	6/27/2005	na	na	na	**2.8**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	**3**	**7.1**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	**1.9**
	3/2/2006	na	na	na	**2.3**	na	na	na	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	**3.5**	< 0.5	< 0.5	< 0.5	< 1	< 50	< 1	< 1	< 0.5	< 0.5	< 0.5	**0.86**
MW-D1	8/26/1988	na	na	na	**1**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	1/18/1989	na	na	na	< 1	na	na	na	DU	**2**	ND	**1.8**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	4/24/1989	na	na	na	< 1	na	na	na	DU	ND	ND	**1.1**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	2/21/1990	na	na	na	< 0.1	na	na	ND	DU	ND	**0.4**	**1.3**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	6/10/1992	na	na	na	< 0.05	na	na	ND	DU	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	6/10/1993	na	na	na	na	**0.22**	**0.23**	na	DU	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	9/24/1993	na	na	na	< 0.05	na	na	na	DU	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	9/29/1993	na	na	na	**0.11**	na	na	na	DU	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	12/14/1999	na	na	na	< 0.05	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	11/12/2003	na	na	na	**0.085**	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	3/12/2004	na	na	na	**0.26**	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	6/15/2004	na	na	na	**0.1**	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	9/14/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 10	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 5
MW-D2	8/26/1988	na	na	na	**1.6**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	1/18/1989	na	na	na	< 1	na	na	na	DU	**6.3**	ND	**12**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	4/24/1989	na	na	na	< 1	na	na	na	DU	ND	ND	**7.7**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	2/21/1990	na	na	na	**0.3**	na	na	na	DU	ND	**0.3**	**1.5**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	6/10/1992	na	na	na	**0.076**	na	na	na	DU	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	6/10/1993	na	na	na	na	**9.1**	**6.2**	na	DU	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	9/24/1993	na	na	na	< 0.05	na	na	na	DU	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	9/29/1993	na	na	na	**0.22**	na	na	na	DU	ND	ND	ND	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	12/10/1998	< 0.05	< 0.05	na	**0.18**	na	**0.095**	< 0.05	< 2	< 2	< 2	< 2	< 50.0	na	na	na	< 2.0	na	na	na	< 100	na	na	< 2.0	< 2.0	na	< 5.0
	12/14/1999	na	na	na	**0.1**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	11/12/2003	na	na	na	**1.4**	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	3/12/2004	na	na	na	**0.33**	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	6/15/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 5	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 10
	9/14/2004	na	na	na	< 0.05	na	na	na	DU	< 5	< 5	< 10	DU	< 5	< 5	< 5	< 5	< 5	< 5	DU	DU	DU	DU	DU	DU	DU	< 5
MW-LD4	9/30/1991	na	na	na	na	na	na	na	**2**	**3.1**	**9**	**24**	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU
	6/10/1993	na	na	na	na	**21**	**1.1**	na	DU	ND	ND	ND	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU
	9/29/1993	na	na	na	**0.7**	na	na	na	DU	ND	ND	ND	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU	DU
	12/10/1998	**0.17**	< 0.05	na	**0.13**	na	**0.083**	< 0.05	< 2.0	< 2.0	< 2.0	< 2.0	< 50	DU	DU	DU	< 2.0	DU	DU	DU	< 100	DU	DU	< 2.0	< 2.0	DU	< 5.0
	12/14/1999	na	na	na	**440**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	1/13/2000*	na	na	na	**630**	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
	6/15/2004	Abandoned																									

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1001 42nd Street Property
Emeryville/Oakland, California

Boring or Well ID	Date Sampled	TPH Diesel (mg/L)	TPH Gasoline (mg/L)	TPH Motor Oil (mg/L)	TPH Mineral Spirits (mg/L)	TEPH (Non-Diesel) (mg/L)	TPPH (Non-Gasoline) (mg/L)	Kerosene (mg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethyl Benzene (µg/L)	Total Xylenes (µg/L)	Acetone (µg/L)	n-Butyl Benzene (µg/L)	sec-Butyl Benzene (µg/L)	tert-Butyl Benzene (µg/L)	1,1-DCA (µg/L)	cis-1,2-DCE (µg/L)	trans-1,2-DCE (µg/L)	p-Isopropyl toluene (µg/L)	MEK (µg/L)	Naphthalene (µg/L)	n-Propyl benzene (µg/L)	1,1,1-TCA (µg/L)	TCE (µg/L)	1,2,4-TMB (µg/L)	Vinyl Chloride (µg/L)
ESL		0.64[a]	0.5[b]	0.64[c]	0.5[b]	0.64[c]	0.64[c]	0.64[a]	46	130	290	100	1500	NE	NE	NE	47	590	590	NE	14000	24	NE	62	360	NE	3.8

Notes:

This table presents the results for all compounds detected in at least one ground water sample, and additional selected compounds detected in soil and/or soil gas samples.
Historical data obtained from historical data reports, which did not always include laboratory reports; in some cases, ERM used data summary tables in creating this table.
Analysis for VOCs was performed by EPA Method 5030C/8260B (2006) and EPA 8260B (all other years).
Analysis for TPH was performed by EPA Method 3510C/8015B (2006) and EPA 8015M with silica gel cleanup (all other years).
mg/L = milligrams per liter (ppm)
µg/L = micrograms per liter (ppb)
< = Non-detections noted by the less than sign (<) followed by the laboratory reporting limit;
na = not analyzed
ND = Not Detected, used in cases where data not available and detection limit unknown
NE = Not Established
IW = the boring contained insufficient water to sample, so no analysis was performed.
DU = data unavailable per ASE Environmental, entries assumed to be ND, since these constituents were not specified on historical data tables as having been detected
* indicates a grab sample.
ESL = the Environmental Screening Levels for areas where groundwater is not a current or potential source of drinking water as established by the California Regional Water Quality Control, San Francisco Bay Region in their "Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater (February 2005)".
TPH ESL categorization based on carbon ranges.
[a] TPH (middle distillates) ESL value
[b] TPH (gasolines) ESL value
[c] TPH (residual fuels) ESL value

Chemicals:

DCA = Dichloroethane
DCE = Dichloroethene
MEK = Methyl Ethyl Ketone
TCA = Trichloroethane
TCE = Trichloroethene
TEPH = Total Extractable Petroleum Hydrocarbons
TMB = Trimethylbenzene
TPH = Total Petroleum Hydrocarbons
TPPH = Total Purgeable Petroleum Hydrocarbons

Table 4
Summary of Analytical Results for Soil Gas Samples
1001 42nd Street Property
Emeryville/Oakland, California

Sample ID	Target Compound Sample Depth (ft bgs)	Sample Date	TPH Mineral Spirits (µg/m³)	BTEX Compounds Benzene (µg/m³)	Toluene (µg/m³)	Ethyl Benzene (µg/m³)	m,p-Xylene (µg/m³)	o-Xylene (µg/m³)	Other VOCs Acetone (µg/m³)	1,3-Butadiene (µg/m³)	n-Butyl Benzene (µg/m³)	sec-Butyl Benzene (µg/m³)	tert-Butyl Benzene (µg/m³)	Carbon Disulfide (µg/m³)	Cyclohexane (µg/m³)	1,1-DCA (µg/m³)	cis-1,2-DCE (µg/m³)
Residential Shallow Soil Gas ESL:			*26,000* [A]	*85*	*63,000*	*420,000*	*150,000*	*150,000*	*660,000*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*	*1,500*	*7,300*
Residential Shallow Soil Gas CHHSL :			*NE*	*36.2*	*135,000*	*NE*	*317,000*	*315,000*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*	*15900*
Off-site Locations:																	
SVP-1	6.0	8/4/2006	< 3,300[B]	< 2.3	**48**	< 3.1	**5.3**	< 3.1	**46**	< 1.6	na	na	na	< 2.2	**3.0**	< 2.9	< 2.8
On-site Locations:																	
SVP-2	6.0	3/28/2007	< 2,600	< 3.1	**9.9**	< 4.3	**4.5**	< 4.3	**26**	**2.2**	na	na	na	< 3.1	< 3.4	< 4	< 3.9
SVP-3	6.0	3/28/2007	< 2,500	**5.6**	**20**	**5.0**	**13**	**5.8**	**30**	**5.4**	na	na	na	**14**	**12**	< 4.1	< 4.1
SVP-4	6.0	3/28/2007	< 2,500	< 3.5	**12**	< 4.8	**5.5**	< 4.8	**34**	**3.8**	na	na	na	< 3.4	< 3.8	< 4.4	< 4.4
SVP-5	6.0	3/28/2007	< 2,500	**6.0**	**15**	< 4.4	**5.7**	< 4.4	**50**	**12**	na	na	na	**4.2**	< 3.5	< 4.1	< 4.1

Sample ID	Target Compound Sample Depth (ft bgs)	Sample Date	Other VOCs (continued) trans-1,2-DCE (µg/m³)	4-Ethyltoluene (µg/m³)	Ethanol (µg/m³)	Heptane (µg/m³)	Hexane (µg/m³)	p-Isopropyltoluene (µg/m³)	MEK (µg/m³)	Naphthalene (µg/m³)	2-Propanol (µg/m³)	n-Propylbenzene (µg/m³)	Tetrahydrofuran (µg/m³)	1,1,1-TCA (µg/m³)	TCE (µg/m³)	1,2,4-TMB (µg/m³)	Vinyl Chloride (µg/m³)
Residential Shallow Soil Gas ESL:			*15,000*	*NE*	*19,000,000*	*NE*	*NE*	*NE*	*210,000*	*71*	*NE*	*NE*	*NE*	*460,000*	*1,200*	*NE*	32
Residential Shallow Soil Gas CHHSL :			*31,900*	*NE*	*NE*	*NE*	*NE*	*NE*	*NE*	*31.9*	*NE*	*NE*	*NE*	*991,000*	*528*	*NE*	13.3
Off-site Locations:																	
SVP-1	6.0	8/4/2006	**21**	< 3.5	**310**	**3.6**	**6.3**	na	**5.0**	na	**140**	< 3.5	< 2.1	< 3.9	< 3.9	< 3.5	< 1.8
On-site Locations:																	
SVP-2	6.0	3/28/2007	< 3.9	< 4.8	< 7.4	< 4	< 3.5	na	**3.8**	< 21	< 9.7	< 4.8	< 2.9	**14**	< 5.3	< 4.8	< 2.5
SVP-3	6.0	3/28/2007	< 4.1	**5.5**	**47**	**4.7**	**4.1**	na	**16**	< 21	**24**	< 5.0	**3.9**	< 5.6	< 5.5	**6.4**	< 2.6
SVP-4	6.0	3/28/2007	< 4.4	< 5.4	< 8.3	< 4.5	< 3.9	na	**8.0**	< 23	< 11	< 5.4	< 3.2	**69**	< 5.9	< 5.4	< 2.8
SVP-5	6.0	3/28/2007	< 4.1	< 5.0	< 7.7	< 4.2	< 3.6	na	**25**	< 21	**260**	< 5.0	**17**	< 5.6	< 7.0	< 5.0	< 2.6

Notes:
This table includes results for only those constituents detected in at least one soil gas sample, and additional selected compounds detected in soil and/or ground water samples.
All analyses performed by Air Toxics, Ltd. of Folsom, California.
Analysis for TPH-mineral spirits was performed by Modified EPA Method TO-17.
Analysis for VOCs was performed by Modified EPA Method TO-15 GC/MS Full Scan, which included a target analyte list of 62 compounds (SVP-1) and 64 compounds (SVP-2 to SVP-5).
µg/m³ = micrograms per cubic meter
bgs = below ground surface
ESL = Environmental Screening Level, from California Regional Water Quality Control Board - San Francisco Bay Region, *Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater, Volume 1* , Interim Final February 2005.
CHHSL: California Human Health Screening Levels, from California EPA *Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties* , January 2005.
NE = ESL or CHHSL has not been established
[A] TPH (gasoline) ESL value, in µg/m³
[B] TPH soil vapor result was analyzed by NIOSH 1550 GC/FID and originally reported as <50 µg. Based on a sample volume of 15L, as indicated in the report, the result was converted to µg/m³.
Isopropyl alcohol was used for detecting leaks within the sampling system.

Chemicals:
DCA = Dichloroethane
DCE = Dichloroethene
MEK = Methyl ethyl ketone
TCA = Trichloroethane
TCE = Trichloroethene
TMB = Trimethylbenzene
TMB = Trimethylbenzene

Table 5
Summary of Chemical Detections in All Media
1001 42nd Street Property
Emeryville/Oakland, California

Constituent	Soil Detections	Ground Water Detections[1]	Soil Gas Detections	Is This a Likely Compound of Concern Associated with Historical Site Operations?
TPH Diesel	Analyzed in only a small subset of samples; results all non-detect	Analyzed in only a small subset of samples; results at several locations > SL	na	Yes - TPH as a class is the primary constituent of concern at the site. Results reported for specific fractions should not be relied upon to reflect solely that fraction, due to the degradation that is likely to have occurred over time and variations in pattern matching. Further analytical testing, including fingerprinting, would be required to assess more reliably the specific fractions present in the samples.
TPH Gasoline	Analyzed in only a small subset of samples; detections (>SL) at two offsite locations (B-1 & B-2)	Analyzed in only a small subset of samples; results at several locations > SL	na	
TPH Mineral Spirits	Routinely detected; most detections lower than SL – exceedances onsite in SE corner and offsite in 41st Street and at B-1	Routinely detected at concentrations > SL in ground water collected from borings and from wells in former UST vicinity (MW-B1, MW-B2, MW-B4); detections also >SL in 2003 BES-1 samples	Results all non-detect	
TEPH (Non-Diesel)	na	Analyzed in only a small subset of samples; none recently (2004 or later)	na	
TPPH (Non-Gasoline)	na	Analyzed in only a small subset of samples; none recently (2004 or later)	na	
TPH Kerosene	na	Analyzed in only a small subset of samples; none recently (2004 or later)	na	
Benzene	Results all non-detect	Sporadic detections at concentrations < SL in ground water collected from borings; no detections in samples collected recently from wells (2004 or later)	Two low detections near detection limits in onsite samples; both <SL	no
Toluene	Results all non-detect except one off-site detection	Several detections at concentrations < SL in ground water collected from borings; no detections in samples collected recently from wells (2004 or later)	Detected in all samples; all detections <SL	no
Ethyl benzene	Results all non-detect	Sporadic detections at concentrations < SL in ground water collected from borings; no detections in samples collected recently from wells (2004 or later)	One low detection near detection limit in onsite sample; detection <SL	no
Xylenes	Results all non-detect	Sporadic detections at concentrations < SL in ground water collected from borings; no detections in samples collected recently from wells (2004 or later)	Detected in all samples; all detections <SL	no
Acetone	Detections in slightly more than 10% of samples (SW corner of Site & in 41st Street); all detections <SL	One detection at concentration < SL in ground water collected from borings; no detections in samples collected recently from wells (2004 or later)	Detected in all samples; all detections <SL	no
1,3-Butadiene	na	na	Low detections in all on-site samples; no SL for comparison	no
n-Butyl Benzene	Results all non-detect	One detection in ground water collected from boring BH-B; one detection in June 2004 sample collected from MW-B2; no SL established for comparison; both locations near former sump/UST	na	no
sec-Butyl Benzene	One detection near former sump (BH-I); detection <SL	Detections in ground water collected from borings BH-C, BH-H, an d BH-I, in the immediate vicinity of the former sump and USTs along the southern property boundary; several detections in recent samples collected from MW-B2 and MW-B4; no SL established for comparison	na	no

[1] The summaries of detections in ground water samples focus on recent results (2004 and later).

Table 5
Summary of Chemical Detections in All Media
1001 42nd Street Property
Emeryville/Oakland, California

Constituent	Soil Detections	Ground Water Detections[2]	Soil Gas Detections	Is This a Likely Compound of Concern Associated with Historical Site Operations?
tert-Butyl Benzene	Detections in slightly more than 10% of samples (south-central portion of Site & in sidewalk and 41st Street); all detections <SL	Detections in several ground water samples collected from borings; several detections in recent samples collected from MW-B2 and MW-B4 (and from MW-B1 during the last sampling round in 2003 in which it was included); no SL established for comparison	na	no
Carbon Disulfide	Results all non-detect	Results all non-detect	Two low on-site detections; no SL for comparison	no
Cyclohexane	Results all non-detect	na	Two low detections (2006 and 2007); no SL for comparison	no
1,1-DCA	Results all non-detect	No detections in recent ground water samples (from 2004 and later)	Results all non-detect	no
cis-1,2-DCE	Results all non-detect	One detection <SL in ground water collected from boring BH-C, in the immediate vicinity of the former sump and UST along the southern property boundary; one detection <SL and near detection limit in recent sample collected from MW-B2 (and in BES-1 during the last sampling round in 2003 in which it was included)	Results all non-detect	no
trans-1,2-DCE	Results all non-detect	No detections in recent ground water samples (from 2004 and later)	One detection in off-site sample, <SL	no
Ethanol	na	na	One off-site, one on-site detection; both <SL	no
4-Ethyltoluene	na	na	One low on-site detection near detection limit; no SL for comparison	no
Heptane	na	na	One off-site and one onsite detection, both low, near detection limits; no SL for comparison	no
Hexane	na	na	One off-site and one onsite detection, both low, near detection limits; no SL for comparison	no
p-Isopropyl toluene	Detections in soil samples from BH-Y, -Z, -AA, -BB, and –CC; no SLs established	Results all non-detect	na	no
MEK	Results all non-detect	Results all non-detect	Detected in all samples; all detections <SL	no
Naphthalene	One detection <SL at BH-Z, in southwest corner of main building	Only two detections, both in ground water samples collected from borings (BH-W and BH-Y); BH-Y detection (from western edge of Office and Printing Building) >SL	Results all non-detect	no
2-Propanol	na	na	Three low detections (2006 and 2007); no SL for comparison	no

[2] The summaries of detections in ground water samples focus on recent results (2004 and later).

Table 5
Summary of Chemical Detections in All Media
1001 42nd Street Property
Emeryville/Oakland, California

Constituent	Soil Detections	Ground Water Detections[3]	Soil Gas Detections	Is This a Likely Compound of Concern Associated with Historical Site Operations?
n-Propylbenzene	Results all non-detect	Only one detection, in ground water sample collected from boring BH-I, near the former sump; no SL available for comparison	Results all non-detect	no
Tetrahydrofuran	Results non-detect in the few samples for which it was analyzed	Results non-detect in the few samples for which it was analyzed	Two low on-site detections; no SL for comparison	no
1,1,1-TCA	Results all non-detect	Only one low detection, in ground water sample collected from MW-B3; at detection limit and <SL	Two on-site detections; both <SL	no
TCE	Results all non-detect	One low detection at detection limit in ground water sample collected from boring BH-G adjacent to former furniture refinishing building; one low detection <SL, in ground water sample collected from MW-B3	Results all non-detect	no
1,2,4-TMB	Results all non-detect	Only three detections in ground water samples, collected from borings BH-T, BH-W, and BH-DD; no SL established for comparison	One low on-site detection near detection limit; no SL for comparison	no
Vinyl chloride	Results all non-detect	One low detection at detection limit in ground water sample collected from boring BH-G near former sump; several detections <SL in ground water samples collected from MW-B2 and MW-B4; detections >SL in 2003 BES-1 samples	Results all non-detect	yes

SL = Screening level, taken from one of the following: California Human Health Screening Levels (CHHSLs; Department of Toxic Substances Control, January 2005), Environmental Screening Levels (ESLs, San Francisco Bay Regional Water Quality Control Board, February 2005); Preliminary Remediation Goals (PRGs, Region IX Environmental Protection Agency, October 2004)

na = Not Analyzed

[3] The summaries of detections in ground water samples focus on recent results (2004 and later).

Table 6
Comparison of Results Using Published Methods for Estimating In-Situ Product Thickness
1001 42nd Street Property
Oakland, California

Measured hydrocarbon thickness in the soil (cm)	de Pastrovich *et al*. (1979)	Hall *et al*. (1988)	Blake and Hall (1984)	Ballestero *et al*. (1994)	Schiegg (1985)	Farr *et al*. (1990)	Lenhard and Parker (1990)
---	1.1	-6.5	-16	-16	-28	2.3	7.1
1	12	50.5	1.1	1.1	29	24.3	74.3
3	13	55.5	4.4	4.4	34	26.2	80.2
7	13.9	60.5	9.7	9.7	39	28.1	86.1
13	16	71.5	13.4	13.4	50	32.4	99.1

References:

Ballestero, T.P., F.R. Fiedler and N.E. Kinner, 1994. An investigation of the relationship between actual and apparent gasoline thickness in a uniform sand aquifer, *Ground Water*, 32(5):708-718.

Blake, S.B. and R.A. Hall, 1984. Monitoring petroleum spills with wells: some problems and solutions, Proceedings, Fourth National Symposium on Aquifer Restoration and Groundwater Monitoring, National Water Well Association, Columbus, OH, pp. 305-310.

de Pastrovich, T.L., Y. Baradat, R. Barthel, A. Chiarelli, and D.R. Fussell, 1979. Protection of ground water from oil pollution, CONCAWE, The Hague, Netherlands.

Farr, A..M., R.J. Houghtalen, and D.B. McWhorter, 1990. Volume estimation of light nonaquous phase liquids in porous media, *Ground Water*, 28(1):48-56.

Hall, R.A., S.B. Blake, and S.C. Champlin, Jr., 1984. Determination of hydrocarbon thickness in sediments using borehole data, *Proceedings, Fourth National Symposium on Aquifer Restoration and Groundwater Monitoring*, National Water Well Association, Columbus, OH, pp.300-304.

Lenhard, R.J. and J.C. Parker, 1990. Estimation of free hydrocarbon volume from fluid levels in monitoring wells, *Ground Water*, 28(1):57-67.

Schiegg, H.O., 1985. Considerations on water, oil, and air in porous media, *Water Science and Technology, 17:467-476.*

Table 7
Remedial Technologies and Process Options
1001 42nd Street Property
Oakland, California

General Response Action	Remedial Technology	Process Option	Applicable Media	Description	Effectiveness	Implementability	Cost	Summary of Screening
No Action	No Action	None	soil/ground water/LNAPL/soil vapor	No institutional controls or treatment.	Not effective for protecting human health and environment.	Implementable but not acceptable to the general public or government agencies.	None	Required as a baseline for comparison by the National Contingency Plan. Retained.
Institutional Controls / Limited Action	Institutional Control	Deed Notification /Restriction, Water Use Notification /Restriction	soil/ground water	Implement deed notification to inform future owners of the presence of potentially hazardous substances at the 1001 42nd Street property and /or implement deed restriction to restrict future use of the property. Implement deed restriction to restrict installation of new wells at the property.	Effectiveness for protection of human health would depend on enforcement of and compliance with deed restrictions.	Technically implementable. Specific legal requirements and authority would need to be met.	Low capital	Potentially applicable in combination with other technologies. Retained.
	Access Control	Fencing /warning signage	soil	Construct fencing and signage to control property access by the general public thereby reducing potential exposure to chemicals of concern.	Effective for reducing exposure risk to the general public provided fencing and signage is maintained in the long term.	Technically implementable but not consistent with future land use.	Low capital.	Not consistent with current and future land use. Not retained.
	Long Term Monitoring	Ground Water Monitoring	ground water	Long term monitoring of the monitoring well network to assess plume stability and contaminant concentration trends over time.	Effective for tracking VOC distribution over time.	Technically implementable. Majority of monitoring well network already established.	Low capital. Moderate O&M.	Potentially applicable in combination with other technologies. Retained.
Containment	Physical Ground Water Barrier	Low Permeability Wall	ground water/LNAPL	Construction of a low-permeability vertical barrier to restrict ground water flow and LNAPL contaminant migration in the downgradient direction. Long-term monitoring of containment structure required.	Effective for containing impacted ground water or providing a barrier for ground water/LNAPL treatment systems. Would need to be implemented in association with additional active treatment technologies to reduce contaminant mass.	Technically implementable in accessible areas. Difficult to implement due to presence of underground utlilities and existing structures.	High capital. Moderate O&M.	Difficult to implement. Not retained.
	Hydraulic Ground Water Barrier	Ground Water Pumping	ground water/LNAPL	Ground water pumping or injection to establish capture zone and restrict ground water flow and LNAPL contaminant migration in the downgradient direction.	Effective for containing impacted ground water and LNAPL. Not effective at reducing concentrations in area downgradient of barrier.	Technically implementable. Treatment of extracted ground water may be required depending on influent contaminant concentrations. Maintenance of a hydraulic barrier requires extensive injection or extraction well network connected with significant conveyance piping.	High capital and O&M.	Not effective at reducing concentrations downgradient from the extraction barrier. Not retained.
In Situ Treatment	Biological Treatment	Natural Attenuation	soil/gound water/LNAPL	Reduction of concentrations through naturally occurring processes such as dilution, volatilization, biodegradation, or adsorption. Sampling and analysis of ground water samples for indicators of natural attenuation is generally included.	Effective for VOCs and TPH, but may take a long time without source removal. Effectiveness evaluated through periodic monitoring of chemical concentrations as well as indicators of attenuation byproducts.	Technically implementable. Would require installation of more extensive network of monitoring wells to provide adequate performance monitoring.	Low capital. Moderate O&M. Low overall cost relative to active remediation options.	Applicable in combination with source removal technologies. Retained.
		Enhanced Anaerobic Bioremediation	soil/gound water/LNAPL	Injection of a carbon source (electron donor) material into the contaminated zone to stimulate degradation of polychlorinated VOCs through reductive dechlorination. Typical injectates include acetate, lactate, and food-grade oils. Can be supplemented with addition of specific degrading microbes to enhance overall effectiveness.	Effective for polychlorinated VOCs. However, daughter compounds such as dichloroethene and vinyl chloride are much more difficult to dechlorinate.	Technically implementable. Bench testing would be required to evaluate biodegradation conditions.	Moderate capital. Low O&M. Moderate cost relative to other in situ treatment options.	Less effective for primary contaminant, TPH, and less chlorinated VOCs than aerobic biodegradation. Not retained.
		Enhanced Aerobic Bioremediation	soil/gound water/LNAPL	Injection of oxygen or oxygen-releasing material into or upgradient of the contaminated zone to enhance degradation of organic compounds through aerobic respiration.	Effective for non-halogenated VOCs, SVOCs, and fuels. More effective for dichloroethene and vinyl chloride.	Technically implementable. Bench testing would be required to evaluate biodegradation conditions.	Moderate capital. Low O&M. Moderate cost relative to other in situ treatment options.	Effective for primary contaminant, TPH, and less chlorinated VOCs than aerobic biodegradation. Applicable in combination with other technologies. Retained.
		Bioventing	soil	Induce air flow in the subsurface by extraction or injection of air to enhance aerobic biodegradation.	Effective at enhancing biodegradation for TPH and VOCs that are amenable to aerobic biodegradation (generally non-halogenated VOCs and VOCs with 1 or 2 halogen substitutions such as dichloroethene and vinyl chloride).	Technically implementable.	Low capital. Moderate O&M. Low overall cost relative to other in situ options.	Applicable in combination with other remedial technologies. Retained.
In Situ Treatment	Physical Treatment	Soil Flushing	soil/LNAPL	The extraction of contaminants from soil or LNAPL with passage of aqueous solution through in-place soils using an injection or infiltration process. Extraction fluids must be recovered from underlying aquifer. Applicable for more soluble contaminants.	Applicable for VOCs and TPH. Presence of fine grained soils limits effectiveness.	Technically implementable. However, there has been little commercial application. Regulatory concerns over potential to wash contaminants beyond fluid capture zones and introduction of surfactants in to the subsurface make permitting difficult.	High capital and O&M. High cost relative to other in situ options.	High cost relative to other in situ treatment options. Not retained.
		Soil Vapor Extraction	soil/soil vapor	Vacuum is applied through extraction pipes to create a pressure/concentration gradient in impacted areas, which induces gas-phase volatiles to diffuse through soil to extraction wells. The process includes a system for treating off-gas. Air flow also induces aerobic bioremediation of some contaminants. Generally applied to highly volatile contaminants.	Moderate effectiveness for VOCs, light TPH fractions, and ozone. Less effective for heavier TPH. Effectiveness limited in low permeability soils where SVE is diffusion limited.	Technically implementable. May require installation of vapor extraction wells and an above-ground treatment system.	High capital. Moderate O&M.	Applicable in combination with other technologies. Retained.

General Response Action	Remedial Technology	Process Option	Applicable Media	Description	Effectiveness	Implementability	Cost	Summary of Screening
		In-Well Air Stripping	ground water	In-well aerators perform air stripping of ground water within the well. Ground water is not removed from the well, but is circulated between an upper and lower screen in the well. Volatile compounds enter the vapor phase and are recovered and treated by a vapor extraction system.	Effective for VOCs, SVOCs and fuels. Less effective for LNAPL. Relies on adequate groundwater flow within an induced recirculation cell, which may be prohibited by layered nature of subsurface soils.	Layered nature of soils would significantly reduce radius of influence of this technology, increasing the number of recirculation wells required.	High capital. Moderate O&M.	Low effectiveness due to heterogeneous soils. Not effective for addressing LNAPL. Not retained.
		Air Sparging	ground water	Air is injected into the saturated zone to induce mechanical stripping and volatilization of contaminants. Introduction of oxygen also enhances aerobic biodegradation. SVE is required to capture vapor phase contaminants.	Effective for VOCs and fuels. Effective removal dependant on ability to sparge adequate air and to remove resultant vapor through SVE. Pilot testing would be required to determine effectiveness. Requires closely spaced SVE wells to effectively capture vapor phase contaminants.	Technically implementable. Heterogeneous soils may require numerous sparge wells and associated SVE wells for adequate effectiveness. Pilot testing will be necessary to determine spacing of sparge wells and operation parameters.	High capital. Low O&M. High cost relative to other in situ treatment options due to required number of wells, extent of equipment, and depth of impacts.	Not expected to be cost effective relative to other technologies. Not retained.
		Passive Skimming	LNAPL	Passive skimmers are placed in product recovery wells at the water table to collect LNAPL through a hydrophobic filter into a reservoir.	Effective for LNAPL. Relies on gravity to collect the LNAPL and, therefore, may have a limited radius of influence.	Technically implementable. Would require installation of product recovery wells.	Low capital. Moderate O&M.	Applicable to LNAPL-impacted areas. Retained
		Vacuum Enhanced Skimming	LNAPL/soil vapor	As with passive skimming, skimmers are placed in product recovery wells at the water table to collect LNAPL through a hydrophobic filter into a reservoir. A low vacuum is applied to induce flow toward the skimmers. Vapor phase treatment of the extracted soil vapor may be necessary.	Effective for LNAPL. The addition of a low vacuum increases the radius of influence compared to passive skimming without generating a significant amount of extracted ground water requiring treatment.	Technically implementable. Would require installation of product recovery wells.	Moderate capital. Moderate O&M.	Applicable to LNAPL-impacted areas. More effective, but higher cost than passive skimming. Retained
	Chemical Treatment	Chemical Oxidation	soil/ground water	Injection of a dilute solution of an oxidant such as potassium permanganate, sodium persulfate, or Fenton's Reagent, into the contaminated zone to directly oxidize VOCs.	Most effective for some organics. Less effective for non-halogenated organic chemicals and LNAPL.	Technically implementable but difficult to achieve sufficient distribution of oxidizing agents in heterogeneous soils.	High capital. Low O&M. High cost relative to other ex situ physical/chemical options.	High cost relative to other in situ treatment options. Less effective for LNAPL treatment than other technologies. Not retained.
		Ozone Sparging	soil/ground water/LNAPL/soil vapor	Sparging of gas-phase ozone to oxidize VOCs in situ. Implemented similarly to air sparging with the addition of ozone to the sparged air. Typically combined with soil vapor extraction. Typically most applicable for high concentration and recalcitrant contaminants.	Ozone can be effective at oxidizing VOCs in ground water. Short-lived ozone requires good distribution for adequate effectiveness. Presence of heterogeneous subsurface soils may limit effectiveness.	Technology is implemented in a similar manner as air sparging, and has similar implementation issues. Pilot testing will be necessary to determine spacing of sparge wells and operation parameters.	High capital. High O&M. High cost relative to other in situ treatment options due to required number of wells and extent of equipment.	More effective at treating LNAPL than chemical oxidation. Applicable in combination with other technologies. Retained.
		Zero-Valent Iron Permeable Reactive Barrier	ground water	Placement of zero-valent iron into the contaminated zone to destroy VOCs through chemically-mediated reductive dechlorination. The zero-valent iron is placed in the form of a reactive barrier wall perpendicular to ground water flow direction. Placement of the zero valent iron may be performed using dug trenches or through high-pressure slurry injection.	Effective for complete destruction of halogenated VOCs. Less effective for non-halogenated VOCs and TPH.	Typically implemented as a reactive barrier wall, treating contaminants passing through wall. Difficult to implement due to existing utilities and structures.	High capital. Negligible O&M. High cost relative to some in situ treatment options.	Difficult and expensive to implement. Not retained.

General Response Action	Remedial Technology	Process Option	Applicable Media	Description	Effectiveness	Implementability	Cost	Summary of Screening
	Thermal Treatment	Electrically Induced Heating	ground water	Electrical current is generated between electrodes installed in the subsurface, which gradually raises the temperature of ground water, thereby enhancing the mobility and volatility of contaminants. This technology also requires an SVE system to control buildup of volatilized contaminants and non-condensable gases.	Effective for VOCs. More effective than steam heating in tight soils. Effective capture of VOCs requires implementation of SVE. Requires closely spaced wells to effectively capture soil vapor in low permeability soils.	Technically implementable, but difficult to implement in areas with surface features because closely space electrodes are required to implement this option. SVE would be required to capture steam and vaporized contaminants. High temperatures will require destruction of existing ground water vapor and monitoring wells and installation of heat resistant wells. Presence of extensive subsurface utilities will require relocation of utilities.	High capital and O&M. High cost relative to other in situ options.	Costly alternative. Not retained.
Removal	Removal/Off-Site Disposal	Excavation	soil	Excavation of impacted material with disposal at an off-site location.	Effective for complete range of contaminant groups.	Implementable for areas of TPH- or VOC-impacted soils, but would be hindered by the presence of site buildings.	High capital, negligible O&M.	Applicable in combination with other technologies. Retained.
Disposal	Off-site Land Disposal	Landfill	soil	Disposal of impacted soil at a permitted, off-site landfill	Effective for complete range of contaminant groups.	Technically implementable. Impacted soil must be profiled and meet land disposal restrictions. Pre-treatment may be required if material does not meet certain restrictions.	Moderate to high capital depending on types of waste present. Negligible O&M	Applicable in combination with excavation. Retained.
	Off-site Disposal	Discharge to Publicly-Owned Treatment Works (POTW)	ground water	Discharge of extracted ground water to the sanitary sewer for conveyance to a local POTW for treatment and discharge.	Effective for disposal of extracted ground water.	Technically implementable. Requires sampling to ensure compliance with permit discharge standards. Pre-treatment may be required prior to discharge.	Low capital. Low O&M.	Potentially applicable for disposal of extracted ground water. Retained.
	Disposal at the Property	Injection Wells	ground water	Discharge of extracted ground water back into aquifer using injection wells	Effective for disposal of extracted ground water. May be used in cooperation with other in situ technologies to increase influence, such as in situ oxidation or enhanced bioremediation	Technically implementable. Permits can be difficult to obtain. Low permeability soils may require extensive injection network. Biofouling would be expected as a result of reinjecting extracted ground water.	Moderate capital. Moderate O&M.	More costly than POTW discharge, with low implementability. Not retained.
Collection/Ex Situ Treatment	Ground Water Pumping	Extraction Wells or Trenches	ground water/LNAPL	Ground water pumping using extraction wells or trenches. Objectives of ground water extraction include removal of dissolved contaminants and LNAPL from the subsurface and containment of impacted ground water and LNAPL to prevent migration. Most applicable for contaminants which cannot be reliably treated in situ or where immediate containment is required.	Effective for plume containment and source area migration control. Can be implemented in combination with in situ technologies to increase influence of the in situ technology by creating regions of recirculation.	Technically implementable. Biological or iron fouling of extraction wells, conveyance piping and treatment systems is a common problem and may limit system performance. Would require treatment of extracted ground water/LNAPL prior to disposal.	High capital. Moderate O&M.	Potentially applicable for contaminant mass removal in source areas. Retained.
	Chemical/Physical Treatment	Air Stripping	ground water	Extracted water is passed downward against a stream of rising air. The countercurrent stream of air strips VOCs from the water. The resulting VOC-laden air is treated following removal from the vessel, if required.	Effective for removal of VOCs from extracted ground water.	Technically implementable. Treatment of off-gas may be required. Biological or iron fouling can severely limit system performance. Well established ex-situ technology readily provided by vendors.	Moderate capital. Moderate O&M. High cost relative to other ex situ treatment options.	Higher cost relative to other ex situ treatment options. Not retained.
		Thermal Treatment	soil gas	Extracted vapor is passed through a combustion chamber, during which organic compounds are oxidized to harmless by-products such as carbon dioxide and water.	Effective against broad range of volatile organic compounds	Technically implementable. Requires additional utilities, working and equipment area.	High capital and O&M costs. Higher overall cost relative to other ex situ treatment technologies	Higher cost relative to other ex situ treatment options. Not retained.
		Liquid or Gas-Phase Carbon Adsorption	ground water/soil gas	Extracted water or vapor is passed through vessels containing granular activated carbon. Organic compounds with an affinity for carbon are transferred from the aqueous or vapor phase to the solid phase by sorption to the carbon.	Most effective for hydrocarbons and SVOCs. Less effective for lower chlorinated VOCs.	Technically implementable. Streams with high suspended solids (> 50 milligrams per liter) cause fouling and require frequent carbon change-out. Streams with high organic concentrations or NAPL will also require frequent carbon change out. Well established ex-situ technology.	Low capital. High O&M. Moderate cost relative to other ex situ treatment options.	Effective for removing organics prior to disposal (ground water) or release (air). Retained.
		UV Oxidation /Reduction.	ground water	UV light and/or oxidizing chemicals (e.g., hydrogen peroxide) can be used to destroy organic constituents.	Effective for most organic compounds including petroleum hydrocarbons and halogenated VOCs. Chloroethanes may be stripped rather than destroyed requiring off-gas treatment with catalytic oxidation or carbon. Incomplete destruction is possible with some compounds.	Technically implementable. However, iron fouling is likely to affect UV units in the same manner as air strippers. O&M to address potential iron fouling is expected to be time consuming and costly for the UV units.	High capital and O&M.	Higher cost and O&M issues than other ex situ physical/chemical technologies. Not retained.

Notes:
Shading indicates Process Option not retained
O&M = operation and maintenance
SVE = Soil Vapor Extraction
SVOC = semivolatile organic compound
VOC = volatile organic compound
LNAPL = light non-aqueous phase liquid
TPH = total petroleum hydrocarbon
POTW = Publically owned treatment works
UV = ultra violet

Table 8
Comparative Analysis of Remedial Alternatives
1001 42nd Street Property
Emeryville/Oakland, California

Evaluation Criteria	Remedial Alternatives				
	1	**2A**	**2B**	**3**	**4**
	No Action	**Passive Skimming with Monitored Natural Attenuation**	**Low-Vacuum Enhanced Active Skimming with Monitored Natural Attenuation**	**Ozone Sparging with Monitored Natural Attenuation**	**Excavation /Dewatering Removal of Source with Monitored Natural Attenuation**
Effectiveness	Low	Highly effective	Highly effective	Highly effective	Highly effective
Implementability	High	High	High	High	Moderate to High
Cost (Present Worth)	$0	$344,000	$406,000	$759,000	$1,224,000

Table 9
Summary of Costs Associated with Evaluated Alternatives
1001 42nd Street Property
Emeryville/Oakland, California

Alternative	Description	Direct and Indirect Capital Costs	NPW of Total O&M Costs	General Contingency (30%)	Estimated Total Cost
Alternative 1	No Action	$0	$0	$0	**$0**
Alternative 2A	Passive Skimming	$74,100	$190,100	$79,300	**$344,000**
Alternative 2B	Low-Vacuum Enhanced Active Skimming	$178,200	$133,700	$93,600	**$406,000**
Alternative 3	Ozone Sparging	$365,000	$218,200	$175,000	**$759,000**
Alternative 4	Excavation/Dewatering Source Removal	$903,000	$38,100	$282,300	**$1,224,000**

Notes:

Alternatives 2 through 4 include Monitored Natural Attenuation
Alternative 4 does not include costs associated with demolition of buildings to provide access for soil removal

Table 10
Components and Costs of Alternative 2A - Passive Skimming
1001 42nd Street Property
Emeryville/Oakland, California

DESCRIPTION	QUANTITY		COST	
	Number	Unit	Unit Cost	Total Cost
DIRECT CAPITAL COSTS				
Preparation Work				
Installation of Additional Monitoring Wells	4	ea.	$3,000	$12,000
Well Permits (1 permit/well)	9	ea.	$300	$2,700
City Encroachment Permit	1	ea.	$1,000	$1,000
SUBTOTAL				**$15,700**
Vacuum & Skimmer Setup				
Extraction Well Installation	8	ea.	$3,000	$24,000
Passive Skimmers	8	ea.	$850	$6,800
Freight	1	ea.	$200	$200
System Setup	1	LS	$5,000	$5,000
SUBTOTAL				**$36,000**
TOTAL DIRECT CAPITAL COSTS				***$51,700***
INDIRECT CAPITAL COSTS				
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$7,800	$7,800
Engineering and Construction Oversight (15% Total Direct Costs)	1	LS	$7,800	$7,800
Health and Safety Costs (3% Total Direct Costs)	1	LS	$1,600	$1,600
Project Management & Administration (10% Total Direct Costs)	1	LS	$5,200	$5,200
TOTAL INDIRECT CAPITAL COSTS				**$22,400**
TOTAL CAPITAL COSTS (Direct and Indirect)				***$74,100***
O & M COSTS				
Yearly Treatment System O&M [(1)]				
Operation and Maintenance Labor	120	hours	$80	$9,600
Operation and Maintenance Equipment	12	day	$65	$780
Product Disposal	15	gal	$1	$15
Reporting	144	hours	$100	$14,400
Replacment Costs (3% Total Direct Costs)	1	LS	$1,600	$1,600
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$3,700	$3,700
Engineering and Construction Oversight (15% Total Direct Costs)	1	LS	$3,700	$3,700
Health and Safety Costs (3% Total Direct Costs)	1	LS	$700	$700
Project Management & Administration (10% Total Direct Costs)	1	LS	$2,500	$2,500
SUBTOTAL				**$36,995**

Table 10
Components and Costs of Alternative 2A - Passive Skimming
1001 42nd Street Property
Emeryville/Oakland, California

DESCRIPTION	QUANTITY		COST	
	Number	Unit	Unit Cost	Total Cost
Groundwater Monitoring Cost Per Event [2]				
Well Sampling Labor and Equipment	8	wells	$400	$3,200
Ground Water Analysis - VOCs, TPH (8 wells + 50% QA/QC)	12	samples	$200	$2,400
Ground Water Analysis - MNA Parameters (4 wells + 25% QA/QC)	5	samples	$250	$1,250
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$1,000	$1,000
Health and Safety Costs (3% Total Direct Costs)	1	LS	$200	$200
Project Management & Administration (10% Total Direct Costs)	1	LS	$700	$700
SUBTOTAL				**$8,800**
FIRST FIVE YEARS O&M COSTS (treatment O&M and quarterly sampling) (1)(3)				**$160,200**
REMAINING O&M COSTS (annual sampling for 5 years)(3)				**$29,900**
TOTAL O & M COSTS				***$190,100***
TOTAL CAPITAL AND O & M COSTS				***$264,200***
General Contingency (30% of Total Capital and O&M Costs)				***$79,300***
TOTAL COST OF ALTERNATIVE (PRESENT WORTH)				***$344,000***

Notes:
(1) Assume 5 years of operation
(2) Quarterly Groundwater monitoring
(3) Present worth cost based on 5% discount factor

Table 11
Components and Costs of Alternative 2B - Vacuum Enhanced Active Skimming
1001 42nd Street Property
Emeryville/Oakland, California

DESCRIPTION	QUANTITY		COST	
	Number	Unit	Unit Cost	Total Cost
DIRECT CAPITAL COSTS				
Preparation Work				
Work Plan (incl. 35%, 90%, and Final Designs)	1	ea.	$30,000	$30,000
Installation of Additional Monitoring Wells	4	ea.	$3,000	$12,000
Well Permits (1 permit/well)	9	ea.	$300	$2,700
Air Permit	1	ea.	$2,000	$2,000
City Encroachment Permit	1	ea.	$1,000	$1,000
SUBTOTAL				**$47,700**
Vacuum & Skimmer Setup				
Extraction Well Installation	5	ea.	$3,000	$15,000
Active Skimming System (incl. equipment enclosure, control panel, in-well skimmer pumps, air compressor, fittings, tubing, misc. costs)	1	ea.	$18,900	$18,900
Vacuum Blower & Accessories	1	ea.	$4,235	$4,235
200 lb Vapor Carbon Filters	2	ea.	$447	$894
Freight	1	ea.	$850	$850
Piping Installation (trench, install, fill)	500	lf	$50	$25,000
Electrical Installation	1	ea.	$7,000	$7,000
System Startup and Optimization	1	LS	$5,000	$5,000
SUBTOTAL				**$76,900**
TOTAL DIRECT CAPITAL COSTS				***$124,600***
INDIRECT CAPITAL COSTS				
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$18,700	$18,700
Engineering and Construction Oversight (15% Total Direct Costs)	1	LS	$18,700	$18,700
Health and Safety Costs (3% Total Direct Costs)	1	LS	$3,700	$3,700
Project Management & Administration (10% Total Direct Costs)	1	LS	$12,500	$12,500
TOTAL INDIRECT CAPITAL COSTS				**$53,600**
TOTAL CAPITAL COSTS (Direct and Indirect)				***$178,200***

Table 11
Components and Costs of Alternative 2B - Vacuum Enhanced Active Skimming
1001 42nd Street Property
Emeryville/Oakland, California

DESCRIPTION	QUANTITY		COST	
	Number	Unit	Unit Cost	Total Cost
O & M COSTS				
Yearly Treatment System O&M (1)				
Air Sampling and Analysis - VOCs	4	samples	$150	$600
Operation and Maintenance Labor	144	hours	$80	$11,520
Operation and Maintenance Equipment	12	day	$250	$3,000
Product Disposal	125	gal	$1	$125
Electrical Power	1	LS	$5,000	$5,000
Reporting	144	hours	$100	$14,400
Replacment Costs (3% Total Direct Costs)	1	LS	$3,700	$3,700
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$5,200	$5,200
Engineering and Construction Oversight (15% Total Direct Costs)	1	LS	$5,200	$5,200
Health and Safety Costs (3% Total Direct Costs)	1	LS	$1,000	$1,000
Project Management & Administration (10% Total Direct Costs)	1	LS	$3,500	$3,500
SUBTOTAL				**$53,245**
Groundwater Monitoring Cost Per Event (1)				
Well Sampling Labor and Equipment	8	wells	$400	$3,200
Ground Water Analysis - VOCs, TPH (8 wells + 50% QA/QC)	12	samples	$200	$2,400
Ground Water Analysis - MNA Parameters (4 wells + 25% QA/QC)	5	samples	$250	$1,250
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$1,000	$1,000
Health and Safety Costs (3% Total Direct Costs)	1	LS	$200	$200
Project Management & Administration (10% Total Direct Costs)	1	LS	$700	$700
SUBTOTAL				**$8,800**
FIRST TWO YEARS O&M COSTS (treatment O&M and quarterly sampling) (1)(3)				**$99,100**
REMAINING O&M COSTS (annual sampling for 5 years)(3)				**$34,600**
TOTAL O & M COSTS				***$133,700***
TOTAL CAPITAL AND O & M COSTS				***$311,900***
General Contingency (30% of Total Capital and O&M Costs)				***$93,600***
TOTAL COST OF ALTERNATIVE (PRESENT WORTH)				***$406,000***

Notes:
(1) Assume 2 years of system operation
(2) Quarterly Groundwater monitoring
(3) Present worth cost based on 5% discount factor
Assumes 1.5 tons per cubic yard for site soils

Table 12
Components and Costs of Alternative 3 - Ozone Sparging
1001 42nd Street Property
Emeryville/Oakland, California

DESCRIPTION	QUANTITY		COST	
	Number	Unit	Unit Cost	Total Cost
DIRECT CAPITAL COSTS				
Preparation Work				
Work Plan (incl. 35%, 90%, and Final Designs)	1	ea.	$30,000	$30,000
Installation of Additional Monitoring Wells	4	ea.	$3,000	$12,000
Well Permits (1 permit/well)	9	ea.	$300	$2,700
Air Permit	1	ea.	$2,000	$2,000
City Encroachment Permit	1	ea.	$1,000	$1,000
SUBTOTAL				**$47,700**
Ozone Sparging System				
Ozone Sparging & SVE Well Installation	10	ea.	$3,000	$30,000
Ozone Sparging System (incl. master panels, in-well units, below-well sparge units, misc. costs)	1	ea.	$80,000	$80,000
Freight	1	ea.	$500	$500
Injection and SVE Piping Installation (trench, install, fill)	500	lf	$50	$25,000
System Building	1	ea.	$7,000	$7,000
Electrical Installation	1	ea.	$10,000	$10,000
SVE System (incl. blower, ozone decomposer, piping, valves, gauges)	1	ea.	$25,000	$25,000
As-Built Drawings and O&M Manual Preparation	1	LS	$20,000	$20,000
System Startup and Optimization	1	LS	$10,000	$10,000
SUBTOTAL				**$207,500**
TOTAL DIRECT CAPITAL COSTS				***$255,200***
INDIRECT CAPITAL COSTS				
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$38,300	$38,300
Engineering and Construction Oversight (15% Total Direct Costs)	1	LS	$38,300	$38,300
Health and Safety Costs (3% Total Direct Costs)	1	LS	$7,700	$7,700
Project Management & Administration (10% Total Direct Costs)	1	LS	$25,500	$25,500
TOTAL INDIRECT CAPITAL COSTS				**$109,800**
TOTAL CAPITAL COSTS (Direct and Indirect)				***$365,000***

Table 12
Components and Costs of Alternative 3 - Ozone Sparging
1001 42nd Street Property
Emeryville/Oakland, California

DESCRIPTION	QUANTITY		COST	
	Number	Unit	Unit Cost	Total Cost
O & M COSTS				
Yearly Treatment System O&M [(1)]				
Air Sampling and Analysis - VOCs	4	samples	$150	$600
Operation and Maintenance Labor	240	hours	$80	$19,200
Operation and Maintenance Equipment	12	day	$250	$3,000
Electrical Power	1	LS	$5,000	$5,000
Reporting	144	hours	$100	$14,400
Replacment Costs (3% Total Direct Costs)	1	LS	$7,700	$7,700
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$6,300	$6,300
Engineering and Construction Oversight (15% Total Direct Costs)	1	LS	$6,300	$6,300
Health and Safety Costs (3% Total Direct Costs)	1	LS	$1,300	$1,300
Project Management & Administration (10% Total Direct Costs)	1	LS	$4,200	$4,200
SUBTOTAL				**$68,000**
Groundwater Monitoring Cost Per Event (2)				
Well Sampling Labor and Equipment	8	wells	$400	$3,200
Ground Water Analysis - VOCs, TPH (8 wells + 50% QA/QC)	12	samples	$200	$2,400
Ground Water Analysis - MNA Parameters (4 wells + 25% QA/QC)	5	samples	$250	$1,250
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$1,000	$1,000
Health and Safety Costs (3% Total Direct Costs)	1	LS	$200	$200
Project Management & Administration (10% Total Direct Costs)	1	LS	$700	$700
SUBTOTAL				**$8,800**
FIRST THREE YEARS O&M COSTS (treatment O&M and quarterly sampling) (1)(3)				**$185,300**
REMAINING O&M COSTS (annual sampling for 5 years)(3)				**$32,900**
TOTAL O & M COSTS				***$218,200***
TOTAL CAPITAL AND O & M COSTS				***$583,200***
General Contingency (30% of Total Capital and O&M Costs)				***$175,000***
TOTAL COST OF ALTERNATIVE (PRESENT WORTH)				***$759,000***

Notes:
(1) Assume 3 years of system operation
(2) Quarterly Groundwater Monitoring
(3) Present worth cost based on 5% discount factor

Table 13
Components and Costs of Alternative 4 - Excavation/Dewatering
1001 42nd Street Property
Emeryville/Oakland, California

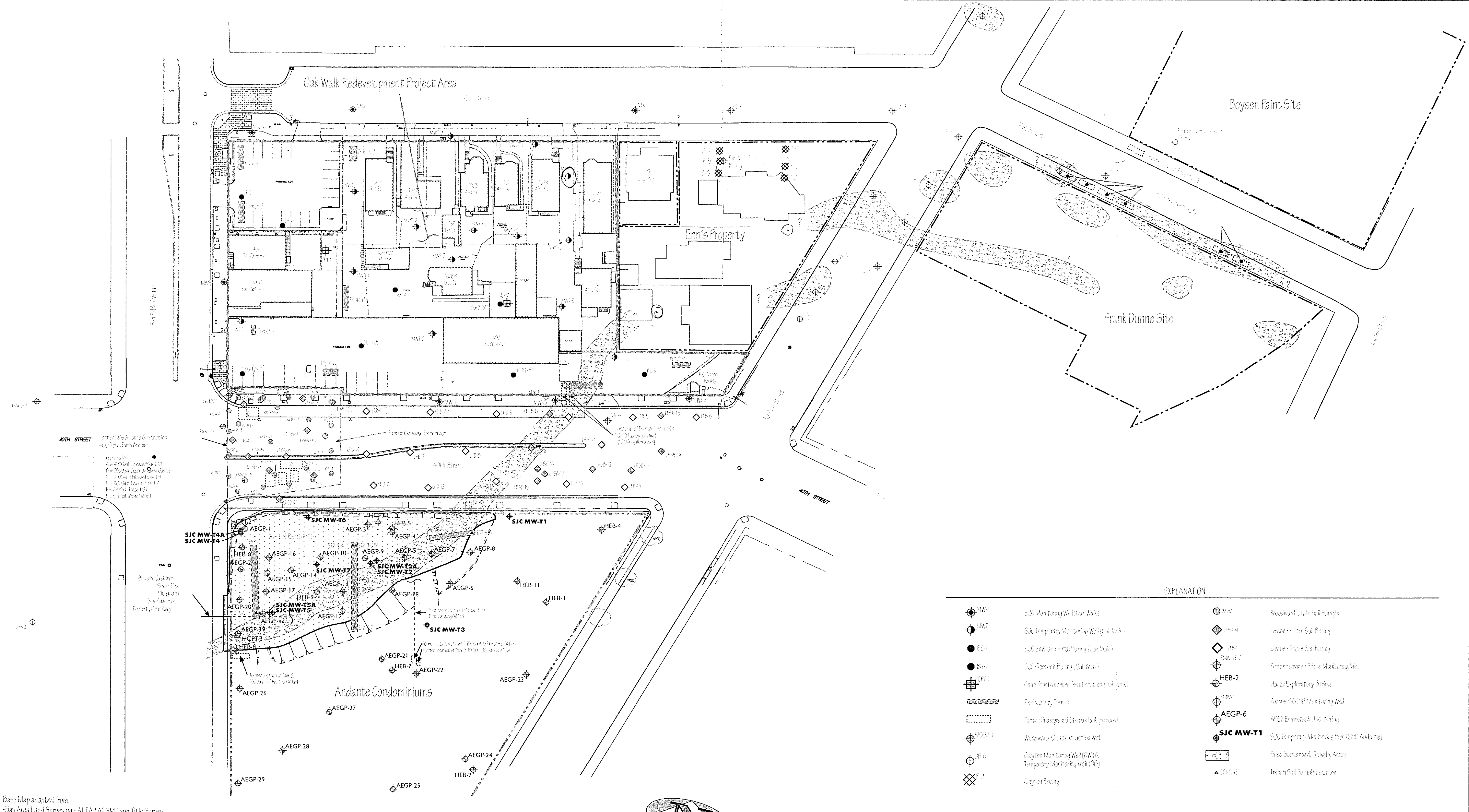
DESCRIPTION	QUANTITY		COST	
	Number	Unit	Unit Cost	Total Cost
DIRECT CAPITAL COSTS				
Preparation Work				
Work Plan (incl. 35%, 90%, and Final Designs)	1	ea.	$30,000	$30,000
Installation of Additional Monitoring Wells	4	ea.	$3,000	$12,000
Well Permits (1 permit/well)	4	ea.	$300	$1,200
POTW Sanitary Discharge Permit	1	ea.	$1,000	$1,000
City Encroachment Permit	1	ea.	$1,000	$1,000
SUBTOTAL				**$45,200**
Excavation & Backfill				
Equipment mobilization	1	ea.	$10,000	$10,000
Excavation, transport, disposal of impacted material	3700	ton	$50	$185,000
Import, placement, compaction of clean backfill	3700	ton	$20	$74,000
Finish surface to match existing (ie asphalt, concrete, etc.)	11100	sf	$25	$277,500
Confirmation Sampling for VOCs & TPH	12	ea.	$200	$2,400
SUBTOTAL				**$548,900**
Dewatering System				
Dewatering pumps	6	mo	$1,400	$8,400
Sedimentation tank	6	mo	$1,500	$9,000
2 - 2,000 lb Liquid Carbon filters	6	mo	$1,665	$9,990
Disposal of treated water	50000	gal	$0.20	$10,000
SUBTOTAL				**$37,400**
TOTAL DIRECT CAPITAL COSTS				***$631,500***
INDIRECT CAPITAL COSTS				
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$94,700	$94,700
Engineering and Construction Oversight (15% Total Direct Costs)	1	LS	$94,700	$94,700
Health and Safety Costs (3% Total Direct Costs)	1	LS	$18,900	$18,900
Project Management & Administration (10% Total Direct Costs)	1	LS	$63,200	$63,200
TOTAL INDIRECT CAPITAL COSTS				**$271,500**
TOTAL CAPITAL COSTS (Direct and Indirect)				***$903,000***

Table 13
Components and Costs of Alternative 4 - Excavation/Dewatering
1001 42nd Street Property
Emeryville/Oakland, California

DESCRIPTION	QUANTITY		COST	
	Number	Unit	Unit Cost	Total Cost
O & M COSTS				
Groundwater Monitoring Cost Per Event				
Well Sampling Labor and Equipment	8	wells	$400	$3,200
Ground Water Analysis - VOCs, TPH (8 wells + 50% QA/QC)	12	samples	$200	$2,400
Ground Water Analysis - MNA Parameters (4 wells + 25% QA/QC)	5	samples	$250	$1,250
Contractor Overhead & Profit (15% Total Direct Costs)	1	LS	$1,000	$1,000
Health and Safety Costs (3% Total Direct Costs)	1	LS	$200	$200
Project Management & Administration (10% Total Direct Costs)	1	LS	$700	$700
SUBTOTAL				**$8,800**
REMAINING O&M COSTS (annual sampling for 5 years)(1)				**$38,100**
TOTAL O & M COSTS				***$38,100***
TOTAL CAPITAL AND O & M COSTS				***$941,100***
General Contingency (30% of Total Capital and O&M Costs)				***$282,300***
TOTAL COST OF ALTERNATIVE (PRESENT WORTH)				***$1,224,000***

Notes:
(1) Present worth cost based on 5% discount factor
Assumes 1.5 tons per cubic yard for site soils
Does not include costs associated with demolition of buildings to provide access for soil removal

Appendix A
Stratigraphy Figures from Prior Investigations



0 40 80

SCALE IN FEET (approximate)

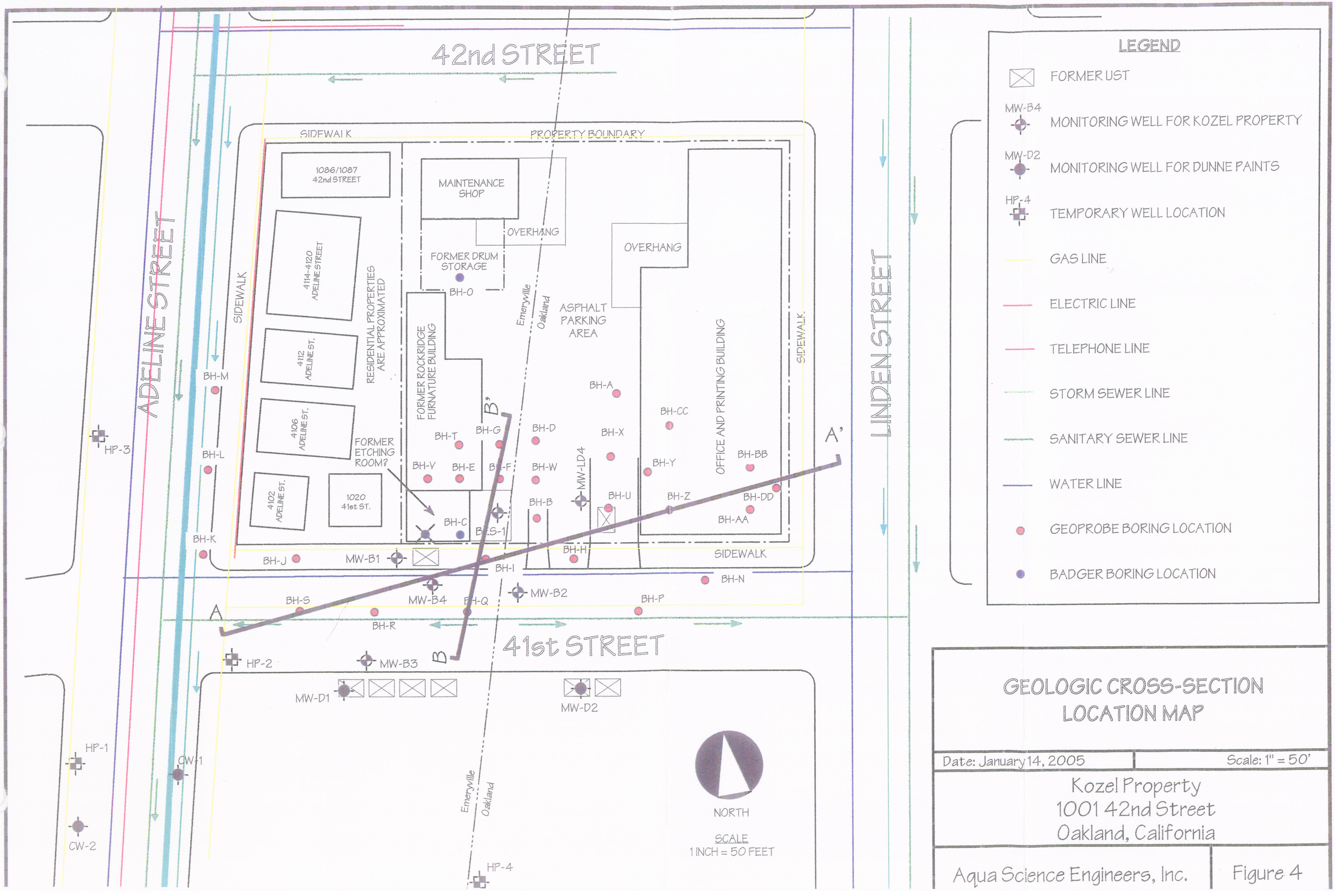
Base Map adapted from:
- Bay Area Land Surveying - ALTA / ACSM Land Title Survey: Portion of Lots 3, 4, 5 & 6 of the H.C. Dohr's Homestead (Nov. 2003)
- Sandis Humber Jones - ALTA / ACSM Land Title Survey; San Pablo Ave. & 40th Street Extension Drawing No. 600104.ALTA (7/25/01)
- Clayton Group Services - Monitoring Well Locations Former Dunner Paints 1007 41st St. Oakland, Figure 2, Project No. 70-03365.04 (12/05/03)
- Clayton Group Services - Historical Subject Property Plan 1007 41st St & 4050 Adeline St., Oakland, Figure 3, Project No. 70-03365.00 (09/06/02)

UNAUTHORIZED RELEASE SITES IN NEIGHBORHOOD OF SUBJECT PROPERTY

Oak Walk Redevelopment Project

Emeryville, California

FIG I-4	**The San Joaquin Company Inc.**	Project Number: 0004.084	
		Drawn by: GNM	Date: 04/25/06



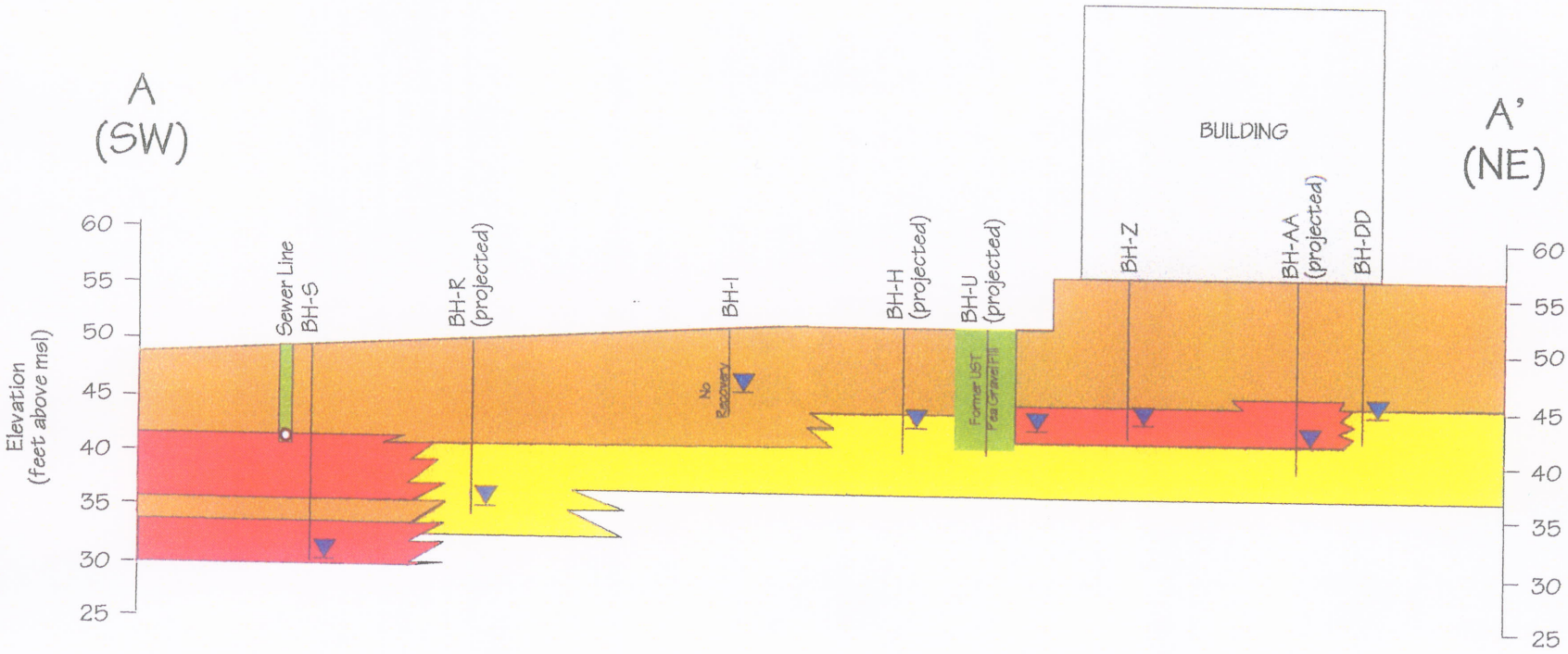
GEOLOGIC CROSS-SECTION LOCATION MAP

Date: January 14, 2005 | Scale: 1" = 50'

Kozel Property
1001 42nd Street
Oakland, California

Aqua Science Engineers, Inc. | Figure 4

GEOLOGIC CROSS-SECTION A- A'



LEGEND

- Soil of low to very low permeability
- Soil of medium permeability
- Soil of high permeability
- Fill material
- Water Level

0 50

Feet (Horizontal)

Horizontal Scale: 1" = 50'

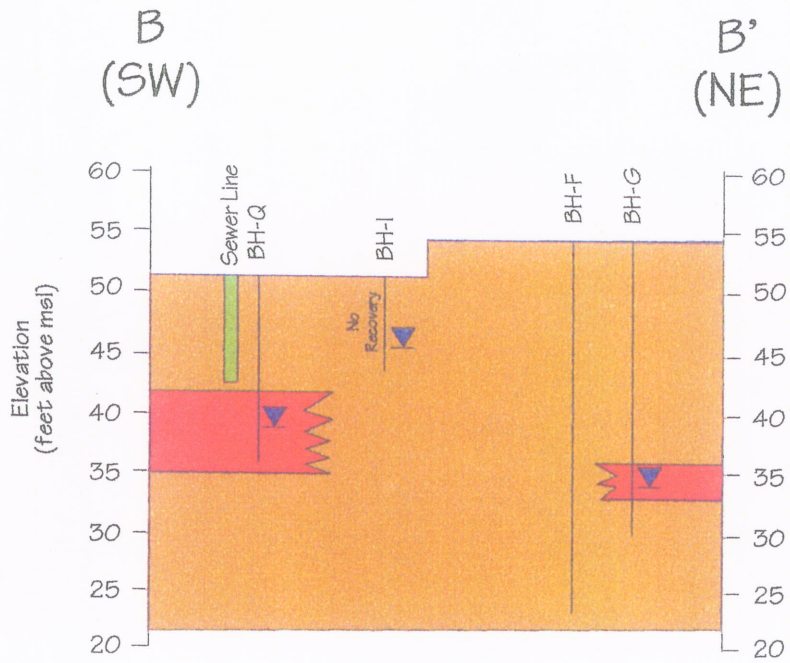
Vertical Exaggeration: 3 x

Geologic Cross Section A-A'

Kozel Property
1001 42nd Street
Oakland, California

AQUA SCIENCE ENGINEERS, INC. | Figure 5

GEOLOGIC CROSS-SECTION B- B'



LEGEND

- Soil of low to very low permeability
- Soil of medium permeability
- Soil of high permeability
- Fill material
- Water Level

0 — 50

Feet (Horizontal)

Horizontal Scale: 1" = 50'

Vertical Exaggeration: 3 x

Geologic Cross Section B-B'

Kozel Property
1001 42nd Street
Oakland, California

AQUA SCIENCE ENGINEERS, INC. | Figure 6